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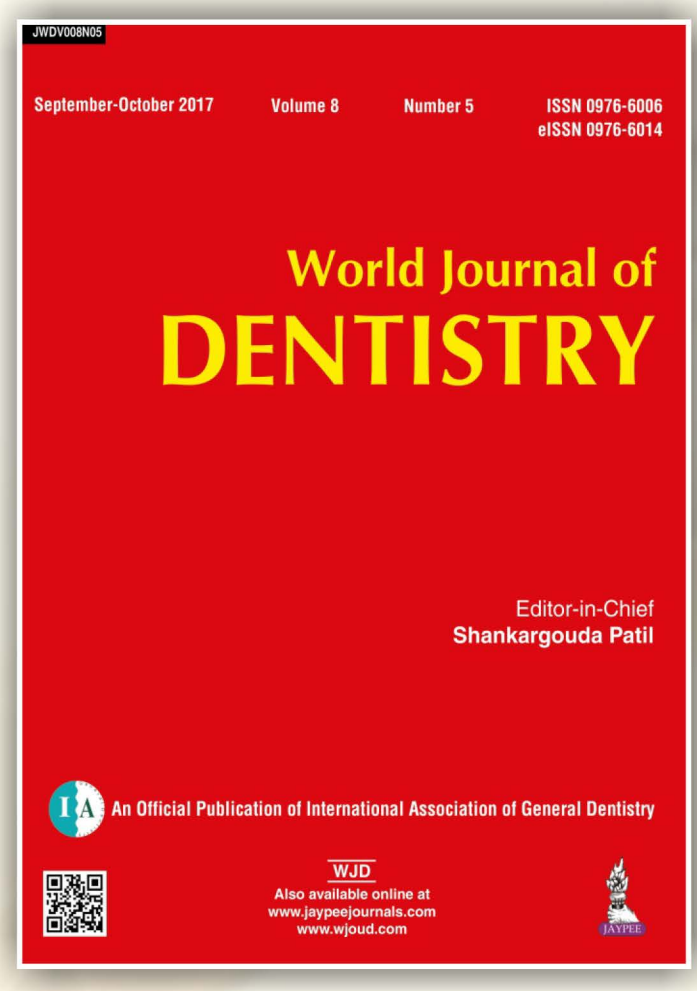

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The Scientific Journal of the Mahatma Gandhi Mission's Dental College and Hospital was launched in June 2011.

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Editorial

An author's dilemma: Indexing or Impact Factor of a journal?

Research has become an integral part of today's growth in any subject, more so in the medical field. Any research needs to be published only then it can be recognized and its content can be utilized for the benefit and betterment of the community health and well being. Its value is enhanced impact factor published in the journal that is viewed by other researchers which has a high impact factor. In the podium of research, accumulation in size of the biomedical literature creates a bigger diversity in context of format and content. Hence to organize and archive these scientific documents, the indexing plays a pivotal role. Indexing of a journal which is most often thought to be reflection of its scientific quality, is a debatable topic. Gradually, the importance of scientific publications is increasingly being recognized by the academic institutions as Dental council of India (DCI) recommended few guidelines regarding the indexing publications for the teaching faculty. As a result, due to practice of publish or perish culture, there is an exponential increase in number of authors and their scientific publication. However, the choice of an indexed journal based on its reliability remains crucial amongst authors because of availability of a number of indexing databases, lack of clarity and ambiguous guidelines.

Since 1879, a comprehensive indexing database, 'Index Medicus' has gained recognition among all medical scientific journals. Till date a number of other renowned indexing databases have developed which include: MedLine, PubMed, EMBASE, SCOPUS, EBSCO Publishing's Electronic Databases, and SCIRUS. In comparison with the aforementioned databases having a high scientific recognition, many more indexation services are mushrooming. These include Caspur, Open J Gate, Directory of Open Access Journals (DOAJ), Genamics Journal Seek, Hinari, Index Copernicus, Primo Central, Ulrich's International Periodical Directory, Pro Quest and Google Scholar.

Apart from Indexing, Impact factor also governs the author's choice of journal selection. It depicts the importance or weightage of a journal in its own scientific field. Calculation of impact factor depends on various ill defined factors which include citation distribution of journals, online availability of publications, negative citations, preference of journal publishers for articles of a certain type, publication lag, citing behavior across subjects. Though various indexing services generate their own impact factors of the indexed journals, the journals indexed in Thomson Reuters Journal Citation Reports are granted the impact factor of higher scientific value.

