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Oral Health: Quantification of Quality Measures

Prof. (Dr.) Vinod Sachdev,
Director-PG Studies, I.T.S Centre for Dental Studies and Research, Muradnagar.
Editor-in-chief

You don't have to be a mathematician to have a feel for numbers! John Forbes Nash, Jr. being an astute geometrician himself, couldn't have said more. This *feel for numbers* has witnessed an interest in 'Big Data' grown exponentially in modern times. Research calls, commercial insights, and government ascendancies, all seem to be directed on exploiting the potential of technology to seize and analyze massive amounts of data in tangibly creative demeanors. Speaking of which, the data in dental health domain is as rich since it is gathered from various sources like public health surveys, census inferences, national health registries, electronic health records, genomic data etc.

The Global Burden of Disease (GBD) study is an ongoing global epidemiologic study, begun in 1990, based on big data science to provide timely information on changes in disease distribution and adverse health impacts on universal population.[(1)] The global burden of oral disease has revealed a whooping number of 3.6 billion people worldwide to be affected by ravages of dental caries thereby affecting oral health from an economic standpoint also. For example, yearly direct and indirect treatment costs due to dental diseases on a overall scale were estimated at US$298 billion and US$144 billion respectively, equivalent to an average of 4.6% of global health expenditure for the former. The findings underline the challenge in responding to the diversity of urgent oral health needs internationally, predominantly in developing communities.

But that is just one part of the story. Numbers are just numbers if not manipulated well. Reflecting back on the quantification of an enormous pool of data in dental health, technology has played an evolutionary role in rendering the populations better informed regarding their oral health. In this regard, the bio-pyscho-social aspect of oral health has been stressed upon, with the Fédération Dentaire International (FDI) very recently having proposed a contemporary definition of Oral Health.[(2)]

The FDI now defines Oral Health as:

Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex.

Further attributes related to the definition state that oral health:[(3)]

- Is a fundamental component of health and physical and mental well-being. It exists along a continuum influenced by the values and attitudes of individuals and communities;
- Reflects the physiological, social and psychological attributes that are essential to the quality of life;
- Is influenced by the individual's changing experiences, perceptions, expectations and ability to adapt to circumstances.

The magnificently articulated definition by its sole virtue encompasses nearly all the realms of philosophies idealized worldwide by different set of populations, oral health importantly, a prudent effort to occlude potential gaps and at the same time being adopted by 200 dental associations across the globe, already translated into six United Nations (UN) languages. A hallmark step indeed.

Owing to a significant impact of oral health on quality of life, and a gradual awareness regarding the same, collective efforts need to be exercised, to ultimately attain a healthier future. Our institute, the I.T.S-CDSR, focuses on this aspect carefully with meticulously organized community participation programs as well as grooming healthy practices in tiny-

tots presenting to our clinics. A visionary insight is the need of the hour to realize our dream of 'growing up cavity free'!

I wish you readers a happy experience while turning around the pages of this wonderful manuscript. Should there be further comments or questions, please feel free to ping an e-mail or contact the editorial board of the journal.

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Dental Discomfort Questionnaire: correlated with clinical manifestations of advanced dental caries in young children

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Abstract

Introduction: Pain is a complex and multidimensional phenomenon. The assessment of pain in children is a challenge for health care professionals, as their cognitive capacities are still underdeveloped, so indirect ways of assessing pain are of great importance.

Aim and Objectives: The present study was carried out to assess the correlation between the dental caries experience and Dental Discomfort Questionnaire (DDQ) in children aged between 2 to 5 years.

Materials and Method: The study sample consisted of sixty children, aged between 2 to 5 years. A self- structured questionnaire recording their demographic details and family structure, was given to the parents / guardians along with DDQ, which is to be filled in all aspects. Each child was examined for recording dental caries experience using the WHO criteria (1997) and advanced dental caries were assessed using the PUFA / pufa scale.

Results: The study revealed that all the sixty children suffered from dental caries but only fifty percent of them reported having toothache. The mean DDQ scores and DMFT scores were 4.27 ± 3.03 and 7.13 ± 5.24, respectively. A statistically significant positive correlation was observed between the DDQ scores and dental caries ($r = 0.40$, $p < 0.05$).

Conclusion: As children face difficulty in reporting the exact nature of dental pain, the DDQ seems to be an effective and functional instrument which can be used by the parents to recognize toothache in their children.

Keywords: Dental Discomfort Questionnaire (DDQ), PUFA / pufa, Dental Pain, Oral health related quality of life (OHRQoL).

Introduction

Pain, an unpleasant sensation, has physiological, psychological as well as emotional components.[1] Due to the strong psychological and emotional basis, pain is perceived differently by different individuals. Furthermore, in young children who are cognitively immature, both pain perception and expression becomes ambiguous.[1,2] Pain evaluation, which is an important component of patient care, is strongly influenced by age, developmental status, cognitive and communication skills, past pain experience and cultural beliefs.[1] This demands age specific tools for pain assessment.

Although self-report measures are the gold-standard for pain assessment, they demand a certain level of cognitive and language development.[3] In order to overcome this drawback, observational (behavioral) pain assessment tools, which assess crying, facial expressions, body postures/movements etc have been developed.[4,5] These methods are flawed in that they are highly subjective, and clinicians may be unable to assess the vagaries of child's pain expression.[6] The next avenue that has been assessed is using a parent-proxy to evaluate pain. Research has shown that parents can offer clinically valid assessment of pain and distress in their children.[7,8]

Like any other acute/ chronic painful conditions, dental pain perception in young children is complex and very difficult to assess. Toothache can manifest in numerous ways influencing a child's behavior.[9] It is these behavioral cues which may help parents and clinicians identify pain experience in young children. Based on the recognition of these behavioral effects of children in pain by parents/ guardians, the Dental Discomfort Questionnaire (DDQ) was developed. It has been shown to have good predictive value when assessing toothache in children (aged 2-4 years).[10,11]

Dental caries in children has been shown to adversely impact the oral health related quality of life (OHRQoL).[12] This undesirable effect on children's OHRQoL is usually a consequence of toothache which results from advanced odontogenic infections like, deep dentinal caries, pulpal involvement, abscess, etc.[13,14] These manifestations of untreated dental caries can be assessed by using the PUFA / pufa index.

Thus we planned the present study to assess the relationship between DDQ scores and the clinical consequences of untreated dental caries in children aged 2 to 5 years.

Materials and Method

Sample: A study cohort consisting 60 children, between the age of 2 to 5 years and their parents were randomly selected from the patients reporting to the Department of Pedodontics and Preventive Dentistry, of the institute. The children were included in the study, if they fulfilled the following criterion:

1. Boys and girls in the age range of 2 to 5 years.
2. No associated systemic illness.
3. The children could be either verbal or preverbal.

4. The parents can understand spoken English or Hindi.
5. Parents, who were unaware of their child's dental caries status.

After the parents had understood the aim, methodology and risk/benefits of the study, their written consent was obtained for inclusion of their child in the study.

Questionnaire: The questionnaire was pretested prior to the start of the study to check for parental understanding and reproducibility and was completed by the parents in the presence of the investigator prior to the clinical examination of the child. It consisted of two parts; the first part included information regarding the parents socioeconomic status (SES) and the second part consisted Dental Discomfort Questionnaire (DDQ).[15]

The first portion of the DDQ questionnaire was concerned with the level of parent's awareness regarding their child suffering from toothache. The parents were questioned if he/ she ever noticed that the child suffered from toothache. This question could be answered by choosing one of the following options: "never", "sometimes", "often", and "I don't know."

The second portion of the questionnaire consisted of eight questions regarding different behaviors displayed by children affected with toothache or any dental discomfort. The questions could be answered on a 3-point scale: 0 "never", 1 "sometimes" and 2 "often". The sum of scores for the second portion of DDQ could thus range between 0-16.

Oral examination: The investigator was calibrated to carry out intraoral examination of children before the start of the study to evaluate both dental caries (WHO Index, 1997) as well as clinical manifestations of advanced dental caries (PUFA/pufa Index, 2010).[16,17] The intra examiner reliability was assessed by re-examining 10% of the sample population, and with a (Kappa score = 0.85) was observed.

The PUFA / pufa index was scored separately from the DMFT/dmft. The pufa scores the presence of visible pulpal involvement (p), ulceration of the oral mucosa (u), presence of a fistula (f) or abscess (a). The PUFA / pufa score per subject has calculated in a cumulative way similar to DMFT/dmft.

A CPI ball-ended probe was utilized for the dental caries examination as described by WHO.[17] Initial carious lesions could not be assessed. PUFA / Pufa scores were obtained visually without the use of any instruments.

Statistical Methods: All the data was analyzed using the SPSS 22.0 software package for statistical analysis. Descriptive statistics were applied to assess the mean dmft / dmfs, pufa and DDQ scores. The association between DDQ, dmft / dmfs and pufa was assessed using Pearson's correlation coefficient. The statistical significance was set at < 0.05.

Results

Sample demographics: The study cohort comprised of 60 children out of which 40 (66.7%) were males and 20 (33.3%) were females. The subjects were categorized into three age groups; 2-3 years (n=21), 3-4 years (n=14), 4-5 years (n=25).

The children included in the study came from varied socioeconomic backgrounds and were assessed using the Kuppuswamy's socioeconomic status (SES) scale.[18] The distribution of children according to their SES was as follows:-4 (6.7%), 35 (58.3%) and 35 (35%), from the lower, middle and upper SES, respectively.

Dental findings: All children included in the study were affected by dental caries. The mean DMFT / dmft (± SD) was found to be 7.13 (± 5.24) and the mean dmfs (±SD) was 13.83 (± 11.76). The overall prevalence of pufa scores in the cohort was 37(61%). Mean pufa (± SD) was found to be 2.18 ± 2.82.

Out of the total sample, 30 (50%) children who had a dmft score >1 suffered from toothache, while 53 (88%) of the children who had positive pufa scores, had toothache. Parents of only 4 (6%) children who had a positive pufa scores reported that the child never suffered from a toothache, and 3 (5%) responded by saying that they did not know (Table 1).

Table 1: Percentage of decayed teeth (dmft >1) and clinical manifestations of untreated dental caries (pufa >1) linked to reported prevalence of toothache

	Toothache	**No Toothache**	**I do not know**	**Total**
dmft > 1	30 (50%)	21 (35%)	9(15%)	60(100%)
dmft = 0	0	0	0	0
pufa >1	53(88%)	4 (6%)	3(5%)	60(100%)

pufa assesses four different odontogenic infections, it is the pulpal component (p) which mostly contributed towards the pufa score (56.66%) followed by the presence of abscess (a) and ulceration (u) (15 % each) and lastly the presence of fistula (13.3%).

Pain data: After questioning the care givers about specific pain related behaviors (DDQ) the mean DDQ score (± SD) was found to be 4.27 ± 3.03. When analyzing each of the eight behaviors for positive prediction of toothache, two of the eight behaviors were more frequently observed i.e. problems chewing and problem with brushing upper teeth (Table 2).

Table 2: Percentage of children with or without toothache demonstrating specific behaviors on Dental Discomfort Questionnaire

Behaviors from the DDQ ('sometimes' or 'often')	Children with decayed teeth and Toothache (n=30)	Children with decayed teeth without toothache (n=30)
Problems with brushing upper teeth	23 (76%)	2 (6%)
Puts away something nice to eat	20 (66%)	11 (37%)
Problems with brushing lower teeth	08 (26%)	1 (3%)
Bits with molars instead of front teeth	21 (70%)	13(43%)
Chewing at one side	19 (63%)	13 (43%)
Problems chewing	24 (80%)	10 (33%)
Reaching for the cheek while eating	18 (60%)	5 (17%)
Crying during meals	10 (33%)	7 (23%)
Proportion of children with a score 4 or higher on the DDQ	27(90%)	6(20%)

Our study found a positive correlation between the average DDQ score and the dmft/dmfs, as well as, pufa scores. A highly statistically significant correlation was noted between DDQ scores and the severity of dental caries assessed by using both dmfs and pufa index(Table 3). No significant association was observed with the family's socioeconomic status.

Table 3: Correlation of DDQ score with mean dmft/dmfs, pufa scores and SES

	Mean score	Pearson correlation	Sig. (p-value < 0.005)
DDQ	4.27 ± 3.03	-	-
dmft	7.13 ± 5.24	0.40	0.002*
dmfs	13.83 ± 11.76	0.51	0.00**
pufa	2.18 ± 2.82	0.53	0.00**
SES	22.18 ± 8.15	-.164	0.211

Discussion

Pain experience is innately subjective and is influenced by the interaction of physiologic, psychologic, developmental and behavioral factors. Cognitive and emotional immaturities in young children (2-5years) make it difficult for them to present with a reliable description of pain thus, toothache recognition is highly complex. It is important that we devise methods to identify pain experience in this age bracket in order to provide effective and timely treatment.

Considering a child's cognitive sequence of development various pain assessment tools were developed according to different age groups.[15] Since subjective reports of pain (e.g. visual analogue scale, Faces scale, etc.) in young children remain unreliable, thus observational pain-assessment tools were introduced for pre-school children to rate the intensity of behavioral distress due to pain using behavioral cues, such as vocalizations, body movements, facial expression, etc.[2] Although clinicians may observe these changes, parents are in a better position to interpret their children's expression of pain, as they are aware of their child's disposition, temperament and daily activities. Parents can thus detect any changes in a child's behavior pattern resulting from a painful experience and thereafter interpret the degree of pain based on verbal communication.

Like other painful experiences, dental pain adversely affects a child's quality of life (QoL).[19] An imperative predictor for the onset of dental pain in children is presence of carious teeth. Filstrup et al, reported that young children with decayed teeth and toothache manifested behavioral changes in their eating/ sleeping habits and daily activities.[20] Likewise, Easton et al, in their study compared acute to chronic dental pain, and concluded that both influenced a child's QoL.[19] Since toothache affects the behavior pattern / QoL of a child, a parent proxy tool was developed namely, the Dental Discomfort Questionnaire (DDQ) (Versloot et al, 2006), to assess toothache in young children aged 2-5 years, where self-report scales cannot be utilized.[15] Extensive interviews with parents led to the formulation of the DDQ, which consists of eight questions related to specific behaviors presented by children when suffering from toothache.

In our study, of these eight behaviors, three were more commonly reported; Problems chewing, Problems with brushing upper teeth and Bites with molars instead of front teeth (Table 2). The reason may be that most children evaluated in our study had carious anterior teeth and thus were more likely to bite with their molars, and continue with this behavior after treatment because of the absence of the teeth. Another study found similar results showing problems brushing upper teeth and bites with molars.[21]A study carried out by Versloot et al, specifically identified the following behaviors to be more commonly reported: Pushes away something nice to eat, problems brushing upper or lower teeth, problems chewing and reaching for the cheek while eating.[15]

When assessing toothache using this parental questionnaire, we found that 50% of the children with decayed teeth suffered from toothache according to the parents (Table 1). This is in line with the 48% found in an earlier study where DDQ was used.[22] This finding may have resulted from the fact that the children without toothache were either suffering from initial/ enamel or dentinal caries, or the parents failed to identify toothache in their child. Literature has shown it is not mere presence of untreated dentinal carious lesions in primary teeth which would be causative factor for toothache.

When evaluating the correlation between the DDQ score and various dental caries assessment parameters; we found a positive correlation with caries prevalence

(dmft), but a stronger positive correlation with caries severity (dmfs), as well as, clinical consequences of odontogenic infections (pufa score). These findings may result from the fact that greater the severity of dental caries, more likely is a child to display pain related behaviors, as supported by previous literature.[23]

The classical DMFT/dmft index only provides information on caries status and restorative aspects but fails to present an overview of the clinical consequences of untreated dental caries, such as pulp involvement, dental abscess, fistula, ulceration, etc. It is these parameters which possibly influence a child's QoL than the carious lesion itself.[24] It is for this reason that the PUFA/pufa scale was developed. The reason for the strong positive correlation between pufa and DDQ scores may be that toothache in children can be objectively assessed only when the carious lesion process reaches advanced stages of odontogenic infections. Other studies have also shown that a primary tooth with a positive pufa score is statistically more likely to be painful.[24]

Furthermore, we assessed the DDQ scores with the families SES. No significant correlation was found between the two. Unlike the findings of our study, Barrette et al (2009) in his study found toothache to be associated with poor SES.[25] The fact that our study did not find any correlation may be due to the reason that our sample size was small resulting in an uneven distribution with regard to the SES. A more extensive study with a larger population cohort should be planned to assess the influence of other factors, such as, SES, family structure, parental education level, etc. on the parental perception of dental pain experience in their child.

Conclusion

Thus, we would like to conclude by saying that initial toothache in children may go unrecognized and the child's misery resulting from a carious tooth may extend gratuitously. It is thus important to train parents in identifying behavioral changes in their child to help predict and manage dental pain in young children. Additionally the pufa index should be used alongside current caries assessment tools, as it will provide a better determinant of child's oral health status and help plan hierarchical and robust oral health programs to meet treatment needs.

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Evaluation of knowledge, attitude and practice among post-graduate staff and post-graduate students of dental colleges in Navi Mumbai for diagnosis, monitoring and management of patients with impaired glucose tolerance: a questionnaire survey

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Abstract

Objectives: To evaluate and compare the knowledge, attitude and practice among post-graduate staff and post-graduate students of dental colleges in Navi Mumbai for diagnosis, monitoring and management of patients with impaired glucose tolerance through a set of 18-item multiple- choice closed ended objective questions.

Materials & Method: The cross-sectional questionnaire survey was conducted among post-graduate staff and post-graduate students of various dental specialties in dental colleges of Navi Mumbai during March – April 2015. The validated questionnaire consisted of 18-item closed ended questions based on recent literature and updated American Diabetic Association Guidelines (ADA) in 2014. Total of 605 individuals participated in the survey out of which 240 were post-graduate staff and 365 were post-graduate students.

Results: After the questionnaire was collected out of 605 participants, 509 participants (84.13% response rate), met the inclusion criteria out of which 202 (39.69%) were PG Staff and 307 (60.31%) were PG Students. The results showed that PG Staff members were very much aware about the diagnosis, monitoring and management of patients with impaired glucose tolerance (IGT) as compared to PG students. The knowledge of PG staff was considerably higher, probably due to their clinical exposure.

Conclusion: The study emphasizes the need for better instillation of diagnosis, monitoring and management protocols for impaired Glucose tolerance (IGT) and guidelines as standardized by ADA amongst both the post-graduate staff members and post-graduate students of dental colleges in Navi Mumbai in order to achieve prevention and better control of diabetes mellitus and its complications.

Keywords: Impaired glucose tolerance test, Diabetes mellitus, American Diabetic Association, Knowledge, Attitude

Introduction

Insulin resistance and compensatory hyperinsulinemia are intimately linked to the metabolic syndrome, a combination of abdominal obesity, hypertension, and dyslipidemia that is associated with increased vascular diseases. The American Diabetes Association issued new classification and diagnostic criterion for diabetes in 1997.(1) These criterion were modified in 2003 to include the diagnosis of impaired fasting glucose and impaired glucose tolerance. Prediabetes is an intermediate state between normoglycaemia and diabetes, where the glucose levels are higher than normal but not significant enough to be diagnosed with diabetes mellitus. Prediabetes includes either impaired glucose tolerance (IGT) i.e. post prandial blood sugar (PPBS) 140-199mg/dl or impaired fasting glucose (IFG) i.e. fasting blood sugar (FBS) 100-125mg/dl alone or combination of both IGT and IFG. Impaired glucose tolerance (IGT) serves as a marker for the state of insulin resistance. Early detection of this status and treatment can prevent development of Diabetes Mellitus and also reduces complications during dental treatment, especially in pre-diabetic subjects having combined IGT and IFG. To achieve prevention and better control of diabetes mellitus and its complications, dentists should be aware about the diagnosis, monitoring and management of the patients with IGT. The purpose of the present survey was to evaluate and compare the knowledge, attitude and practice among post-graduate staff members (PG-S) and post-graduate students (PG-s) of various dental specialities of dental colleges in Navi Mumbai for diagnosis, monitoring and management of patients with IGT.

Materials and Method

A questionnaire was prepared based on recent literature and updated American Diabetes Association Guidelines 2014. PG-S and PG-s of various dental colleges in Navi Mumbai were invited to participate in the survey. This survey was conducted after procuring permission from the head of institutions during March 2015. The one time cross-sectional survey form consisted of 18-item multiple choice questions with single best answer, out of which 8 were based on diagnosis, 5 on monitoring and 5 on management. A team of 10 experts from MGM dental college did content validation and face validation of the questionnaire from department of Endocrinology, Internal Medicine and department of Pharmacology. The validity was examined by evaluating whether the questions in the questionnaire are correct and comprehensive reflection of the concept of the questionnaire which is intended to be measured is

correct. Reliability was tested by asking the pilot sample to complete the questionnaire on two separate occasions i.e. 2 weeks apart. Consistency of the questionnaire was evaluated using Cronbach's Alpha (0.80). The Ethical approval was obtained from the Ethics Committee of the MGM dental college, Kamothe, Navi Mumbai. The participation was voluntary and responses were anonymous. The participants were given questionnaire in hand and were given a duration of twenty minutes to complete the questionnaire so as to maximize respondent's compliance. Participants were not permitted to ask questions, share answers or to refer to any reference material. Partially filled or unfilled or incomplete questionnaire were excluded from the study.

Statistical analysis was performed using SAS statistical package (version 9.0; SAS Institute, Inc., Cary, NC). The results were expressed as frequencies (percentages) for quantitative variables. Chi-square test was used to test differences in proportions. A *p* value of < 0.05 was considered significant.

Results

Total 605 individuals participated in the survey out of which 240 were PG-S and 365 were PG-s. After the questionnaire was collected out of 605 participants, 509 participants (84.13% response rate), met the inclusion criteria out of which 202 (84.16%) were PG-S and 307 (84.10%) were PG-s. The various responses for the questions posed to the PG-S and PG-s regarding diagnosis, monitoring and management of IGT are given in (Table 1).

Table 1: Questionnaire responses of the participants regarding management of IGT

Questions	Options	Total population (n=509)	
		PG Staff (n=202) (%)	PG Student (n=307)
Q.1 Conditions that may cause IGT	a) Infection	53 (73.76)	156 (50.82)
	b) Trauma	62 (30.69)	45 (14.66)
	c) Cystic Fibrosis	159 (78.71)	218 (71.01)
	d) Hypothyroidism	27 (13.37)	92 (29.97)
	e) Down Syndrome	30 (9.77)	22 (10.89)
	f) Carpel Tunnel Syndrome	------	11 (3.58)
	Totally correct	25 (12.37)	8 (2.6)
Q.2 Drugs that may cause IGT	a) Antimalarial	------	-----
	b) Alpha interferon	48 (23.76)	44 (14.33)
	c) Glucocorticoids	172 (85.15)	248 (80.78)
	d) Mineralocorticoids	------	13 (4.24)
	e) Oral contraceptives	149 (73.76)	232 (75.57)
	f) Thiazides	83 (41.09)	82 (26.71)
	Totally correct	43 (21.28)	26 (8.47)
Q.3 Most appropriate method of collecting blood sample for checking BSL	a) Capillary blood	80 (39.6)	236 (76.87)
	b) Venous blood	122 (60.4)	71 (23.13)
Q.4 Do you have Glucometer in your operatory?	a) Yes	43 (21.29)	16 (5.21)
	b) No	159 (78.71)	291 (94.79)
Q.5 Above what levels of BSL will you infers patient has IGT?	a) ≥110mg%	43 (21.29)	21 (6.84)
	b) ≥126mg%	-----	57 (18.57)
	c) ≥140mg%	157 (77.72)	134 (43.65)
	d) ≥120mg%	2 (0.99)	95 (30.95)
Q.6 What is the lower limit of FBSL?	a) ≥110mg%	38 (18.81)	9 (2.93)
	b) ≥126mg%	164 (81.19)	198 (64.59)
	c) ≥140mg%	------	65 (32.18)
	d) ≥120mg%	------	35 (39.09)
Q.7 Most reliable test to diagnose diabetes?	a) Random blood sugar	-----	155 (50.49)
	b) Post-prandial blood sugar	38 (18.81)	55 (17.92)
	c) Fasting blood sugar	145 (71.78)	92 (29.97)
	d) Oral glucose tolerance test	19 (9.41)	5 (1.63)
Q.8 Most reliable test for diagnosing gestational Diabetes?	a) Fasting blood sugar	------	------
	b) Oral glucose tolerance test	142 (71.3)	26 (8.47)
	c) Post-prandial blood sugar	------	------
	d) Random blood sugar	60 (29.7)	281 (91.53)

Q.9 Good control in HbA1c?	a) 6.0%-6.5% b) 7.0%-7.5% c) 7.5%-8.0% d) 6.5%-7.0%	159 (78.71) 43 (21.29) ------ ------	99 (32.25) 208 (67.75) ------ ------
Q.10 Glycated fructosamine measures BSL over a period of?	a) 1-2 weeks b) 2-3 weeks c) 3-4 weeks d) 2-4 weeks	----- 173 (85.64) 29 (14.37) -----	----- 129 (42.02) 177 (57.66) -----
Q.11 How many hours patient is asked to fast before checking the FBSL level	a) Atleast 6 hrs b) Atleast 8 hrs c) Atleast 10 hrs d) Atleast 12 hrs	35 (17.33) 149 (73.76) 18 (8.91) -----	76 (24.76) 91 (29.64) 140 (45.60) -----
Q.12 Instruction to the patient before Post- prandial blood sugar level?	a) Have regular meals 2 hrs before the test b) Have 75gms of glucose 2 hrs before the test c) Have your regular meals 3 hrs before the test d) Have 100gms of glucose 2 hrs before the test	145 (71.78) 57 (28.22) ------ ------	260 (84.69) 46 (14.98) 1 (0,33) -------
Q.13 When do you advise a patient to get test done for blood sugar levels?	a) Routinely b) Only if the patient is symptomatic c) Only in patients with history of diabetes d) Only if patient has to undergo surgical procedure	94 (46.54) 68 (33.66) 40 (19.80) ------	59 (19.22) 107 (34.85) 141 (45.93) ------
Q.14 What test you advise to a diabetic patient before surgery?	a) Random blood sugar b) Post-prandial blood sugar c) Fasting blood sugar d) Glycated haemoglobin	----- 136 (67.33) ----- 66 (32.67)	29 (9.45) 220 (71.66) ----- 58 (18.89)
Q.15 If elective surgery is to be performed what is the maximum post prandial BSL at which you will operate?	a) 200-250mg/dl b) 250-300mg/dl c) 300-350mg/dl d) >350mg/dl	200 (90.01) 2 (0.99) ----- -----	299 (97.40) 8 (2.61) ------ ------
Q.16 If emergency surgery is to be performed at 250mg/dl post prandial BSL what will you do?	a) Give patient antibiotic and start the surgery b) Take physicians consent	------ 202 (100)	------ 307 (100)
Q.17 Which all emergency drugs you have in your operatory?	a) Glucose powder b) Glucagon (1mg I.M) c) Sodium bicarbonate d) Dextrose (0.5% I.V)	202 (100) 27 (13.37) 13 (6.44) 12 (5.94) All: 4 (1.98%)	307 (100) 8 (2.61) 4 (1.3) -----
Q.18 Is there a need for continuing education programme?	a) Yes b) No	201 (99.51) 1 (0.49)	307 (100) -----

The conditions that may be responsible for IGT were correctly identified by 25 (12.37%) PG-S and 8 (2.6%) PG-s. Around 43 (21.28%) PG-S and 26 (8.47%) PG-s correctly identified the drugs that may be responsible for causing IGT. 122 (60.4%) PG-S and 71 (23.13%) PG-s decorously marked that the most appropriate method of collecting blood for testing blood sugar levels is venous blood. 43 (21.29%) PG-S and 16 (5.21%) PG-s confirmed that they have glucometer at their work place. Blood sugar levels of ≥ 140mg/dl are indicative of IGT that was marked correctly by 157 (77.72%) PG-S and 134 (43.65%) PG-s. The lower

most limit that is indicative of FBSL is ≥ 126mg/dl that was responded correctly by 164 (81.19%) PG-S and198 (64.59%) PG-s. FBSL is the most reliable test to diagnose diabetes that was responded correctly by 145 (71.78%) PG-S and 92 (29.97%) PG-s. Oral glucose tolerance test is the most appropriate method to diagnose gestational diabetes that was responded correctly by 142 (71.3%) PG-S and 26 (8.47%) PG-s. Values in the range of 6.0%-6.5% are considered as good control in HbA1c that was answered correctly by 159 (78.71%) PG-S and 99 (32.25%) PG-s. Glycated fructosamine measures BSL over a period of 2-3 weeks that was responded correctly by 73 (85.64%) PG-S and 129 (42.02%) PG-s. Patients are asked to be nil by mouth for atleast 8 hours before checking the FBSL level that was marked correctly by 149 (73.76%) PG-S and 91 (29.64%) PG-s. Patients are to be instructed to have 75gms of glucose 2hrs before checking the Post-prandial blood sugar level that was marked correctly by 57 (28.22%) PG-S and 46 (14.98%) PG-s. Around 94 (46.54%) PG-S and 59 (19.22%) PG-s are of the opinion that the patients should be asked to get their blood sugar levels checked routinely. Glycated hemoglobin is considered as the most appropriate method to check control of diabetes before any surgical procedure was marked correctly by 66 (32.67%) PG-S and 58 (18.89%) PG-s. 200 (90.01%) PG-S and 299 (97.40%) PG-s answered that at post-prandial blood sugar levels of 200-250mg/dl an elective surgery can be performed. 202 (100%) PG-S and 307 (100%) PG-s believe that it is necessary to take physicians consent before any surgical procedure if the post-prandial blood sugar levels are above 250mg/dl. Glucose powder, glucagon (1mg I.M), sodium bicarbonate and dextrose (0.5% I.V) are the emergency drugs that should be present in all the operatory units that were marked correctly by 4 (1.98%) PG-S and none of the PG-s student marked all the options. 201 (99.51%) PG-S and 307 (100%) PG-s felt that there is a need for continuing education in regards to IGT.

Discussion

This survey was conducted to evaluate the knowledge of diagnosis, monitoring and management of IGT on a representative sample of PG-S and PG-s of various dental colleges in Navi Mumbai. The following were the significant findings: (1) a significant disparity exists in the level of knowledge of diagnosis, monitoring and management of IGT between the PG-S and PG-s. (2) The knowledge about IGT was significantly lower in PG-s than in PG-S. The probable reason could be because the PG-S are professionals particularly dedicated to continuous medical education, with longstanding experience in diabetes care and high academic levels on an average.

Infections, trauma, cystic fibrosis, Down syndrome[(1)] are amongst the various conditions that may be responsible for IGT, 25 (12.37%) PG-S and 8 (2.6%) PG-s correctly identified the various causes of IGT. Alpha interferon, Glucocorticoids, Oral contraceptives and Thiazides may be responsible for causing IGT,[(1)] 43 (21.28%) PG-S and 26 (8.47%) PG-s correctly identified these drugs. 122 (60.4%) PG-S and 71 (23.13%) PG-s decorously marked that the most appropriate method of collecting blood for testing blood sugar levels is venous blood that is in accordance with Boyd et al.[(2)] 43 (21.29%) PG-S and 16 (5.21%) PG-s confirmed that they have glucometer at their work place. In 1997 and 2003, the Expert Committee on Diagnosis and Classification of Diabetes Mellitus[(3)] recognized an intermediate group of individuals whose glucose levels do not meet the criterion for diabetes, yet are higher than those considered normal. These people were defined as having impaired fasting glucose (IFG) [fasting plasma glucose (FPG) levels 100 mg/dL (5.6 mmol/L) to 125 mg/dL (6.9 mmol/L)], or impaired glucose tolerance (IGT) [2-h values in the oral glucose tolerance test (OGTT) of 140 mg/dL (7.8 mmol/L) to 199 mg/dL (11.0 mmol/L)]. Individuals with IFG and/or IGT have been referred to as having prediabetes, indicating the relatively high risk for the future development of diabetes,[(1)]157 (77.72%) PG-S and 134 (43.65%) PG-s correctly answered the lower most limit of IGT. The lower most limit that is indicative of FBSL is ≥ 126mg/dl[1], was responded correctly by 164 (81.19%) PG-S and198 (64.59%) PG-s. FBSL is the most reliable test to diagnose diabetes that was responded correctly by 145 (71.78%) PG-S and 92 (29.97%) PG-s. Carpenter and Coustan established the criteria for glucose intolerance in pregnancy using a 50-g oral glucose challenge test.[(4)] Their criteria are supported by the American Diabetes Association. The actual diagnosis of gestational diabetes mellitus is usually based on a 3-h oral glucose tolerance test in which a fasting blood sample is drawn after 8–14 h of fasting. This is immediately followed by giving a 100-g glucose load orally and then drawing blood samples again at 1, 2, and 3 hour time-points. If two or more of the threshold glucose levels are exceeded the diagnosis is made, 142 (71.3%) PG-S and 26 (8.47%) PG-s responded correctly for the diagnosis of gestational diabetes. Values in the range of 6.0%-6.5% are considered as good control in HbA1c,[(5)] which was answered correctly by 159 (78.71%) PG-S and 99 (32.25%) PG-s. Glycated fructosamine measures BSL over a period of 2-3 weeks that was responded correct1y by 73 (85.64%) PG-S and 129 (42.02%) PG-s.[(6)] Patients are asked to be nil by mouth for atleast 8 hours before checking the FBSL level that was marked correctly by 149 (73.76%) PG-S and 91 (29.64%) PG-s. Patients are to be instructed to have 75gms of anhydrous glucose solution for 2hrs before checking the Post- prandial blood sugar level,[(7)]that was marked correctly by 57 (28.22%) PG-S and 46 (14.98%) PG-s. 94 (46.54%) PG-S and 59 (19.22%) PG-s are of the opinion that the patients should be asked to get there

blood sugar levels checked routinely. Glycated hemoglobin is considered as the most appropriate method to check control of diabetes before any surgical procedure by 66 (32.67%) PG-S and 58 (18.89%) PG-s. 200 (90.01%) PG-S and 299 (97.40%) PG-s answered that at post-prandial blood sugar levels of 200-250mg/dl elective surgery can be performed. 202 (100%) PG-S and 307 (100%) PG-s believe that it is necessary to take physicians consent before any surgical procedure if the post-prandial blood sugar levels are above 250mg/dl. Glucose powder, glucagon (1mg I.M), sodium bicarbonate and dextrose (0.5% I.V) are the emergency drugs that should be present in all the operatory units',[7] that were marked correctly by 4 (1.98%) PG-S and none of the PG-s student marked all the options. 201 (99.51%) PG-S and 307 (100%) PG-s felt that there is a need for continuing education in regards to IGT.