There are some dilemmas in authors' mind while choosing the right journals to publish their manuscripts like neither all indexed journals have impact factor nor the journals which are indexed in eminent databases like MedLine/PubMed are indexed in the Thomson Reuters Journal Citation Reports. Likewise, the journals indexed in Thomson Reuters Journal Citation Reports may have an impact factor but are not listed in Index Medicus/PubMed/MedLine. Hence it is a very difficult task to select a good quality journal as there is no transparency in this context which adversely affects the individual or institutional research output. Now this is high time that the scientific administrative bodies or medical/dental councils should address this issue so that authors could be effectively guided in choosing a journal for submission of their novel and valuable research work.

Sabita M Ram
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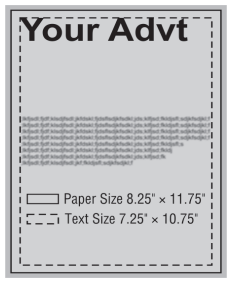

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ORIGINAL RESEARCH

Governmental and Private Dentists' Knowledge, Educational Background, Opinion, and Clinical Experience toward Obstructive Sleep Apnea and Oral Appliances

[1]Saeed M Banabilh, [2]Rasha Al-afaleg

ABSTRACT

Aim: The aims of this study were to determine the knowledge, educational background, opinion, and clinical experience of general practice dentists toward obstructive sleep apnea (OSA) and oral appliances (OAs).

Materials and methods: A cross-sectional study was carried out through a questionnaire which was distributed randomly to 200 general practice dentists both in public and private dental clinics at Qassim, Kingdom of Saudi Arabia. About 175 completed questionnaires were returned. The data were statistically analyzed using Statistical Package for the Social Sciences (SPSS).

Results: The results showed that only 48.6% of our governmental and private dentists were familiar with the term OSA with a statistical significance among governmental dentists (37.9%) who were more familiar with OSA signs and symptoms than private (21.1%) dentists ($p < 0.016$). In addition, the majority of the respondents (90.9%) reported a general lack of education in both OSA and OAs during their study in the dental school. A total of 142 (81.1%) dentists never prescribed OAs for OSA patients. However, 87.4% have never consulted or referred a suspected OSA patient to physicians.

Conclusion: General practice dentists surveyed possess poor knowledge and low clinical experience regarding OSA and OAs, which reflects the weak level of education in this field of dental sleep medicine.

Keywords: Awareness, Clinical experience, Education, Knowledge, Obstructive sleep apnea, Opinion, Oral appliance.

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INTRODUCTION

Obstructive sleep apnea is a big public health problem characterized by recurrent events of upper airway obstruction during sleep associated with clinical signs and symptoms.[1,2] Obstruction may involve awakening under the effect of increased respiratory effort and a reduction (hypopnea) or complete cessation (apnea) of airflow in the presence of respiratory movements.[3] Recent epidemiological research showed a high prevalence of undiagnosed OSA in terms of morbidity and significant associations between OSA and serious medical and social problems, such as hypertension, cardiovascular disease, stroke, and automobile crashes, with overall negative effects on the quality of life.[4]

A National Center on Sleep Disorders study estimated that between 50 and 70 million Americans are affected by a sleep disorder.[5] In the Middle East, 3 out of 10 Saudi men and 4 out of 10 Saudi women are at a high risk of developing OSA.[6,7] In the United Arab Emeritus (UAE), the prevalence of symptoms of OSA among adult UAE citizens was found to be very high, and highest prevalence observed was between ages 51 and 60 years in both genders.[8] It is clear that OSA is a medical problem and primary care physicians play important role in the detection and proper referral of patients with OSA. Dentists can also play a big role in recognizing OSA, involving in OSA diagnosis, making appropriate recommendations and referrals for OSA patients, and treating OSA with OAs.[9,10] Moreover, dentists could be the first healthcare providers to notice the signs and symptoms of the disease, such as a long soft palate, macroglossia, or a small mandible.[11] Nevertheless, awareness regarding sleep disorders is insufficient among dentists. Thus, a significant number of patients with sleep disorders remain undiagnosed as a result of limited dental sleep medicine education among healthcare providers.[2,10] Most previous studies focused primarily on physicians' knowledge and attitudes toward sleep disorders.[12] Some investigations evaluated the nature and extent of sleep medicine provided in medical schools,[13-15] but there were fewer studies that focused on the role of the dentists and their knowledge in relation to sleep disorders and their treatment modalities

especially in Kingdom of Saudi Arabia. Therefore, the aims of this study were to determine knowledge, educational background, opinion, and clinical experience of general practice dentists toward OSA and OAs.

MATERIALS AND METHODS

A cross-sectional study through a questionnaire-based survey was conducted among a sample of general practicing dentists both in public and private dental clinics at Qassim Province, Kingdom of Saudi Arabia. Ethical approval and informed consent for carrying out the present study was obtained from the ethical committee at Dental Research Centre (DRC), College of Dentistry, Qassim University. A list of dentists and specialist in Qassim was then obtained from the list of Saudi Commission for Health Specialties database. A random number generator was then used to select 200 dentists from this database. Those dentists who were unable or unwilling to fill the complete questionnaire were excluded. The purpose of the study was explained to each participant, and consent form were obtained prior to the distribution of the study questionnaire. The questionnaires were distributed and collected back again after being completed. The paper-based questionnaire used in the study was an anonymous self-administered pretested structured questionnaire that was developed and validated by Bian.[9] The questionnaire consisted of 21 questions: The first 5 questions comprised items on demographic data: Age, gender, education level, whether they worked in public or private clinics, and years of experience. Some of the questions were designed to assist knowledge and clinical experience of the participants about OSA and OAs, such as "OSA is a potential life-threatening illness"; "For some OSA patients, an oral appliance is an effective treatment"; "Dentists and physicians should cooperate in dealing with OSA"; "Obstructive sleep apnea is a medical problem, but dentists can detect, diagnose, and treat it." Respondents were asked to use a 4-point Likert-type scale (strongly agree to strongly disagree) to answer the opinion on items. Other items asked participants to recall their previous clinical experiences regarding OSA and OAs using the following questions: "How many times have you consulted with physicians for a suspected OSA patient in your practice?", "How many times have you been referred OSA patients by physicians?," and "How many times have you prescribed OAs for OSA patients?" The last three questions evaluated participants' previous knowledge of OSA and OAs, such as "Did you learn about OSA in your dental school?," "Did you attend any postgraduate course about OSA?," and "Would you like to attend OSA course?" Each question offered two response choices: yes or no. Collected data were analyzed using the SPSS, version 19. The questions were given variable names from Q1 to Q21 of the questionnaire. Then the choices in each question got a numeric value relevant to the corresponding answer of each participant.

Descriptive statistics were performed using frequency count and percentages. The χ^2 test was performed to determine the difference between the studied groups at the 5% level of significance.

RESULTS

Out of 200 questionnaires distributed, 175 were returned; the response rate was 87.5%. Table 1 shows the socio-demographic and background characteristics of the study sample.

Knowledge

Only 48.6% of our governmental and private dentists were familiar with the term OSA. A statistical significance was found among governmental dentists (37.9%) who were more familiar with OSA signs and symptoms than private (21.1%) dentists ($p < 0.016$). Both governmental and private dentists agree that OSA is a potential life-threatening illness (92.6%); dentists and physicians should deal with OSA (94.3%), and OSA is a medical problem that can be detected, diagnosed, and treated by dentists with no statistically significant difference regarding their agreement (Table 2).

Educational Background

Majority of our dentists (90.9%) did not learn about OSA and OA when they were in dental schools. Similarly, the majority of governmental dentists (81.8%) and private dentists (79.8%) did not attend any course on management of OSA. However, most of them (95.4%) were interested in attending OSA management courses (Table 3).

Table 1: Distribution of studied cases according to demographic data

Variables	*n = 175 (%)*
Gender	
Male	104 (59.4)
Female	71 (40.6)
Place of work	
Governmental	66 (37.7)
Private	109 (62.3)
College of graduation	
Governmental	136 (77.7)
Private	39 (22.3)
Specialty	
General practitioner	142 (81.1)
Specialist	33 (18.9)

Table 2: Dentists' knowledge toward sleep apnea

		Place of work			
		Governmental	*Private*	*Total*	
		No (%)	*No (%)*	*No (%)*	χ^2 *(p)*
Familiar with the term OSA	Yes	37 (56.1)	48 (44.0)	85 (48.6)	0.123
	No	29 (43.9)	61 (56.0)	90 (51.4)	
Know the common signs and symptoms of OSA	Yes	25 (37.9)	23 (21.1)	48 (27.4)	0.016*
	No	41 (62.1)	86 (78.9)	127 (72.6)	
Agree that OSA is a potential life-threatening illness	Agree	58 (87.9)	104 (95.4)	162 (92.6)	0.065
	Disagree	8 (12.1)	5 (4.6)	13 (7.4)	
Agree that dentists and physicians should deal with OSA	Agree	62 (93.9)	103 (94.5)	165 (94.3)	0.878
	Disagree	4 (6.1)	6 (5.5)	10 (5.7)	
Agree that OSA is a medical problem, but dentists can detect, diagnose, and treat it	Agree	52(78.8)	85 (78.0)	137 (78.3)	0.9
	Disagree	14 (21.2)	24 (22.0)	38 (21.7)	