Limitations

The survey sample may not be representative of the entire fraternity. Absence of established guidelines for dentist may be responsible for significant disparity in the methodology of diagnosis, monitoring and management of patients with impaired glucose tolerance among different professionals. The survey aims to highlight the need for establishing uniform norms for all the professionals for the same.

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Perception, attitude and behavioral changes regarding Swine-flu outbreak among patients attending OPD in a dental college at Ghaziabad, India

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Abstract

Introduction: Swine flu caused by novel Influenza A H1N1 virus had led to considerable chaos and panic among common people globally. During a communicable disease upsurge, it is important to find out as much as possible about the concerns, perceptions, attitude and behavior of the public. Such credible information could be crucial for the betterment of health campaigns by public health officials and clinicians.

Aim: To study, perception, attitude and behavioral changes regarding Swine-Influenza outbreak among patients attending dental OPD in a dental college, located at Ghaziabad, India.

Materials & Method: On obtaining approval from Institutional authority, a cross-sectional questionnaire survey was conducted among 300 patients attending OPD during the month of April-May 2015. After the pilot survey a pretested validated questionnaire translated in vernacular language was used by a single calibrated interviewer to conduct the study. Study subjects having participatory consent were interviewed ensuring confidentiality. Perception, attitude and behavioral changes about swine-flu were assessed. The data entry and statistical analysis was performed by SPSS 20 Version.

Results: All studied population heard about the disease as a name. The primary source for getting a perception about Swine-flu was TV. The level of satisfactory perception, positive attitude and good practice of studied population where directly related to their socio-economic status. Hand washing and quarantine were reported as most effective measures for prevention.

Conclusion: Dentists and other public health communicators should especially focus on promoting hand hygiene and coughing/sneezing etiquettes while providing health education to the community.

Keywords: Influenza A (H1N1), Pandemic, Swine flu

Introduction

Influenza although generally constitutes a mild and self-contained illness has the potency to induce substantial morbidity as it spreads extensively in the community. Influenza A outbreak happens nearly each year, though its extent and severity vary widely. In the last century, influenza virus induced 3 pandemics - the 1918 Spanish flu, the Asian flu in 1957 and the Hong Kong flu in 1968. These outbreaks have differed in the extent of spread, the severity of the sickness as well as the causative pathogen.(1) The 1918 pandemic, which is frequently represented as the most widespread and severe, caused by the H1N1 strain and affected about one-third of the human race. It left in its wake about 40 million deaths and probably even imparted to the end of the World War 1.(2) After the control of this outbreak the virus went back to its regular pattern of inducing smaller epidemics till in 1957, an antigenically discrete strain of the virus again emerged globally in immunologically naive population. This strain was the H2N2 strain. Eleven years later, this virus strain was replaced by the H3N2 strain. Until recently this is the leading variant of influenza in mankind.(1)

The novel H1N1 strain which is accountable for the outbreak of swine origin influenza in 2009 was first recognized at the border between Mexico and U.S.A. in April 2009 and within a brief span of two months became the first pandemic of the 21st century.(3) The first confirm subject of swine influenza in India was reported on 16th May 2009, who was the traveler from America at Hyderabad airport since then cases were on rise enormously.(4) On 10 august 2010, the WHO announced that the Swine Influenza pandemic is officially over. The increased count of cases in different nations in later years has answered, that why it is a leading threat worldwide. India's Health Ministry reported on March 02 2015 that 1,115 of the 20,795 people infected with swine flu in 2015 have died.(5)

Prevention constitutes the most appropriate measure to check H1N1 flu pandemic. The Government has been successful in providing information to people about Swine flu via various means of mass communication. Keeping all this in consideration the survey was planned to evaluate the perception, attitude and behavioral changes concerning Swine-flu outbreak amongst patients attending dental OPD in a dental college.

Materials and Method

On obtaining approval from the institutional ethical committee, this cross-sectional study was carried out in the month of April-May 2015, the study subjects were the patients attending dental OPD, during April to May 2015. The subjects were evaluated by an interview process, applying a pre-tested close ended hindi questionnaire. A pilot study was performed on 50 participants in order to establish the reliability of the questionnaire. Cronbach's alpha test (α =.87). The data from the pilot study was not included in the final study. Following data was inquired from patients:

A: Personal and Demographic data, including age, sex and residence (rural/ urban)
B: Socioeconomic status that was classified into upper, upper, middle, lower, middle, upper, lower and lower classes, using the modified kuppuswamy's socioeconomic status scale.[6]
C: Source of information about Novel A/H1N1.
D: Perception towards A/H1N1: Causative agents, source of infection, mode of transmission, risk group, symptoms, complications, presence of treatment and vaccination.
E: Attitude: Whether the disease is dangerous, Do you worry about suffering from H1N1, Has your daily life been disturbed by H1N1, Interest in knowing the methods of prevention, Is the protective measures are sufficient for prevention, Be afraid of the H1N1 vaccine adverse reaction, Taking the vaccine if present, Notification of a suspected case, Interesting in following the disease news, Available information, Measures taken by the government and Continuity of these measures**.**
F: Behaviors: of hygiene practice while coughing and sneezing, concerning infection control as regards washing hands, covering nose and mouth during coughing or sneezing, for protection from infected person and regarding behaviors of self-care and safety measures during pandemic like face mask usage, social distancing, crowded areas and self-health care.Inclusion criteria for patient selection were patients with minimum age of 18 years and those patients who gave their consent for participating in the study. Patients less than 18 years of age, patients who did not give their consent for participation in the study, patients who were mentally or physically handicapped and patients withmedical problems and under any medication were excluded from the study.

The sample size was determined to be 300 based on the results of the pilot study. 300 Study participants were selected by convenient random sampling for an interview out of all the patients came for treatment or consultancy at OPD in the days of survey.
Statistical Analysis: The results were collected, tabulated and statistically analyzed by a personal computer using the SPSS software program (Statistical Program for Social Science), Version20. Quantitative data were expressed as mean and standard deviation. Qualitative data were expressed as number and percentage.

For the aim of analysis all questions in the knowledge, attitude and behavior segment that were replied positively were given a grade of 1 and questions that were replied negatively were given a grade of 2. Each question that was replied "Don't know" was given a grade of 3, except question number 2, 6, 7 and 8 in knowledge section and questions regarding spitting in public area and use of mouth mask in practice segment for statistical analysis. The individual scores were summed up to yield a total score.

Students t-test was applied to determine the significant difference in the means of knowledge, attitude and behavior for gender and residence at p value <0.05. One-way ANOVA was applied to determine the association of knowledge, attitude, and behavior in relation to different socio-economic classes. Chi- Square test (χ 2) was applied with a 5% level of significance and Karl Pearson's correlation test was applied to determine the correlation between knowledge, attitude and behavior.

Results

347 patients were approached, from whom only 313 agreed to take part in the study. Out of them,13 patients were excluded due to communication difficulties while directly interviewing them. The demographic profile of the participants has been represented in (Table 1).

Table 1: Demographic profile of participants

Characteristic		Number	Percent
Gender	Male	169	56.3%
	Female	131	43..7%
Residence	Urban	177	59%
	Rural	123	41%
Socio-economic class	Upper middle (II)	183	61%
	Lower middle (III)	72	24%
	Upper lower (IV)	45	15%

Perception (Table 2): In the present study, 100% of the participants acknowledged the Swine flu as a disease. In this survey, 59% of the participants developed their perception about Swine-flu from TV, while 24.3% from newspapers and rest from their fellow workers. In this survey, 97.3% of the participants recognized that, the disease was a viral illness.This survey indicated that, 84% of patients knew that, sneezing is the primary mode of transmission. The survey demonstrated that, 85.3% of the participants recognized that cough, sore throat, runny or blocked nose are the symptoms of Swine Influenza. 94% study subjects consider Swine flu as severe illness that can lead to death. 69.7% of study subjects know about the presence of treatment of Swine flu, whereas 16.7% and 13.7% of study subjects think that there is no treatment for Swine flu and don't know about anything regarding treatment of Swine flu respectively. 60% study subjects have no idea about vaccination against Swine flu and 31.3% think it has side effects. Only 8.7% participants consider vaccination against swine flu useful and effective.

Table 2: Knowledge response of participants

Question		Male	Female	Percent
Hearing about swine flu	Yes	169	131	100%
	No	-------	------	--------
Source of knowledge about swine flu	Batch-mates	22	28	16.66%
	Newspapers	60	13	24.33%
	TV	87	90	59.00%
	Internet	-----	-----	
Presence of cases in India	Yes	169	123	97.33%
	No	------	----	
	I do not know	--------	8	2.66%
The cause of the disease	Virus	133	77	70.00%
	Bacteria	-----	13	4.33%
	I do not know	36	41	25.66%
Source of infection	Infected persons	130	94	74.66%
	Consumed pork	4	6	3.33%
	I do not know	35	31	22.00%
Mode of transmission of Swine-flu	Touching the mouth	----	13	4.33%
	Sneezing	148	104	84.00%
	Kissing and shaking hands	13	6	6.33%
	Touching contaminated surfaces	-------	--------	
	Consuming pork meat	4	4	2.66%
	I do not know	4	12	5.33%
At risk group for Swine flu	Pregnant women	9	-----	3.00%
	Children less than 5 years old	30	51	27.00%
	I do not know	130	80	70.00%
Symptoms of the disease	High temperature	----	-----	
	Cough, sore throat - runny or blocked nose	155	101	85.33%
	Diarrhea or vomiting	4	13	5.66%
	Body aches – Headaches	-------	-----	
	Difficulty of breathing	--------	-----	
	I do not know	10	17	9.00%
Complications of Swine flu	• Sever illness that can lead to death	165	117	94.00%
	• No serious illnesses	-----	------	
	• I do not know	4	14	6.00%
Presence of treatment for Swine flu	• Yes	128	81	69.66%
	• No	27	23	16.66%
	• I do not know	14	27	13.66%
What about the vaccination against swine flu Infection?	• No idea	93	87	60.00%
	• It is useful and effective	26	---	8.66%
	• Have side effects.	50	44	31.33%

There was a statistically significant difference between different socio-economic groups regarding knowledge response as determined by one-way ANOVA as shown in (Table 5). Females had statistically significant, more knowledge than males as shown in (Table 6) as determined by Students t-test.

Attitude (Table 3): All participants considered the Swine flu as a dangerous disease. 93% study subjects have worries regarding suffering from H1N1. 75% participant confessed that their daily life has been disturbed because of H1N1. All of them showed interest in knowing methods of prevention of Swine flu. 79% participants considered protective measures against Swine flu to be sufficient. 70.7% participants are not afraid of H1N1 vaccines adverse reaction. 83.7% study subjects were ready to take a vaccine against Swine flu, if present. All of them were ready to notify about suspected cases of Swine flu and also were interested in following the news about Swine flu. 56% participants considered available information regarding Swine flu to be sufficient, whereas 44% considered it insufficient. 52.7% participants considered measures

taken by government regarding Swine flu as insufficient. 57% of participants agreed that there is continuity in measures taken by government regarding Swine flu.

Table 3: Attitude response of participants

Questions		Male	Female	Percent
Is the disease is dangerous	Yes	169	131	100.00%
	No	-----	----	
Do you worry about suffering from H1N1?	Yes	165	114	93.00%
	No	4	17	7.00%
Has your daily life been disturbed by H1N1	Yes	140	85	75.00%
	No	29	46	25.00%
Interest in knowing the methods of prevention	Yes	169	131	100.00%
	No	----	----	
Is the protective measures are sufficient for prevention.	Yes	136	101	79.00%
	No	33	30	21.00%
Be afraid of H1N1 vaccine‘s adverse reaction	Yes	37	51	29.33%
	No	132	80	70.66%
Taking the vaccine if present.	Yes	150	101	83.66%
	No	19	30	16.33%
Notification of a suspected case.	Yes	169	131	100.00%
	No	----	-----	
Interesting in following the disease news.	Yes	169	131	100.00%
	No	-----	-----	
Available information.	Sufficient	119	49	56.00%
	Insufficient	50	82	44.00%
Measures taken by government.	Sufficient	98	44	47.33%
	Insufficient	71	87	52.66%
Continuity of these measures	Yes	122	49	57.00%
	No	47	82	43.00%

Table 4: Practice response of participants

Question		Male	Female	Percent
Practice Questions Pertaining to Hygiene				
a. When coughing and sneezing:				
• Covered mouth and nose with tissue or handkerchief	Yes	153	101	84.66%
	No	16	30	15.33%
• Threw away the used tissue into the bin	Yes	48	90	46.00%
	No	121	41	54.00%
• Turn face from others	Yes	135	80	71.66%
	No	34	51	28.33%
• Spit in public area	Yes	----	5	1.66%
	No	169	126	98.33%
b. I wash my hands				
• Before touching eyes or nose	Yes	60	63	41.00%
	No	109	68	59.00%
• After toilet	Yes	156	131	95.66%
	No	13	-----	4.33%
• Using soap	Yes	142	101	81.00%
	No	27	30	19.00%
• After covering nose when sneezing	Yes	52	52	34.66%
	No	117	79	65.33%
c. Measures for protection If contact with an infected person:				
• Avoid contact with infected case	Yes	115	115	76.66%
	No	54	16	23.33%
• Avoid touching or shaking hands	Yes	149	84	77.66%
	No	20	47	22.33%
• Put a handkerchief on your nose and mouth	Yes	92	91	61.00%
	No	77	40	39.00%

• Go to the doctor if you experience any symptoms of the disease	Yes	128	89	72.33%
	No	41	42	27.66%
• Recommends that infected person not mixing with others	Yes	66	75	47.00%
	No	103	56	53.00%
Questions Pertaining to Self-care and Safety Measures during Pandemic				
a. Face mask usage:				
• Never use it	Yes	10	4	4.66%
	No	159	127	95.33%
• Wear face mask when having fever, cough or runny nose	Yes	159	127	95.33%
	No	10	4	4.66%
• Make sure mask fully covered mouth and nose properly	Yes	64	26	30.00%
	No	105	105	70.00%
• Wear the face mask recommended by Ministry of Health	Yes	47	19	22.00%
	No	122	112	78.00%
• Changed to a new face mask after using it once	Yes	89	56	48.33%
	No	80	75	51.66%
b. Social distancing during outbreak				
• Avoid going to crowded places	Yes	165	128	97.66%
	No	4	3	2.33%
• Avoid going to shopping mall	Yes	13	13	8.66%
	No	156	118	91.33%
• Practiced social distancing	Yes	69	45	38.00%
	No	100	86	62.00%
• It is very important not to leave the house.	Yes	----	13	4.33%
	No	169	118	95.66%
c. Crowded areas				
• Wear facemask at crowded areas	Yes	159	127	95.33%
	No	10	4	4.66%
• Used 'hand sanitizer' at crowded places	Yes	47	58	35.00%
	No	122	73	65.00%
d. Self-health care				
• Wash hands frequently specially after shaking hands with others	Yes	148	127	91.66%
	No	21	4	8.33%
• Avoid sharing fork and spoon during eating	Yes	35	21	18.66%
	No	134	110	81.33%
• Seek for additional information regarding (H1N1)	Yes	38	48	28.66%
	No	131	83	71.33%
• Consumed food supplements (e.g. vitamins)	Yes	13	13	8.66%
	No	156	118	9133%
• Drink plenty of water	Yes	26	13	13.00%
	No	143	118	87.00%

There was a statistically significant difference between different socio-economic groups regarding attitude response as determined by one-way ANOVA (Table 5). Females show statistically significant more positive attitude than men as determined by Students t-test (Table 6).

Table 5: Association of socioeconomic group with knowledge, attitude and practice using one way ANOVA

	Socio-economic group	Number of participants	Mean	Std. Deviation	Std. Error	P value
KS	Upper middle	183	7.7760	1.16688	.08626	.000
	Lower middle	72	10.2500	2.74118	.32305	
	Upper lower	45	14.3556	3.49776	.52142	
	Total	300	9.3567	3.14576	.18162	
AS	Upper middle	183	14.3443	1.51786	.11220	.000
	Lower middle	72	14.9583	1.57835	.18601	
	Upper lower	45	16.3778	2.32857	.34712	
	Total	300	14.7967	1.81650	.10488	
PS	Upper middle	183	37.2131	3.09793	.22901	.000
	Lower middle	72	38.3889	5.80324	.68392	
	Upper lower	45	40.4222	4.98857	.74365	
	Total	300	37.9767	4.33576	.25033	

*significant at $p \leq 0.05$; KS = knowledge score: AS = attitude score: PS= practice score.

Table 6: Association of gender with knowledge, attitude and practice using Students t-test

	Gender	N	Mean	Std. Deviation	Std. Error Mean	P value
KS	Male	169	8.9822	2.51773	.19367	.019
	Female	131	9.8397	3.76179	.32867	
AS	Male	169	14.2781	1.72504	.13270	.000
	Female	131	15.4656	1.71553	.14989	
PS	Male	169	38.0059	4.03186	.31014	.895
	Female	131	37.9389	4.71455	.41191	

*significant at $p \leq 0.05$; KS = knowledge score: AS = attitude score: PS= practice score.

Practice (Table 4): Among all participants, 82.7% covered mouth or nose with a tissue or handkerchief, 29.7% threw away the used tissue into the bin, 71.7% turned away their faces from others and 98.3% of them avoid spitting in public places. 81.0% use soap to wash their hands, 41.0% wash their hands before touching eyes or nose, 95.7% after toilets and 34.7% after covering their nose. 76.7% participants avoid contact with infected cases, 77.7% avoid touching or shaking hands. 61.0% put a handkerchief on their nose and mouth for protection when in contact with an infected person. 72.3% went to the doctor if they experienced any symptoms of the disease. 47% recommended that infected person should not mix with others as a protective measure.

95.3% used face mask and used it when having fever, cough or runny nose, 30.0% made sure that the mask fully covered their mouth and nose properly. Only 22.0% wear the face mask recommended by the Ministry of health and only 48.3% changed to a new face mask after using it once. 97.7% avoid going to a crowded place during an outbreak, but in contrast, only 8.7% avoid going to the shopping malls. 37.7% practiced social distancing and only 4.3% considered not leaving the house as a preventive practice. 98.0% were wearing facemask at crowded places and 35.3% use hand sanitizer at crowded places.

With respect to self-health care, 91.7% wash hands frequently and especially after shaking hands with other and 18.7% avoid sharing fork and spoon during eating. 28.7% seek for additional information regarding H1N1. 8.7% and 13.0% of participants consumed food supplements and drink plenty of water respectively.

There was a statistically significant difference between different socio-economic groups regarding practice response as determined by one-way ANOVA shown in (Table 5). There is no statistically significant difference found between males and females regarding practice reply as determined by Students t-test (Table 6). There was a positive linear relationship observed between knowledge and attitude, knowledge and practice and attitude and practice as shown by Karl Pearson's correlation test (Table 7).

Table 7: Correlation between knowledge, attitude and practice using Karl Pearson's correlation test

Relation between		Karl Pearson's coefficient of correlation
Knowledge score	Attitude score	$+.674^{**}$
Knowledge score	Practice score	$+.524^{**}$
Attitude score	Practice score	$+.532^{**}$

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

Novel influenza A (H1N1), also known as swine flu, has lately emerged from Mexico and has induced the 1st pandemic of the century.[6] Whenever people are to react befittingly during an outbreak of infectious disease, they require having some basic knowledge about disease transmission, the availability of vaccines and efficient medical treatment. For the above mentioned reasons we have conducted the present survey to collect the baseline data for governmental preventive measures and to look into perception, attitude and behavioral response of study population regarding Swine flu.

All study subjects acknowledged the Swine flu as a disease, which was similar to the findings of study done by Farahat et al.[7] for secondary school children and was higher than the findings of study done on general population by Kamate et al.[8] this can be explained by the increasing effectiveness of health promotion programs run by government and various national as well as international health agencies.

TV was the main source from which the study subjects acknowledged to develop their perception regarding swine flu, which was in agreement with the findings of study done by Farahat et al.[7] and by Balkhy et al.[9]

The virus was acknowledged as a main causative organism of the disease in the present study (97.3%), similar to the findings (84.2%) of a study done by Farahat et al.[7] However, in an Indian study by Kamate et al.[8] only 18.2% of the study subjects considered the Swine flu as viral disease, this result indicates great success of various health promotional programs running in India regarding Swine flu.

84% study subjects considered sneezing to be the primary mode of transmission in comparison to that of 44% study subjects of the study done by taghreed farahatet al.,[7] which further support the effectiveness of various health programs going on concerning Swine flu in India.

82.7% of study subjects in the present study showed good cough and sneezing etiquette practices which was higher than previous studies done by Farahat et al.[7] and by Osman et al.[10]

Almost all study subjects (95.3%) used face mask for prevention and avoiding spreading of Swine flu, which was significantly higher than the findings of the study done by Farahat et al.[7] and by Osman et al,[10] but only 30% wear face mask properly covering their nose and mouth properly and only 22% study subjects use government recommended face mask. These can be considered few drawbacks of the current health programs which should be amended soon.

91.7% study subjects frequently washed their hands after shaking hands with others which was higher than the results obtained in the previous work of Farahat et al.[7]

97.7% of respondents avoided going to the crowded place during an outbreak, which is significantly higher than the results found in study of Kamateet al.,[8] these findings can be attributed to the more severe mass media campaign regarding Swine flu sometimes blowing things out of proportion.

The present study showed a poorer perception towards a vaccine for swine flu when compared to the previous study by Farahat et al.,[7] whereas the study subjects had significantly higher attitude towards the Swine flu vaccination in comparison of the results of the study by Farahat et al.[7] and the study done by Han et al.[11]

Conclusion

Scientific literatures suggest that hand hygiene and coughing/ sneezing etiquettes are the most effective non-medical measures in reducing the spread of swine flu outbreak. The result of our survey shows that there is satisfactory perception, positive attitude and good practice towards Swine flu in study subjects. It signifies that public health communicators had some success in preventing confusion and in promoting healthy lifestyles by incorporating hygiene practices. Ministry of Health & Family Welfare (MOHFW) also effectively provides scientific and effective information through the prime media.

Further, we can recommend that dentists and other public health communicators should especially focus on promoting hand hygiene and coughing/sneezing etiquettes while providing health education to their patients and to the community.

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Effect of different patterns of breastfeeding on dental caries of children at 3-5 years of age

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Abstract

Aim: To study and compare the prevalence and severity of dental caries in children from 3-5 years of age with different patterns of breastfeeding practices.

Materials and Method: All the children, aged 3-5 years, attending Immunization Clinic/ Outpatient Department were recruited for the study. The detailed lactation history was inquired from the mothers to assign them into 3 different study groups:

A. Group I: Children who were not breast-fed.
B. Group II: Children with exclusive breastfeeding for 6 months and continued breastfeeding for ≤1 year.
C. Group III: Children with exclusive breastfeeding for 6 months and continued breastfeeding for >1 year but ≤ 2 years.

The detailed case history was taken after recording child's basic information. A dental examination was carried out for each child and standardized indices were recorded for oral health assessment. Chi-square test was used for statistical significance of difference in prevalence of caries. Kruskal Wallis test and Mann Whitney test were used for inter group comparisons. Confounding variables were adjusted using negative binomial with log link function.

Results: Children who were not breastfed (Group I) had 61% prevalence of caries and mean dmft index of 1.6. The prevalence of caries was 57% with mean dmft index of 1.0 in Group II and the prevalence of caries was 26% with mean dmft index of 0.6 in Group III. Negative binomial model proved highly significant relation of dental caries with breastfeeding up to 2 years.

Conclusion: The prevalence and severity of dental caries was significantly less in breast fed children, especially in those children who were breast fed for 2 years.

Keywords: Ad libitum breastfeeding, Dental caries, Early childhood caries

Introduction

Breastfeeding and human milk are the reference normative standards for infant feeding and nutrition. It confers unique nutritional and non nutritional benefits to the infant and the mother and optimize growth and development of the child.(1) Optimal infant and young child feeding includes exclusive breastfeeding for the first six months of life followed by continued breastfeeding with adequate complementary foods for up to two years and beyond.(2)

Human milk is full of species specific, anti-infective factors and truly the first vaccination to prevent diseases. It contains easily digestible nutrients in optimal amount and in appropriate ratios to achieve maximum growth. It is uniquely adapted to the infant's needs and is the most appropriate milk for the human infant.(2)

Dental caries is a disease of microbial origin that is induced by refined carbohydrates in the diet.

In a review based on available epidemiological data from countries worldwide on prevalence of dental caries, it has been found that during the past decade there is an alarming increase in prevalence of dental caries globally.(3) It is a serious health problem affecting people and therefore measures should be taken for its control. If left untreated, it may cause pulpitis, periodontal infection, abscess, which may lead to extraction of teeth, malocclusion of permanent teeth, phonetic problems and lower self-esteem.(4,5) It has also been demonstrated that children with dental caries weighed less than 80% of their ideal body weight and growth is resumed after comprehensive oral rehabilitation.(6)

Human breast milk is uniquely superior in providing the best possible nutrition to infants and has not been epidemiologically associated with caries. Frequent night time bottle-feeding with milk is associated with, but not consistently implicated in early childhood caries. Breastfeeding more than 7 times daily after 12 months of age is associated with increased risk for early childhood caries. Ad libitum breastfeeding after introduction of other dietary carbohydrates and inadequate oral hygiene are risk factors for early childhood caries.(7) The evidence in the literature finding the association between breastfeeding and dental caries is ambivalent.

Identification of pattern of breastfeeding related to the prevention of dental caries is important for maintaining an optimal oral health in children. Therefore, the aim of our study is to determine the association of different patterns of breastfeeding on dental caries of children at 3-5 years of age.

Materials and Method

An observational, descriptive study was conducted at Department of Pedodontics and Preventive Dentistry and Department of Pediatrics, University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi. An approval from institutional ethical committee was obtained before commencement of the study. A total of 360 healthy children, aged 3-5 years, of both genders who fulfilled the criteria of feeding, attending immunization clinic/ Outpatient Department of Pediatrics were recruited for the study.

The children with the following conditions/ diseases were excluded from the study i.e. Severe acute malnutrition (Weight for Height<=3 SD),[8] Obesity (BMI ≥ 30 kg/m^2),[8] chronic systemic illnesses**,** known congenital anomalies**,** dental fluorosis**,** preterm and low birth weight babies**,** born to mothers with major illnesses during pregnancy, born to mothers with history of smoking during pregnancy.

The purpose and design of the study was explained to the guardian. Written informed consent was obtained from the guardian for participation of their children in the study.

For Children who fulfilled the inclusion criteria, a detailed lactation history was inquired from the mother. A lactation history criterion was used to assign them into different study groups.

- **Group I** included those children who were not breast-fed at all/ received breastfeeding for ≤ 2 weeks
- **Group II:** Children who were exclusively breastfed for 6 months and continued breastfeeding for ≤ 1 year
- **Group III:** Children who were exclusively breastfed for 6 months and continued breastfeeding for >1 year but ≤ 2 years. However, children consuming non-nutritive drinks e.g. water, tea, juices occasionally were included under exclusive breastfeeding.

Detailed history was taken after recording child basic information including dietary habits, oral hygiene habits, history of bottle feeding, history of breastfeeding and socioeconomic status.[9] Information about dietary habits including number of feedings per day, frequency of snacking and number of fruits / vegetables per day were recorded. Oral hygiene habits like age at which tooth brushing started and frequency of brushing were elicited. Detailed history of bottle feeding was taken mainly related to duration and adding of sugar in feeding bottle. History of breastfeeding was taken with respect to duration of exclusive breastfeeding and age at which breastfeeding was terminated.

Children underwent dental examination and dental caries were assessed using standardized indices in the Department of Pedodontics and Preventive dentistry.

Before the clinical examination was carried out on study population, calibrations among the examiners were carried out and kappa values of 0.95 for intra-examiner reproducibility and 0.87 for inter-examiner reproducibility were found.

Dental caries index - decayed, missing, filled teeth (dmft) and decayed, missing, filled surfaces (dmfs) caries index as per WHO oral health assessment form (1997)[10] were used.

The data was transferred to the Microsoft excel, checked for accuracy and analyzed into a computer equipped with SPSS Software 2008. Chi-Square was performed to find the statistical significance of difference in the prevalence of dental caries. Mean values of decayed missing filled teeth and decayed missing filled surfaces were compared using Kruskal Wallis test and Mann Whitney test is used for intergroup comparisons. The significance of difference between multiple groups was assessed by Post Hoc Tukey test. A p-value of less than 0.05 suggested statistical significance. Confounding variables were adjusted using negative binomial with log link function to find the association of breastfeeding and dental caries. All the potential confounders included were categorical variables; therefore, estimate for each co-variable compares the association of particular category to a reference category.

Results

The study sample consisted of 207 males and 153 females with the mean age of 4 years. Dental caries was present in 40% of the cases with the mean dmft of 1.0 and mean dmfs of 1.3.

Comparison of dental caries in various groups: The number of children with dental caries were highest in Group I (61%) when compared to Group II (57%) and Group III (26%). The 3 study groups are compared in (Table 1).

Table 1: Comparison of dental caries in various groups (n=360)

Groups	Caries affected n(%)	Caries free n(%)	p value
Group I** (Not breastfed) (n=120)	61 (50.8%)	59 (49.2%)	0.001 (Chi-square test)
Group II** (Exclusive breastfed for 6 months followed by breastfeeding for ≤1 year) (n=120)	57 (47.5%)	63 (52.5%)	
Group III (Exclusive breastfed for 6 months followed by breastfeeding for >1 year but ≤2 year) (n=120)	26 (21.7%)	94 (78.3%)	

** p value < 0.001 when compared with the Group III (Chi-square test)

The difference in prevalence of dental caries was significant between groups (p< 0.001). When multiple comparisons were done, difference was statistically significant between Group I and Group III; and Group II and Group III.

The severity of dental caries was determined by calculating mean values of dmft and dmfs index. Analysis shows that mean dmft and dmfs values were highest for Group I and lowest for Group III. (Table 2) shows mean values of dmft and dmfs indices in various groups.

Table 2: Mean values of dmft and dmfs index in various groups (n=360)

Groups	$\bar{X}$dmft ± SE Median (IQR$^{\phi}$)	$\bar{X}$dmfs ± SE Median (IQR$^{\phi}$)	p value
Group I** (Not breastfed) (n=120)	1.6 ± 0.20 1.0 (0.0-3.0)	2.2 ± 0.28 1.0 (0.0-4.0)	0.001 Kruskal-Wallis Test
Group II** (Exclusive breastfed for 6 months followed by breastfeeding for ≤1 year) (n=120)	1.0 ± 0.13 0.0 (0.0-2.0)	1.2 ± 0.15 0.0 (0.0-2.0)	
Group III (Exclusive breastfed for 6 months followed by breastfeeding for >1 year but ≤2 year) (n=120)	0.4 ± 0.09 0.0 (0.0-0.0)	0.5 ± 0.11 0.0 (0.0-0.0)	

$^{\phi}$Interquartile range

** p values of mean dmft and dmfs < 0.001 when compared with the Group III (Mann-Whitney test)

The differences in mean dmft and mean dmfs was statistically significant between the groups (p<0.001).Mann-Whitney test was used for multiple comparisons that revealed difference between Group I and Group III and between Group II and Group III statistically significant (p<0.001).

Negative binomial model for adjustment of cofounding variables: Confounding variables were that previous studies had suggested were plausible predictors of caries experience. In order to assess the influence of breastfeeding and various confounding factors (i.e. that are age, gender, tooth brushing frequency, frequency of snacking, bottle feeding and socioeconomic class) on caries experience in the children, we utilized negative binomial model.

Negative binomial with log link function is used because variance of dmft is higher than mean value.

The expected count of dmft in Group II was 128% higher than in Group III. Similarly, expected count of dmft in Group I was 194% higher than in Group III. Among confounding variables, age of the child, frequency of snacking and bottle feeding had significant association (*p< 0.05*) (Table 3).

Table 3: dmft values after adjusting for confounding variables

Variables		Unadjusted analysis	Adjusted analyses			
		Crude RR$^{\phi}$ (95% CI$^{\Psi}$)	Estimate	Standard error	p-value	Adjusted RR$^{\phi}$ (95% CI$^{\Psi}$)
Group	Group I	3.88 (2.61-5.78)	1.08	0.26	0.00	2.94 (1.76-4.93)
	Group II	2.37 (1.57-3.59)	0.82	0.23	0.00	2.28 (1.44-3.62)
	Group III	1	Reference			1
Age	3 years	0.24 (0.15-0.36)	-1.31	0.24	0.00	0.27 (0.16-0.43)
	4 years	0.42 (0.42-0.81)	-0.50	0.19	0.008	0.60 (0.41-0.88)
	5 years	1	Reference			1
Sex	Male	1.04 (0.77-1.39)	0.26	0.17	0.14	1.29 (0.92-1.80)
	Female	1	Reference			1
Tooth brushing frequency	None/Occasional	1.00 (0.75-1.35)	0.25	0.17	0.15	1.29 (0.92-1.80)
	Once/Twice	1	Reference			1

Frequency of Snacking	< 3 times	0.71 (0.35-1.06)	-1.41	0.20	0.00	0.24 (0.16-0.36)
	≥ 3 times	1	Reference			1
Bottle-feeding	Yes	2.40 (1.77-3.25)	0.55	0.21	.009	1.73 (1.15-2.61)
	No	1	Reference			1
Socio-economic class	Class III	0.99 (0.72-1.35)	-0.31	0.19	0.1	0.74 (0.51-1.06)
	Class IV	1	Reference			1

ϕRelative risk,ψConfidence interval Model LR Chi-square = 158.837, df-9, p value < 0.00.

The expected count of dmfs in Group II was 129% higher than in Group III. Similarly, expected count of dmft in Group I was 234% higher than in Group III. Among confounding variables, age of the child, frequency of snacking and bottle feeding had significant association (*p< 0.05*) (Table 4).