*Significant at $p < 0.05$

Table 3: Dentists' educational background toward sleep apnea

		Place of work			
		Governmental	*Private*	*Total*	
		No (%)	*No (%)*	*No (%)*	χ^2 *(p)*
Did you learn about OSA and OA when you were in dental school?	Yes	5 (7.6)	11 (10.1)	16 (9.1)	0.576
	No	61 (92.4)	98 (89.9)	159 (90.9)	
Did you attend any courses on the management of sleep apnea or socially disruptive snoring?	Yes	12 (18.2)	22 (20.20)	34 (19.4)	0.746
	No	54 (81.8)	87 (79.8)	141 (80.6)	
Are you interested in attending a course on the dentist's role in the management of sleep disorders?	Yes	62 (93.9)	105 (96.3)	167 (95.4)	0.463
	No	4 (6.1)	4 (3.7)	8 (4.6)	

Table 4: Dentists' opinion toward sleep apnea

		Place of work			
		Governmental	*Private*	*Total*	
		No (%)	*No (%)*	*No (%)*	χ^2 *(p)*
Do you think that for some OSA patients OAs are an effective treatment?	Agree	35 (53.0)	77 (70.6)	112 (64.0)	0.019*
	Disagree	31 (47.0)	32 (29.4)	63 (36.0)	
Would you discuss any side-effects of OAs with your patient?	Yes	26 (39.4)	65 (59.6)	91 (52.0)	0.009*
	No	40 (60.6)	44 (40.4)	84 (48.0)	

*Significant at $p < 0.05$

Opinion

Opinions about OSA showed statistically significant differences between both groups. About 70.6% of private dentists think that for some OSA patients, OAs are an effective treatment, while 53% of governmental dentists believe in that ($p < 0.019$). Most private dentists (59.6%) discuss the side effects of OA with their patients.

On the contrary, the majority of governmental dentists did not discuss that with their patients ($p < 0.009$; Table 4).

Clinical Experience

Clinical experience variable showed that 76.6% of dentists had infrequently seen patients with chronic snoring or possible OSA. Majority of dentists either governmental or private do nothing for their patients with chronic snoring or OSA. Most dentists did not consult physicians for their cases. Prescriptions of OAs were only done by 22.7% of governmental dentists and 19.3% of the private dentist, and a small number of governmental and private dentists (9.1 and 11.9% respectively) treated their patients with these OAs (Table 5).

DISCUSSION

Several studies have assessed medical students' knowledge in the field of sleep medicine.[14,15] The literature is lacking significant research to assess sleep medicine knowledge and education among dental students or general practice dentists. General practice dentists are more likely to be among the first to contact who detect, refer, or treat potential OSA patients.[16] Therefore, this current study was carried out to investigate the knowledge, educational background, opinion, and clinical experiences of general practice dentists in both government and private clinic

Table 5: Dentists' clinical experience toward sleep apnea

		Place of work			
		Governmental	Private	Total	
		No (%)	No (%)	No (%)	χ^2 (p)
See patients with chronic snoring or possible OSA	Frequently	10 (15.2)	16 (14.7)	26 (14.9)	0.182
	Infrequently	51 (77.3)	83 (76.1)	134 (76.6)	
	Occasionally	4 (6.1)	2 (1.8)	6 (3.4)	
	Never	1 (1.5)	8 (7.3)	9 (5.1)	
Treatment of patients with possible OSA or chronic snoring	Nothing	30 (45.5)	44 (40.4)	74 (42.3)	0.813
	Lifestyle advice	12 (18.2)	21 (19.3)	33 (18.9)	
	OA	12 (18.2)	26 (23.9)	38 (21.7)	
	Referred to sleep clinic	12 (18.2)	18 (16.5)	30 (17.1)	
Consult with physicians for a suspected OSA patient in your practice	Yes	12 (18.2)	14 (12.8)	26 (14.9)	0.336
	No	54 (81.8)	95 (87.2)	149 (85.1)	
Patients being referred as OSA by physicians	Yes	12 (18.2)	14 (12.8)	26 (14.9)	0.336
	No	54 (81.8)	95 (87.2)	149 (85.1)	
Prescribed OAs for OSA patients	Yes	15 (22.7)	21 (19.3)	36 (20.6)	0.583
	No	51 (77.3)	88 (80.7)	139 (79.4)	
Provide patients with OAs	Yes	6 (9.1)	13 (11.9)	19 (10.9)	0.559
	No	60 (90.9)	96 (88.1)	156 (89.1)	