Table 4: dmfs values after adjusting for confounding variables

Variables		**Unadjusted analysis**	**Adjusted analyses**			
		Crude RRϕ (95% CIψ)	**Estimate**	**Standard error**	**p-value**	**Adjusted RRϕ (95% CIψ)**
Group	Group I	4.29 (2.95-6.26)	1.20	0.25	0.00	3.34 (2.03-5.49)
	Group II	2.28 (1.54-3.38)	0.83	0.22	0.00	2.29 (1.47-3.57)
	Group III	1	Reference			1
Age	3 years	0.22 (0.15-0.33)	-1.36	0.22	0.00	0.26 (0.16-0.39)
	4 years	0.48 (0.35-0.66)	-0.67	0.18	0.00	0.51 (0.35-0.73)
	5 years	1	Reference			1
Sex	Male	1.08 (0.82-1.42)	0.26	0.16	0.11	1.30 (0.94-1.80)
	Female	1	Reference			1
Tooth brushing frequency	None/Occasional	0.94 (0.71-1.24)	0.18	0.16	0.27	1.20 (0.87-1.66)
	Once/Twice	1	Reference			1
Frequency of Snacking	< 3 times	0.24 (0.17-0.35)	-1.42	0.20	0.00	0.24 (0.16-0.36)
	≥ 3 times	1	Reference			1
Bottle-feeding	Yes	2.64 (1.98-3.53)	0.57	0.20	0.00	1.76 (1.18-2.63)
	No	1	Reference			1
Socio economic class	Class III	0.99 (0.73-1.34)	-0.32	0.18	0.07	0.72 (0.51-1.03)
	Class IV	1	Reference			1

ϕRelative risk,ψConfidence interval

Model LR Chi-square = 158.837, df-9, p value < 0.00

Negative binomial with log link function is used because variance of dmft is higher than mean value.

Discussion

The present study was carried out in 3-5 year old children to study the effect of different patterns of breastfeeding on dental caries of children. The 3-5 year age group was selected since the deciduous dentition is completed by this age and effect of breastfeeding will be clearly evident at this point of time. The study groups i.e. Group I (non breastfed) was selected in order to make good comparison with Group II and III who were breast fed. Group II and III were based on breast feeding recommendations by American Academy of Pediatrics[1] and Indian Academy of Pediatrics.[2] Both bodies recommend exclusive breast feeding for 6 months and continued breastfeeding for 2 years and beyond. Since many mothers are likely to

stop breastfeeding in less than 2 years, Group II was formed. Group II also helped in detailed analysis.

The data collected in study showed that children who were not breastfed (Group I) had 50.8% prevalence of caries and mean dmft index of 1.6. The prevalence of caries was 47.5% with mean dmft index of 1.0 in Group II as compared to 21.7% prevalence of caries with mean dmft index of 0.6 in Group III. The results were similar to a study by Dini et al[11]who found 56.7 percent prevalence of caries and 2.3 mean dmft index in non-breast fed children and 40.6 percent prevalence and 1.5 dmft index in children who were breast fed till 2 years.

Our findings were similar to results of the study by Mattos- Graner et al[12] who found that the prevalence of ECC in children who were not breastfed at all or who were breastfed up to 3 months was higher compared to those children breastfed for longer than 12 months. Huntington et al[13] showed that children who were breastfed had lower significant risk of ECC. Children who were not breastfed had double the risk of ECC when compared to their breastfed siblings. Silver[14] found that the breast fed babies appeared to have an advantage, with more of them being caries free. Weerheijm et al,[15] Mohebbi et al[16] and Kramer et al[17] observed prolonged breastfeeding does not lead to higher prevalence of dental caries. In line with these studies, this study revealed that breastfeeding and its duration was not associated with increase in prevalence and severity of dental caries. On the contrary, it was observed that breastfeeding has a protective role against dental caries.

Negative binomial model further proved highly significant relation of dental caries with breastfeeding up to 2 years. The model also showed significant increase in caries with the increase in age, greater frequency of snacking and use of bottle for feeding the child. Relationship of gender, frequency of tooth brushing and socioeconomic status with dental caries was not observed.

Breast milk is tailored to the infant's specific nutritional needs, contains immunological agents such as secretary IgA and IgG and has anti-inflammatory properties that offer protection to the potentially immature immune systems of both term and preterm infants.[18] Breast milk contains bioactive components that are resistant to digestive processes and that enhance the infants immune system, thereby contributing to short and long term health protection.[19] The immune factors present in human breast milk plays an important role in protection against dental caries.[20] Erikson and Mazhari[21] reported that human breast milk is not cariogenic as it did not cause a significant drop in plaque pH and consequently cause enamel decalcification even after 12 weeks exposure. Breast milk contains bacterial and viral antibodies with relatively high concentration of secretary IgA antibodies, which play a vital role in the general and oral defense system.[22] IgA and IgG also have the potential to retard streptococcal growth.[23,24] Grenby et al,[25] Rose[26] and Aimutis[27] described that the components in milk namely lactoferrin, lysozyme, albumin, peroxidase have an inhibitory or bactericidal activity against S.mutans and S.sorbinus. Alaluusua et al[28] showed that breastfeeding does not affect the mutans streptococci levels in the child and thus does not allow the development of dental caries. Sharma and coworkers[29] found least number of high colony forming units of S.mutans in breast fed children as compared to children using nursing bottle. The colony forming units of S.mutans were maximum in the children who were neither breastfed nor fed with nursing bottle. This indicated decreased caries potential in oral cavity of breast fed children.

Lactoferrin is an antibacterial milk protein comprising features of a lysozyme, immunoglobulin and lacto-peroxidase.[30,31] It plays an important role in the human innate defense mechanisms against pathogenic microorganisms such as bacteria, fungi and viruses.[32,33] Lactoferrin has strong bactericidal action against Streptococcus mutans.[23,24] It also chelates iron, making this essential nutrient inaccessible to an invading microorganism, thereby limiting its growth. The human milk, components are able to inhibit adhesion of S. mutansto hydroxyapatite crystals.[34,35] Therefore, biochemically breast milk is protective against Streptococcus mutans.

Lactose sugar is present in breast milk but it is not easily fermented as sucrose. Lactase enzyme does not split lactose into glucose and galactose in the oral cavity, rather in the intestine. Lactose in breast milk is also protected byits antibacterial and enzymatic qualities. Breast milk having lactose in absence of other added sugars does not cause dental caries.[20] The anti – infective activity of human milk is potentially greater than the sum of its microbial components secretary IgA, lactoferrin, Lewis factor X, SLPI(secretary leucocyte protease inhibitor), defensins, complements, mucins, prostaglandins and interleukins.[36] Breast milk may have a protective role against dental caries due to its nutritional content, buffering capacity and other defense mechanisms. Breast milk protects against all infectious diseases of infancy, including dental caries.[34]

Contrary to the present study, Okawa et al[37] and Tanaka et al[38] reported that breastfeeding for 18 months or longer increases the prevalence of dental caries. Weerhijam et al[15] demonstrated that frequent breast feeding was contributing factors in process of nursing caries. Feldens et al[39] suggested prolonged breastfeeding per se is not a risk factor if it occurs once/ twice a day but greater frequency of breastfeeding allowed prolonged contact of human milk with teeth contributing to dental caries. They attributed cariogenicity in children with high frequency of breastfeeding to the sugars in their diet which could possibly contributed to increased levels of S. mutans, a

variable not investigated in the study. Azevedo et al,[40] Yonezu et al[41] found association between caries and bedtime breastfeeding.

The most important limitation of studies mentioned above was that the internationally adopted definitions of breastfeeding were not used and multiple definitions of dental caries and early childhood caries were used. Valaitis et al[42] in a systematic review verified that the definitions of variables compared in studies were weak, inconsistent, ambiguous or even absent. They found none focused solely on examination of the association between breastfeeding on demand and ECC. They observed that investigators combined on-demand and night time breastfeeding into one category but issues related to night time breastfeeding may differ from those assumed to be related to on-demand breastfeeding. On the basis of the scientific evidence, they concluded that evidence did not suggest strong association between breastfeeding and dental caries.

Authors[15,37-47] found that caries was positively associated with breastfeeding when there was ad libitum feeding, greater number of breastfeeding a day, prolonged breastfeeding and mainly frequent breastfeeding during the night, which results in accumulation of milk on the teeth that may produce tooth decay. However, the mechanism of breastfeeding appeared to protect the teeth against dental caries. Breast milk is expressed directly into the soft palate and thus does not stagnate over teeth while being sucked.[47]

Our study had several strengths. There was no selection bias as the sample was chosen randomly. Definition of exclusive breastfeeding and dental caries used were well accepted. A variety of potential confounding factors were controlled using negative binomial model. The parents were motivated for a dental check up. This influenced their participation in the study. The mothers of caries free children were sensitized in the process to care for child's dentition. The study was a good opportunity to instill preventive dental behavior in children and to give them suitable dental treatment.

The study also had some limitations. History of exclusive breastfeeding and duration of breastfeeding was assessed at 3-5 years of age and this could lead to recall bias. Although we have adjusted our analyses for most potential cofounders but residual cofounding effects like maternal oral health status, individual susceptibility, fluoride use may be included in further studies on the subject.

Conclusion

The prevalence and severity of dental caries was significantly less in breast fed children, especially in those children who were breast fed for 2 years. Breastfeeding for 2 years was found most protective for dental caries. In view of above, breastfeeding up to age of 2 years should be encouraged by pediatricians and pediatric dentist to promote oral health in 3-5 year old children.

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Minimally invasive treatment for reconstruction of deficit interdental papillae: a pilot study

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Abstract

Background and Aim: Black triangles, the open interdental embrasures appear very unaesthetic and may give rise to various concerns chiefly, food impaction, difficulty in phonetics and gradually periodontitis. Gingival black triangles have a multifactorial etiology and a range of treatment options. The aim of this study was to evaluate the clinical application of injectable hyaluronic acid gel (non-animal based) for reconstruction of gingival black triangles in anterior esthetic zone.

Materials and Method: Four systemically healthy adult individuals with at least one anterior site with class I or class II interdental papilla loss were recruited. Following local anesthesia, ~0.2 ml of hyaluronic acid gel was injected directly into the base of papilla 2-3 mm apical to the coronal tip of the involved papilla using 23 gauge needle. The injection was repeated after 20 days. The patients were monitored for the results in the subsequent follow-ups. Lost papilla surface area was calculated using clinical photographs taken at baseline, 1 month, 3 month and 6 month post-operative follow-ups. Differences in the lost papillary surface area between baseline and post-operative clinical photographs were statistically analyzed using SPSS 19.0 version using ANOVA test.

Results: Each site was individually evaluated. Application of hyaluronic acid for reconstruction of gingival black triangle was successful in a 6-month follow-up period. 5 sites had complete papilla reconstruction and 3 sites had 34-57% of reconstruction rate.

Conclusion: Results from this pilot study are encouraging and present the evidence that class I and class II gingival black triangles can be enhanced by injecting hyaluronic acid gel. Thus injectable hyaluronic acid gel may be a promising treatment for enhancing gingival papillary esthetics.

Keywords: Interdental papilla, Hyaluronic acid gel, Esthetic zone, Regeneration

Introduction

Gingival black triangles are considered to be esthetically unappealing especially when present in anterior esthetic region in cases with high lip line and have a multifactorial etiology and a variable range of treatment options. There is an increasing demand for perfect esthetics from patients these days. Reconstruction of lost interdental papilla in the anterior esthetic zone is a challenging situation for a clinician. Open gingival embrasures may occur following periodontal treatment and after tooth replacement by an implant/prosthesis due to loss of interproximal papilla volume. In addition gingival black triangles may cause functional and phonetic discomfort to the patient. Several techniques have been proposed for reconstruction of this lost interdental papilla. However, these techniques are invasive and have unpredictable results.[1,2,3]

A non-invasive technique using hyaluronic acid gel for this purpose has been recently proposed and being administered for management of black tringles. Hyaluronic acid is an extracellular matrix component and a majority of the cells of the system are able to produce it during several phases of the cell cycle. The most important function of hyaluronic acid is its role in tissue repair and healing, tissue resilience and volume. Hyaluronic acid is also involved in a series of inflammatory reactions including activation and neutralization. It also stimulates cell proliferation, migration and angiogenesis, re-epithelization and proliferation of basal keratinocytes and reduces collagen scar formation. Due to these efficient characteristics of hyaluronic acid, it can be used as an effective medication for treatment of gingivitis, enhancement of tooth extraction socket healing and treatment of recurrent apthous ulcers.[2,4,5]

The potential of a hyaluronic acid gel injection to augment the volume of interdental papilla and reduce the black triangle has not been evaluated in a controlled clinical study.[6,7] The present study evaluates the clinical application of injectable hyaluronic acid gel (non-animal based) for reconstruction of gingival black triangles in anterior esthetic zone.

Materials and Method

In this experimental prospective study, four systemically healthy adult individuals with at least one anterior site with class I or class II interdental papilla loss were recruited. These patients had esthetics as their chief concern. A written informed consent was taken from the patient before enrolling the patient in the

study. The patient was well informed about the procedure and consequent follow-up visits.[12]

The ethical clearance was obtained from the institute for the clinical trial.

Norland and Tarnow[8] proposed the classification using three reference points, i.e., contact point, facial and apical extent of cemento-enamel junction (CEJ), and interproximal extent of CEJ (iCEJ), and was classified into the following four classes:

- Normal: Interdental papilla occupies embrasure space to the apical part of the interdental contact point.
- Class I: Tip of interdental papilla occupies space between the interdental contact point and the most coronal part of CEJ.
- Class II: Tip of interdental papilla lies at/or the apical to the iCEJ but coronal to the apical most part of the CEJ on facial aspect.
- Class III: Tip of interdental papilla lies at level with or apical to the facial CEJ.

The loss of interdental papilla can be due to multiple reasons including gingivitis, oral hygiene procedures with trauma, tooth shape with abnormal anatomy, improper contour of restoration, following periodontal surgeries and following tooth loss.

Inclusion criteria in the study were:

- Age range: 20-65 years
- Maxillary anterior teeth
- Plaque index less than 20%
- Teethwithout caries and prosthesis
- Patients who were non-smokers
- Patient with no systemic diseases effecting the periodontium
- Patient not consuming of drugs that cause gingival overgrowth.[7]

Patients were completely informed about the study.

Following administration of local anesthesia, ~0.2 ml of hyaluronic acid gel was injected directly into the base of papilla 2-3 mm apical to the coronal tip of the involved papilla using 23 gauge needle. The patient was instructed not to brush following 48 hours post-treatment. After 48 hours of study, tooth brushing was advised in anterior esthetic zone on the surgical site using soft bristle toothbrush and start their routine oral hygiene measures except on the treatment site.The injection was repeated after 20 days. The patients were monitored for the results in the subsequent follow-ups. Measurement of black triangle reconstruction was done using clinical photographs. Photographs were taken at end of three months and the clinical photographs were compared.

Lost papilla surface area was calculated using clinical photographs taken at baseline, 1 month, 3 month and 6 month post-operative follow-ups. Differences in the lost papillary surface area between baseline and post-operative clinical photographs were statistically analyzed using SPSS 19.0 version using ANOVA test.

This technique resulted in significant improvement of papillary volume and thus esthetics. Therefore, desired result was attained by hyaluronic acid gel.

Fig. A″: Pre-Operative intraoral clinical photograph showing gingival recession in maxillary central incisors, B″: Application of hyaluronic acid gel injection in the deficit interdental papilla, C″: 1-month post-operative follow-up on the deficit interdental papilla which shows improvement, D″: 3-months post-operative follow-up on the deficit interdental papilla which shows improvement, E″: 6-months post-operative follow-up on the deficit interdental papilla which shows improvement

Results

Each site was individually evaluated. A total of 8 interdental papillae in 4 patients including 2 males and 3 females with mean age of 27.3 years were evaluated. All the subjects were medically healthy and were considered ideal according to the inclusion criteria. All the subjects were followed until the end of the treatment and no associated complication, hypersensitivity or allergy was noted. According to the periodontal status, all sites were classified as Class I.

In the first follow up (1 month) following the treatment, 1-15% improvement in the papilla reconstruction was observed. In the second follow up (three monthslater) 12-83% improvement and at the third follow up (6 months after the injection), 22-100% improvement was noted. In the second follow up, approximately 2subjects showed 50% improvement; while in thethird follow up (at 6 months), about 2 subjects demonstrated improvement in interdental papilla reconstruction by over 50%. The effect of underlying factors such as gingival recession, periodontal status, bone crest-contactpoint distance, tight or loose contact and age wasalso evaluated and statistical analyses revealed that interdental papilla reconstruction did not have significant correlation with the above-mentionedfactors except for age.

Application of hyaluronic acid for reconstruction of gingival black triangle was successful in a 6-month follow-up period. 5 sites had complete papilla reconstruction and 3 sites had 34-57% of reconstruction rate.

Table 1: Number of gel applications, total months followed and percentage change for deficit interdental papillae in 4 patients included in the pilot study

Identification	No.of Applications	No. of Sites	Total months followed	Percentage Change
Patient 1	2	2	7	77
Patient 2	2	3	8	82
Patient 3	3	2	6	62
Patient 4	2	1	9	97

Discussion

Use of 0.2% hyaluronic acid gel gave significant improvement for reconstruction of lost interdental papilla. Additionally the technique illustrated is non-invasive and patient friendly with reduced surgical procedures for regeneration. The main advantage of this study is that it is nontoxic to the patient and there is reduced discomfort after the procedure as compared to other surgical procedures proposed. Furthermore, this study can be elaborated by more number of patients depending upon the size and type of the black triangle.

Several studies have been proposed regarding the effects of hyaluronic acid on periodontium. Becker et al. concluded that hyaluronic acid gel is a synthetic material and can be used with no drug interference and is a safe material, which significantly decreases the interdental black triangle in the esthetic zone. The Food and Drug Association have also approved it.[1]

Vedamurthy reported hyaluronic acid to be dermal filler and applied it for soft tissue augmentation, observing significant improvements.[10] Monheit et al. discussed the inherent properties of hyaluronic acid that make them ideal for cosmetic surgeries.[11] Prato *et al* studied gingival augmentation with an autologous cell hyaluronic acid and reported significant results with the complete coverage.[12] Pendyala et al found that antioxidant capacity of hyaluronic acid is inversely proportional to the severity of inflammation and can be used as a biomarker in periodontitis. It is acceptable that injecting hyaluronic acid to periodontal wound sites had shown significant effects in periodontal tissue regeneration. Engström et al reported bone regenerative effects of hyaluronic acid in nonsurgical and surgical groups and showed no statistical difference when evaluated on radiographs in the nonsurgical group; however, there was remarkable decrease in the height of alveolar bone after oral prophylaxis in both the nonsurgical and surgical group. There was also decrease in pocket probing depth after surgical treatment and also with scaling and root planing. Hyaluronic acid when involved with soft and hard tissues showed negligible effect on the immune system of the patient.[13] Ballini et al stated enhanced accelerating capacity of new bone formation in the intra-bony defects when combined with autologous bone graft.[14]

Conclusion

This study indicates possible clinical improvement in reconstruction of lost interdental papilla and thus removal of gingival black triangle by injecting hyaluronic acid into the deficit papilla using a non-surgical approach. This approach reduces the surgical procedures of elaborative regenerative techniques and hence it is non-invasive and it also reduces the patient discomfort. This study demonstrates hyaluronic acid gel to be a nonsurgical noninvasive approach for regenerating lost papilla and also gave significant and satisfactory clinical improvement. To overcome the limitations of this study, the study can be extended to wider number of patients depending on the lost interdental papilla volume and size of gingival black triangle.

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Comparative effect of Herbal and Carbopol formulated dentifrices on established gingivitis

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Abstract

Introduction: Bacteria in dental plaque are one of the main etiological factors causing periodontal disease. Gingivitis is common and non-specific inflammatory reaction to a complex indigenous micro-biota. Supra-gingival plaque control is an effective method of controlling gingivitis and the most widely practiced form of oral hygiene is tooth brushing with a dentifrice. Carbopol dentifrice has added properties like mucoadhesion and polymeric mineral surface active agents like carbomers making it superior to other dentifrices for controlling gingivitis.

Purpose: To evaluate and compare the effectiveness of Herbal dentifrice and Carbopol formulated dentifrice in subjects with established gingivitis.

Materials and Method: 30 subjects with chronic marginal gingivitis were selected and randomly divided into 2 groups. Group 1 received Carbopol formulated dentifrice. Group 2 received Herbal dentifrice. Subjects were asked to use the allocated dentifrice, two times a day, for 42 days. Values of Simplified oral hygiene index, Plaque index, Gingival index, and Sulcular bleeding index were assessed at baseline, after 21 and at 42 days. Data was analyzed by Student's t-test ($\alpha = 0.05$).

Results: Oral hygiene (tooth brushing with dentifrices for 42 days) led to a significant decrease in plaque accumulation by 13% in group 1 and 8% in group 2. Simplified oral hygiene index showed improvement by 23% in group 1 and 10% in groups 2, Gingival sulcus bleeding showed reduction by 62% in group 1 and 24% in group 2 and gingival inflammation decreased by 14% in group 1 and 9% in group 2. Outcome of various indices in Carbopol formulated group (Gp1) showed a significant improvement in all the parameters ($P < 0.05$), except sulcular bleeding index from baseline to 42 days as compared to the Herbal test group (Gp2).

Conclusion: Continuous use of Carbopol formulated dentifrice provided significant improvement of oral hygiene level in patients with established gingivitis.

Keywords: Dental plaque, Gingivitis, Herbal, Carbopol formulated, Dentifrice

Introduction

Dental plaque is a microbial biofilm which is invariably present on the hard and soft tissues of the oral cavity and it contains a complex blend of various microorganisms. Plaque is considered as the precursor of dental caries, gingivitis and periodontitis. The prevention and control of dental caries and periodontal disease is dependent on optimal plaque control.(1) Self-performed mechanical plaque removal is an unquestioned method of controlling plaque and gingivitis.(2) The considerable prevalence of gingival inflammation within the general population suggests that most patients practice inadequate oral hygiene, particularly within certain regions of their mouths and in certain areas of their teeth.(3) The need for additional help in controlling bacterial plaque provides the rationale for patients to use antimicrobial dentifrices in addition to their mechanical oral hygiene regimens.(4)

A number of controlled clinical trials have demonstrated that tooth brushing with herbal dentifrices reduces supra-gingival plaque and gingivitis.(5) Interest in natural-based toothpastes has increased recently. Of the various herbal dental products considered, Hiora-K (Himalaya herbal healthcare) has received great attention. It is composed of certain herbal extracts like Palakya (spinacia oleracea), Triphala, Trikatu. Palakya (spinacia oleracea) that contain natural oxalate compounds, which help in forming phytocomplexes on the teeth that occludes dentinal tubules and blocks the pain transmission. It also contains certain herbal powders like Suryakshara and Yashodabhasma that have immune stimulatory properties and are natural antiseptic. Naturally derived Suryakshara (potassium nitrate) inhibits pain in hypersensitive teeth through its desensitizing effect on dentinal nerves. Oils like Twak (cinnamomum zeylanicum) that act as natural anti-inflammatory agent and Lavanga (syzygium aromaticum) are also present. Lavanga (clove) contains an anesthetic chemical compound called eugenol and oil of clove that acts as an antiseptic. Sukumaran(6) conducted a study to evaluate the efficacy and safety of Hiora-K toothpaste on sensitive tooth and the efficacy parameters showed good results with an overall improvement and no adverse effects.

Good plaque control preserves oral health for a lifetime. Many clinical studies clearly indicate that the major deposits of plaque form in stagnation areas, such as the proximal areas, gingival margins, and defects in the teeth.(7) These areas are protected from the natural

cleansing mechanisms of oral tissues. Thus, emphasis must be placed on the effectiveness and efficacy of plaque-removing devices used to facilitate oral hygiene in these elusive areas.[2]As tooth brushing is the most common oral hygiene method, dentifrices are the most ideal vehicle for the daily delivery of antibacterial agents. These chemotherapeutic agents should provide a preventive effect against caries and gingivitis.[8]

The other toothpaste used in this study is the Carbopol formulated dentifrice. In the recent decades, there has been considerable interest in using Carbopol as an excipient in a diverse range of pharmaceutical applications. Carbopol polymers or carbomers are polymers of acrylic acid cross-linked with poly-alkenyl ethers or di-vinyl glycol. They are produced from primary polymer particles of about 0.2 to 6.0 micron average diameter. Each particle can be viewed as a network structure of polymer chains inter-connected via cross-linking.[9] Carbomers were first prepared and patented in 1957.[10] Sensodyne repair & protect is a recent advancement that has Carbopol as its active constituent. Apart from being efficient thickeners and binders, they deliver the added benefit of mucoadhesion i.e. it retains on the mucosal surfaces. The polymeric mineral surface active agent protects enamel surface from demineralization, prevents biofilm attachment to enamel thus reducing gingivitis, delays plaque mineralization and enhances deposition of active compounds to enamel surfaces The microgel structure of Carbopol polymers also imparts a shear-thinning property to the system. To the best of our knowledge, this is the first study done to evaluate the effectiveness of Carbopol on established gingivitis.

The main aim of this study was to evaluate the efficacy of Carbopol formulated dentifrice for the improvement of oral hygiene and the reduction of gingival inflammation in patients with established gingivitis as a whole, in comparison to Herbal dentifrice.

Materials and Method

30 subjects diagnosed with chronic marginal gingivitis with generalized probing depth of 2-3mm having no radiographical signs of bone loss were selected from the out-patient department of Periodontology, Subharti Dental College & Hospital, Meerut. The subjects were randomly allocated to one of the two groups. Group 1 (n=15) - Brushed twice daily with Carbopol formulated dentifrice (Sensodyne repair & protect). Group 2 (n=15) - Brushed twice daily with Herbal dentifrice (Hiora-K, Himalaya herbal healthcare). Technique of brushing in both the groups was modified bass technique. The subjects were informed about the study, and their consent was obtained in a prescribed form. The study was carried out after approval by the ethical committee of Swami Vivekananda Subharti University.

Inclusion criteria

- 20-40 yrs of age
- Poor oral hygiene status
- Signs of gingival inflammation corresponding with chronic marginal gingivitis
- Systemically healthy

Exclusion criteria

- Advanced periodontal inflammation
- Fixed orthodontic appliances
- Patients on antibiotics or anti-inflammatory medicines
- Pregnant females and nursing mothers
- Patient on anti-inflammatory or antibiotic medication during the study
- Large carious lesions
- Non-compliant subjects

Oral examination was performed at the beginning of the study (baseline), after 21 days (3 weeks) and at 42 days (6 weeks).

The following parameters were assessed:

- Simplified oral hygiene index (OHI-S)[11]
- Sulcular bleeding index (SBI)[12]
- Gingival index (GI)[13]
- Plaque index (PI)[14]

Study data obtained were entered into statistical software (Microsoft excel for Windows 7; Statsoft Inc., Tulsa, OK) and Student's t-test was used to compare the difference between groups. Results were tested for significance at the $P < 0.05$ level.

Results

Evaluation of oral hygiene status: The baseline examination showed that the oral hygiene status of all subjects was unsatisfactory according to Simplified oral hygiene index (OHI-S) and Plaque index (PI).

Evaluation of Simplified oral hygiene index (OHI-S): Table 1 and Fig. 1 shows differences in OHI-S values from baseline to 42 days in Carbopol formulated group. Table 2 and Fig. 2 shows difference in OHI-S values from baseline to 42 days in Herbal group. Both were not significant ($P > 0.05$). The percentage difference in Carbopol formulated group and Herbal group between baseline and 42 days was 23% and 10% respectively. Table 3 shows difference in P value between baseline and 42 days in carbopol formulated and herbal group was statistically significant 0.018 ($P < 0.05$).

Evaluation of Plaque index (PI): Table 1 and Fig. 1 shows differences in plaque index values from baseline to 42 days in Carbopol formulated group. Table 2 and Fig. 2 shows difference in plaque index values from baseline to 42 days in Herbal group. Both were not significant ($P>0.05$). The percentage difference in Carbopol formulated group and Herbal group between baseline and 42 days was 13% and 8% respectively. Table 3 shows difference in P value between baseline

and 42 days in Carbopol formulated group and Herbal group was statistically significant0.003 (P< 0.05).

Evaluation of periodontal status: Baseline data revealed that all participants had signs of gingival inflammation (GI): bleeding on probing, hyperemia, and edema of the gingival margin.

Evaluation of Gingival index (GI): Table 1 and Fig. 1 shows differences in gingival index values form baseline to 42 days in Carbopol formulated group. Table 2 and Fig. 2 shows differences in gingival index values in Herbal group from baseline to 42 days. Both were not significant (P >0.05). The percentage difference in Carbopol formulated group and Herbal group between baseline and 42 days was 14% and 9% respectively. Table 3 shows difference in P value between baseline and 42 days in Carbopol formulated group and Herbal group was statistically significant 0.004(P< 0.05).

Evaluation of Sulcular bleeding index: Table1 and Fig. 1 shows differences in sulcular bleeding indices values from baseline to 42 days in Carbopol formulated group. Table 2 and Fig. 2 shows differences in sulcular bleeding index values from baseline to 42 days in Herbal group. Both were not significant (P >0.05). The percentage difference in carbopol formulated group and herbal group between baseline and 42 days was 13% and 6% respectively. Table 3 shows difference in P value between baseline and 42 days in carbopol formulated and herbal group was statistically insignificant 0.167 (P>0.05).

Table 1: Intra-group comparison of all parameters in Group 1 over 42 days using student's t-test

Clinical Parameter	Carbopol formulated (Gp1) [n=15]			
	Baseline	21 days	42 days	% difference between baseline and 42 days
Oral hygiene index (OHI-S)	4.32	3.71	3.34	23%
Plaque index (PI)	2.01	1.87	1.76	13%
Gingival index (GI)	2.13	1.93	1.83	14%
Sulcular bleeding index (SBI)	83.08	75.52	72.63	13%

Table 2: Intra-group comparison of all parameters in Group 2 over 42 days using student's t-test

Clinical Parameter	Herbal (Gp2) [n=15]			
	Baseline	21 days	42 days	% difference between baseline and 42 days
Oral hygiene index (OHI-S)	4.28	4.04	3.84	10%
Plaque index (PI)	2.04	1.97	1.88	8%
Gingival index (GI)	2.17	2.09	2.0	9%
Sulcular bleeding index (SBI)	80.6	77.54	75.88	6%

Table 3: Inter-group P value difference between baseline and 42 days

Clinical Parameter	Carbopol formulated (T1) [n=15]		Herbal (T2) [n=15]		P value difference between baseline and 42 days
	Baseline	42 days	Baseline	42 days	
Oral hygiene index (OHI-S)	4.32	3.34	4.28	3.84	0.018*
Plaque index (PI)	2.01	1.76	2.04	1.88	0.003*
Gingival index (GI)	2.13	1.83	2.17	2.0	0.004*
Sulcular bleeding index (SBI)	83.08	72.63	80.6	75.88	0.167

* Statistically significant at P < 0.05

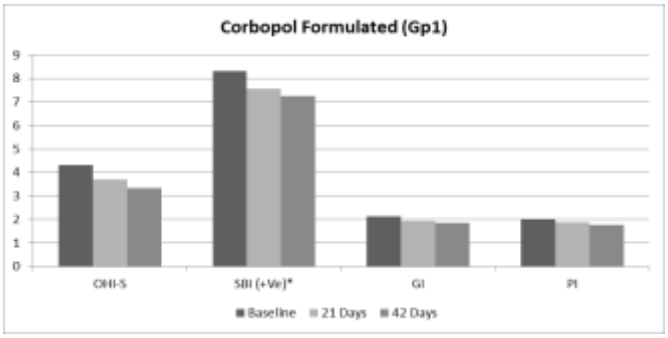

Fig. 1: Comparison of all parameters in Carbopol formulated (Gp1) over 42 days

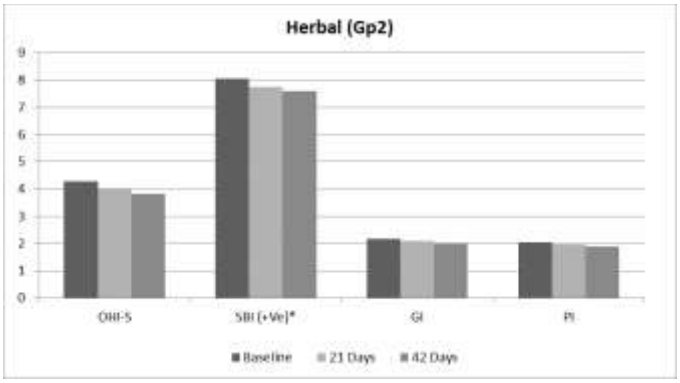

Fig. 2: Comparison of all parameters in Herbal (Gp2) over 42 days

Discussion

To the best of author's knowledge this was the first study to compare the effectiveness of Carbopol formulated dentifrice in established gingivitis subjects. The results of the clinical study demonstrated that both of the carbopol formulated dentifrice and herbal dentifrice were effective and led to an improvement in oral hygiene and in the periodontal status in patients with established gingivitis. After 21 days, considerable improvement of periodontal condition was observed in both groups; this reduction may be partially due to the mechanical brushing which to some extent eliminates and controls the microbial plaque.

The use of Carbopol formulated dentifrices led to a considerable reduction in dental plaque accumulation both on smooth and approximal tooth surfaces. After 42 days, final values of all indices except for sulcular bleeding in Carbopol formulated groups were significantly lower compared to baseline data and to corresponding values in the herbal group. Carbopol formulated dentifrices use increased the effectiveness of plaque control. Probably, active ingredients of the Carbopol formulated dentifrices penetrate the biofilm and prevent plaque accumulation.

A double-blinded controlled clinical study with parallel groups was done to investigate the effectiveness of a herbal-based toothpaste in cases of gingivitis and concluded that the herbal-based toothpaste was as effective as the conventional dentifrice.[15] Ibrahim K et al[16] conducted a study to assess the microbial quality and the effectiveness of seven brands of toothpaste. They found that 71% of the toothpaste brands were found to significantly ($p=0.068$) increase saliva bacteria. The two triclosan-containing toothpastes exerted a greater reduction in mouth bacteria which was followed by the herbal toothpaste and fluoride showed the least.

In the present study, Carbopol formulated tooth paste was more effective for the reduction of dental plaque than Herbal tooth paste with significant differences. This may be due to the three pillars of Carbopol polymers which include their ability of controlled release,[17] bioadhesion[18] and long term stability in oral suspensions.[19] However, there was no significant differences of sulcular bleeding index values between both the groups after 42 days, indicating equivalence of Carbopol formulated and Herbal dentifrices in improving bleeding score.

Conclusion

Regular application of Carbopol formulated dentifrice during 42 days provided significant reduction of dental plaque accumulation and some signs of gingival inflammation. These agents possess bactericidal activity against most of the periodontal pathogens without a negative influence on the normal micro-flora. Further long term studies are required to see the effect of these dentifrices on gingival and periodontal inflammation.

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Knowledge attitude and practice of Indian dentists on topical fluoride application in children

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Abstract

Objectives: To assess the knowledge, attitude and practice of dentists towards Topical fluoride application in Delhi, National Capital Region (NCR).

Materials and Method: A self-made questionnaire was designed in a manner through which Knowledge, Attitude and Practice of the practitioners on topical fluoride application could be studied. The validated questionnaire was mailed to 100 dentists. Data were analysed using SPSS version 20 for inferential statistics and Spearman's correlation coefficient.

Results: 70 0f 100 respondents filled the questionnaire. Majority of the practitioners who were enrolled in the study were paediatric dentists (50.7%), followed by General practitioners (31.9%). Majority of the dentists (71%) did not face any difficulty in integrating preventive procedure in their practice. Acidulated phosphate fluoride (APF)/Sodium Fluoride (NaF) gel was the preferred choice amongst the practitioners. Most of the dentists had a positive attitude regarding practicing preventive procedure and thought it is for the betterment of their patient. There was no correlation found in the knowledge and attitude scores as well as attitude and practice scores.

Conclusion: Dentists had average knowledge and positive attitudes towards fluoride application. Paediatric dentists were more knowledgeable towards practising preventive dentistry and were more likely to manage the high-risk patients more efficiently.

Keywords: Fluorides, Risk, Caries management.

Introduction

Dental caries is a major health problem in most industrialized countries and is thought to affect 60-90% of school aged children. The treatment of oral disease using traditional methods is costly and in industrialized countries currently rates the fourth most expensive disease to treat. Over a period of time, management of dental caries has evolved from a conventional to a more evidence based approach. Modern dentistry focuses on preventive methods and conservative techniques to apply less-invasive procedures to tooth structure. Awareness towards the importance of preserving tooth tissue combined with a patient-friendly approach is becoming self-evident.(1) It has been shown that operative dental treatment often leads to an increasing scale of more surgical and invasive treatments. The advances made in dental technology have made secondary and tertiary level preventive care more evident. However, little information exists on how primary preventive dentistry is being practiced in dental clinics in India and where preventive oral health services are placed on the priority scale by dental practitioners.

Topical fluoride application is the most effective preventive method against caries, and its effectiveness in preventing and reversing incipient dental caries is well documented.(2)

Topical fluorides in the form of solutions, gels, prophylaxis pastes, varnishes and rinses are widely used by dental practitioners. The reasons for the popularity of these procedures are presumably the perceived ease of use by the operator with a relatively good financial return, acceptance by patients and the effectiveness of the procedures in caries reduction reported in the literature.(3)

According to the Centre for Disease Control (CDC) "the laboratory and epidemiologic research" that has led to the better understanding of how fluoride prevents dental caries indicates that fluoride's predominant effect is post-eruptive and topical and that the effect depends on fluoride being in the right amount in the right place at the right time.(4)

Dentists are the main source of health information for the patients and they play an important role in rendering preventive care to the infants at the right stage. Given the changing state of knowledge and clinical recommendations relating to the use of fluoride products and prevention in general, the extent of dentists' knowledge and clinical practice is still uncertain as very few studies have been conducted in India to assess the same. Hence a study was carried out to assess the level of knowledge of dentists about systemic and topical effects of fluorides and their attitude towards its use and prescription of fluoride products.

Materials and Method

Ethical approval for the study was obtained from the Institutional Ethics Committee of I.T.S-Centre for Dental Studies and Research, Ghaziabad, India. Seventeen-item questionnaire was mailed to dentists in Delhi NCR region and out of 100 mailed-out

questionnaires 70 (70%) were received back completely filled. Description of the questionnaire was explained by the researcher in the mail itself and willingness to fill the questionnaire indicated consent. Also, the link to the Google form website (www.google.co.in/forms) was embedded within the mail. All the questions were kept anonymous.

Questionnaire Structure: A self-made questionnaire was designed in a manner through which Knowledge, Attitude and Practice of the practitioners on topical fluoride application can be studied. Questionnaire comprising of three sections based on the relevant literature was used in this survey.[2,3,4,6,9] Questions related to knowledge were designed from the American Academy of Paediatric Dentistry(AAPD) guidelines.[5]

The questions related to preventive practice of the dentist and attitude were adopted from previous surveys on similar topics. The questionnaire included 3 questions on knowledge, 8 questions to assess practice and 5 questions to estimate the attitude of dentists towards preventive dentistry.

To validate the questionnaire a pilot study was conducted on 10 dentists, none of them participated in the final data collection, any modification suggested in the question were recorded for final questionnaire formation.

Knowledge based questions for Dentists: The questions asked were designed to elicit knowledge regarding (1) American Dental Association (ADA) recommendation of topical fluoride application in children under 6 years of age (2) During which period of tooth development consuming fluoride has higher risk of dental fluorosis (3) Knowledge about tooth mousse or any other technology for remineralization.

The questionnaire consisted of demographic information including name, age, qualification and year in practise of the practitioner and which speciality they belong to.

Attitude based questions for Dentists: Attitude was assessed on the basis of the existence of alternative to topical fluoride application and its efficacy in children and adults and whether the practitioners feel that practising preventive dentistry is for betterment of their patient.

Practice based questions for Dentists: Last section evaluated the type of topical fluoride dentist preferred and whether the practitioners advocated topical fluoride application in children with active cavities or not.

Statistical Analysis: Data was entered in Microsoft Excel 2007 for descriptive statistics and imported to SPSS Statistics for Windows version 20 for inferential analysis. Percentages of correct answers for each aspect of Knowledge, Attitude and Practice were estimated.

Correlation between knowledge and attitude scores and knowledge and practice scores were estimated using Spearman's correlation coefficient.

Results

Out of the 100 questionnaires mailed among the dentists, 70 dentists completed the questionnaire and were included in the study. Out of the 70 respondents 50.7% were Paediatric dentist, 17.4% were General dentists and the remaining 31.9% were from other specialities.

Knowledge of Dentists: When questioned about the period of tooth development during which consuming fluoride has higher risk of dental fluorosis only 36.8% could answer it correctly i.e. 0-2 years.

53.6% of the dentists were aware about the ADA recommendation of topical fluoride application under 6 years of age, while 33.3% believed that topical fluoride application under 6 years was not recommended, 13% were not able to answer.

Dentists Attitude towards topical fluoride application and its practice: Of all the enrolled dentists 71% did not face any difficulty in integrating preventive procedure in their practice whereas 29% reported difficulty in the same. Majority of the practitioners (97.1%) felt that practicing preventive dentistry is for the betterment of their patient.

71% of the practitioners preferred Acidulated Phosphate Fluoride (APF)/ Sodium Fluoride (NaF) gel, 13% preferred fluoride varnish and only 10.1% opted for fluoride mouthwash when asked about their preference in topical fluoride application mode (Fig. 1).

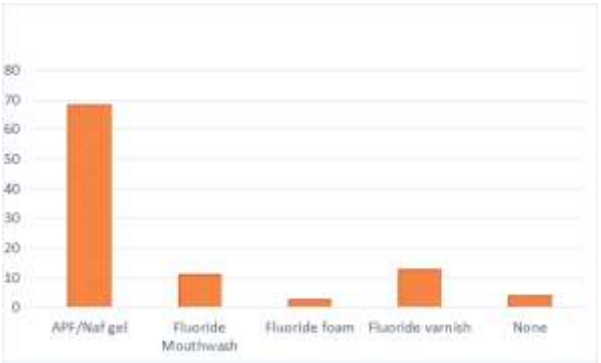

Fig. 1: Different methods of topical fluoride application preferred by practitioners

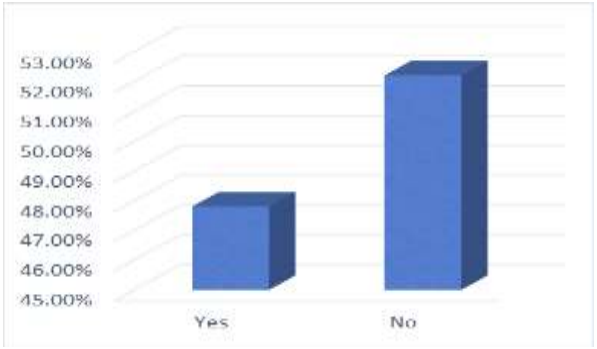

Fig. 2: Diagrammatic representation showing percentage of dentists attending educational seminars regarding fluorides

63.8% of the practitioners routinely advocated topical fluoride application in children with active cavities, but only 44.9% of the practitioners advocated topical fluoride in children without active cavities. (Fig. 3)

Only 48.5% of the respondents agreed that dietary fluoride supplement was effective whereas 26.5% disagreed to it and 25% were clueless about the same.

79.7% of the respondents were effectively aware about tooth mousse and other technologies for remineralization of incipient lesions in the tooth. However, only 47.8% of the dentists reported on receiving updates/ attending seminars regarding fluoride while 52.2% did not actively participate in it.

Only 20.6% of the respondents assessed the water fluoride level of the area in which the patient resides before topical fluoride application, strikingly 77.6% of the dentists believed that assessing water fluoride level of the patient's area should affect topical fluoride application.

The Knowledge scores were not correlated to Attitude scores, similarly the Attitude score were not significantly correlated to Practice scores (Table 1).

Table 1: Spearmans Correlation Coefficient analysis of Knowledge, Attitude and Practice scores

	Attitude
Knowledge Correlation Coefficient	.077
Sig	.525
Practise Correlation Coefficient	.170
Sig	.164

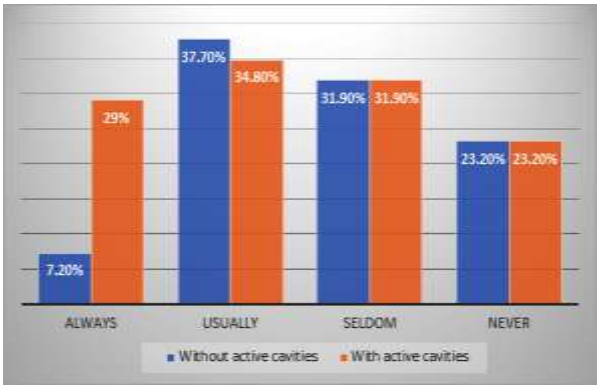

Fig. 3: Dentists advocating topical fluoride application in children with and without active cavities

Discussion

Our study presents us with a preview of current status of the knowledge of the dentists about preventive measures using topical fluorides. Also, it provides a perception regarding the attitude of the dentists towards the use of topical fluorides in their practice. The dentists were knowledgeable about the effects of topical and systemic administration of fluoride and had positive attitude towards the preventive effect of fluoride especially in children is shown in our study.

Out of all the respondents 50.7% were paediatric dentists and 17.4% were General practitioners. Majority of practitioners (71%) did not experience any problem in integrating preventive procedures in their practice, whereas only 29% of them agreed to have experienced problem in integrating preventive procedures in their practice. This finding can be attributed to the fact that that majority of the respondents involved in our study were paediatric dentists who have undergone rigorous training of preventive programmes like fluoride application.

Only 53.6% practitioners were aware of ADA recommendation about the application of topical fluoride in children below 6 years of age and only 36.8% of the dentists were able to correctly answer when questioned about the period of tooth development during which consuming fluoride had higher risk of dental fluorosis, this shows lack of diffusion of information amongst the dentists in our study.

However according to a study conducted in Vadodara by Ramya R et al[6] majority of study subjects (80.49%) exhibited average knowledge level.

CDC has given guidelines on recommendation for using fluorides to prevent and control dental caries, which were published in 2001 and also summarized in the Journal of the American Dental Association (JADA) (2006).[7]

In a study conducted in Indiana on 6,681 dentists and dental hygienists, use of fluoride in children and adults with and without active or recent caries was evaluated, in which they found that 95% respondents administered fluoride therapy for children with active caries while 62% of respondents reported the use of fluoride for adult patients with the same conditions.[8]

However, according to our study only 34.8% practitioners advocated topical fluorides in children with active caries and 7.2% without active caries.

In another study done in Texas by Bansal et al[9] 94% of American dentists reported that they routinely perform fluoride therapy in their clinics. 20% of the respondents were in agreement with the recommendation that topical fluoride application is not beneficial for low risk patients. 93% correctly responded that topical fluoride should be prescribed every three to six months for high-risk children under six years of age.

According to the AAPD Guidelines 2014,[5] 5% sodium fluoride varnish (NaF; 22,500 ppm F) and 1.23% Acidulated Phosphate Fluoride (APF; 12,300 ppm F), are the most commonly used agents for professionally-applied fluoride treatments.

According to our study APF gels were the most preferred choice of the type of topical fluoride application for dental practitioners (71%) followed by varnish (13%) and Fluoride mouthwash (10%).

Similarly, 66% of dentists preferred APF/NaF gel for their routine dental practice according to Bansal et al.[9]

As stated by CDC, it is important to monitor the fluoride intake of children younger than six years old, as the first six years of life is an important period for tooth development. Overuse of fluoride during this period can result in enamel fluorosis, a developmental condition of tooth enamel that may appear as white lines or spots.[7]

For children who live in communities that have high fluoride content in their water supply, supplements and high-concentration fluoride products should be used judiciously.[7]

However, in our study only 20.6% of the respondents assessed the water fluoride level of the area in which the patient resides before topical fluoride application.

In our study only 47.8% of the dentist received updates or attended seminars on topical fluorides application in contrast to 62.20% of participants as reported by Ramya R et al[6] in 2015. However, attending CDE programmes on preventive dentistry was not found to significantly affect practitioners' knowledge on preventive dentistry.[6] This observation was in concordance with the study results of Ghasemi H et al[10] among Iranian dentists that reported of no impact on knowledge level of the dentists through participation in CDE programmes on preventive dentistry.

The knowledge and attitude scores of this study were not significantly correlated inferring to the fact that greater knowledge scores do not assure a better practice and vice versa.

Limitation of the study

The chances of bias increases in questionnaire surveys due to over representation of responding dentists. Also, dentists tend to present themselves in a manner which is more socially acceptable, so that it gives an impression that they practice preventive procedures in their clinical practice. Poor response rate was another important limitation of the study.

Conclusion

In spite of the universal recommendation of topical fluoride application in preventing dental caries, it has failed to become an integral part of Dental practice in India.

Although majority of the surveyed dentists were aware of the principles of preventive dentistry and showed favourable attitudes towards prevention, the practice of fluoride application was found to be unsatisfactory.

It also reflects the generalized attitude of Indian dentistry which focuses more on corrective treatments rather than the preventive ones.

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Evaluation of mast cells in odontogenic cysts by toluidine blue & c-kit gene product (CD117)

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Abstract

Introduction: Odontogenic cysts are characterized by an expansile non–infiltrative growth through several mechanisms which include presence of mast cells in the capsule. The mast cells can be demonstrated histochemically as well as immunohistochemically.

Aim and Objectives: The primary objective of the study was to analyze the presence and distribution of mast cells in radicular cyst, dentigerous cyst and keratocystic odontogenic tumor histochemically and immunohistochemically, to intercompare their expression and to correlate it with the degree of inflammation.

Materials and Method: Tissue sections of 30 cases each of radicular cyst, dentigerous cyst and keratocystic odontogenic tumor were stained with toluidine blue and CD117. Quantitation and localization of mast cells was determined by dividing the section into subepithelial and deep zone. The mean number of mast cells was compared between toluidine blue and CD117 for each cyst, and also between two zones for each cyst, using ANOVA test. Correlation of mast cells with degree of inflammation was done using Pearson's correlation coefficient.

Results: The mean number of mast cells were maximum in keratocystic odontogenic tumor, both histochemically and immunohistochemically, with high localization in the subepithelial zone. Immunohistochemical staining detected higher number of mast cells than histochemistry (4.54 and 3.23 respectively). Statistically significant correlation of mast cells with degree of inflammation was observed.

Conclusion: Mast cells may play a role in the pathogenesis of odontogenic cysts as an elevated number of mast cells were found in the connective tissue capsule of all three odontogenic cysts.

Keywords: CD117; Keratocystic Odontogenic tumor; Mast cells; Radicular cyst; Toluidine blue.

Introduction

Odontogenic cysts, possibly the most common benign destructive lesions in human maxillofacial skeleton, are characterized by an expansile non–infiltrative growth.[1] The exact mechanism of growth and expansion associated with these lesions is still not clear, but it is known that several different cell types, including mast cells, can participate in these phenomena.[2]

Mast cells have often puzzled investigators from the time they were first identified and named by Ehrlich in 1879 as 'Mastung'/'Mastzellen', i.e. they exist to nourish the surrounding tissue.[3,4] They are divided into two subsets in rodents – connective tissue mast cells (CTMC) that are located in connective tissue, demonstrated by toluidine blue, and secrete enzymes tryptase and chymase; and mucosal mast cells (MMC) that are located within mucosa, demonstrated by Alcian blue at acidic pH, and secrete enzyme tryptase. The MMCs are predominantly found in the alveolar walls and small intestinal mucosa, whereas the CTMCs are ubiquitous.[5,6] Moreover, the visualisation of MMCs requires the application of appropriate fixative and staining procedures, as the glycosaminoglycans stored in their granules have relatively low molecular weight and though they are coupled with proteins, they can easily be dissolved in routinely used fixatives.[7] In humans, three types of mature mast cells are identified: MCt - mast cells containing only tryptase; MCtc - containing tryptase, chymase and carboxypeptidase; and the less frequent MCc - containing chymase.[8]

Mast cells participate in events associated with inflammation and bone resorption and interact with other cells of the immune system.[9] Their presence has also been recognized in odontogenic cysts in terms of total glycosaminoglycan content (heparin) of cyst capsular wall.[10]

Mast cells are not easily recognized by hematoxylin and eosin staining,[11] hence they are commonly stained by basic dyes like toluidine blue. The presence of sulphated mucopolysacchrides, within the granules gives the characteristic metachromatic staining reaction with toluidine blue.[12] However, such staining seems to be dependent on an intact number of mast cell granules, whereas the more sensitive immunohistochemical techniques are able to detect partially degranulated mast cells, which still contain enough tryptase.[9] Moreover, basophils also have the capacity to release tryptase in vivo, and so anti-tryptase antibodies cannot be used to distinguish these two cell types from one another; and therefore tryptase is not an exclusive marker of mast cells.[13]

Existing data revealed that mast cells have strong membrane reactivity for CD117 that may be useful in

diagnosis of mast cell disorders.[14] Since literature review revealed very few studies where immunohistochemical evaluation of mast cells has been carried out using CD117 in periapical lesions and odontogenic cysts, the present study was planned with the aim of analyzing the presence and distribution of mast cells in radicular cyst (RC), dentigerous cyst (DC) and keratocystic odontogenic tumor (KCOT) histochemically and immunohistochemically; to intercompare their expression and to correlate it with degree of inflammation.

Materials and Method

Patients: The study comprised of total 90 cases, 30 each of RC, DC and KCOT diagnosed on the basis of clinical and histopathological correlation. The specimens of those patients who presented with the history of chronic allergic reactions, inflammatory and parasitic infections were excluded. Also, the specimens that had undergone decalcification were excluded as mast cell granules could be masked by this technique. The study protocol was reviewed by the Ethical Committee of the institute and was granted ethical clearance. Formalin fixed paraffin embedded tissue blocks of these cases were retrieved from the archives of the Department of Oral and Maxillofacial Pathology of the institute.

Histochemical staining and evaluation: Serial sections of 4-5 µm thickness were cut from the paraffin wax blocks of 90 specimens. For histochemical evaluation, the sections were stained with freshly prepared 1% toluidine blue (adjusted at ph 2.0 – 2.5) for 2-3 minutes, using Toluidine blue staining protocol for mast cells.[15] Following dehydration and clearing, the sections were mounted with resinous mounting media [DPX (Rankem, RFCL Ltd)] and followed by mast cells counting. Round, oval, or fusiform cells containing purplish red metachromatic granules in their cytoplasm were considered to be mast cells (Fig. 1).

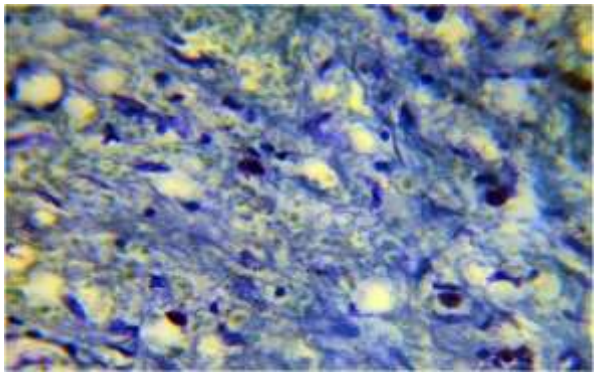

Fig. 1: **Photomicrograph showing mast cells under toluidine blue stain (100x magnification)**

Immunohistochemical staining and evaluation: For immunostain with CD117, the sections were mounted on super frost slides, dewaxed, and incubated with 0.3% hydrogen peroxide in methanol at room temperature for 10 min. Slides were then washed in running tap water for 15 min and treated with 0.1% trypsin (Sigma) mixed in 0.1% calcium chloride (pH 7.8) for 10 min at room temperature. Nonspecific binding of protein was blocked by incubation in normal rabbit serum diluted 1:5 in Tris-buffered saline (TBS; pH 7.6) for 15 min. the slides were then incubated for 18 h at 4^0C with the polyclonal rabbit anti-human antibody CD117 (anti-c kit antibody) DAKO ((A) 4502, Dako, Cambridge, UK), washed in TBS (Tris-buffered saline) for 7 min and then incubated for 30 min with biotinylated rabbit anti-mouse IgG (Amersham, UK). Later, the slides had been washed in TBS for 7 min; they were further incubated with streptavidin-biotin complex conjugated with HRP (horse-radish peroxidase) polymer for 30 min. The slides were developed in diaminobenzidine-hydrogen peroxide substrate (Sigma) for 10 min, rinsed in TBS and washed in tap water for 5 min. Sections were then counterstained with Harris' hematoxylin, dehydrated, cleared, and mounted in DPX (Rankem, RFCL Ltd). The controls for staining were obtained by omitting the primary antibody in the staining sequence which was replaced by normal mouse serum (Dako, Glostrup, Denmark).

The immunohistochemical results demonstrating strong membrane positivity in the round, oval, or fusiform cells, were considered to be mast cells (Fig. 2).

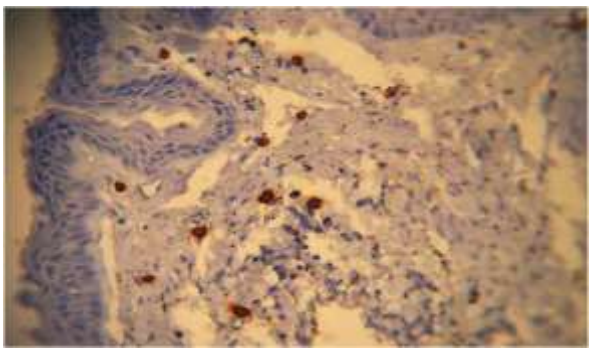

Fig. 2: **Photomicrograph showing mast cells under CD117 stain in Keratocystic Odontogenic Tumor (40x magnification)**

Counting of mast cells: For the quantitation and localization of mast cells by both toluidine blue and CD117, the section was divided into two zones: subepithelial and deep zone; using an ocular grid. For the subepithelial zone, the 1 cm^2 graticule was oriented along the connective tissue capsule at its junction with the epithelium and every alternate high power microscopic field was counted (The area encompassed by the graticule was taken as one microscopic field). The graticule was then moved two high power fields into the connective tissue and the procedure repeated for the deep zone. In this way, 10 fields were counted at each zone of the capsule in each specimen which makes

a total of 300 high power fields for each cyst (n=30 for each cyst).

Degree of inflammation in the cyst wall was scored as per the criteria given by Netto et al,[2] Smith et al[10] and Debta P et al[16] by counting inflammatory cells in 10 random high-power fields and describing the mean number of cells per field according to the following scale: no inflammation (zero inflammatory cells), mild + (average of 15 inflammatory cells or fewer / field), moderate ++ (average of 16–50 inflammatory cells/ field), and severe inflammation +++ (average of more than 51 inflammatory cells / field).

Statistical analysis: The total number of mast cells per high power field for individual cyst was recorded in the two zones and the mean and standard deviation (SD) values were calculated. The mean number of mast cells was compared between toluidine blue and CD117 for each cyst, and also between the two zones for each cyst, individually for toluidine blue and CD117 using one way ANOVA (Analysis of Variance) test, where significance was established as $p<0.05$. The quantity of mast cells in each cyst was correlated with the degree of inflammation using Pearson's correlation coefficient. All the statistical analysis was carried out using SPSS software, version 11.5.

Results

Mast cells were evaluated in the connective tissue capsule of all the cyst specimens examined. On comparing the zone wise distribution of mast cells stained with toluidine blue, we found that the mean number of mast cells was higher in the subepithelial zone as compared to the deep zone in all the three cysts, with a statistically significant difference ($p<0.05$) between the observed zones. Also, this concentration was higher in KCOT (mean = 2.62) as compared to other cysts (Table 1).

Table 1: Comparison of distribution of mast cells between zones in the three cyst groups stained with Toluidine Blue

Cyst	Zone	Number of High Power Fields	Mean± Standard Deviation	p* Value
Radicular Cyst	Subepithelial	300	**2.13** ± 1.342	0.012
	Deep	300	1.55 ± 1.176	
Dentigerous Cyst	Subepithelial	300	**1.34** ± 1.087	0.017
	Deep	300	1.14 ± 1.086	
KCOT	Subepithelial	300	**2.62** ± 1.529	0.041
	Deep	300	2.17 ± 1.655	

* p value < 0.05 = statistically significant

Similarly, on comparing the zone wise distribution of mast cells stained with CD117, we found that the mean number of mast cells was higher in the subepithelial zone as compared to the deep zone in all the 3 cysts, with a statistically significant difference (p =0.001, 0.012, 0.009 for RC, DC and KCOT respectively) between the observed zones. Also this concentration was higher in KCOT (mean = 3.46) as compared to other cysts (Table 2).

Table 2: Comparison of distribution of mast cells between zones in the three cyst groups stained with CD 117

Cyst	Zone	Number of High Power Fields	Mean± Standard Deviation	p* Value
Radicular Cyst	Subepithelial	300	**2.89** ± 1.543	0.001
	Deep	300	2.19 ± 1.453	
Dentigerous Cyst	Subepithelial	300	**1.86** ± 1.134	0.012
	Deep	300	1.45 ± 1.563	
KCOT	Subepithelial	300	**3.46** ± 1.875	0.009
	Deep	300	2.45 ± 1.269	

*p value < 0.05 = statistically significant

Further intercomparison between toluidine blue and CD117 for the three cysts revealed a statistical significant difference ($p <0.05$), clearly indicating that the mean number of mast cells detected was higher in all cysts when evaluated with immunohistochemical marker CD117 (Table 3).

Table 3: Comparison of toluidine blue and CD117 stained mast cells in the three cyst groups

Cyst	Stain	Number of High Power Fields	Mean ± SD	p* Value
Radicular Cyst	Toluidine Blue	300	3.22 ± 1.653	0.005
	CD 117	300	**4.23 ± 1.542**	
Dentigerous Cyst	Toluidine Blue	300	2.43 ± 1.647	0.007
	CD 117	300	**3.65 ± 1.32**	
KCOT	Toluidine Blue	300	4.06 ± 2.064	0.001
	CD 117	300	**5.76 ± 3.786**	

*p value < 0.05 = statistically significant

Inflammation was maximum in the RC followed by KCOT and DC. The mean and standard deviation values for mast cells revealed a significantly positive correlation with the degree of inflammation in each of the cyst (Table 4).

Table 4: Correlation of mast cells with degree of inflammation in odontogenic cysts

	Inflammation	RC	DC	KCOT
Pearson Correlation	1	.680(*)	.589(*)	.697(*)
Sig. (1-tailed)		.017	.034	.011
N	90	30	30	30

*Correlation is significant at the 0.05 level (1-tailed)

Discussion

Most physicians and immunologists, if they think of the mast cell at all, regard it as something of a 'pariah'. Other cells of the hematopoietic origin, such as neutrophils, macrophages, and platelets, are clearly important in host defense, hemostasis, or both. In contrast, the contributions of mast cell to pathologic conditions come to mind much more readily than any role it may have in the maintenance of health.[17]

Mast cells contribute to a broad spectrum of physiologic, immunologic and pathologic processes of inflammation.[18] Degranulation, i.e. the extracellular release of mast cell mediators, releases both preformed [histamine, proteoglycans (heparin, chondroitin sulphates) and neutral proteases (tryptase) stored in secretory granules] and newly synthesized mediators [arachidonic acid metabolites such as leukotrienes and prostaglandins, cytokines, TNF and interleukins (IL)-4, IL-5 and IL-6]. Under normal circumstances, these mediators help to orchestrate the development of a defensive acute inflammatory reaction and immediate allergic reactions initiated by immunoglobulin IgE.[5] This action is significant in the pathogenesis of different lesions like lichen planus, early periodontal diseases, ulcerative colitis, pulmonary fibrosis, inflammatory bowel, systemic mastocytosis and odontogenic cysts.[19]

Odontogenic cysts can destroy bone and undergo expansive growth in the jaw as a consequence of breakdown of the extracellular matrix, buildup of osmotic pressure in cystic fluid, and/ or perilesional bone resorption.[2] Chatterjee[1] formulated the mechanism of cystic expansion and proposed that the degranulating mast cells release products that contribute to cystic enlargement in different ways. The release of heparin and other hydrolytic enzymes facilitates the breakdown of glycosaminoglycans and proteoglycans present in the connective tissue capsule of odontogenic cysts. These released components then largely diffuse into the luminal fluid owing to the poor lymphatic drainage in the cyst wall, thereby raising the internal hydrostatic pressure.[16] Cyst expansion is also affected by the rate in which the surrounding bone is destroyed particularly at the cyst-bone interface. Teronen et al[20] stated that activated mast cells stimulate the production of prostaglandins, interleukin-1α, TIMP and other collagenases, which are said to be important in bone resorption.

The present study endeavors to compare the number, distribution, and location of mast cells in these cysts, both histochemically and immunohistochemically, and strives to elucidate their potential association with the processes related to cyst growth. Here, we observed that the number of detected mast cells was higher when stained with CD117 (mean = 4.54 mast cells/field) in comparison with toluidine blue staining (mean = 3.23 mast cells/field) in all the three cysts. Thus, in accordance with the results of Netto et al[2] We suggest that immunohistochemistry should be employed whenever possible. Also, on comparing the three cysts using toluidine blue and CD117, we observed that the total mast cell count was higher in KCOT followed by RC and then DC. These results were in accordance with the results of Smith et al[8] and Chatterjee et al.[1]

Chatterjee et al[1] stated that the greater concentration of mast cells in KCOT than dentigerous and radicular cyst suggests an increased breakdown of capsular matrix. KCOT epithelium has been shown to be nonkeratinized at places, which causes a transport of breakdown matrix products into the cystic lumen, and consequently can determine an elevated osmolality of the cystic fluid, which partly explains the greater aggressiveness of KCOT compared to other odontogenic cysts.

A few studies focusing on the presence of mast cells in periapical lesions using different histochemical and immunohistochemical techniques have been published. Rodini et al[21] and Mahita et al[22] through toluidine blue staining, found more mast cells in periapical cysts in comparison with periapical granulomas. Similarly, but through immunohistochemical membranous detection of CD117 protein, Drazic et al[9] found that mast cells were more common in cysts than in granulomas and suggested that this difference could be associated with the longer duration of cysts as well as with the presence of the fibrous connective tissue wall. In contrast to these studies, Shojaei S et al[23] observed more numerous mast cells in periapical granulomas compared to periapical cysts suggesting that the fibrotic complications in periapical lesions are related to mast cells functions. But these results cannot be directly compared with the present study as these authors have not included other odontogenic cysts in their studies.

Furthermore, on comparing the zone wise distribution of mast cells, we found that the number of mast cells was more in the subepithelial zone in all the three odontogenic cysts, both with toluidine blue and CD117, with a statistically significant difference between the observed zones. Also this concentration was higher in KCOT as compared to other two cysts. These results were in accordance with the results of Smith et al,[10] Chatterjee et al[1] and Shylaja et al.[19]

Smith et al[10] and Shylaja et al[19] stated that the subepithelial collection of mast cells in odontogenic cysts could be ascribed to their chemotactic stimulus, attracting them to the epithelial lining or luminal fluid contents. The nature of such stimulus is ambiguous, but the secretory matrix proteins of the normal odontogenic epithelium have been reported to be chemotactic to mast cells. Although odontogenic cysts are not known to secrete enamel matrix proteins, the epithelial lining stains positively for keratins and has been shown to share common antigenic determinants with enamel matrix proteins.

Our results were in contrast to that obtained by Netto et al[2] and Teronen et al[20] who used immunohistochemical staining of mast cell tryptase. Netto et al[2] observed a higher frequency of mast cells in the deepest region of the connective tissue wall in all three studied groups. This can indicate higher activity of these cells in the most external layer of the cystic wall, in close proximity to perilesional bone, suggesting that these cells may be associated with the phenomenon of bone resorption. Similarly, Teronen et al.[20] noted that the density of intact mast cells decreased outwards from the cyst lumen. Degranulated mast cells were highest at the periphery of the cysts, at their border with bones, indicating higher activity of mast cells in this area.

This difference could be attributed to the mast cell anti-tryptase antibody that has been used as a marker for mast cell activation; which also stains degranulated mast cells, but this is not a property of the marker used in our study - CD117. CD117 is an important cell surface marker, which is a transmembrane tyrosine kinase receptor protein encoded by the proto-oncogene c-kit that maps to chromosome 4 (4q11-12).[24] When this receptor binds to its ligand known as SCF (a substance that causes certain types of cells to grow), also known as "steel factor" or "c-kit ligand",[25] it forms a dimer that activates its intrinsic tyrosine kinase activity, that in turn phosphorylates and activates signal transduction molecules that propagate the signal in the cell.[26] Moreover, CD117 is a proto-oncogene, meaning that overexpression or mutations of this protein can lead to cancer, which could partly explain the aggressive behavior and neoplastic nature of KCOT, as increased number of mast cells were found in it as compared to other to cysts.

Further, the infiltration of mast cells in the present study revealed significant positive correlation with degree of inflammation in all three cysts; with maximum correlation with RC, followed closely by KCOT and DC. Smith et al[10] observed that the association of mast cells with increasing inflammation was apparent in non-keratinizing cysts, but not in odontogenic keratocyst. They also noted that mast cells were not found within areas of dense inflammatory infiltrate but rather more adjacent to them. While Debta et al.[16] found that the mast cell infiltration did not necessarily correlate with the degree of inflammation in the three cyst types. Netto et al[2] and Teronen et al[20] found that mast cells were especially localized in the connective tissue wall and also adjacent to inflammatory cells and speculated that mast cell participation in odontogenic lesions was at least partially associated with the presence of inflammation.