toward OSA and OAs. The result showed that 48.6% of our governmental and private practicing dentists were familiar with the term OSA, and 59.0% of our governmental (37.9%) and private (21.1%) dentists were familiar with OSA signs and symptoms. This result also showed that governmental practicing dentists were more familiar with OSA signs and symptoms than private practicing dentists ($p < 0.016$). This could be attributable to the nature of government dentists' place of work where they are surrounded by many medical specialties. Previous studies also reported similar data for different countries. For example, 75% of US dentists could recognize the definition of OSA but 58% of them did not know possible common signs and symptoms of OSA.[9] The lack of knowledge regarding sleep medicine among our general practice dentists in both government and private sector is the result of the limited time assigned for teaching sleep medicine in dental schools, as only 16 (9.1%) out of 175 dentists learned about OSA and OAs in dental school; 159 (90.9%) knew little or nothing about this issue.

Results of this study are consistent with other findings, which showed that dental school education and postgraduate training seem to fall off behind clinical developments in sleep medicine and sleep dentistry. For example, a survey of medical schools in the United States reported that fewer than 2 hours of the medical education curriculum was devoted to sleep and sleep disorders.[17-19] A more recent survey on sleep education in the Medical School curriculum in 12 countries in the Asia-Pacific region and North America reported that the overall time allocated to sleep education was less than 2.5 hours.[15] The mean number of hours devoted to sleep medicine in the majority of US dental hygiene program curricula was 1.5 hours.[20] Similarly, this phenomenon is seen more clearly in the Middle East dental schools, as only nine Middle East dental schools (23%) reported the inclusion of sleep medicine in their undergraduate curriculum compared with 75.5% of the US dental schools, with a total average hours dedicated to teaching sleep medicine in the corresponding dental schools was 1.2 hours.[15] This level of education at many dental schools is inadequate to prepare dentists for their potential role in patient education, screening, and management of sleep-related breathing disorders as the early detection and management of patients with sleep disorders depends considerably on the knowledge and awareness of practicing dentist. In addition, 85.1% of our sample reported that they do not refer OSA patients to physicians, which indicates either poor communication in our medical and dental professional communities or the lack of knowledge among physicians about OAs as a more suitable or alternative treatment than medical therapy for some patients. The lack of knowledge among general practicing dentists in our sample helps explain the inability to detect OSA patients in their clinics. In consequence, 20.6% prescribed OA for OSA patients and 10.9% provide patients with OAs. A considerable number of studies have proved the effectiveness of OAs.[21-23] Unfortunately, because sleep medicine education in our sample dental schools is highly limited, it is likely that sleep disorders will be underrecognized and that patients with these disorders may be inaccurately diagnosed and may receive inappropriate treatment. It has been demonstrated that doctors who receive training in sleep disorders are more likely to recognize and treat sleep disorders.[14] In practice, dentists should consider more attention to two important

matters. First, before dentists assume responsibility for an OSA patient, they should prepare themselves with information about sleep medicine and OAs.[21] Second, team approach best manages OSA. Cooperation between dentists and physicians provide professional communication and mutual respect, which is critical for managing the health and well-being of patients.[24,25]

As a result of this research, we highly recommend two measures: First, an introduction and increase of the number of hours of teaching dedicated to sleep medicine in different courses in the curriculum related to sleep disorders; and second, an urgent need for increasing the awareness and training regarding OSA and OAs in dental school.

CONCLUSION

General practice dentists surveyed possess poor knowledge and low clinical experience regarding OSA and OAs, which reflects the weak level of education in this field of dental sleep medicine.

CLINICAL SIGNIFICANCE

These results suggest the urgent need for increasing the education background, awareness, and training regarding OSA and OAs in dental school, as well as improvement in the cooperation between dentists and physicians for better patient care.

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ORIGINAL RESEARCH

A Sixteen-year Retrospective Study of Biopsied Pediatric Oral Lesions from North Kerala

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ABSTRACT

Aim: This study aimed at providing updated information on biopsied oral and maxillofacial lesions from children below 12 years, received between 2001 and 2016, from a tertiary health care center in North Kerala, India.

Materials and methods: The archives of the Department of Oral Pathology and Microbiology, Government Dental College, Kozhikode, India, were retrospectively analyzed over a period of 16 years (2001–2016). Patients aged 12 years and below were considered as the pediatric population. Age, gender, site, and histopathologic diagnosis were recorded. Subjects were divided into three age groups: 0 to 6, 7 to 9, and 10 to 12 years. The oral and maxillofacial lesions were classified into eight different categories. Data were analyzed using descriptive statistics.