The treatment protocol often used for these odontogenic cysts is surgical enucleation, but in extreme cases where surgical intervention is not possible, one might consider the role of the inhibitors of mast cells or that of mast cell tryptase. Substances directed to mast cell membrane targets, such as the humanized monoclonal antibody omalizumab, directed to the receptor binding domain of circulation IgE (blocking its attachment to FceRI on inflammatory cells), or to extracellular targets, such as tryptase inhibitors, should inhibit cystic growth, although there is no available confirmatory evidence. As mast cells

could also interact with other inflammatory cells, modulating antibody responses to specific antigens should promote other additional effects.[27-29]

Conclusion

Based upon the present study and previous similar investigations, it can be concluded that mast cells are imperative in the pathogenesis of odontogenic cysts as an elevated number of mast cells was found in the connective tissue capsule of all three odontogenic cysts. Also, the number of detected mast cells was observed to be higher with CD117 than with toluidine blue staining which suggests that immunohistochemistry should be employed whenever possible. Further studies examining the influence of mast cell antagonists on cyst expansion may help unravel the precise role of mast cells in the pathogenesis of odontogenic cysts.

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Assessment of the relationship of developmental milestones and pattern of primary teeth eruption among Saudi children –a cross sectional study

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Abstract

Introduction: The time of eruption of deciduous teeth is an important concern for the parents, which shows a significant difference of timing in the population of Saudi Arabia. However, there are only few studies which assess the relationship between the eruption time of primary teeth with other developmental milestones of the children. Our study focus on the correlation between the time of eruption of deciduous maxillary and mandibular central incisors with the time at which the child starts to sit or walk.

Materials and Method: This study was conducted on 75 children in Riyadh and Qassim provinces of Saudi Arabia. Written consent was obtained from the parents regarding their willingness to participate in the study. A printed questionnaire was given to each parent and their responses regarding the time of eruption of upper and lower central incisors and the age at which the child starts sitting and walking were recorded during the interview and the correlation between them was assessed statistically.

Results: The study revealed that the correlation between the age at which child starts walking and the time of eruption of the mandibular central incisor was (0.443) and for the maxillary central incisors was (0.385). The relationship was less evident between the mandibular central incisors and walking, than in the maxillary central incisors, (0.058). On the other hand, there was no significant relationship between the eruption of the deciduous upper and lower central incisors with the age at which the child stared to sit.

Conclusion: There was a positive correlation between delayed eruption of primary teeth and the time the child starts to walk. Parent's awareness of delayed eruption of primary teeth is an important matter that can help for an early pediatric or medical intervention.

Keywords: Developmental milestones, Primary teeth eruption Saudi children

Introduction

Oral health is integral to general health and should not be interpreted as separate entities. Oral diseases are progressive and cumulative and become more complex over time. They can affect our ability to perform our day-to-day activities. These diseases can also affect economic productivity. A healthy oral cavity is important in a growing child, as it helps to develop good speech, healthy eating habits, and good social skills.(1)

The age at which the primary teeth erupt is of great significance in relation to growth and development of the child. Mostparents are anxious about the timing of eruption, which is considered as an importantmilestone during a child's development. The parents often seek pediatricians' opinion regarding thetiming of eruption of primary teeth.(2)

The formation of teeth, development of dentition and growth of craniofacial complex are closely related. Several studies have shown variation in the ages at which individual primary teeth erupt as well as variations of eruption pattern between different ethnic and racial groups.(3) Other suggested factors, which affect the eruption time, may include gestational period, diseases, nutritional status and growth.

The relation of deciduous tooth emergence to a child's growth and development has been little studied. The sparse literature on this subject usually states that deciduous tooth emergence is relatively independent of other growth processes. Most reports, however, are inadequately described methods and the previousstudies lack adequate statistical analysis with contradictory and confusing results.(4)

The objective of the present study was to acquirethe correlation between the time of the eruption of the maxillary and mandibular central incisors with thetiming of other milestones like starting to sit and walk. Also, to check for any deviation in time of eruption in thispopulation with the international standards of eruption schedule.

Materials and Method

This study utilized a cross-sectional design. The study population was Saudi children from Riyadh and Qassimprovinces of Saudi Arabia. All the subjects were randomly selected, clinically healthy and aged between 6 to 36 months.

This study was conducted on 75 children (42 boys and 33 girls). Written consent was obtained from the parents regarding their willingness to participate in the study. A printed questionnaire was givento the parents and their responses regarding thetime of the eruption of

upper and lower central incisors and the time when the child starts to walk and sit were collected based on the interview with the child's parents.

The study was done in Zulfi city mall, Zulfi, Alnakheel mall in Riyad city and Al Othaim Mall in Buraidah city of Qassim province during the month of October and November 2016. The nationalities of the children were verified from the place of birth using the national identity cards of both parents.

The collected data were statistically analyzed by using the bivariate Pearson Correlation.Additionally, the mean and the median of the collected data were recorded.

Results

The statistical analysis revealed a significant correlation between the eruption of the maxillary and mandibular central incisors with the time the child starts to walk. On the other hand, there was no significant relationship between the eruption of the deciduous upper and lower central incisors with the time when the child starts to sit. The study revealed that the correlation between the time of walking and the time of eruption of the mandibular central incisor was 0.443 and with the maxillary central incisors was 0.385. The relationship wasmore significant between the mandibular central incisors with the walking than in the maxillary central incisors, 0.058(Table 1).

Additionally, the study revealed the mean values(Table 2) of the eruption times of maxillary central incisors to be 9.227and for mandibular central incisors to be 7.253 which fall inthe same range as given in the chronology table given by the American Dental Association (Fig. 1).

Table 1: **Correlations between age at which child starts to sit / walk and eruption time of maxillary and mandibular central incisors**

		Time of Eruption of Mandibular Central (Months)	Time of eruption of maxillary central (Months)
Age at which child started to sit (Months)	Pearson Correlation	.226	.188
	Sig. (2-tailed)	.052	.106
	N	75	75
Age at which child started to walk (Months)	Pearson Correlation	.443**	.385**
	Sig. (2-tailed)	.000	.001
	N	75	75

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2: Mode, mean and median of time of eruption of maxillary and mandibular central incisors

	Time of Eruption of Mandibular Central incisors (Months)	Time of eruption of maxillary central incisors (Months)
N	75	75
Mode	7	9
Mean	7.253	9.227
Median	7.000	9.000

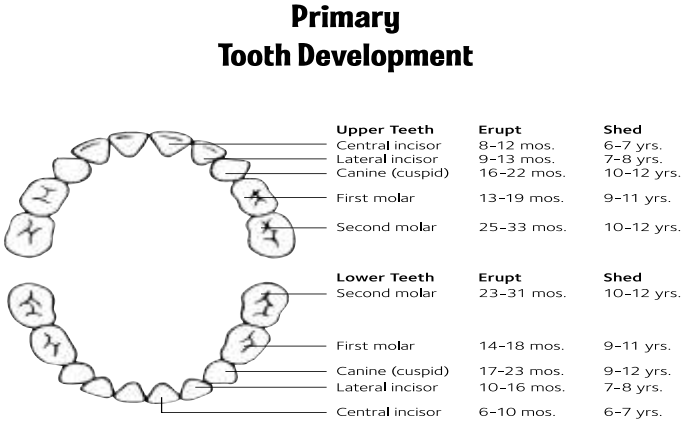

Fig. 1: Primary teeth eruption, American dental association

Discussion

The eruption sequence and growth of the jaws are key elements in the development of functional and aesthetic occlusions. Furthermore, dental formulas are used to estimate biological age and to track children's growth.[4-5] Different studies provide information on the ages of eruption of individual teeth, along with their variations and most frequent order of tooth eruption,[6-7-8] but a few of these studies showed a specific relationship between the eruption time of the deciduous teeth and the milestones of the child's growth. The present study, suggest a significant relationship between eruption time of deciduous central incisors and the age at which the child starts to walk, but there is no significant relationship between the eruption time of deciduous central incisors and the age at which the child starts to sit, which shows us different results compared toanother study done in India. However, no conclusion could be drawn between developmental milestones and tooth eruption.[1] There were also significant associations between the total number of teeth present and height, weight and head circumference in boys; the associations in girls were significant for teeth vs. height. These findings indicate that the timing of deciduous tooth emergence is significantly related to general somatic growth and perhaps nutritional status.[4] Majority of the differences and the relations of the eruption time of the deciduous teeth with the developmental milestoneswere attributed to geographic, climatic and environmental conditions, which makes it difficult to evaluate the role of these factors in the present study and therefore further research is needed.

As far as results related to the eruption time of primary teeth are concerned, they illustrated a delayed eruption of primary teeth of Saudi population compared with another populations.[2] However, in this study, the results show an eruption time in the population of Saudi Arabia (Riyadh and Qassim provinces) in the maxillary central incisors, the median is 9 months and in mandibular central incisors is 7 months, which is in the range of the standard of the American dental association as in the maxillary central incisors erupts from 8 to 12 months and mandibular central incisors erupts from 6 to10 months. Another study of emergence of primary teeth in children of Sunsari district of eastern Nepal, which suggested delayed eruption of incisors teeth compared with other groups.[4] The findings of previous studies of delayed eruption of primary teeth were not significant as compared with the American dental association.[9-15] The correlation between the eruptions of central deciduous teeth with the activity of the child (walking) is useful for identifying cases either with delayed eruption or with delayed activity (walking).

Conclusion

The main purpose of the present paper was to find a correlation between the eruption for primary dentition in children and the developmental milestones (sitting and walking). Our study showed a positive correlationbetween delayederuption of primary teeth and the time the child starts to walk, but we would like to replicate this on large sample and formulate a standard eruption schedule of all teeth for the studied population. Parent's awareness of delayed eruption of primary teeth is an important matter that can help for an early pediatric or medical intervention.

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Knowledge, attitude and perception of gingival pigmentation among students aged 18-23 Years in UP, India

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Abstract

Background: The clinical appearance of sound gingiva differs from individual to individual and even at different sites in the oral cavity. Some characteristics are genetically influenced; others appear to be determined by external factors, and biological factors such as growth, gender and age. The present study was carried out to assess and compare knowledge, perception, awareness, extent, severity and factors affecting gingival pigmentation among 18-23 year old males and females studying in an institution in UP, India.

Materials & Method: The study sample consisted of 300 degree college students aged between 18 to 23 years. A structured and self-administered questionnaire was used for obtaining information on knowledge, perception, awareness and clinical observations with regard to gingival pigmentation among the participating students.

Results: It was observed that 87% males and 43% females in the 14-18 region, in 87% males and 54.7% females in 13-23 region, 93.5% males and 40.8% females in 24-28 region, 87% males and 45.3% females in the 44-48 region, 87% males and 59.2% females in the 33-43 region, 87% males and 40.8% females in the 34-38 region of the gingiva. Gingival pigmentation was found to be more of mild to moderate than severe, among the students. About half of the study population was still unaware of the treatment modalities available for reduction of gingival pigmentation. A little more than half of the population was not willing to undergo depigmentation procedures the most common reason was that they were fine with the appearance of their own gingiva.

Conclusion: This study showed that females had higher prevalence of gingival pigmentation in the area of the smile line and were more concerned about the appearance of their gingiva than males.

Keywords: Gingival hyperpigmentation, Gingival pigmentation index

Introduction

Gingival hyperpigmentation is manifested as partial or complete darkening of gingiva in contrast to the coral pink colour of normal gingiva. Excessive melanin deposition in the basal and suprabasal cell layers of the epithelium is the cause of the pigmentation seen in the gingiva. Physiologic pigmentation seen in some individuals is genetic in nature. Production of melanin is much more in dark-skinned and black individuals, which is a result of hyperactivity of their melanocytes, and in fair persons, reactivity of melanocytes is highly variable. Hyperpigmentation could also occur due to endocrinal disorders such as Albright's syndrome, malignant melanoma, Peutz-Jeghers syndrome etc. Other causes could be trauma, hemachromatosis, chronic pulmonary disease, HIV, smoking and use of anti-malarial drugs, oral contraceptives, etc.[1]

Gingival hyperpigmentation is benign; however, cosmetic concerns are common especially in patients with a high smile line. This is because much of the gingiva is visible during normal day to day functions such as speech and smiling. This can cause psychosocial problems especially in individuals whose appearance is of vital importance affecting the individual's confidence and self-esteem. Therefore, the social interaction of these patients with other people is affected. These individuals may even miss out on several opportunities due to lack of confidence. There are several treatment modalities for gingival depigmentation unknown to the public and dental practitioners and they include; gingivectomy, gingivectomy with free gingival autografting, surgical depigmentation, electrosurgery, cryotherapy, chemical agents, Nd:YAG lasers, semiconductor diode laser, argon laser, CO_2 laser.[2]

Information on knowledge, perception and prevalence of gingival pigmentation in young adults of Muradnagar, India, is insufficient. Abundant literature on treatment modalities for gingival aesthetic improvement exists and unfortunately, data on prevalence, incidence and knowledge and awareness of varying gingival aesthetic manifestations in populations is still scarce. This study is the first of its kind, which is aimed at determination of knowledge, perception and prevalence of gingival pigmentation among young adults studying at various fields of a degree college at UP, India. Through this study an assessment of treatment needs, to improve gingival aesthetics could be made in the near future.

Materials and Method

Ethical approval was taken from the Institutional Review Board. Permission for conduction of the study was taken from Principals of all the three degree colleges. Study subjects consisting of 300 students (18

to 23 years) were conveniently selected from the Biotechnology, Pharmacy and Dental colleges of the institute. 100 students were randomly selected from each degree college. The students were included in the study if they fulfilled the following criteria;

1. Those who gave their consent.
2. Those who had undergone some kind of drug therapy in the past which had been discontinued 6 months prior.

Students were excluded from the study if:

1. They had undergone gum surgery previously.

Questionnaire: The questionnaire was structured and self-administered and was pretested prior to the start of the study to check for understanding and reproducibility (chronbach's alpha value was 0.90) and was completed by the participants in the presence of the investigator prior to the clinical examination. It consisted of two parts; the first part included information regarding the general information (6 questions), personal information (4 questions), knowledge (3 questions), perception (3 questions), attitude (3 questions) of the students and the second part consisted of clinical examination (3 questions).

Oral examination: The second portion of the questionnaire consisted of clinical data which was recorded on a clinical examination form by the examiner. Students were examined using sterile diagnostics under natural illumination.

Gingival melanin pigmentation and pigmented lesions index by Peeran et al (2014)[3] was recorded by a single trained and calibrated investigator (good intraexaminer reliability, i.e. kappa value of >0.91 was reached).

This index measured gingival pigmentation from scores 0-10, with score 0 indicating normal gingiva, scores 1 & 2 concerned with severity of gingival pigmentation, score 3 exclusively for posterior gingival pigmentation, score 4, 5, 6 and 7 according to the etiology of the pigmentation and 8, 9 and 10 scores according to the systemic associations of the gingival pigmentation.

Smile Line classification by Liebart and Deuelle (2004)[4] was used to analyze each student's smile line, as follows:

Class 1- Very high smile line-more than 2mm of the marginal gingiva visible during smile

Class 2- High smile line-0 to 2mm of marginal gingiva visible during smile

Class 3- Average-gingival embrasures visible only during smile

Class 4- Low- gingival embrasures and cement-enamel junction not visible during smile

Statistical Analysis: MS excel 2007 was used for data entry of the variables. Correlation of variables was assessed by chi square test @ p value<0.05 (95% CI) as significant. The results were collected, tabulated and statistically analyzed by a personal computer using SPSS software program (Statistical Program for Social Science), Version 20 under Windows 8. Quantitative data were expressed as mean and standard deviation. Qualitative data were expressed as number and percentage.

For the aim of analysis all question in the knowledge, perception and awareness parts that was replied positively was given a grade of 1 and each question that was replied negatively was given a grade of 2.

Student t-test was applied to determine the significant difference in the means of knowledge, perception and awareness for gender at p value < 0.05. One-way ANOVA was applied to determine the association of knowledge, perception and awareness in relation to gender. Chi- Square test (χ 2) was applied with 5% level of significance.

Results

When it came to the concern of the colour of their gingivae, 59.3% of the subjects were concerned. 58.7% felt that the colour of the gums should match the facial colour. 75% of the subjects thought dark gums to be unattractive. 92.3% of the study subjects felt that pink is the normal colour of gums, while 7.7% felt it to be brown. (Table 1) 55.7% of the study subjects reported the colour of their gingivae to be pink, followed by 26.7% being brown and 17.7% having black gums.(Table 2)

54.3%, 63% and 54.3% of the subjects exhibited gingival pigmentation in the sextants 18-14, 13-23 and 24-28 respectively. 52.7%, 66.3% and 56% of the study subjects exhibited gingival pigmentation in the 34-38, 43-33 and 48-44 areas respectively. Gender wise, pigmentation of the gingival was found in 87% males and 43% females in the 14-18 region, in 87% males and 54.7% females in 13-23 region, 93.5% males and 40.8% females in 24-28 region, 87% males and 45.3% females in the 44-48 region, 87% males and 59.2% females in the 33-43 region, 87% males and 40.8% females in the 34-38 region of the gingiva. (Table 3 and 4)

Mild gingival pigmentation was seen in 31.7%, 27.7%, 30%, 28%, 29.3% and 33.3% of the subjects respectively in the 18 -14, 13-23, 24-28, 34-38, 43-33 and 48-44 areas. Moderate to severe gingival pigmentation was seen in 18.7%, 25.7%, 20.3%, 18.7%, 27.3% and 18.7% in the 18 -14, 13-23, 24-28, 34-38, 43-33 and 48-44 areas respectively. Tobacco associated pigmentation was seen in 2%, 9.7%, 2%, 4%, 9.7% and 2% of the study subjects in the 18 -14, 13-23, 24-28, 34-38, 43-33 and 48-44 areas respectively. Drug related gingival pigmentation was seen in 2% each of the 18-14, 24-28, 34-38 and 48-44 areas respectively. (Table 5 and 6)

More than half (55.7%) of the population was aware of treatments that are available for reducing darkness of the gingiva. Females were better aware

(58.3%) than males (48.1%), of the fact that treatment for reducing darkness of gingiva is available. (Table 7)

54.7% of the total population was willing to go for gum treatment in future. Reasons for unwillingness were that they were fine with the appearance of their gums (41.3%). Among other reasons the population did not want to go for treatment were cultural (2%) and financial (3.7%). (Table 8)

Table 1: Perception of study subjects towards gingiva

Perception		Percentage of study subjects(%)
Colour of gingiva	Pink	92.3
	Brown	7.7
Matching of facial skin and gingival colour important		58.7
Darks gums are unattractive		75
Were concerned about gingival colour		59.3

Table 2: Prevalence of gingival pigmentation according to colour

Colour	Percentage of study subjects (%)
Pink	55.7%
Brown	26.7%
Black	17.7%

Table 3: Prevalence of gingival pigmentation in maxillary arch

Study subjects	Sextant		
	14-18	13-23	24-28
Females	43%	54.7%	40.8%
Males	87%	87%	93.5%
Total	54.3%	63%	54.3%

Table 4: Prevalence of gingival pigmentation in mandibular arch

Study subjects	Sextant		
	44-48	33-43	34-38
Females	45.3%	59.2%	40.8%
Males	87%	87%	87%
Total	52.7%	66.3%	56%

Table 5: Prevalence of gingival pigmentation in maxillary arch, in accordance with Gingival index by Peeran et al (2014)

Criteria	Sextant		
	18-14	13-23	24-28
Mild	31.7%	27.7%	30%
Mod/severe	18.7%	25.7%	20.3%
Tobacco associated	2%	9.7%	2%
Drug associated	2%	0	2%

Table 6: Prevalence of gingival pigmentation in mandibular arch, in accordance with Gingival index by Peeran et al (2014)

Criteria	Sextant		
	48-44	43-33	34-38
Mild	33.3%	29.3%	28%
Mod/severe	18.7%	27.3%	18.7%
Tobacco associated	4%	9.7%	4%
Drug associated	2%	0	2%

Table 7: Knowledge of gingival depigmentation procedures

Study subjects	Knowledge
Males	48.1%
Females	58.3%
Total	55.7%

Table 8: Willingness to undergo depigmentation procedures

Reason for unwillingness to undergo depigmentation procedures	Percentage of study subjects(%)
Comfort with own gingival colour	41.3%
Culture	2%
Financial constraints	3.7%

Discussion

Oral esthetics depends on several variables, including tooth visibility and proportions as well as healthy gingival tissues. Proper integration between teeth and periodontal tissues plays an important role in esthetic success, which is mainly represented by an appealing smile.

Today, innovative restorative materials and techniques allow for minimally invasive prosthetic procedures, which are paramount to the preservation of hard and soft dental tissues. An integrated approach combining dental and esthetic medical therapies could be useful to improve the quality of life of patients, improving function, esthetics, and self-confidence.[5]

Demand for cosmetic therapy of gingival hyperpigmentation is common. Various methods such as chemicals, gingivectomy, gingivectomy with free gingival autografting, acellular dermal matrix allografts, electrosurgery, cryosurgery, abrasion with diamond bur and various types of lasers have been used in the treatment of gingival melanin depigmentation with varied degrees of success.[6]

Our study was carried out among 18-23 year old young students attending ITS group of colleges.

In our study, more than 50% of study subjects reported the colour of their gingivae to be pink. However, our findings were inconsistent with those reported by Tamizi et al,[7] with respect to Asians.

Mild gingival pigmentation was seen in maxillary arch in 29.8% study subjects and 30.2% in the mandibular arch. Moderate to severe gingival pigmentation was seen in 21.5% in the maxillary arch and 21.56% in the mandibular arch. This finding was in accordance with a study by Dummett et al,[6] where they found that gingival hyperpigmentation was bilateral and clearly demarcated. Tamizi et al[7] reported decreasing gingival pigmentation from incisal regions to the posterior regions.

Smoking related pigmentation in the maxillary arch was seen in the mandibular arch, similar to a finding reported by Hajifattahi F, Azarshab M, Hagoo R, Lesan S,[8] where they discovered that smoking does have an effect on gingival pigmentation. Drug related gingival pigmentation in maxillary and mandibular arch was seen among study subjects. However, number of study subjects in whom external factors were found to be associated with gingival hyperpigmentation was inadequate, making it impractical to comment on the above.

Gender wise, pigmentation of the gingiva was found more in males than females in the maxillary and mandibular arch. The difference in the prevalence of gingival pigmentation, between the genders was found to be significant in this study, quite contradictory to as reported by Caldeira PC et al[9,10] according to whom physiological melanin pigmentation of the oral mucosa affects males and females equally.

The study population had an average smile line, followed by very high, low and a high smile line. This meant that in 76% of the study subjects, gingiva is visible when they smile, thus making them more conscious about the appearance of their gingiva.

The study subjects perceived pink as the normal colour of gums. Knowledge on the natural appearance of normal gingival was found to be very good in the study subjects. Dummet et al[6] had surveyed personal attitudes of other populations and had found that pink gums were the ideal ones which was in coherence with our study.

The lack of concern among the subjects could be due to the low level of knowledge of gingival pigmentation and treatments available. More people need to be educated and made aware about gingival esthetics, looking at the above results.

Conclusion

From our study, we concluded that majority of the study subjects felt that pink is the ideal colour of gingiva but not much difference was observed between subjects who were and who weren't concerned about the colour of their gingiva. Most students felt dark gums to be unattractive. Pigmentation was observed to be bilateral and more severity was seen in the lower anterior region as compared to other regions. Not even half of the study subjects were aware of availability of depigmentation procedures and only a little more than half of the study subjects were willing to undergo depigmentation procedures.

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Comparative evaluation of the efficacy of locally delivered 0.1% curcumin irrigation, meswak irrigation and 0.2% CHX irrigation in management Chronic periodontitis patients

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Abstract

Introduction: Ayurvedic medicines like turmeric possess anti-inflammatory, anti-oxidant, and anti-microbial properties. This study was carried out using the purest form of turmeric and meswak to test their anti-plaque and anti-inflammatory properties in the form of a sub gingival irrigation. The aim of the present study was to evaluate the clinical efficacy of locally delivered curcumin irrigation and meswak irrigation as an adjunct to scaling and root planing in the treatment of chronic periodontitis.

Materials and Method: Study group consisted of patients diagnosed with chronic periodontitis, aged between 21-45 years. 30 sites with pocket depth >5mm were selected and randomly divided into 3 groups. Group A: Test group received 0.1% curcumin (CU) irrigation along with scaling and root planing. Group B: Test group received meswak (HIORA) irrigation along with scaling and root planing. Group C: Control group received scaling and root planing along with 0.2% chlorhexidine(CHX) irrigation as positive control. Clinical parameters: Plaque index, bleeding index, probing pocket depth and relative attachment level were measured for each patient at baseline and 21 days. Plaque samples were taken at baseline and 21 days interval and total colony count was done.

Results: All the groups showed significant improvement in all clinical parameters from baseline to 21 days. There was statistically significant improvement in gingival index in Group A as compared to other groups. However, intergroup differences in other clinical parameters were not significant. The percentage reduction in microbial load at the 21 days was highest in chlorhexidine group.

Conclusion: CHX and Herbal agents showed similar clinical efficacy but CHX irrigation was more effective in reducing bacterial counts.

Keywords: Curcumin, Meswak, Chronic periodontitis, Chlorhexidine, Relative attachment level

Introduction

Periodontitis is a chronic inflammatory disease of tooth supporting structures causing gradual tooth loss. As the major etiology behind development of periodontitis is dental plaque, much of the research should be directed towards a more effective and economic way of controlling dental plaque and further disease progression.[1]

The mechanical plaque control involves tooth brushing either using a manual brush, powered tooth brush or using pressurized water pump system which involves the use of water under pressure which is pumped through fine blunt needle or nozzle.[2] As the probing depth increases, the efficacy of the mechanical aids in controlling the pathogenic flora and their toxic products decreases. Hence efforts are made to develop a therapeutic system that use the subgingival delivery of antimicrobial agents.[3] From the past four decades, one of the effective means for the treatment of periodontal diseases is subgingival irrigation. Delivery of antimicrobial agents subgingivally is one of the potent means of oral hygiene regime in both home and office procedures. Various antimicrobial agents such as CHX,[4] metronidazole,[5] tetracycline[6] and herbal products[7] have been proven to be efficacious in management of periodontal disease.

The substantivity and antiplaque property of Chlorhexidine Gluconate (CHX) has proven to be the gold standard.[8] CHX which is a cationic broad-spectrum antimicrobial agent, acts mainly by preventing pellicle formation and causes disruption of the outer bacterial membrane preventing cell wall adsorption and binding of mature plaque. Till date, chlorhexidine is considered as the best anti plaque agent and it has been shown that the use of 0.2% CHX prevents development of experimental gingivitis.[9]

Though the use of such synthetic compounds offers certain disadvantages like staining of teeth, alteration of taste sensation etc., this led to the need of developing certain herbal products which are safe. Various herbal extracts such as, *Aloe Vera, Ocimum Sanctum, Matricaria Chamomile,* etc. have been shown to have potent anti-inflammatory, anti- oxidant and anti-bacterial properties and thus proving to be effective in improving gingival health.[10]

One such herbal extract is Curcumin (CU) which is a yellow coloured pigment obtained from *Curcuma longa*. Curcuma longa comprises three major curcuminoids (approximately 77% Curcumin, 17% dimethoxy curcumin and 3% bisdemethoxy curcumin).[11] The antioxidant,[12] antibacterial,[13] anti-inflammatory[14] and chemotherapeutic[15] properties of

Curcumin makes it an effective agent to be used as a subgingival irrigant. The inhibition of pro-inflammatory leukotriens, prostaglandins and neutrophil function attributes to its anti-inflammatory property.[14] However due to limited literature regarding the efficacy of oral irrigants on the clinical and microbiological parameters, this study aimed to compare and evaluate the efficacy of locally delivered 0.1% curcumin irrigation and meswak irrigation in management of chronic periodontitis patients.

Materials and Method

Patients diagnosed with chronic periodontitis, aged between 21-45 years were selected from the Outpatient Department of Periodontology and Oral Implantology, I.T.S Centre for Dental Studies & Research, Muradnagar, Ghaziabad, U.P. Ethical clearance was obtained from Institutional review board and informed consent was taken from the patients.

30 sites with pocket depth >5mm were selected and randomly divided into 3 groups. Group A received 0.1% curcumin irrigation along with scaling and root planing. Group B received meswak (HIORA) irrigation along with scaling and root planing and Group C received scaling and root planing along with 0.2% chlorhexidine irrigation as positive control.

Upper and lower impressions were made and acrylic stents were prepared. A vertical groove was cut in the stent so that the point of entry of the probe could be standardized at each visit. During the first visit (day 0) after obtaining informed consent, all the clinical parameters including plaque index (Silness and Loe),[16] Gingival index (Loe and Silness),[17] Probing Pocket Depth (PPD) and Relative Attachment Level (RAL) were measured. UNC-15 graduated periodontal probe was used to measure the clinical parameters.

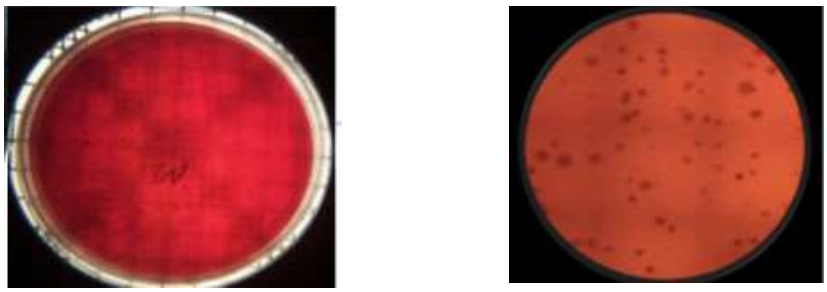
Patients with probing depth of ≥ 5mm or relative attachment level (RAL) ≥ 4-6 mm and vertical bone loss ≥ 3mm on intraoral periapical radiographs were included in the study.

Patients who were medically compromised, with any history of allergy to the material used, on antibiotics or antimicrobial therapy in previous 6 months or on any drug therapy which is known to influence the periodontium were not included in the study. Patients who were pregnant or lactating and who were tobacco users were also excluded from the study.

After thorough scaling and root planing, each site was irrigated with the respective irrigant (2ml) twice at an interval of 1 minute at baseline. For irrigating the sites, 2 ml syringe with a 24 gauze needle was used. Patients were made aware about the importance of maintaining oral hygiene. Same procedure was repeated after 7 and 21 days. Subgingival plaque samples were collected with the help of a curette and inoculated on blood agar followed by incubation for 24 hrs. Aerobic colony count was performed at baseline and 21 days.

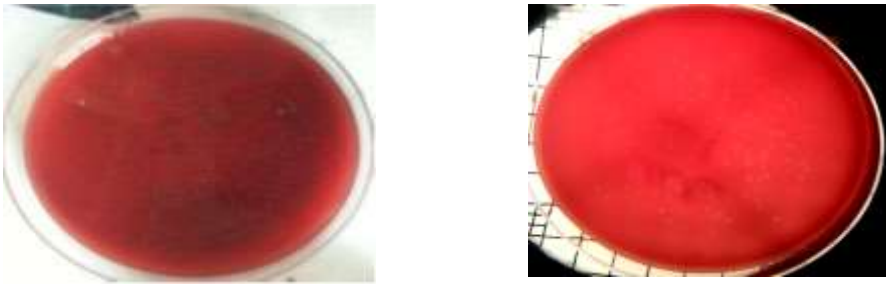
Baseline **3 Weeks**

Fig. 1: Comparison of colony forming units at baseline and 3 weeks in Group A



Baseline **3 Weeks**

Fig. 2: Comparison of colony forming units at baseline and 3 weeks in Group B



Baseline **3 Weeks**

Fig. 3: Comparison of colony forming unit at baseline & 3 weeks in Group C

Statistical Analysis: Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 16.0 for windows). Test for qualitative variables, mean and standard deviation were calculated. Gingival index, Plaque index, Probing Pocket Depth and RAL were compared statistically between the groups using one way ANOVA and Kruskal Wallis test.

Results

After thorough sub-gingival irrigation at different time intervals including the baseline, results were evaluated at 21 days. In the present study, the mean gingival index reduced significantly in all three groups at 21 days (Table 1). Also on intergroup comparison significant reduction was observed at 21 days. The plaque index, probing depth and RAL (Table 1) decreased drastically in all the groups but on intergroup comparison no significant differences were observed at 21 days. There was no significant difference between any of the groups but the groups (CHX, CU and MESWAK) produced reduction in all the clinical parameters.

Microbial Count

There was a significant reduction in microbial colony count when all three groups were evaluated at 21 days (Table 2, Fig. 1-3). Maximum reduction in colony forming units was observed in Group C followed by Group A.

Table 1: Intergroup comparison of various clinical parameters

Clinical Parameters		CHX	Curcumin	MESWAK	p Value
Plaque Index (PI)	Baseline	3.63±.518	4.75±.463	3.0±.756	.549
	21 Days	1.13±.354	1.25±.463	1.38±.518	
Gingival Index (GI)	Baseline	1.63±.518	1.63±.518	1.50± .535	0.025*
	21 Days	.38±.518	.68±.518	.04±.000	
Probing Pocket Depth(PPD)	Baseline	7.50±.926	7.25±1.282	7.0±1.69	.282
	21 Days	5.50±1.06	5.25±1.28	4.63±.916	
RCAL	Baseline	9.75±.463	10.25±1.188	10.25±1.18	.850
	21 Days	7.38±.916	7.25±1.282	7.00±1.69	

Table 2: Reduction in microbiological load and percentage reduction at 21 Days in all the 3 Groups

Group	Baseline	21 Days	% Reduction
CHX	259.6	79.6	69.10
CURCUMIN	276.4	115.6	58.17
MESWAK	267	124.4	53.40

Discussion

Curcumin has been widely studied throughout literature for its anti-inflammatory, anti-oxidant, antibacterial and wound healing properties. However; its application in dentistry has been reported only in the last decade. Therefore this clinical study was carried out to assess the clinical and anti-microbial efficacy of curcumin irrigation as an adjunct to scaling and root planing as compared to Herbal and CHX irrigation. The results of this study showed that all the parameters decreased significantly in all the three groups, though CHX proved to be highly efficacious in reducing the microbial load (69.10% reduction) as compared to CU and meswak. There were no significant difference between CHX and CU ($p<0.05$) in terms of plaque index. These results are in accordance with the study done by Vinholis et al[18] and Paolantonio et al[19] who showed no significant differences in plaque index between CHX and CU. In the present study the reduction in probing pocket depth in between CHX and CU groups at the end of 21 days were non-significant, these results are in accordance with the study done by Nayyar et al,[20] Mizrak et al.[21] In contrast to this study, Gottumukkala et al[22] showed an increase in the

pocket depth scores in CU group from 1 months to 6 months interval which might be due to its reduced substantivity on the root surface over a period of time. The result of the microbiological study showed that chlorhexidine was much more efficacious in reducing the microbial load as compared to CU and meswak. In another study, Gottumukkala et al[(1)] observed that CU group showed better reduction in microbial load as compared to chlorhexidine, though the difference was non-significant. These results can be attributed to the anti-inflammatory and antioxidant properties of CU.

Significantly higher improvement in gingival inflammation in Curcumin group can be attributed to the down regulation of inflammatory response by curcumin. Curcumin reduces the activity of cyclooxygenase-2 (COX-2), lipoxygenase, and inhibits the production of the inflammatory cytokines like tumor necrosis factor- alpha (TNF-a), interleukin (IL) - 1, -2, -6, -8, and -12 and monocyte chemoattractant protein (MCP).[(23)]

The efficacy of CHX can be attributed to its substantivity and its slow release in the oral cavity. However the results of chlorhexidine were far more superior than herbal products, though the latter didn't include any other side effects. Almas et al[(24)] conducted a study to determine the efficacy of eight mouthwashes and concluded that the mouthwash containing chlorhexidine was much more efficacious.

Conclusion

Within the limitations of this study, chlorhexidine gluconate, curcumin and meswak proved to be equally efficacious in showing anti-plaque activity. Curcumin irrigation was more effective in reducing the gingival inflammation in patients with chronic periodontitis. Hence it was concluded that though CHX and herbal agents showed similar efficacy in terms of pocket depth reduction, in consideration of reduced side effects and better patient compliance, the latter can be used as an alternative. Future directions of this study should target on improving the substantivity of the drugs and on using the varied concentrations of the drugs so that maximum therapeutic benefit can be obtained in the management of periodontal disease.

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Establishing the association of periodontal disease with obesity and overweight

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Abstract

Background and Objective: According to statistics provided by WHO, in 2014, over 600 million individuals were declared obese. India alone accounts for 20% of the world's obese adults. It has been established that obesity is associated with various other systemic diseases. This study aimed to establish if there existed a similar association between Body Mass Index (BMI) and periodontal disease among the North Indian adult population.

Materials and Method: A cross sectional study was conducted from October - December 2015, recruiting a total of 199 subjects who had been diagnosed with chronic periodontitis and gave no history of systemic illness. The personal details of the subjects including their age, sex, etc. were recorded along with their height (in cm) and weight (in Kg). Body mass index was calculated and subjects were categorized based on the same. Periodontal status was assessed using Russell's Periodontal Index (PI).

Results: A significant difference was seen in the values of BMI and PI, as well as in the BMI categories, among the study participants when categorized by gender. When the subjects were stratified according to 3 age groups: young (18–34), middle aged (35–60) and older adults (60+), a highly significant change was observed in the mean BMI and PI scores between the 3 categories. A weak and statistically insignificant association was found between the subjects' BMI and their respective periodontal status.

Conclusion: Though the literature supports a positive correlation between obesity and periodontal disease incidence and severity, the findings of our study implied the presence of an indistinct link between periodontal disease and body mass index among different variables in the North Indian adult demographic.

Keywords: Body mass index, Periodontal disease, Obesity, North India, Russell's Periodontal Index, Cross-sectional

Introduction

The Glossary of Periodontal Terms defines periodontitis as "the inflammation of the supporting tissues of the teeth, usually a progressively destructive change leading to loss of bone and periodontal ligament."[(1)] Periodontitis is known to be a common cause of tooth loss and is often associated with various systemic diseases such as stroke, heart disease and endocrine disorders. According to the WHO overweight and obesity are defined as "abnormal or excessive fat accumulation that presents a risk to health."[(2)] A basic measure for the presence of obesity is the Body Mass Index that reflects a weight (in kilograms) – to – height (in meters) ratio parameter.[(3)] Individuals with BMI in the range of 25-30 are considered overweight, whereas a BMI of over 30 is categorized as obese.[(3)] Obesity has now been declared as a growing cause for concern with global prevalence doubling over the past 4 decades.

According to statistics provided by the WHO, in 2014, more than 1.9 billion adults were found to be overweight, with over 600 million among them falling under the category of obese persons.[(3)] India alone accounts for approximately 1/5th of the world's obese adults.[(4)] It has been found that obesity is associated with a number of systemic conditions, such as sleep apnoea, diabetes, cardiovascular disease, gastric discomfort, osteoarthritis and certain categories of cancers.[(5,6)] In recent studies, obesity also appears to be an independent risk factor for the development of periodontal disease even after controlling for other risk factors such as age, smoking habits and associated medical conditions.[(7)] Fat cells, which were once considered to have limited function solely in the form of energy stores, are now known to also produce hormones and other substances, many of which are now thought to increase the inflammatory response of the body.[(8)] This may, thus, lead to a weakened immune status, which may in turn cause an increase in predisposition to periodontal disease.

This study aimed to establish the link between BMI and periodontal disease, among the North Indian adult population.

Materials and Method

A cross sectional study was conducted from October - December 2015 in the Department of Periodontics and Implantology, National Dental College and Hospital, Dera Bassi, Punjab, recruiting a total of 199 subjects. The sample was selected through convenience sampling of patients visiting the Department of Periodontics and Implantology during the time period selected, who agreed to participate, had been diagnosed with chronic periodontitis and gave no history of systemic illness. Such a sampling design made for an uneven distribution of subjects in each category.

A standard form was made to be filled out with the personal details of the subject, i.e., name, age, sex, occupation for record purposes. The subjects were categorized by age as young (18–34), middle aged (35–59) and older (60–90) adults.

Weight (in Kg) and height (in cm) of the subjects were recorded. Body mass index (BMI) was calculated using the formula, BMI = $\frac{\text{Weight}}{\text{Height}^2}$ and was further broadly classified as per the WHO criteria.[9] Thus, subjects with BMI values below 18.5 kg/m^2, were classified as 'underweight'. Those with BMI values in the range of 18.5 – 24.99 kg/m^2 were categorized as 'normal', and those with BMI values between 25.0 – 29.99 kg/m^2 were categorized as 'overweight'. Subjects whose BMI values were equal to or exceeded 30.0 kg/m^2 were classified as obese.

The periodontal status was assessed according to Russell's Periodontal Index (PI).[10]

The statistical analysis was done using SPSS 21.0 (Chicago, USA). Descriptive statistics and cross tabulation were done. Comparison of BMI and Periodontal Index score among different demographic variables were made using Chi-Square test and ANOVA.

Results

The study subjects included 64 females, with mean age of 29.64 years, and 135 males, with mean age of 35.6 years. The mean BMI of the male subjects and female subjects was 29.055 and 27.495, respectively, which was found to be statistically significant (P = 0.001). Other demographic variables are shown in Table 1.

A significant difference was observed in the BMI and PI values, as well as in the BMI categories, among the study participants when categorized by gender. (Table 2)

When the subjects were stratified according to 3 age groups: young (18 – 34), middle aged (35 – 60) and older adults (60 +), a highly significant difference was observed in the mean BMI and PI scores between the 3 categories (P = 0.00). (Table 3)

The mean PI scores for the underweight, normal, overweight and obese categories were found to be 2.00, 1.98, 2.09, 2.21, respectively. The difference between the scores for these respective categories was not found to be statistically significant (P value = 0.657). Fig. 1 depicts distribution of BMI categorization and PI Interpretation among study subjects.

Discussion

In this study, the mean BMI and PI scores were observed to increase significantly as age group increased from young (18 – 34 years) to middle age (35 – 60 years) to older (60 +) adult ages. As adults progress towards older adulthood, some amount of weight gain is normal in apparently healthy individuals, and that may contribute to a greater mean BMI among the older adult age groups.[11] A weak correlation was found between the BMI and PI scores among the young and middle aged adult age brackets but this is not statistically significant. The absence of such an association among the older adults is thought to be a result of a variety of other factors taking precedence as part of the ageing process, such as an increasing incidence of systemic diseases that may be more significant risk factors for periodontal disease. According to a similar study held by Al-Zahrani et al to study the relationship between obesity and periodontal disease among young, middle aged and older adults, a link was found between the two factors only among younger individuals.[12]

A possible explanation for this may be that both periodontitis and obesity could be precipitated in young individuals due to poor dietary habits. A diet consisting of a large percentage of simple sugars would cause an increase in the visceral fat accumulation in the body. Such a diet could also cause a much greater plaque accumulation by providing adequate substrate for pathogens to bind to and multiply around. A substantial buildup of plaque would unavoidably cause greater risk for the destruction of the underlying periodontium. Hence, periodontal disease and obesity may be linked by a shared etiology.

The mean PI scores for male and female individuals exhibited a significant difference in the periodontal disease prevalence and severity among the genders in the sample. In addition, the BMI scores among males and females also exhibited significant variation, with over 88% of males having BMI $\geq$ 25, whereas only 75% of female subjects had a BMI $\geq$ 25. These gender differences may be ascribed to treatment bias, lifestyle differences and societal factors.

In other studies done to further understand the significance of a higher body mass index in the prevalence of periodontitis, it was found that higher BMI and excess abdominal fat were associated with a greater risk for developing periodontal disease, greater mean probing depth and greater bone destruction.[13-16]

The basis for this association may lie in the metabolic activities carried out by the excess adipose tissue in the body. As we now know, adipose tissue is a biologically active tissue that carries out a variety of functions, one of which is the production of circulating pro-inflammatory cytokines.[8,17] A rise in the numbers of these substances would cause a more aggressive inflammatory response to the toxins released by orally present pathogens, thus causing a greater severity of tissue destruction resulting in periodontal disease.[18] This argument was further substantiated by a study conducted by Lakkis et al that showed an improved periodontal status and better response to periodontal therapy among subjects whose adiposity had been surgically reduced.[19]

It may also be argued that certain environmental factors may play a significant role in the etiology of obesity as a result of certain neuroendocrine responses to stress.[20,21] Conversely, obesity along with its associated comorbidities, can in turn result in increased psychosocial strain as a result of societal attitudes relating to overweight and obesity. These physical responses to mental distress have further been hypothesized to strongly influence the inflammatory changes in periodontal disease.[22,23]

Conclusion

We appreciate that one of the limitations of this study lies in its cross-sectional format, where changes that have occurred with time in each patient are unable to be brought into consideration. Though the literature supports a positive correlation between obesity and periodontal disease, our study reports the pertinence of an indistinct link between periodontal disease and body mass among different in the North Indian demographic. However, we aim to gather more detailed data to further substantiate the nature and validity of this association while taking into consideration more complex confounding factors.

Table 1: Demographic details of study subjects

Gender	Number	Percent
Male	135	67.8
Female	64	32.3
18 - 34	90	45.2
35 - 60	75	37.6
60 +	32	16.0
Underweight	2	1
Normal	30	15.1
Overweight	94	47.2
Obese	73	36.7
Established Destructive Periodontal Disease	86	43.2
Terminal Disease	113	56.8

Table 2: Distribution of BMI and PI among study participants based on gender

Gender	BMI Categorization				PI Interpretation	
	Underweight	Normal	Overweight	Obese	Established Destructive Periodontal Disease	Terminal Disease
Male	2 (100%)	14 (46.7%)	63 (67%)	56 (76.7%)	55 (40.7%)	80 (59.3%)
Female	0 (0%)	16 (53.3%)	31 (33%)	17 (23.3%)	31 (48.4%)	33 (51.6%)
P Value	<0.05				<0.05	

Table 3: Distribution of BMI and PI among study participants based on age

Age	BMI Categorization				PI Interpretations	
	Underweight	Normal	Overweight	Obese	Established Destructive Periodontal Disease	Terminal Disease
18 – 34	2 (2.2%)	22 (24.4%)	45 (50%)	21 (23.3%)	57 (63.3%)	33 (36.7%)
35 – 60	0 (0%)	7 (9.3%)	38 (50.7%)	30 (40%)	22 (29.3%)	53 (70.7%)
60+	0 (0%)	1 (3.1%)	10 (31.2%)	21 (65.6%)	7 (21.9%)	25 (78.1%)
P Value	<0.001				<0.001	

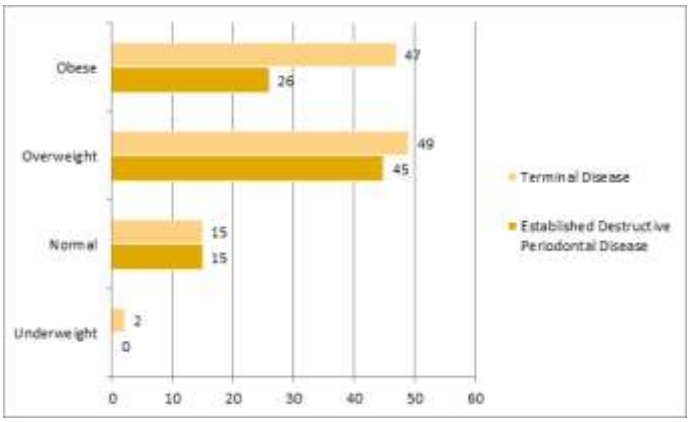

Fig. 1: Relationship of BMI and PI score among study participants

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Awareness of Consumer Protection Act (CPA) among dental fraternity of North India and its implications on the profession

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Abstract

Background: Consumer awareness is emerging in the country, concepts are changing, laws are getting updated and consumers are getting more and more demanding. So it is essential on the part of medical professionals to have updated and adequate knowledge and awareness about CPA to give better services and prevent consumer disputes and further procure the necessary cues for handling of intricate medical cases.

Aim: To study the awareness among dental fraternity of North India regarding consumer protection act and its implications on the profession.

Materials and Method: A questionnaire having 32 questions was sent either via e-mails or by sending printed copies to 1000 dental professionals, while maintaining anonymity of all the participants.

Results: Majority (64.3%) of dental fraternity had good awareness level regarding CPA and most of them thought that it hampers the professional freedom. Few dentists thought that the CPA did not affect professional freedom. It may provide an opportunity to doctors to bring transparency in dental profession.

Conclusion: Most of the dental fraternity had good knowledge about consumer protection act.

Keywords: Awareness, Consumer Protection Act, Dental Fraternity, Implications, Dental profession.

Introduction

The classical concept of a doctor-patient relationship born in the golden days of family physicians has undergone a radical change due to immense strides in medical technology, availability of sophisticated imaging systems, high tech electronics, and preponderance of new diseases. In the present era, health care has emerged as a profitable sector attracting investors from varied backgrounds.[(1)]

The practice of medicine in India has undergone considerable change during the last five decades effecting delivery of health in both positive and negative directions. As a result, it was felt that medical treatment should also be made answerable therefore, doctors were covered by various laws.[(2)]

Finally, it was on 13th November 1995 that the Supreme Court of India gave judgment on application of CPA, 1986 to the medical/ dental profession, hospitals, dispensaries, nursing homes, and other related services. This act enables the patient to file law-suits (in case of perceived negligence) in consumer courts. It is concerned only with negligent acts.[(3)]

Medical negligence arises from an act or omission by a medical/dental practitioner, which would not have been committed by any careful practitioner. However, when the patients are not satisfied with the treatment they receive from their dentists, the patient turns to a legally competent body, which can judge whether the complaint is reasonable or not. In earlier times, the remedy for medical negligence was available only under the law of Tort, but now it is possible to get redressal for such negligence[(2,3)] under CPA.

Consumer awareness is emerging in the country and therefore it is essential on the part of medical professionals to have updated and adequate knowledge about CPA to give better services and prevent consumer disputes. Studies on awareness of health professionals and in particular of dentists, about such laws, seems to be rarely reported.[(2,4,5,6)]

Hence, the present study was carried out to study the awareness among dental fraternity in North India regarding consumer protection act and its implications on the profession.

Materials & Method

It was a cross-sectional questionnaire study conducted over a period of three months from June to August 2015. Clearance was obtained from institutional ethical committee. All the participants gave consent for being a part of the study.

A questionnaire consisting of 32 questions pertaining to demographic details (7), awareness (15) and practice (2) and implications (8) of CPA was developed for the study. All questions were close ended except the participant's demographics. A panel of experts in the field of law and epidemiology validated the questionnaire. A pilot study was conducted among 50 dentists who were not the part of main study sample

to test the reliability of the questionnaire. (Cronbach's alpha coefficient = 0.85).

Dental fraternity comprised of BDS final year, interns, PG's and Dental Graduates. List of dental fraternity was obtained from respective Indian Dental Association branches. Based on result of pilot study (margin of error=0.025; z-score= 1.96; prior judgment of correct value of p=0.2) sample size of 983 was calculated (rounded off to 1000). Finally, 1000 dental fraternity were randomly included in this study; the questionnaire was sent either via e-mails or by sending printed copies while maintaining anonymity of all the participants.

Each correct answer was given score 'one' and wrong and don't know answers were given score 'zero'. The responses were further grouped into poor (score <6), fair (score 6-8), good (score 9-12) and very good awareness level (score >12).

Statistical analysis: Data analysis was done using SPSS version 20.0 (SPSS Inc., USA). The individual score was summed up to yield a total score. Chi -square test was used to find association between awareness and demographic data.

Results

Response rate was 86%. The mean age of study participants were 29.6±3.3 years with 26.5% males and 73.5 females. The study population comprising of BDS students, interns, PG students, BDS and MDS doctors were 21.7%, 43.8%, 17.7%, 4.4% and 12.4% respectively. Two interns, 2 BDS and 7 MDS doctors were unaware regarding CPA (Table 1). MDS had highest awareness level followed by PG students. Males had higher awareness level as compared to females. However, the difference was not significant (Fig. 1, 2). Overall awareness level was found to be good among 64.3% of dental fraternity.

Table 1: Awareness regarding CPA for each question

Questions	Options	Response	Awareness
Which of following is NOT the aim and objectives consumer protection act?	Promotion and protection of rights of consumer	13.8	65.7
	Inexpensive settlement of disputes within 2 years of complaint (ideally)	65.7	
	Inexpensive settlement of disputes within 90days of complaint (ideally)	20.5	
Can a consumer lodge a complaint without presence of lawyer?	Yes	87.6	87.6
	No	5.2	
	Dont Know	7.1	
Where is consumer forum at District Panchkula located? (open ended questionnaire)	Correct	5.2	5.2
	Incorrect	94.8	
Who all are liable under consumer protection act? (options not shown in table)	Aware	51.9	51.9
	Unaware	48.1	
Can a patient sue a doctor for rejecting an emergency case?	Yes	87.1	87.1
	No	10.0	
	Don t know	2.9	
Can a patient sue a doctor for rejecting a medically compromised case?	Yes	64.3	64.3
	No	27.6	
	Don t know	8.1	
At which level should a compensation claim of Rs 25 lakhs be made?	District level	1.4	78.6
	State level	78.6	
	National commission	20.0	
The centre which the patient approaches to file a complaint is determined by?	The severity of clinical mishap	24.3	24.3
	The compensation consumer quotes	52.9	
	Don't know	22.9	
What is maximum time period within which a patient can sue the concerned doctor with evidence?	Within 6 months after treatment	49.5	19
	Within 2 years after treatment	19.0	
	Don't know	31.4	
What should a doctor do in case of mishap?	Explain and inform the patient	100	100
	Remain quiet	0	
	Threaten the patient	0	
For a patient 15 years of age, consent for examination is	Patient	14.8	100
	Parent/guardian	85.2	

taken from			
	Classmate	0	
Situations where consent may not be obtained	Emergency situation	47.6	41
	Information provided would not be processed rationally	5.2	
	Immigrants	6.2	
	All of the above	41.0	
What should be done to informed consent after treatment is over?	Given to patient	28.1	71.9
	Preserved by dentist	71.9	
	Discarded	0	
A doctor is liable for the negligence of his junior staff	Agree	74.3	74.3
	Disagree	25.7	
A consent is valid only when it is documented and understood by the patient/patient party	Agree	96.2	96.2
	Disagree	3.8	

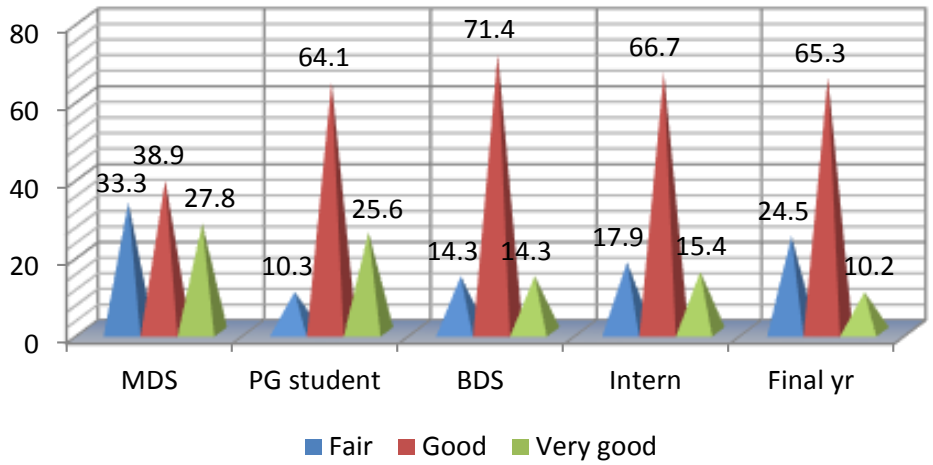

Fig. 1: Awareness of consumer protection act based on qualification

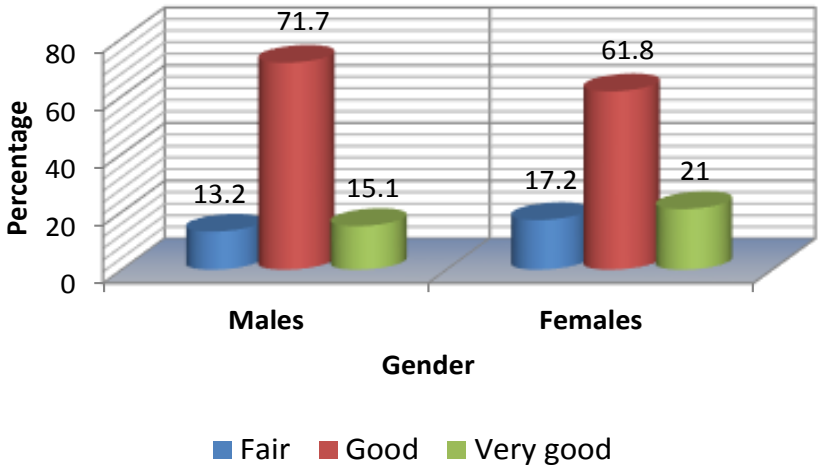

Fig. 2: Awareness of consumer protection act based on gender

Regarding subjects pertaining to practice questions, 29% of dentists made a note if attendant who were erring on any account, 29.5% of dentists always took a written consent. The perceived implication of consumer protection act on doctor, patient and on medical practice is also highlighted (**Table 2).** Most of doctors (>90%) felt that CPA enables the doctors to communicate better and also give rise to efficient patient care. On the other hand, a majority

(>70%) of participants did feel that CPA hampers the services provided by the doctor, makes doctor practice defensive medicine and there is filling of false and vexatious complaints. When the participants were asked about implications of CPA on Medical Practice, they told that CPA causes commercialization in practice and increases insurance coverage. Majority (71.9%) of participants felt that government has established clear standards for regulation of health care services.

Table 2: Implications of consumer protection act

	Agree (%)	Disagree (%)
Implications of Consumer Protection Act on Patient		
Doctors communication better	93.8	6.2
Rise to efficient patient care	94.8	5.2
Implications of Consumer Protection Act on doctors		
Hampers service	75.7	24.3
Practice of defensive medicine	71.9	28.1
Filling of false and vexatious complaints	91	9
Implications of Consumer Protection Act on medical practice		
Commercialization in practice	91.4	8.6
Increase insurance coverage	90.5	9.5
Government has established clear standards for regulation of health care services	71.9	28.1

Discussion

The consumer protection act 1986 enabled the health care providers, including doctors, nurses, paramedics and hospital administrators to understand the responsibilities that they have, with regard to the legal and administrative sense. Therefore, it is important to have properly documented patient's record to safeguard the staff involved in consumer service. After the consumer protection law came into being, innumerable negligence cases have been reported, which earlier would have been surfaced.

The present study revealed that majority of dental fraternity had good awareness level regarding CPA and majority of the dentists think that CPA will hamper the professional freedom. Majority of subjects had low awareness about basic rules and regulations such as about location of consumer forum in their district, determining the centre which the patient approaches to file a complaint and maximum time period within which a patient can sue the concerned doctor. Hippocratic Oath says "I will treat without exception all who seeks my ministrations". However, still 12.9% of dentists feel that patient has no right to sue a doctor if rejected emergency treatment.

A non-significant higher percentage ($p > 0.05$) awareness was found among males as compared to females. This was in concordance with study done by Sikka (2012)[5] and can be attributed to males showing more inclination towards their profession. Further, non-significant higher awareness was also seen in dentists with post graduate degree as compared to dentists with graduate degree which can be attributed to their higher knowledge as a part of their degree program. The results were in concordance with study done by Singh K (2010),[2] Ajithkrishnan CG (2011)[4] and Sikka M (2012).[5] As most of the subjects were in age group of 20-30 years, having 0-5 years of experience, mostly engaged in academics and treating 0-10 patients in a week, these demographic variables were not linked with awareness level.

Conclusion

The present study revealed that majority of the dental fraternity had good knowledge about consumer protection act and there is need to upgrade our knowledge at all levels of the dental profession. The attitude should be changed to deliver quality dental care by incorporating a practice to spread the message of consumer protection act. Dental and medical councils should exercise their powers more strictly so that it will help in structuring the law and legal processes, for the betterment of the society. The goals of the CPA can only be achieved when the doctors extend their full co-operation.

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An evaluation and comparison of the effect of five mouthrinses on the microhardness of esthetic hybrid composite restorative material - an in vitro study

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Abstract

Aim and Objectives: The aim of the present *in-vitro* study was to evaluate and compare the effect of five commercially available mouthrinses i.e. Listerine, Benzydamine, Rexidine, Proflo, Hiora on the microhardness of the hybrid composite restorative material.

Materials and Method: Fifty specimens were prepared withHybrid Composite Restorative Material (Te-Econom Plus) and immersed in Saleve (artificial saliva; supplied by the manufacturer) for 24hr. The baseline microhardness of specimens was recorded using Vicker's microhardness tester.The pH of mouthrinses was recorded with digital pH meter. All 50 specimens were divided into five groups of 10 samples each and immersed into20 ml of - Group I - Listerine (alcohol based) mouthrinse, Group II - Benzydamine (HCl based) mouthrinse,Group III- Rexidin (Chlorhex based) mouthrinse, Group IV-Proflo (fluoride containing) mouthrinse, and Group V -Hiora (alcohol free, herbal) mouthrinse and incubated for 24hr at 37ºC. After immersion the microhardness values of the specimens were recorded again and the data was tabulated for statistical analysis. Kruskal–Wallis test was used for inter group comparison followed by pairwise comparison of groups using Mann–Whitney U test.

Results: All mouthrinses tested showed decreased microhardness of the Te-Econom Plus (hybrid composite restorative material) ($P<0.001$). Group I-(Listerine) showed highest reduction while Group II-(Benzydamine) showed the lowest reduction in the microhardnessof the hybrid composite restorative material respectively.

Conclusion: All the five groups decreased the microhardness of the Hybrid Composite Restorative Material. The highest reduction in microhardness was found in alcohol-containing mouthrinse (Listerine).

Keywords: Microhardness, Mouthrinse, Resin composite, Vicker

Introduction

Now-a-days, the use of tooth-colored dental material is increasing very rapidly because of the esthetic needs of the patients. Composite resins are one of the best dental materials to make minimal invasive treatments as they have various properties like – easy handling, biocompatibility, adhesive, esthetic, non-thermal conduction, no mercury related side effects and adequate strength.

The oral cavity is the main entry gate of the body which is under constant varying concentration of pH and temperature cycle that alter the organic and inorganic matrix of composite resins particles. The use of mouthrinses has become very popular as they prevent and control caries, plaque, gingivitis, oral malodor and periodontal diseases. Mouthrinses contain antibacterial agents (like – fluoride, alcohol, cetylpyridinium, chloride), flavours (thymol, eucalyptol, menthol and mint oils) humectants (glycol, sorbitol, glycerol, propylene) sweetner (sodium saccharin) and colorants in an aqueous or alcoholic medium.

In previous studies, Asmussen et al (1984)[(1)] indicated that alcohol in the mouthrinses can soften the composite resin restorations. Diab et al (2007)[(2)] and Lavvaf et al (2011)[(3)] stated that alcohol containing mouthrinses decreases the hardness of the composite resins. Similarly, Shabzendedar et al (2011)[(4)]indicated that mouthrinses that contain fluoride can affect the solubility of some composite restorative materials.

Today, mouthrinses are the part of people's routine oral hygiene. They are commonly used even without professional prescription. Long term use of mouthrinses can lower the longevity of restoration and may affect the oral tissues.

Currently, a wide variety of mouth rinses are available in the market and many of them are not studied for their effect on the restorations. Hence, the aim of this study was to evaluate the effect of five commercially available mouth rinses (containing alcohol, fluoride, chlorhex, HCL and alcohol free) on the microhardness of Hybrid Composite Restorative Material.The null hypothesis was that there would be no significant difference in the microhardness value of the hybrid composite restorative material (Te-Econom Plus) after immersion in these mouthrinses-Listerine, Benzydamine, Rexidine, Proflo, Hiora.

Materials and Methods

Fifty specimens (3 mm in diameter and 3 mm in height) were prepared with Hybrid Composite Restorative Material (Te-Econom Plus) with the help of plastic mould. On a glass slide, plastic molds were placed and filled with light curing hybrid composite and covered with a matrix strip. Another glass slide was placed on matrix strip and gently pressed to obtain a smooth surface. Each specimen was cured with Blue LEX LD dental light lamp (Monitex Industrial Co. Ltd, New Taipei City, Taiwan) with a light intensity of 1000mW/cm^2 for 08 seconds on both, top and bottom side as per manufacturer's instructions. The specimens were then kept in "Saleva" (artificial saliva) for 24

hours to simulate the oral environment. After 24 hours, all the specimens were subjected to Vicker's microhardness tester (Model No. Future Tech - FM-700) to record the baseline microhardness values with a load of 200 gm for 15 seconds.

The pH of all mouthrinses was recorded by using a digital pH meter. The pH value of Listerine was 3.38, Benzydamine-pH: 5.27, Rexidin-pH: 4.43, Proflo–pH: 4.75 and Hiora-pH: 4.09. Table 1 shows the composition of Mouthrinses and Hybrid Composite Restorative material used in the study.

Table 1: Composition of Mouthrinses and Hybrid Composite Restorative material

Mouthrinses	Composition	Manufacturer
Listerine (alcohol based)	Thymol – 0.06%, Eucalyptol-0.09%,Menthol- 0.04%, alcohol-21.6%, benzoic acid and water	Johnson & Johnson Ltd, Kolhapur, India
Benzydamine (HCl based)	22.5mgbenzydamine hydrochloride, methyl Parahydroxybenzoate	U & V Cancure Pvt Ltd
Rexidin (Chlorhex based)	Chlorhexidine Gluconate - 0.2%,	Warren, Indoco Remedies Ltd, India
Proflo (fluoride containing)	Sodium Fluoride solution – 0.2%	Sandhika Pharma. Pvt Ltd
Hiora (alcohol free, herbal)	Pilu – 5mg,Bibhitaka - 10mg Nagavalli- 10mg,Ela- 0.2mg Peppermint satva– 1.6mg Yavani satva- 0.4mg	Himalaya Drug Co., Bangalore, India
Te-Econom Plus (Hybrid Composite Restorative material)	The organic part; Bis-GMA, urethane dimethacrylate and triethylene glycol dimethacrylate (18.8% by weight) and a small amount of catalyst, stabilizers and pigments (0.21% by weight). The inorganic filler (81% by weight. The filler size is (0.7ìm).	Ivoclar Vivadent, Schaan,

All 50 specimens were randomly divided into five groups of 10 samples each and immersed into 20 ml of different mouthrinses. Group I was immersed in Listerine (alcohol based) mouthrinse, Group II in Benzydamine (HCl based) mouthrinse, Group III in Rexidin (Chlorhex based) mouthrinse, Group IV in Proflo (fluoride containing) mouthrinse and Group V in Hiora (alcohol free, herbal) mouthrinse. All groups were kept in an incubator at 37°C for 24hrwhich is equivalent in time to 1 year of 4minutesdaily use of mouthrinse.

4 minute/day x 365 days = 1460 minutes, simulated by 24 hours x 60 minutes = 1440 minutes

After that, all specimens were washed thoroughly with distilled water and post immersion microhardness was checked by using same microhardness tester.

The mean values were computed to determine significant difference within the groups (Pre and post immersion). For Intergroup comparison, Kruskal Wallis Test was followed by Mann Whitney U-Test with SPSS Version 16 and MS Excel Version 7. The level of significance was set at P=0.05.

Results

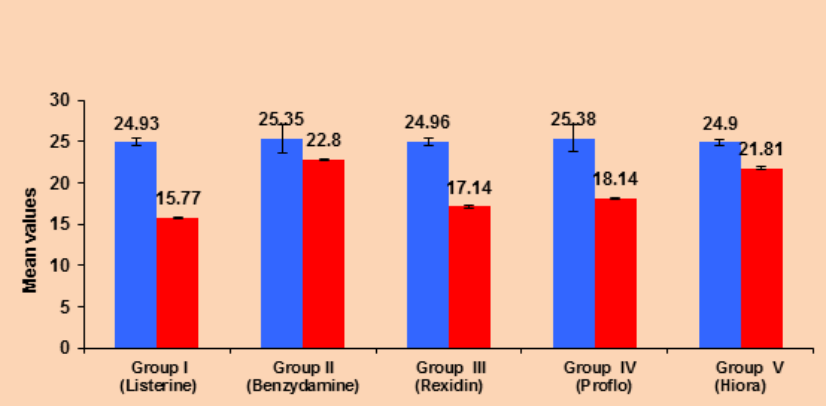
A significant reduction in the microhardness was observed in all the groups after immersion in the mouthrinses compared to baseline values with P<0.001. Therefore, null hypothesis was rejected. (Table 2, Graph 1)

Table 2: Intra (row) and Inter (column) group comparison of microhardness of Hybrid composite Restorative Material immersed in various mouthrinses

	Pre - Immersion		Post – Immersion		p value
	Mean	Std. Deviation	Mean	Std. Deviation	
Group 1 (Listerine)	24.93	0.416	15.77	0.116	<0.001*
Group 2 (Benzydamine)	25.35	1.638	22.8	0.0943	0.001*
Group 3 (Rexidin)	24.96	0.381	17.14	0.143	<0.001*
Group 4 (Proflo)	25.38	1.625	18.14	0.0966	<0.001*
Group 5 (Hiora)	24.9	0.406	21.81	0.1449	<0.001*

*p value <0.05 denotes statistically significant difference

Graph 1: Comparison of Hardness of Hybrid composite Restorative Material (Pre and Post - Immersion) among groups



Kruskal–Wallis test showed a statistically significant difference in microhardness between the five groups of mouthrinses with $P < 0.05$. Further analysis was done applying Mann–Whitney U test for pair wise comparison.