Results: Of the total 8,306 biopsied cases, 334 cases were from the pediatric population. Cases showed almost equal predilection between males (48%) and females (52%); M:F = 1:1.08. Both mandible (26.94%) and maxilla (26.05%) showed almost equal site predilection followed by lower lip (19.76%), gingiva (14.67%), and tongue (5.39%). The most common condition diagnosed individually was periapical cyst (21.86%), followed by mucocele (17.37%) and dentigerous cyst (13.17%). Regarding the diagnostic categories, most lesions were in the cystic group (37.43%) followed by the inflammatory/reactive group (31.44%) and benign odontogenic tumors (10.48%).

Conclusion: This study showed similar trends as well as contradictory results when compared with other studies. This can be due to geographical and ethnic variations, difference in criteria, and difference in age groups selected.

Keywords: Children, Mucocele, Odontome, Pediatric lesions, Periapical cyst.

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INTRODUCTION

Children are a distinct part of the general population. Continuous emotional, physiological, socioeconomic, and psychological changes in them lead to the development of various types of alterations and lesions in the orofacial region.[1,2] Certain diseases have a predilection for the pediatric population compared with their adult counterparts. Reviews of oral pathological lesions in children are rare. Some of the previous studies on pediatric oral lesions from different parts of the world are shown in Table 1.[3]

There is difference in the distribution of these lesions in different parts of the world as racial and environmental factors and the lifestyles of populations influence the prevalence of these lesions.[5-7,18] Literature reveals very few studies involving pediatric pathologies from India. To the best of our knowledge, no studies have been done in the pediatric population of northern Kerala. Since geographic distribution is a source of variation,[7,18], the occurrence of this type of lesions in different geographic areas may be a relevant topic to investigate. Thus, the aim of this study was to evaluate retrospectively the prevalence and characteristics of biopsied pediatric oral lesions in this geographical area.

Table 1: Studies of biopsied oral and maxillofacial lesions in pediatric populations from different countries

Authors	*Country*	*Cases*	*Age in years*	*Period*
Skinner et al[4]	USA	1,525	0–19	14
Keszler et al[5]	Argentina	1,289	0–15	25
Das and Das[6]	USA	2,370	0–20	11
Chen et al[7]	Taiwan	534	0–15	12
Lawoyin[8]	Nigeria	561	0–16	10
Sousa et al[9]	Brazil	2,356	0–14	15
Gultelkin et al[10]	Turkey	472	0–15	8
Jones and Franklin[11]	UK	4,406	0–16	30
Dhanuthai et al[12]	Thailand	1,251	0–16	15
Lima et al[13]	Brazil	625	0–14	20
Wang et al[14]	Taiwan	797	0–14	29
Shah et al[15]	USA	5,457	0–16	16
Zuniga et al[16]	Chile	542	0–16	15
Lei et al[3]	Taiwan	1,023	0–15	15
Krishnan et al[17]	South India	97	0–15	10
Heera et al[18]	South Kerala, India	540	0–12	20
Resmi et al (present study)	North Kerala, India	334	0–12	16

MATERIALS AND METHODS

After obtaining the Institutional Ethics Committee clearance, archives of biopsy reports of pediatric patients were retrieved from the Department of Oral Pathology and Microbiology, Government Dental College, Kozhikode, India, during the time period from January 2001 to December 2016. Children aged 12 years and below were considered as the pediatric population. Subjects were categorized into three age groups; 0 to 6, 7 to 9, 10 to 12 years respectively. Age, gender, anatomic location, and histopathologic diagnosis of pediatric cases were recorded. Lesions were classified into eight categories:

1. Cystic lesions
2. Inflammatory/reactive lesions
3. Odontogenic tumors
4. Soft tissue neoplasms
5. Bone pathologies
6. Developmental conditions
7. Autoimmune diseases
8. Miscellaneous lesions/others

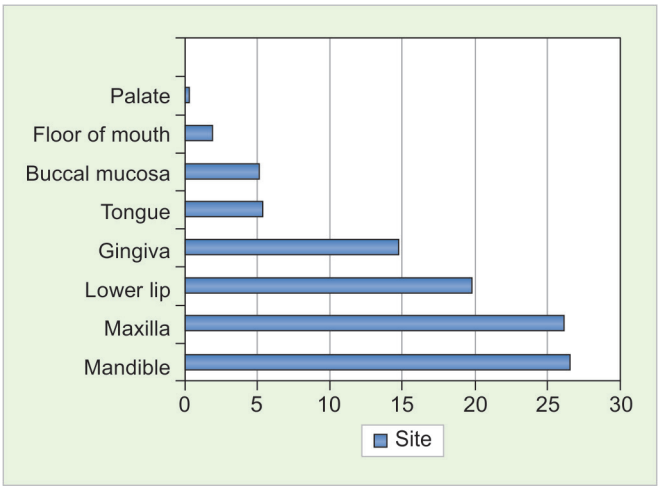
Statistical Analysis

Data were recorded and analyzed by descriptive statistics using computer software Statistical Package for the Social Sciences.