Group I (Listerine) showed highest reduction in microhardness value among all the groups and Group II (Benzydamine) showed the lowest reduction in the microhardness of the test material.

Group III (Rexidin) showed the higher reduction in microhardness value than Group II (Benzydamine), Group IV (Proflo) and Group V (Hiora) and the difference was statistically significant.

Group IV (Proflo) showed less reduction than Group I (Listerine) & Groups III(Rexidin) and more reduction than Group II (Benzydamine) & Group V (Hiora).

Group V (Hiora) showed less reduction than Group I (Listerine), Groups III (Rexidin) & Group IV (Proflo) and more reduction than Group II (Benzydamine).

Discussion

Hybrid Composite Restorative Material (Te-Econom Plus) contains Dimethacrylate and TEGDMA as resin matrix and the filler particles are Barium glass, Ytterbium trifluoride, Silicon dioxide and mixed oxide. Te-Econom Plus has an excellent physical properties, high radiopacity and long working time.[5]

Hardness is defined as the resistance of a material to indentation or penetration. It is a property of the restorative materials to have long term durability in the oral cavity. Vickers hardness tester was developed in 1924 by Smith and Sandland. In this tester a diamond tip is used to indent the test material in the form of a right pyramid with a square base and an angle of 136º between opposite faces subjected to a test force of between 1gf and 100kgf. The Vickers hardness is the quotient obtained by dividing the kgf load by the square mm area of indentation.Vickers test is easier to use than other hardness tests since the required calculations are independent of the size of the indenter, and the indenter can be used for all materials irrespective of hardness.[6,7]

In this in-vitro study, results showed that all mouthrinses decreased the microhardness of the hybrid composites restorative material. This may be because of the acidic pH of the mouthrinses which would have caused acid erosion of the hybrid composite restorative material by acid etching. This is in agreement with Penugonda et al (1994),[8] Gurgan et al (1997),[9] Cavalcanti et al (2005),[10] and Diab et al (2007),[2]who had reported that both alcohol containing and alcohol-free mouthrinses affected the hardness of the resin-composites.

Inter group comparison showed that highest reduction in the microhardness of the composite restorative material was found in Group I - Listerine mouthrinse (containing 21.6% w/v alcohol) as compared to Group II - Benzydamine and Group V - Hiora. This may be because of the lower percentage of alcohol in Benzydamine and Hiora is alcohol free. This finding was in accordance with Kao et al(1989)[11] who stated that both Bis GMA and UDMA-based polymers are susceptible to chemical softening by ethanol. Weiner et al (1997)[12] reported that composite soaked in mouthrinses containing alcohol significantly reduces hardness of composites than the ones soaked in non-alcoholic mouthrinses. Similarly, Penugonda et al (1994)[8] reported that the higher percentage of alcohol in the mouthrinses causes more reduction in the hardness of restorative materials.

Listerine has low pH (3.38) and contains benzoic acid with high percentage of alcohol which greatly affects the microhardness of the composites restorative material. Low pH increases composite biodegradation over time, deteriorate the mechanical properties and reduces the microhardness of composite restorations. The low pH of mouthrinse also changes the composite resin matrix by acting as a catalyst for the ester groups that are present in dimethacrylate monomers and causes degradation of the polymer network and reduces the microhardness of the composite resin. This was in accordance with the observations by Weiner et al (1997),[12] Yap et al (2003)[13] and Gurdal et al (2002).[14] They reported that low pH and high

percentage of alcohol in Listerine affects the hardness of resin-composite.

In the present study, Group II (Benzydamine) showed the lowest reduction in the micro hardness of the test material. This may be because Benzydamine mouthrinse contain low alcohol content and has higher pH value as compared to all other groups.

Group I (Listerine) with pH value of 3.38 showed the higher reduction in microhardness as compared to Group II (Benzydamine with pH 5.27) and Group IV (Proflo with pH 4.75). This is because the Listerine mouthrinse is more acidic than Benzydamine and Proflo mouthrinse and causes more biodegradation of composite restorative material.

Also Group IV – Proflo (containing sodium fluoride) showed higher reduction in microhardness of hybrid composite restorative material than Group II – Benzydamine and Group V – Hiora. This was in accordance with Abate et al (2000)[15] who stated that mouthrinses containing sodium fluoride as an active ingredient causes surface degradation and reduction in microhardness of composite resin.

As observed in this study, high alcohol content and low pH can have an effect on the microhardness, but these two factors may not be interdependent on each other in reducing the microhardness of the composite restorative material tested.

Though Group V - Hiora has low pH value (4.09) than Groups III- Rexidin (pH value 4.43) and Group IV –Proflo pH value 4.75), it showed less reduction in microhardness than Rexidin and Proflo. This may be because it has no alcohol in it.

Hence the long-term, regular use of alcohol based mouth rinses like Listerine with higher alcohol content (21.6% w/v) and low pH value (3.38) may be detrimental to the Hybrid Composite Restorative Material (Te-Econom Plus) used in the present study.

The results of this *in- vitro* study may not be directly related to the clinical situation as in-vitro studies do not consider certain variables such as natural saliva, food, drinks and the pH of the oral environment. Hence, further *in-vivo* studies are recommended.

Conclusion

Within the limitations of the experimental design and the test parameter, it was concluded that –

- All mouthrinses (alcohol containing, alcohol-free) decreased the microhardness of hybrid composite material (Te-Econom Plus).
- The Benzydamine mouthrinse had lowest reduction in microhardness.
- Listerine mouthrinse with low pH value and high alcohol content showed highest reduction in microhardness of light curing hybrid composite material.

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Von Willebrand disease - broadening our vision: a pediatric case report with dental considerations

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Abstract

Von Willebrand disease is an autosomal inherited bleeding disorder caused due to the quantitative or qualitative defects of a multimeric glycoprotein, the Von Willebrand factor (VWF). VWF is a multi-adhesive protein that carries factor VIII in circulation and initiates aggregation of platelets to exposed sub endothelial collagen fibers. The deficiency or abnormality of VWF causes reduction in the levels of factor VIII, as seen in Hemophilia A patients. The common clinical manifestations of Von Willebrand disease include soft tissue and mucosal bleeding. The severity of the disease is determined by the extent of von Willebrand factor and factor VIII reduction in the circulation. Since symptoms are often mild, a significant majority of patients remain undiagnosed. This article presents the ongoing dental management of a seven-year old female diagnosed with Von Willebrand disease. The primary aim of the article is to focus on the diagnosis, management and dental considerations of this common yet overlooked disorder and distinguish it from Hemophilia.

Keywords: Von Willebrand disease, Von Willebrand factor, Bleeding disorders, Hemophilia A

Introduction

Haemostasis plays a pivotal role in maintaining the integrity of blood circulation.(1) Normally, haemostasis occurs through two independent and related processes- the coagulation cascade and the platelet activation process.(2) The combined interaction of the endothelial cells, platelets and several coagulation factors results in haemostasis. A multimeric glycoprotein, Von Willebrand factor (VWF) produced by the endothelial cells and megakaryocytes circulates in a non-covalent complex along with factor VIII (FVIII), thereby protecting it from early proteolytic degradation. The high shear stress condition in the microvasculature propagates the binding of the sub-endothelial VWF to platelets. This causes the stimulation of platelets via the glycoprotein Ib–V–IX complex thereby, mediating platelet aggregation which results in consolidation of platelets with fibrin and formation of clot at the site of injury.(3,4,5)

Von Willebrand disease (VWD) is a family of inherited bleeding disorders arising from quantitative or qualitative defects in Von Willebrand factor (VWF), which plays a crucial role in the adhesion of platelets to the sub-endothelium during vascular injury and is essential for normal primary haemostasis to occur.(6) First described by Erik Adolf Von Willebrand in 1926 as 'pseudohaemophilia'. Von Willebrand disease is a congenital bleeding disorder characterized by a life-long tendency toward easy bruising, frequent epistaxis, haematomas, menorrhagia and heavy and delayed bleeding after oropharyngeal surgery.(7) The prevalence of VWD was assessed to be 0.6–1.3% in population based studies as compared to 0.005–0.01% in special centers where symptomatic patients with VWD are often referred.(8,9)

In the present report, we describe the ongoing dental management of a seven-year old female with Type 2N Von Willebrand disease focusing on the diagnosis, haematologic conditioning and dental considerations of the same. The aim of the review is to bring to the forefront the dental management of one of the most common yet overlooked bleeding disorder- Von Willebrand disease.

Case Report

A seven-year old female reported to the Department of Pedodontics with the complaint of recurrent bleeding from upper right front tooth region. Her medical history revealed that she was a diagnosed case of Von-Willebrand disease. There was history of easy bruisability, epistaxis, gum bleeding in the past which used to stop after factor infusion under medical supervision. There was no history of consanguineous marriage of parents. The pedigree analysis of the family was done and none of the members of the family were affected suggesting either an autosomal recessive pattern of inheritance or de novo mutation. The patient had overall normal physical and mental development. Extra-oral examination revealed the absence of pallor, icterus, cyanosis, clubbing and lymphadenopathy. Intraoral examination revealed a root stump in relation to 52, the offending tooth from where recurrent bleeding occurred. There were multiple carious lesions in primary and permanent teeth (Fig. 1). An informed consent was taken from the haematologist prior to the extraction procedure. The patient's consent was taken and haematological investigations were carried out (Table 1). The treatment plan aimed at infusion of theVWF/ FVIII concentrate since VWF is the carrier protein for Factor VIII, establishment of haematologic

equilibrium followed by extraction of 52. The extraction was done 60 minutes after the infusion of Anti-haemophilic Factor (Inj. Immunate, 250 IU).The local haemostatis was achieved using Tranexamic Acid (TexidInj, 500 mg/5ml). Post extraction instructions were imparted and Acetaminophen 125 mg (15mg/kg/dose) analgesic was prescribed. The routine follow up of the child was done after 24 hours to check for post-operative bleeding. The child is presently undergoing conservative dental treatment involving restorations of the several carious primary and permanent teeth (Fig. 2). The complete treatment of the patient is a teamwork being done in close collaboration with the Haematologist.

Fig. 2: Follow up post-operative picture

Fig. 1: Pre-operative picture

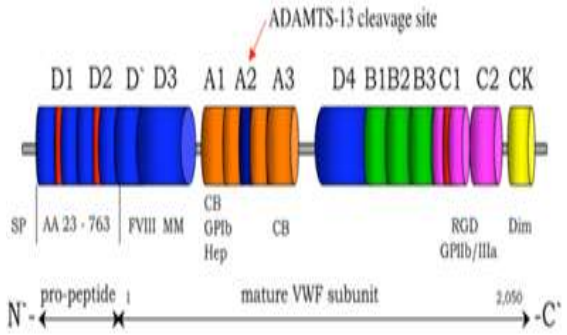

Fig. 3: Subunit structure of VWF

Table 1: Result of the pre-operative haematologic investigations

Investigation	Result	Normal Range
Hemoglobin Concentration (g/dL)	8.7	10.9-14.9
Platelet count (mm3)	4,80,000	150,000–500,000
Erythrocyte count (x 10^6 /µL)	4.5	3.80-5.20
White cell count (x 10^3 /µL)	9.5	4.5-11.5
Bleeding time (min)	2	1-4
aPTT (s)	34.59	25-35
Prothrombin time (s)	11.4	11-14
INR	1.85	0.8-1.2
Factor VIII (%)	29.05	50-100
Factor IX (%)	94.3	50-100

aPTT- activated partial thrombolastin time, INR- Internantional Normalized Ratio

Table 2: Classification and characterization of von Willebrand disease (VWD) types

Type	Pathogenetic mechanisms	Inheritance	Most frequent VWF gene defects
VWD1	Partial quantitative deficiency of VWF	Autosomal dominant	Missense mutations (85%), null alleles (15%), variable penetrance
VWD2A	Decreased VWF-dependent platelet adhesion due to a loss of High Molecular Weight	Autosomal dominant	Missense mutations, mainly in D3, A2, and CK domains

	VWF multimers	Autosomal recessive	Missense mutations in propeptide
VWD2B	Increased affinity of VWF for platelet GPIba	Autosomal dominant	Missense mutations in A1 domain
VWD2M	Decreased VWF-dependent platelet adhesion without a loss of High Molecular Weight VWF multimers	Autosomal dominant	Missense mutations in A1 domain
VWD2N	Decreased binding affinity of VWF for factor VIII	Autosomal recessive	Missense mutations in D' and D3 Domains
VWD 3	Virtually complete deficiency of VWF	Autosomal recessive	Mainly null alleles, Large–small deletions

Table 3: Laboratory assays for VWF activities

Test	Pathophysiological Significance
Antigen VWF (VWF:Ag)	Antigen concentration
Ristocetin cofactor activity VWF (VWF:RCo)	VWF–GPIb interaction as mediated by ristocetin in vitro
Factor VIII procoagulant activity (FVIII:C)	FVIII–VWF interaction
Binding of VWF to collagen (VWF:CB)	VWF–collagen interaction
Binding of FVIIIto VWF (VWF:FVIIIB)	FVIII-vWF interaction
RIPA	Threshold ristocetin concentration inducing patient's platelet-rich plasma aggregation
Multimer analysis	Multimer composition of VWF
Closure time PFA-100	Simulates primary hemostasis after injury to a small vessel
Propeptide assay (VWFpp)	Measures the amount of VWF-pp released in plasma

Discussion

VWF is a large multimeric adhesive plasma glycoprotein, composed of a series of dimers of mature subunits that has an essential role in both primary and secondary hemostasis.[10] The scheme of Von Willebrand factor monomer molecule along with itsfunctional domains is shown in (Fig. 3). The pro-VWFpolypeptide is indicated with amino acids numbered from the amino-(aa23) to carboxy-terminal portions (aa763). Binding sites are indicated for factor VIII (D' and D3 domains), platelet glycoprotein Ibα (GPIbα) (A1 domain), collagen (A1 and A3 domains) and integrin αIIbβIII (RGDS sequence within the C1 domain).The cleavage site (Tyr1605-Met1606) for ADAMTS13 is located at the central A2 domain of Von Willebrand factor.

Von Willebrand disease is one of the most common inherited coagulation disorder caused due to deficiency and abnormality of Von Willebrand factor. Its prevalence is nearly 0.6-1.3% as per the population based studies, however, clinically relevant cases have 10-fold lower prevalence.[4] The current classification proposes six different types of VWD based on the pathogenic mechanisms, mode of inheritance and gene defects as summarized in (Table 2).

In VWD, bleeding episodes occur by two pathogenic mechanisms- (1) Impairment ofplatelet–VWF interactions. This is usually assessed in plasma by platelet-dependent VWF activity (PD-VWFact) in the presence or absence of ristocetin and by decreased VWF collagen binding activity (VWF:CB). (2) The reduction inFVIII levels that often accompany the VWF defect.[11]

The most common presenting symptoms in persons subsequently diagnosed with VWD are epistaxis, menorrhagia, bleeding after dental extraction, ecchymoses, bleeding from minor cuts or abrasions, gingival bleeding, postoperative bleeding, hemarthrosis, gastrointestinal bleeding.[12]

The three main criteria essential for correct diagnosis are: (i) Presence of positive bleeding history since childhood; (ii) Reduction in VWF activity in plasma; and (iii) History of bleeding in the family with autosomal dominant or recessive pattern of inheritance. Several clinical, laboratory and molecular parameters are useful for diagnosing the variant of VWD.[11]

The clinical factors include both personal and family history of muco-cutaneous and post-operative bleeding. The presence of other affected members within the family is important to determine the type of inheritance trait. Quantitation of mucocutaneous bleeding symptoms in children with VWD is done using the Pediatric Bleeding Questionnnaire. The bleeding score 2 or more in children is a cut off to identify those with a bleeding diathesis requiring measurement of VWF related activities.[13] Several laboratory assays covering the entire spectrum of VWF activities essential in diagnosing VWD have been enumerated in (Table 3).[4]

In the present case, none of the family members were affected suggesting a recessive pattern of inheritance or de novo mutation. There was a deficiency in the binding of FVIII to VWF suggesting defect in the N-terminal region of VWF where the binding domain (D' and D3) for FVIII is located.

The molecular diagnosis is useful to verify and confirm the specific VWF defect in VWD families especially Type 2 VWD since mutations are clustered in specific exons of VWF gene. However, in Type 3 and Type 1 VWD gene defects are spread through the entire VWF gene.[14]

VWD3 is always classified as severe by definition since the VWF levels are undetectable in both plasma and platelets with relatively low amounts of FVIII:C (<20U/dL) in plasma. Conversely; VWD1, VWD2A, VWD2B, VWD2M, and VWD2N show a varied clinical presentation with the severity strictly correlating with the circulating levels of functional VWF activity. The severity of the bleeding tendency is comparative to the degree of the primary deficiency of VWF and to that of the secondary deficiency of FVIII, sinceVWF is the carrier of FVIII in circulating plasma.[15] Thus, in VWD the aim of therapy is to correct the abnormal platelet adhesion-aggregation defect of hemostasis and the abnormal intrinsic coagulationresulting from low levels of FVIII.[4] Desmopressin (DDAVP) which releases endogenous VWF from endothelial cells and replacement therapy with exogenous VWF/FVIII concentrate or VWF concentrates devoid of FVIIIformthe basis of treatment.VWF/FVIII concentrates are indicated for patients with Type 3 VWD, for patients with Type 2B (since DDAVP can induce transient thrombocytopenia) and, for all those patients with types 1 and 2 VWD who are unresponsive or who may have contra-indications to DDAVP. In the present case, Immunate 250 IU was used which is a FVIII/VWF concentrate since the patient was a case of 2N type VWD. Combined estrogen-progestogen drugs and anti-fibrinolytic agents (tranexamic acid and epsilon aminocaproic acid) are also significant in controlling bleeding during oral surgical procedures.[16,17]

Conclusion

VWD is one of the most common inherited bleeding disorder due to the heterogeneity of VWF defects. It is thus imperative to have a thorough knowledge of diagnosis and classification of VWD to provide the best therapeutic approach to VWD patient.

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Orthodontic molar intrusion with palatal implant: a case report

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Abstract

Patients with missing molars usually present with supraerupted antagonist molars, hampering rehabilitation by prosthesis. In such cases orthodontic intrusion of the supraerupted molar can be considered. There are several modalities for intrusion but active intrusion can be achieved by temporary anchorage devices or TAD's. Intraorally TAD's can be placed at various sites in the maxilla such as buccal alveolus, palatal alveolus and mid palatal region. Among these, palatal alveolus provides more favorable periodontium for stability of TAD's. This case report presents molar intrusion with a palatal implant.

Keywords: Molar intrusion; Palatal implant; Supraeruption; Missing molar.

Introduction

It is not uncommon to encounter supraerupted maxillary molars in dental practice. Most of times early loss of the mandibular first molar leads to extrusion of the opposing maxillary first molar into the edentulous space.(1) In such cases intrusion of the extruded molar prior to rehabilitation of the space with a prosthesis is often required.

Molar intrusion has been one of the difficult tooth movement in orthodontics. There are many indications for molar intrusion such as in patients with anterior open bite, vertical maxillary excess, supra-eruption of teeth due to missing opposing teeth etc. Various methods for molar intrusion have evolved in the field of modern orthodontics such as sectional mechanics,(2) a removable appliance,(3) a transpalatal bar,(4) anchorage from mini screws,(6) or magnets.(7) The choice of treatment method depends on the periodontal condition, bone quality and patient's need.

Patient compliance for molar intrusion is not of utmost importance with alternative treatment modalities like temporary anchorage devices or TADs.(1) The present case report documents a case of molar intrusion using a palatal implant with a trans-palatal arch.

Case Report

A 22 year old female patient presented with a chief complaint of spacing in her anterior teeth. The clinical examination revealed a Class I incisor relationship on a skeletal Class II base with upper and lower anterior spacing, a normal overjet and overbite complicated by a mutilated occlusion due to a grossly carious lower right first molar and a supraerupted maxillary right first molar as shown in (Fig. 1). The profile was convex with protrusive lips.

The objectives of treatment were to consolidate upper and lower anterior spacing and intrusion of the upper right first molar to facilitate placement of prosthesis. Treatment plan included extraction of the root stumps of the lower right first molar and pre-adjusted edgewise fixed appliance (MBT .022 prescription). Molar intrusion was planned with a trans-palatal arch and a palatal implant.

A microimplant of 1.3x8 mm was placed on the palatal mucosa between the upper right first and second molarsas shown in (Fig. 2). A trans-palatal arch was fabricated from 0.9 mm S.S wire to prevent palatal tipping of the crown of the first molar. A force of 150 grams was applied with an elastic chain from the lingual sheath of the first molar to the palatal implant (Fig. 3). 3mm of intrusion was achieved in 6 months as shown in (Fig. 4). Pre and post treatment cephalometric parameters are shown in (Table 1). Superimposition on palatal plane shows molar intrusion (Fig. 5). After debonding, the patient was referred for composite build-up of right maxillary central incisor and maxillary lateral incisors. Patient was given a temporary removable prosthesis while waiting for dental implant placement as shown in (Fig. 6).

Table 1: Pre and Post treatment cephalometric parameters

Parameters	Pre-treatment	Post-treatment
SNA	86°	85°
SNB	81°	80°
ANB	5°	5°
SN – GoGn	22°	23°
U1 to NA	30°	20°
LI toNB	39°	34°
U6 to NF	24mm	21mm

Fig. 1a: Intraoral pre-treatment photograph

Fig. 1b: Intraoral pre-treatment photograph

Fig. 1c: Intraoral pre-treatment Photograph

Fig. 1d: Intraoral pre-treatment photograph

Fig. 1e: Intraoral pre-treatment photograph

Fig. 1f: Extraoral pre-treatment photograph

Fig. 1g: Extraoral pre-treatment photograph

Fig. 1h: Extraoral pre-treatment photograph

Fig. 2: TPA & palatal implant for molar intrusion

Fig. 3a: Treatment progress

Fig. 3b: Treatment progress

Fig. 4a: Intraoral post-treatment photograph

Fig. 4b: Intraoral post-treatment photograph

Fig. 4c: Intraoral post-treatment photograph

Fig. 4d: Intraoral post-treatment photograph

Fig. 4e: Intraoral post-treatment photograph

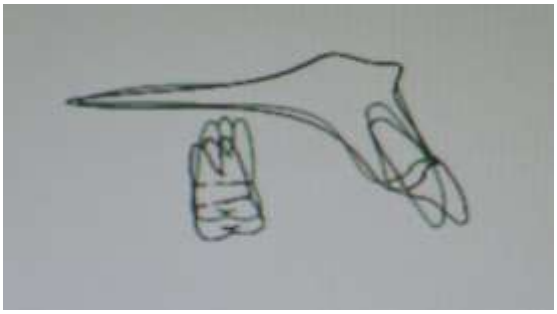

Fig. 5: Superimposition on palatal plane

Fig. 6: Removable retainer with prosthesis

Discussion

Area with high bone density and thin keratinized tissue are good for mini-screw insertion. Patient's safety and biomechanical tooth movement are the two important criterions for determining the location of mini-screw. Bone density and soft tissue health are the key determinants that affect stationary anchorage and miniscrew success.[8] Palatal alveolus was chosen for the placement of implant because the cortex is thicker on the palatal alveolus than the corresponding buccal side, and there is more interproximal space between the palatal roots. Thus, palatal alveolus has been recommended as insertion sites to be used for molar intrusion.[9]

We applied 150 g of force because intrusive force should be light and continuous to produce the appropriate pressure within the periodontal ligament and minimize the risk of root resorption.[10] Melsen and Fiorelli used 50 g of force to intrude maxillary molars in adults.[2] Park et al used 200 g of force for miniscrew-supported maxillary molar intrusion.[11]

3mm of molar intrusion was achieved in 6 months. Yao et al reported a mean intrusion of 3 to 4 mm (range 3.68-8.67 mm) for the first molar and a mean intrusion of 1 to 2 mm for the second molar in7.5 months.[12]

Conclusion

With miniscrews, orthodontist can overcome anchorage limitations and perform difficult tooth movements predictably and with minimal patient compliance. In adult patients, a multidisciplinary treatment may present a more conservative approach to rehabilitate the patient's occlusion. Restorative dentists, periodontists and surgeons should have some understanding of the many applications of orthodontics when presenting patients with options for correcting occlusal problems.

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Large cystic Adenomatoid Odontogenic Tumor associated with impacted maxillary canine - a case report

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Abstract

Adenomatoid odontogenic tumour(AOT) is a benign, non -neoplastic lesion with slow progressing growth. It occurs in two forms intraosseous and peripheral forms. This lesion is commonly found in the anterior maxilla and is mostly associated with the impacted canine tooth. Here we report a case of large cystic AOT associated with an impacted canine appearing to be a dentigerous cyst grossly and radiographically. Histopathologically varied spectrum of the lesion were noticed, which have been documented and will help us to better our knowledge of AOT.

Keywords: Adenomatoid odontogenic tumor, Dentigerous cyst, Impacted tooth

Introduction

Adenomatoid odontogenic tumor (AOT) was first recorded in literature as epithelioma adamantinum by Steensland in 1905. Later, it was documented by Harbitz in 1915 as cystic adamantoma. But it was Philipsen and Birn who in 1969, proposed the widely accepted and currently used term Adenomatoid odontogenic tumor, which was adopted in the first edition of World Health Organization (WHO) classification of odontogenic tumors in 1971. In 2005, WHO defined, Adenomatoid odontogenic tumor as a tumor composed of odontogenic epithelium presenting different histoarchitectural patterns, embedded in a mature connective tissue stroma, and characterized by slow but progressive growth.(1)

AOT is described as an uncommon benign odontogenic tumor with a relative frequency of 2.2-7.1%. It appears as an intraoral/ extraoral swelling in maxilla. It is sometimes referred to as "Two-thirds tumor" because two third of the cases occur in maxilla, two third of the affected are young females, two third cases are associated with unerupted tooth, and two third of the unerupted teeth were canines.(2)

As histogenesis of AOT is still uncertain, there has been long debate as to whether it represents anomalous hamartomatous growth, or is a true neoplasm. Though, it is currently accepted as a true odontogenic neoplasm. Rightfully called the "master of disguise", AOT has been known for its varied clinical and histoarchitectural patterns. This unique report of a large cystic AOT showing varied histoarchitecture is presented which may augur our understanding of the biology of the tumor.

Case Report

A 17 year old male patient reported to the clinical outdoor wing with a complaint of malaligned teeth. Extra oral examination was insignificant. Intra oral examination revealed permanent dentition upto second molars in both the arches, except missing permanent left canine. Radiographic examination revealed an impacted permanent left canine completely surrounded by a large, well defined cystic lesion. A provisional diagnosis of an impacted canine associated with dentigerous cyst was given and surgery was advised followed by orthodontic treatment to correct the malalignment. After obtaining the patient's consent, enucleation of the cyst was done along with extraction of the associated impacted canine which was done under local anesthesia.

The gross specimen was brownish yellow in color, firm in consistency and was attached to the maxillary left canine, along with the cystic lining, measuring about 3 cm x 4.2 cm in dimension, the tooth was attached to the cystic lining in the cervical region (Fig. 1). The specimen had a gritty feel on cutting. The soft tissue bits were sent for routine histopathological examination. The histopathological examination of the specimen revealed cystic lining epithelium which was 2-4 layers thick, resembling reduced enamel epithelium (Fig. 2). The supporting connective tissue capsule comprised of bundles of collagen fibres lying parallel to the cystic epithelium. Certain areas revealed connective tissue capsule comprising of cuboidal to columnar cells arranged in the form of nests and rosettes (Fig. 3). In the same bit solid areas with duct like pattern, and tubular appearance was seen (Fig. 4). Few cells were also arranged in plexiform pattern. Foci of extravasated red blood cells was seen in few areas. Some amount of calcification, eosinophilic material was observed (Fig. 5). Correlating the histopathological features with the clinical and radiographic findings, a final diagnosis of cystic adenomatoid odontogenic tumor (AOT) was

given. The healing was uneventful and the orthodontic treatment is in progress.

Fig. 1: Photograph showing gross specimen with cystic lining attached to the tooth

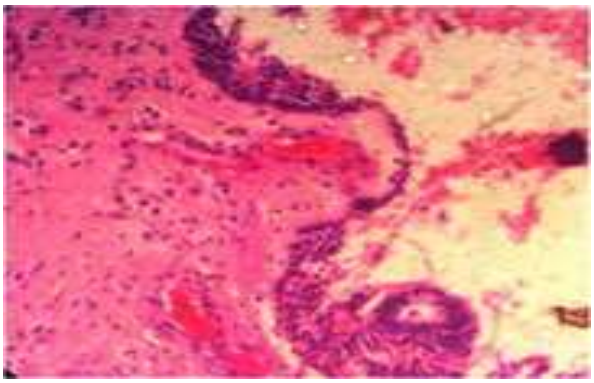

Fig. 2: Cystic lining comprising of 2-6 cell thick epithelial cells similar to dentigerous cyst (10x, H and E Stain)

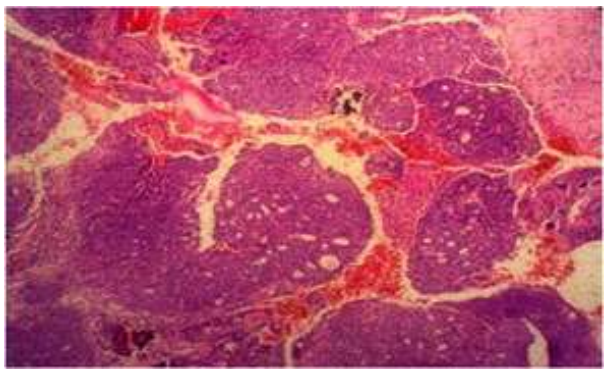

Fig. 3: Connective tissue capsule comprising of cuboidal to columnar cells arranged in the form of nests and rosettes (4x, H and E Stain)

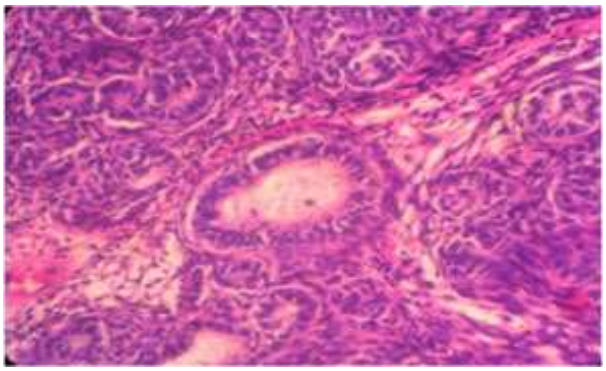

Fig. 4: Photomicrograph showing solid areas, duct like pattern, and tubular appearance (40x, H and E stain)

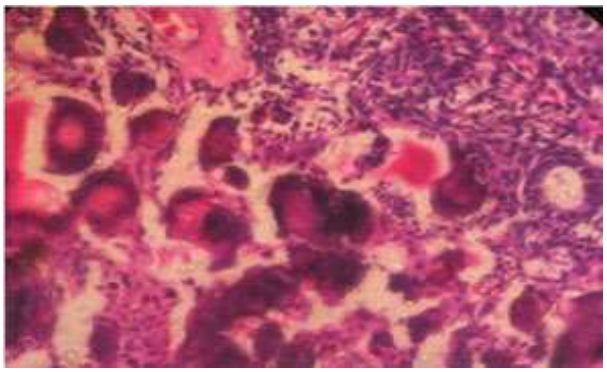

Fig. 5: Photomicrograph showing calcification and eosinophilic material (40x, H and E stain)

Discussion

AOT is a benign, non- invasive odontogenic lesion showing slow growth. Unal et al gave a list of all terms given to AOT in literature: adenoameloblastoma, ameloblastic adenomatoid tumor, adamantinoma, epithelioma adamantinum and teratomatous odontoma to name a few to describe AOT. It is generally intraosseous, but can occur in peripheral locations. AOT is mostly seen in young patients, especially in second decade of life, with mean age of 13.2 years and is uncommon in patients older than 30 years of age. Females are affected more than males with female:male ratio of 1.9:1. This is more marked in Asian population, with highest female incidence recorded in Sri Lanka(3.2:1). Maxilla is the most common site (Maxilla:Mandible=2.6:1). Anterior part of maxilla is commonly involved. An unerupted maxillary canine is the tooth generally associated with AOT.[2,3]

AOT may be radiographically divided into two types: follicular or pericoronal and extrafollicular or extracoronal. Former is characterized as a well-defined unilocular radiolucent lesion surrounding the crown and is often part of the root of an unerupted tooth. The latter is a well- defined radiolucent lesion but located between, above or superimposed upon the root of an unerupted tooth. Minute variable shaped radiopacities are frequently found within the lesion.[3] The follicular

and extrafollicular variants are both intrabony and account for approximately 96% of all AOTs of which 71% are follicular type. In fact 77% of all follicular types are diagnosed as dentigerous cyst.

Comparing the diagnostic accuracy between panoramic and periapical radiographs, Dare et al found that intra oral periapical radiographs allow perception of radioopacities having flocculent pattern within radiolucency even with minimal calcific deposits. Apart from that to differentiate between dentigerous cyst and AOT, in the former the radiolucency is never associated with the part of the root (always attached to the cervix) whereas the latter is always associated with the part of the root.[4] In our case, the sclerotic margins were associated with the apex of the root but grossly the lining was attached at the cervix.

AOT is usually surrounded by well-developed connective tissue capsule. It may present as a solid mass, a single large cystic space, or as numerous small cystic spaces. The tumor is composed of spindle-shaped or polygonal cells forming sheets and whorled masses in a scant connective tissue stroma. Between the epithelial cells as well as in the center of the rosette like structures are amorphous eosinophilic materials and are called as "tumor droplets". The characteristic duct like structures are lined by single row of columnar epithelial cells, the nuclei of which are polarized away from central lumen. Dystrophic calcification in varying amounts and in different forms is usually found in most AOTs within the lumina of the duct like structures, scattered among epithelial masses or in stroma.[5,6] Our case showed all the classically described features of AOT along with the dentigerous cyst like lining epithelium.

In 1971, WHO defined this lesion as, "a tumor of odontogenic epithelium with duct like structures and with varying degrees of inductive change in the connective tissue. The tumour may be partly cystic and in some cases the solid lesion may be present only as masses in the wall of a large cyst. It is generally believed that the lesion is not a neoplasm".[7]

Though the definition states the lesion as cystic very few cases have been reported having described cystic lining. Cystic presentation of AOT has been reported way back in 1915 by Harbitz as "cystic adamantoma". The histopathological features seen in our case were both of dentigerous cyst and AOT. Grover et al also reported 10 cases of dentigerous cysts associated with AOT.[8]

Our case becomes unique because of the varied AOT features seen in the capsule of the cyst, grossly and histopathologically a challenging case.

Marx and Stern considered AOT as a cyst and not a tumor and coined the term Adenomatoid odontogenic cyst (AOC). According to them AOC does not arise from the follicle of the tooth crown but instead arises from HERS, which could explain the lining of the tooth being completely within the lumen rather than the tooth root being inside the bone, which lead us to give the final diagnosis of cystic AOT.[9]

Philipsen et al have strongly argued in favor of the concept that AOT is derived from complex system of dental lamina or its remnants. The origin of AOT is controversial. However, most authors accept its odontogenic source. It occurs within the tooth-bearing areas of the jaws and is often found in close association of embedded teeth, having cytological features similar to those of components of enamel organ, dental lamina, reduced enamel epithelium or their remnants. Few support the idea that lesion is a developmental outgrowth or hamartoma while others consider it to be a neoplastic growth of odontogenic epithelium.[8,9,10]

Conclusion

Adenomatoid odontogenic tumor (AOT) is a benign non- invasive odontogenic tumor, having mostly a slow and sustained growth pattern. It affects young individuals, has a female predilection and generally occurs in the second decade of life. AOT has been considered as a hamartoma rather than a true neoplasm because of its limited size, minimal growth potential and lack of recurrence. Even though enucleation and curettage for AOT is the most common treatment modality, accurate histological diagnosis is mandatory to avoid unnecessary mutilating surgery. Still the search for accurate classification and ideal nomenclature for AOT continues.

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Conventional tooth supported overdenture with metal reinforced opposing complete denture: A case report

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Abstract

The overdenture is a removable prosthesis that is supported by both selectively retained teeth and the residual ridge or mucosa. It is a versatile and successful means of achieving long-term restoration of a partially edentulous jaw. Insertion and removal of the denture and routine oral hygiene are easy to perform. The many advantages of root retention include alveolar bone maintenance, better prosthesis support, proprioceptive feedback, aesthetics and psychological benefits. As for the treatment plan a conventional complete denture opposing a tooth supported overdenture results in midline fracture of the prosthesis due to increased forces. Therefore it is suggested to fabricate a metal reinforced denture opposing tooth supported overdenture. This paper presents a case report of rehabilitation of a partially edentulous patient with a tooth supported overdenture in mandibular arch with metal reinforced maxillary complete denture.

Keywords: Tooth supported overdenture, Metal reinforced framework, Metal copings, Esthetics, Proprioceptive feedback

Introduction

Mastication, esthetics and phonation are 3 very important factors that should be given due consideration while performing any dental procedure to achieve a successful outcome of treatment. An individual often deals with esthetic, functional, psychological and social impairment following tooth loss.[1,2] The use of conventional complete dentures/ removable prosthesis is often accompanied with dissatisfaction of the patient due to instability of the prosthesis.[3] This is commonly seen in the mandibular arch due to the movement of the denture on the soft tissue.[3] Thus, the preservation of roots is an effective way to provide adequate retention to the denture and cause effective patient satisfaction.[3] In 1978, Rissin et al[4] found that overdenture patients had a higher chewing efficiency than complete denture patients in their study that compared the masticatory performance in patients with natural dentition, complete denture and over denture.[4] Crum and Rooney (1978) found that retention of mandibular canine for over denture were the most effective teeth that helped in the preservation of the alveolar bone.[5] Overdentures involve the use of retained teeth, tooth roots, or dental implants over which a removable complete denture prosthesis is placed. This is not a new concept and practitioners have been successfully using existing tooth structures or retained roots to assist with complete denture treatment for more than a century.[6] Overdentures can be defined as a prosthesis that covers and is partially supported by natural teeth, tooth roots and dental implants.[6] Rationale of an overdenture is to preserve a portion of major sensory inputs i.e. input from the periodontal proprioceptors.[7] The periodontal receptors input are also protective against occlusal overloading.[7] Overdentures are indicated when the result of the treatment would be same or higher to another line of treatment which involve few remaining healthy teeth with adequate periodontal support.[7] Other indications would be poor prognosis for complete dentures, poorly defined sublingual fold space and poor residual ridge in edentulous areas.[7,8,9] It is contraindicated in periodontaly weak teeth, which cannot provide adequate support for the denture and patients with poor oral hygiene.[8,9] Contraindications of endodontic treatment for preserved teeth are vertical fracture, mechanical perforation of root, internal resorption and broken instrument in root canal.[8,9]

The aim of this clinical case report was to present oral rehabilitation of mandibular tooth-supported overdenture using a metal coping and mesh of metal to prevent fracture of denture and metal reinforced maxillary denture.

Case Report

A 62-year-old male patient reported to the Department of Prosthodontics at I.T.S. Centre for Dental Studies and Research, Muradnagar, with a chief complaint of missing teeth. No relevant medical history affecting the outcome of prosthodontic treatment was noted. His major desire was to improve his masticatory function by retaining natural teeth. On examination it was found that the patient had a completely edentulous maxillary arch (Fig. 1) and a partially dentulous mandibular arch (Fig. 2). The mandibular anterior teeth had sound periodontal and bone support. The patient had a low well-rounded ridge in the maxillary arch, and uneven mandibular ridge. Phonetic examination revealed sufficient inter- arch space.

Fig. 1: Maxillary complete edentulous arch

Fig. 2: Mandible partial edentulous arch (Kennedy's class I)

The patient was presented with different treatment options available that included complete dentures, removable partial dentures and dental implants. The patient was hesitant to undergo dental implants due to the need for additional surgery and extended treatment duration as well as an increase in cost of the procedure. Therefore an effective treatment plan was made that included a metal reinforced denture for the maxillary arch and a tooth supported overdenture for the mandibular arch using metal copings and metal meshwork to prevent fracture of the denture.

Clinical procedure: To obtain a favorable crown root ratio and avoid encroachment of the teeth into the interocclusal space the teeth were endodontically treated and reduced in size. A dome shaped preparation with a chamfer finish line was done for all the teeth (Fig. 3). Impressions were made using light body and cast was poured. The metal copings were fabricated on the obtained casts and finished and tried in the patient's mouth and were luted to the abutment teeth (Fig. 4).

Fig. 3: Dome shaped teeth preparations

Fig. 4: Metal copings in patient's mouth

A primary impression of the maxillary arch was made with impression compound and a special tray with spacer was fabricated on the primary cast. Using conventional techniques border molding was done and secondary impression was made with zinc oxide eugenol paste (Fig. 5). Cast was poured in die stone and complete denture metal framework was fabricated (Fig. 6).

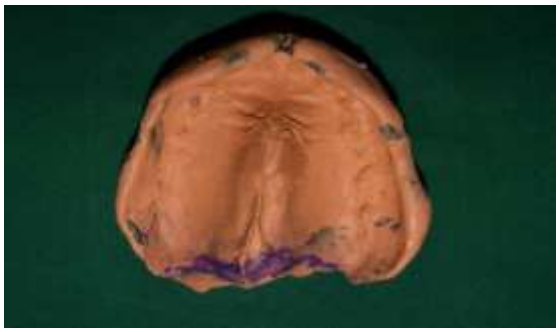

Fig. 5: Secondary impression of maxillary arch

Fig. 6: Maxillary complete denture metal framework

A primary impression of the mandibular arch was made with alginate and a special tray was fabricated on the primary cast after block out. Using conventional techniques border molding was done and secondary impression was made with light viscosity rubber base material (Aquasil TM Ultra Monophase, DECA Regular Set, Dentsply) (Fig. 7). Cast was poured in die stone and base plate was fabricated.

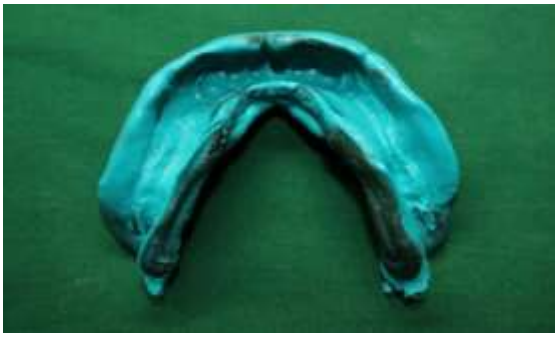

Fig. 7: Border molding and final impression of mandibular arch

Record rims were made and facebow transfer was recorded (Fig. 8) which was followed by recording of jaw relation. Teeth arrangement was done and a try-in (Fig. 9) was accomplished. After a satisfactory try-in, the waxed up denture was processed using heat cure acrylic. Mandibular denture has recess areas on the intaglio surface of the denture to accommodate the abutments.

Fig. 8: Facebow transfer

Fig. 9: Try in

The dentures were finished, polished and inserted into the patient's mouth (Fig. 10). Proper oral hygiene instructions along with practice for removal and insertion of the mandibular denture were given to the patient and the patient was recalled for periodic follow up appointments.

Fig. 10: Final Prosthesis

Discussion

Preventive prosthodontics deals with the use of procedures to delay or eliminate any kind of future problems that may be faced by the patient.[7,8,9] The concept of overdentures basically deals with retaining natural teeth so as to preserve the residual ridge and the overlying soft tissues.[7,8,9] Tallgren[10] observed that the anterior mandibular ridge resorbed four times faster than the maxillary ridge in case of conventional dentures. Two 5 year studies[5,11] concluded that retaining of the mandibular canines led to the preservation of the alveolar bone. Patients with overdenture were found to have a chewing efficiency that was one third higher than that of conventional denture wearers.[4,11] The psychological advantage of retaining the natural teeth in cases of patients with

overdenture has been well documented in literature.[11,12] Tooth supported overdenture can be an effective means in preventive prosthodontics since it conserves the few remaining natural teeth and in the process conserves the alveolar ridge.[13] Two schools of thought can be related to this treatment; the first one states that there is continued preservation of alveolar bone around the retained teeth; while the second states that there is retention of the periodontal sensory mechanism that plays a part in the guidance and monitoring of the gnathodynamic functions.[13] The most common failure seen with mandibular over denture is its fracture at the midline due to the absence of central and lateral incisors in order to overcome this metal mesh incorporated in the denture during the packing of the heat cure acrylic.[14] The improvement of the mechanical strength of acrylic denture bases using reinforcements has been the focus of research for many years and different reinforcement agents like cobalt-chromium wires, metallic wires have been found to have increased the strength of the Polymethyl methacrylate matrix considerably. The main advantage of mandibular overdenture is better retention and stability of the final prosthesis. The maxillary overdenture is of great value when it opposes remaining mandibular anterior teeth, because it aids in conserving the ridge against resorption from masticatory stresses.[14] Fenton and Hahn (1978)[15] showed the presence of caries on the abutment teeth and focused on the importance of application of sodium fluoride gel at regular intervals in order to reduce the cariogenic activity. Derkson and MacEntee (1982)[16] showed that 0.4% stannous fluoride gel had a beneficial effect on the gingival health of the abutments. Root canal therapy is an important phase in overdenture treatment and single rooted or double rooted teeth with accessible canals are generally preferred.[17] The short coping design showed least amount of stress than any of the other design like tapered coping design & tapered coping with occlusal bearing design.[17] This design minimizes horizontal torque on the roots and provides ease of maintenance of oral hygiene.[17] Proper patient selection and establishment of a mode of treatment satisfying both the patient and the dentist are significant factors that lead to success of an overdenture treatment.

Conclusion

Improvement in retention, stability and maintenance of proprioception make root supported overdenture a better alternative to conventional dentures. Prosthetic rehabilitation of partial anodontia helps in the improvement of function and esthetics along with providing a psychological boost in the morale of the patient especially if the patient is young. Good patient awareness about maintenance of proper oral hygiene is very important if the treatment has to remain satisfactory for a long period of time.

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Use of a semi-precision attachment to fabricate a removable partial denture – a case report

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Abstract

Use of attachments in providing better retention to removable prosthesis is not an outdated treatment modality. It is important for dentists to have more updated knowledge about its use and the success of such prosthesis is necessary to be able to benefit the patients. Proper diagnosis and treatment planning is necessary for selection of appropriate attachment type. This case report discusses use of an extracoronal attachment to enhance retention of a removable partial prosthesis.

Keywords: Attachment, Precision, Prosthesis, Removable, Sagix, Ceka, Crown

Introduction

The therapy for patients presenting with partially edentulous arches pose several challenges. The oral hygiene maintenance, periodontal status of the abutment teeth, supra-eruption of teeth opposite to the edentulous area of concern and esthetics play a major role in selection of treatment plan. In maxillary distal extension cases, as fixed prosthesis cannot be given owing to absent terminal abutment and difficult implant placement due to pneumatisation of maxillary sinus, rehabilitation becomes even more challenging. The use of attachments in dentistry may act as a saviour for such patients. Attachment-retained removable prosthesis is a treatment modality which can aid in aesthetic as well as functional rehabilitation of missing teeth in such situations. Studies in this regard have shown a survival rate for 5 years of upto 83.3% and for 20 years of 50%.[1,2] Besides, this treatment plan demands more patient visits and higher clinician expertise.

Attachments are retainers comprising of a metal housing and within it a tightly fitting female matrix analogous to the male patrix component contained within the natural or extended contours of the crown of the abutment.[3] They may be rigid/non-resilient or resilient attachments. Non-resilient attachments allow virtually no movement between the prosthesis and the abutment while the resilient attachments permit a wide range of movements. The selection of attachments can be done only on basis of knowledge of biomechanics in partially edentulous arches. The direction of forces along with leverage needs to be evaluated. Rigid attachments can be considered for Kennedy Class III and Class IV tooth-supported prosthesis while for tissue supported large Class IV and distal extension class I or II cases, resilient attachments are preferrable.[4]

Attachments can also be classified as precision attachments which are prefabricated and machined with utmost finesse and semi precision attachments which are generally made from either wax, nylon or plastic or may be hand waxed by the technician and then casted.[5] These may be intracoronal or extracoronal. Intracoronal attachments serve as retainers in fixed prosthesis while extracoronal attachments offer stability and retention for removable prosthesis. The functional and the physiological requisites of the prosthesis influence the attachment selection. The laboratory expertise and clinician experience in handling specific attachment systems should also be considered.[6]

This case report discusses the use of a semi-precision, extra coronal attachment to restore missing maxillary posteriors and fabrication of a palateless denture in Kennedy's class II situation.

Case Report

This case was addressed in the Department of Prosthodontics, M.M. College of Dental Sciences and research, Mullana where a 32 year old woman complained of inability to chew due to missing upper left posterior teeth and lower left and right posterior teeth.(Fig. 1, 2) On intraoral examination, the periodontal status of all teeth was found to be favourable. The patient was advised various options for rehabilitation of missing teeth, i.e., conventional removable partial denture, cast partial dentures, attachment retained dentures or implant supported prosthesis. However, due to economical limitations, the patient chose to opt for conventional treatment.

Fig. 1: Pre-operative photograph of maxillary arch

Fig. 2: Pre-operative photograph of mandibular arch

As the patient had already got RCT done for the upper left canine, placement of a preci-sagix attachment distal to the crown which would be given to the canine was planned so as to be able to give her a palateless denture. The tooth preparation for the upper left canine was done for a PFM crown (Fig. 3) and impressions were made. The preci-sagix castable male was attached to the distal side of the wax pattern, using an insertion tool attached to the dental surveyor. The wax pattern was casted, metal trial was done followed by fabrication of the final PFM crown. (Fig. 4) The crown was cemented in the patient's mouth.(Fig. 5)

Fig. 3: Tooth preparation w.r.t maxillary left canine

Fig. 4: PFM crown with casted attachment

Fig. 5: PFM crown with attachment cemented intraorally

Impressions of the upper and lower arches were made with alginate and poured in type 2 dental stone. This was followed by making dual impressions of both the arches. Final casts were thus obtained. Base plate was adapted on the final casts and occlusal rims were fabricated. The jaw relations were recorded and facebow transfer was done. The occlusal rims were articulated on a semi-adjustable articulator and teeth setting was done. After the wax trial, the duplicating dummy/processing female part was placed on the sagix attachment and the base plate was cut out from that area to adjust the dummy. Wax up was done around the dummy and the rims and the dentures were fabricated in heat cure acrylic material.

After retrieval, finishing and polishing of the denture, the dummy was removed and the preci-sagix female attachment was inserted in its place. The denture was placed in patient's mouth and premature occlusal contacts adjusted. The upper denture was palateless and had satisfactory retention. Denture maintenance instructions were given to the patient and recalled after two weeks for adjustments. (Fig. 6, 7, 8)

Fig. 6: Female part of the attachment inside the intaglio surface of the denture

Fig. 7: Denture insertion

Fig. 8: Post insertion photograph of the patient

Discussion

In the early 20th century, Dr. Herman Chayes[7] first documented the invention of attachments. Till date, their use has not been explored to a great extent. Attachments in combination with removable prosthesis render a better retention, better aesthetics, higher level of patient satisfaction and confidence.[8] Especially in distal extension cases, where fixed prosthesis cannot be given due to lack of terminal abutment, use of attachments can be highly beneficial and cost saving for the patient. In this case, it was only possible to give a palateless denture due to the additional retention provided by the attachment used. Thus, long term success of such prosthesis can be multifactorial and reasonably predictable if properly planned. The use of these attachments has three prerequisites–oral hygiene maintenance, periodontally sound abutment tooth/teeth and presence of sufficient interarch space. In the case discussed above, all the prerequisites were met and thus, the patient could benefit from the use of this attachment.[9,10]

The preci- sagix attachment is a sagittal ball attachment with segmented female component useful for removable prosthesis. Its advantages include patented snap mechanism, low cost, easy replacement of female component and long lasting retention.[11] It has a castable male component which is available in two sizes – 1.7mm and 2.0 mm. For anterior teeth, lesser diameter abutment is useful and for posterior abutments, a 2 mm male attachment may be used. A processing female is available which acts as a spacer for the final female part and can withstand high curing temperatures. The female component is available in 1.7 and 2mm sizes in three different colors – white, yellow and red (in increasing order of retention).

The use of attachments in removable prosthesis increases its retention, which directly influences the confidence and satisfaction of the patient. The chewing efficiency is better for a more stable prosthesis and these factors overall increase the patient satisfaction. Owall[12] stated that these type of dentures have a longer life span and don't incur significant amount of maintenance problems. Treatment failure only occurs due to loss of abutment tooth due to secondary caries or periodontal disease.

The patient had a severe gag reflex and would have been unable to wear the prosthesis continuously due to presence of trigger zones in area of soft palate. She was highly satisfied by the insertion of a palateless denture which was easy to maintain and rehabilitated her missing teeth at a reasonable cost.

Conclusion

Attachment retained removable prosthesis are a viable treatment modality for patients who cannot afford or are contraindicated for implant supported fixed prosthesis. However, lack of proper knowledge of the use of these attachments and inadequate training in this field leaves patients devoid of this treatment option.

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Association of kissing odontome and molar - A case report

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Abstract

Odontomas are the benign odontogenic tumors, usually asymptomatic and discovered incidentally during routine radiologic investigations, but sooner when infected. Complex odontomas are irregular calcified masses of dental tissues, with a disorderly arrangement, that bear no morphologic similarity to teeth. We report a case of infected unerupted complex odontoma in the posterior mandible of an adult patient with clinical and radiological features.

Keywords: Odontome, Odontogenic tumors, Complex, Compound

Introduction

The term "odontome" refers to any tumour of odontogenic origin. An odontoma is a mixed tumor composed of both epithelial and mesenchymal cells, which exhibit complete differentiation resulting in functional ameloblasts and odontoblasts, which in turn form enamel and dentin respectively. The enamel and dentin are subsequently laid down in an abnormal pattern due to the failure of organization of the odontogenic cells to reach a normal state of morphodifferentiation.(1) First described by Paul Broca in 1967, now odontomas are considered as hamartomas rather than true neoplasms, composed of mature enamel, dentin, cementum and pulp tissues.(2)

Worth classified odontomes according to ectodermal origin (Enameloma), mesodermal origin (dentinoma, cementoma), mixed origin (complex composite odontome, compound composite odontome, geminated odontome, dilated odontome, including dens in dente).(3)

The WHO Histologic Typing of Odontogenic Tumours, second edition, classifies odontomas into complex composite, compound composite, and ameloblastic odontoma. Complex odontomas, represent dental tissues that are well formed, but exhibit an amorphous and less orderly arrangement. Compound odontomas, represent dental tissues that are normal, arranged in an orderly pattern, but their size and conformation are altered, giving rise to multiple small teeth-like elements called "denticles". Adding to these types, Ameloblastic odontoma or odontoameloblastoma is another rare tumor, consisting of a mixture of enamel, dentin, cementum, and dentinoid and osteoid material and dental papilla, held within the stromal connective tissue. Thus, it is characterized by the concomitant occurence of amelobastoma and composite odontoma within a single entity.(1,4) Recently, a "hybrid" type of odontogenic neoplasm, histologically identical to other odontogenic tumors such as ameloblastoma, adenomatoid odontogenic tumor (AOT), ameloblastic fibroma (AF), and ameloblastic fibro-odontoma (AFO) has been proposed.(5)

According to their clinical presentation, odontomas have also been classified as central, peripheral and erupted odontoma. The central/intraosseous odontomas are common (51%), occurring in anterior maxilla (compound odontoma) followed by mandibular molar region (complex odontoma). Extraosseous peripheral complex odontomas occur uncommonly in the maxillary sinus, while the compound type is seen in the gingiva. The erupted odontoma is the one which is present coronal to an erupting or impacted tooth or its superficial location in the bone may have enabled its eruption into the oral cavity.(6) Odontomas constitute 22% of all odontogenic tumors, wherein the complex composite entity accounts for 5-30% of all odontomes. The most uncommon type of odontome is ameloblastic odontoma followed by the complex composite and compound composite respectively.(1,5)

Case Report

An-18-year old male patient reported to Department of Oral Medicine and Radiology, Haldia Institute of Dental Sciences & Research, Haldia, West Bengal with the chief complaint of a painful swelling in left lower jaw since 5 months. There had been multiple episodes of pain and swelling in relation to the same region in the preceding months that were subsequently relieved on medication. Patient's personal, medical and dental history were non-contributory. The patient was conscious, co-operative with normal gait and vital signs. Extraoral examination revealed mild facial asymmetry on the left without any palpable lymph node. On intraoral examination, an apparent absence of left mandibular second molar (37) was noted, along with a breach in the corresponding alveolar mucosa.

Fig. 1: Absence of left mandibular second molar (37) with tearing of overlying alveolar mucosa distal to left mandibular first molar

A swelling, with normal overlying mucosa, measuring approximately 1cm x 0.5cm in dimension, was present on the buccal aspect of left posterior mandibular region, with obliteration of the buccal vestibule and expansion of buccal cortical plates. It was hard and tender on palpation. (Fig. 1) No bleeding and pus discharge was elicited during palpation. Based on history and clinical features, a provisional diagnosis of infected dentigerous cyst was suggested in relation to left mandibular second molar, with a differential diagnosis of odontoma and unicystic (mural) ameloblastoma. The IOPAR revealed a well-defined, radiopaque mass with irregular borders, attached to the coronal aspect of a completely impacted (horizontal impaction) left mandibular second molar, the occlusal surface of which was attached with the mesial surface of the calcified mass. The radiopaque mass was uniform with the density greater than that of bone, and equivalent to that of teeth. Lower border of the mass was circumscribed by a thin, irregular radiolucent halo. Panoramic radiograph showed a uniformly dense, rounded radiopacity (approximately 3 cm × 2.5 cm in dimension), distal to horizontally impacted left mandibular second molar. Radiopaque area was amorphous, circumscribed by a thin, irregular radiolucent border. (Fig. 2a, b)

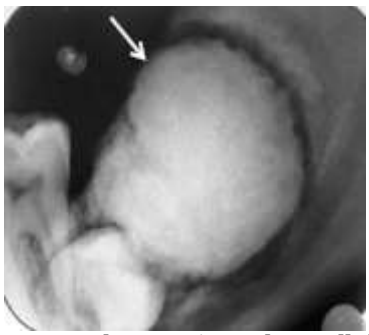

Fig. 2a: IOPAR shows an irregular, well-defined, radiopaque mass attached to the coronal aspect of impacted left mandibular second molar

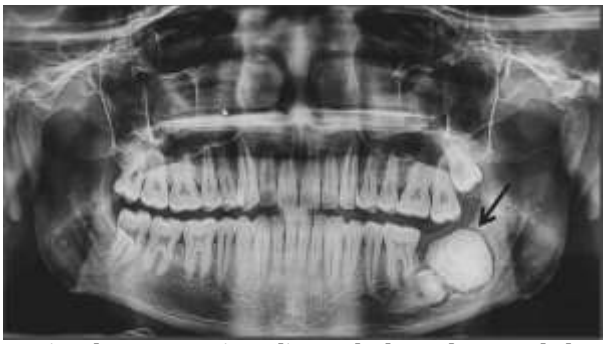

Fig. 2b: Panoramic radiograph showed a rounded radiopacity, in association with unerupted left mandibular second molar. The dense radiopaque area was amorphous, and circumscribed by a thin, irregular radiolucent boundary

The patient was treated by excision of the lesion, done conservatively, using an intraoral approach, in order to preserve the periosteum and mandibular basal cortical bone, which was quite thin. During surgery, the odontome along with impacted left mandibular second molar, which exhibited no apparent changes in shape and size, were removed. (Fig. 3) The surgical cavity was totally smoothened and the mucoperiosteal flap was closed with interrupted sutures. Histopathologic examination revealed irregularly arranged tubular dentin, cementum and pulp tissue embedded within loose fibrous connective tissue. (Fig. 4) Hence, based on the clinical, radiological, and histopathologic investigations, the final diagnosis of infected complex odontome was confirmed. One year follow-up showed that the bone healing was uneventful.

Fig. 3: Surgically removed odontome, "kissing" the coronal aspect of impacted left mandibular second molar

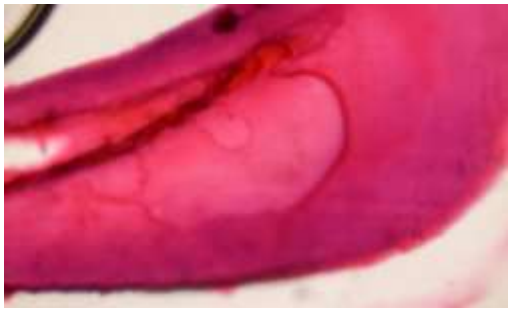

Fig. 4: Sheets of tubular dentine and pulp, bounded peripherally by cementum

Discussion

WHO has classified odontomas as benign mixed odontogenic tumors that frequently lead to impaction, delayed eruption of permanent teeth, malposition, or tooth malformation.[6] Clinical presentation might be asymptomatic or the odontoma might be associated with pain, expansion of cortical plates, tooth displacement, lip numbness, swelling, and devitalization of adjacent tooth.[1,2]

The etiology of odontome is idiopathic, however, it has been attributed to local trauma, inflammation and/or infection, hereditary anomalies (Gardner's syndrome, Hermann's syndrome), odontoblastic hyperactivity, or genetic mutation.[7]

Occurrence of complex odontomas peak in the second and third decade of life, with a male predilection ratio of 1.5:1. Further, most of them are located in the mandibular molar region followed by anterior maxilla. Complex odontomas occur less commonly than the compound variety in the ratio of 1:2.[6] Peripheral complex odontomas have been reported in the maxillary sinus, subcondylar regions, and floor of the mouth.[8,9]

These hamartomas are incidental findings on radiographs, appearing as amorphous radio-opaque masses, surrounded by a fine radiolucent rim (suggestive of connective tissue capsule histologically), which in turn is circumscribed by a thin sclerotic line. The radiological appearance of complex odontomas depends on their development stage and corresponding degree of mineralization. The first stage is characterized by radiolucency sans any calcification, the intermediate stage by partial calcification; while in the third stage, the lesion usually appears completely radiopaque with disorganized masses of mineralized dental tissue surrounded by a radiolucent halo.[10]

Histologically the complex odontoma is characterized by sheets of haphazardly arranged tubular dentin, pulp, and cementum, with enamel confined to small rims in cavities in the dentin mass, embedded in a loose, myxoid connective tissue stroma. Cementum-like tissues are often admixed with dentinoid structures, with presence of ghost cells, especially in complex odontoma. A thin fibrous connective tissue capsule is usually seen surrounding the lesion. The present case revealed similar histological findings.[11]

Conservative surgical excision of the lesion is the treatment of choice. Since the lesion is encapsulated, recurrences are rare. In children and adolescents, odontomas should be removed when the permanent teeth adjacent to the lesion exhibit about one half of their root development because this ensures safety of the normal permanent teeth and prevents interference with their eruption. Kaban states that odontomas are easily enucleated and adjacent teeth are seldom harmed by the excision, since they are usually separated from the lesion by a septum of bone.[12]

As a differential diagnosis, complex odontomas has to be differentiated from cemento-ossifying fibromas by the tendency of odontomas to associate with unerupted molar teeth and their property of being more radiopaque than fibromas. Periapical cemento-osseous dysplasia/ focal cementoosseous dysplasia (PCOD/FCOD) are mature fibro-osseous osseous lesions, which must be differentiated from mature complex odontomas. Usually the PCOD or FCOD form, in persons in their fourth and fifth decades of life, whereas a complex odontoma develops in patients in second or third decade of life. PCOD has a predilection for mandibular anterior region, and is situated deep in the alveolar bone, whereas a complex odontoma often extends high into the alveolus towards the crest of the ridge. Ameloblastic fibro-odontoma, believed to be an early, undifferentiated complex odontoma, is another differential, with more connective tissue as seen in ameloblastic fibroma. Odontoameloblastoma is an extremely rare condition and involves the simultaneous occurrence of an ameloblastoma and a complex odontome.[1,13]

Conclusion

An infected unerupted complex odontoma in the mandibular molar region has been reported. Symptomatic cases associated with pain, inflammation should be treated promptly. Simultaneously, the patients' families should provide adequate psychological and nutritional support to cope with the process. Early diagnosis and proper management of odontomas also prevents future craniofacial complications and other developmental anomalies.

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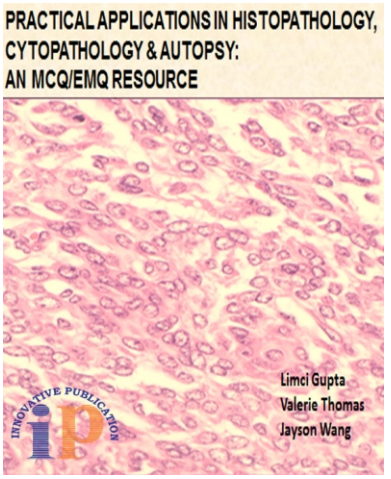

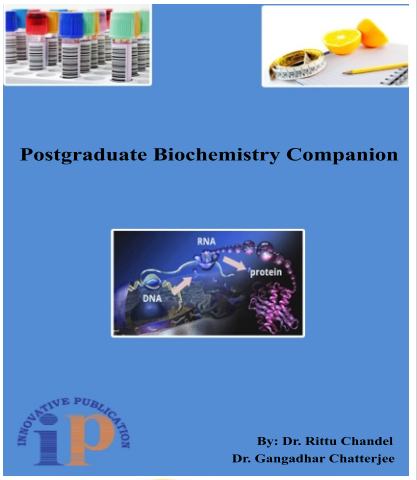

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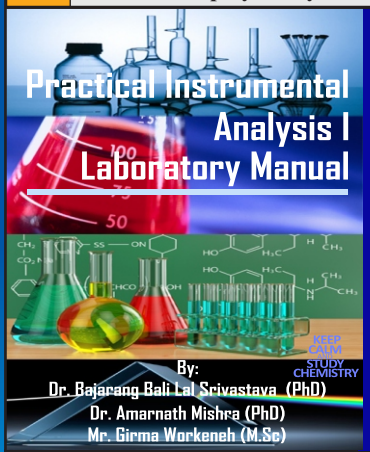

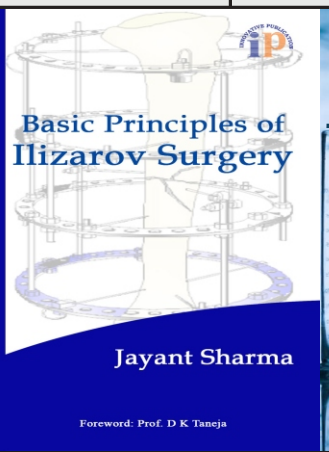

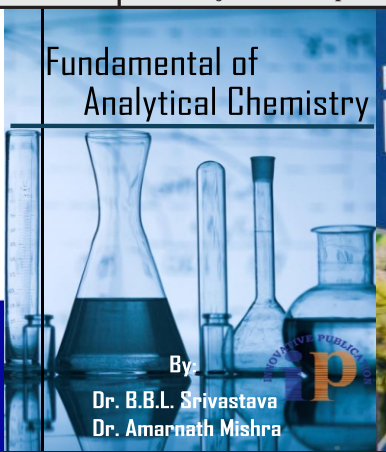

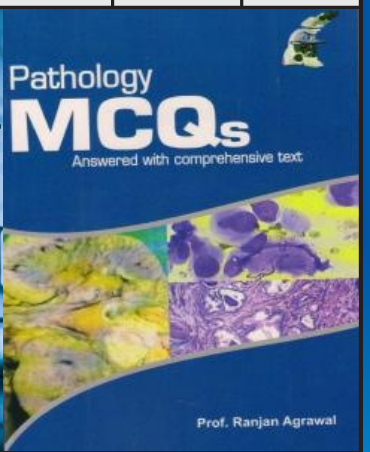

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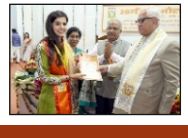

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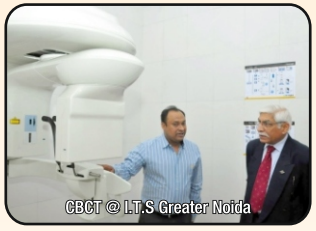

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