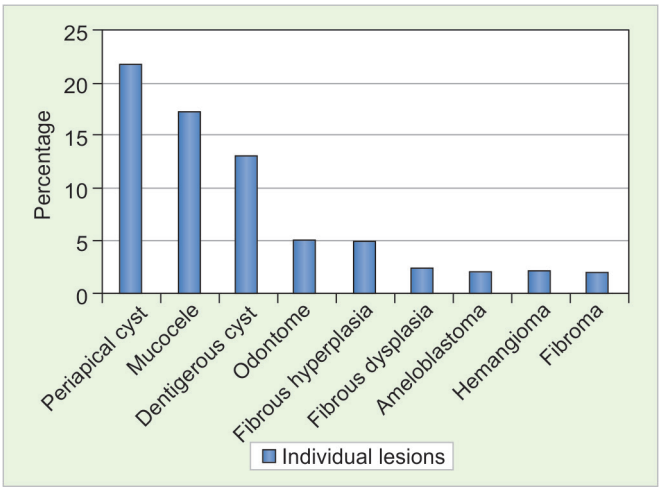
RESULTS

During the 16-year period from January 2001 to December 2016, 8,306 biopsy specimens were received, of which 334 cases were from the pediatric population between 0 and 12 years of age. This patient pool represented 4.02% of all the biopsies received for that period. The prevalence of lesions was the highest in the age group 10 to 12 years (42.81%) followed by 7 to 9 (38.62%) and 0 to 6 years (18.56%; Graph 1).

Graph 1: Percentage distribution of lesions according to age



Graph 2: Percentage distribution of cases according to site



Graph 3: Percentage distribution of the most frequent oral lesions

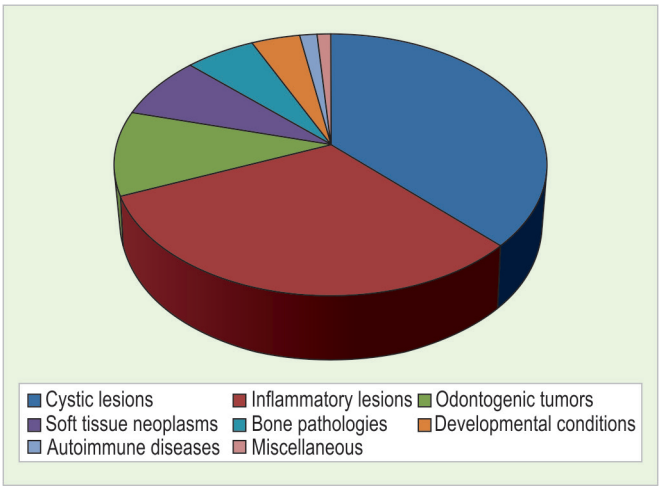
The lowest age observed was 11 months, diagnosed histopathologically as traumatic ulcerative granuloma with stromal eosinophilia.

Almost similar prevalence was observed between boys (48%) and girls (52%) (male:female ratio 1:1.08).

Maxilla and mandible showed almost equal site predilection (26.05 and 26.94% respectively). Other sites were lower lip (19.76%), gingiva (14.67%), tongue (5.39%), buccal mucosa (5.09%), floor of mouth (1.80%), and palate (0.3%; Graph 2).

Periapical cyst was the most common condition (21.86%) followed by mucocele (17.37%) and dentigerous cyst (13.17%; (Graph 3).

Regarding the diagnostic categories, major groups were cystic (37.43%), inflammatory/reactive group (31.44%), odontogenic tumors (10.48%), soft tissue neoplasms (7.78%), and bone pathologies (5.99%). The minor categories were developmental conditions (4.19%), autoimmune diseases (1.5%), and miscellaneous group (1.2%; Graph 4).



Graph 4: Percentage distribution of diagnostic categories

Periapical cyst was the most common condition in the cystic group (58.4%) followed by dentigerous cyst (35.2%) and odontogenic keratocyst (4%). Mucocele (55.24%) was the most common condition in the inflammatory/reactive category. Odontome was the most common odontogenic tumor, which accounted for 48.57% of all odontogenic tumors. Ameloblastoma was the second commonest lesion in this category (20%). Hemangioma and fibroma showed equal prevalence in the soft tissue tumors (26.9%). Among the bone pathologies, fibrous dysplasia was the commonest one (40%; Table 2). Malignant tumors and salivary gland tumors were not reported in the sample.

Table 2: Type and prevalence of oral lesions

Categories of lesion	*Number of lesion*	*Percentage of pediatric population*
Cystic lesions (n = 125)		37.43
Periapical cyst	73	
Dentigerous cyst	44	
Odontogenic keratocyst	5	
Calcifying odontogenic cyst	2	
Glandular odontogenic cyst	1	
Inflammatory/reactive lesions (n = 105)		31.44
Mucocele	58	
Fibrous hyperplasia	17	
Pyogenic granuloma	12	
Nonspecific ulcer	5	
Peripheral giant cell granuloma	4	
Remaining lesions	9	
Odontogenic tumors (n = 35)		10.48
Odontome	17	
Ameloblastoma	7	
Peripheral odontogenic fibroma	5	
Adenomatoid odontogenic tumor	4	
Ameloblastic fibroma	2	
Soft tissue neoplasms (n = 26)		7.78
Hemangioma	7	
Fibroma	6	
Papilloma	1	
Neurofibroma	1	
Neurilemmoma	1	
Granular cell tumor	1	
Others	9	
Bone pathology (n = 20)		5.99
Fibrous dysplasia	8	
Juvenile ossifying fibroma	4	
Central giant cell granuloma	3	
Others	5	
Developmental conditions (n = 14)		4.19
Hyperplastic follicle	4	
Dentin dysplasia	3	
Dentinogenesis imperfecta	2	
Others	5	
Autoimmune diseases (n = 5)		1.5
Pemphigus	4	
Lichen planus	1	
Miscellaneous/others (n = 4)		1.2
Moderate epithelial dysplasia	2	
Traumatic keratosis	1	
Melanin hyperpigmentation	1	

DISCUSSION

In the current study, we analyzed the prevalence of the biopsied oral and maxillofacial lesions occurring in a pediatric cohort in our institution. Our institution is a major tertiary referral center in northern Kerala, catering to patients from five northern districts of Kerala. Hence, the data presented in this study can, in the most part, represent the prevalence of the pediatric oral and maxillofacial lesions in northern Kerala.

Previous studies on oral and maxillofacial lesions in pediatric patients worldwide showed that the number of pediatric biopsies accounted for less than 10% of all cases referred to histopathology services.[7,18,19] Similar prevalence was observed in our study also, which accounted for 4.02% of the total biopsies. This graph was in accordance with the study from south Kerala, which accounted for 3.47% of the total biopsies.[18] However, some other authors have found the percentage of oral and maxillofacial biopsies ranging between 11 and 27.2% of the total number of pediatric cases.[19] This disparity between different studies may be due to differences in the inclusion criteria. Some studies recruited children up to 15 years of age, whereas others included older children in their study group. In addition, factors, such as time interval during which study was conducted, geographical region, genetic background of the population, and type of institution where the study was conducted contributed to the difference.[19] It is difficult to determine in which age interval pediatric oral and maxillofacial lesions occur most frequently because of the different age stratifications used in different studies.[19] In

our study, the pediatric populations were categorized into three age groups: 0 to 6, 7 to 9, and 10 to 12 years for the ease of comparison. The majority of the pediatric lesions occurred in the older age group of 10 to 12 years followed by the age interval of 7 to 9 years. This observation is similar to the studies of Heera et al,[18] Krishnan et al,[17] Das and Das,[6] and Chen et al.[7] In some other studies, most of the oral and maxillofacial lesions were seen in mixed dentition period.[9,10,19]

Most of the earlier studies have shown almost an equal distribution between both genders as reported by Gultelkin et al,[10] Das and Das,[6] and Jones and Franklin.[11] However, in the study by Krishnan et al[17] and Heera et al,[18] it was found that pathologies were more common in females. Our study also showed almost equal distribution between both genders and, therefore, it can be inferred that there was no greater propensity for oral and maxillofacial lesions in either sex.

Studies by Maia et al[20] and Lima et al[13] reported maxilla as the most common site, but studies from South India showed predilection for mandible.[17,18] Our study showed almost equal predilection between maxilla and mandible. This is because of the fact that most of the lesions were odontogenic cysts and tumors. The most common soft tissue sites were lower lip followed by gingiva and tongue.

Samples evaluated in the study comprised a wide spectrum of lesions ranging from inflammatory processes to neoplasms.

Cystic Lesions

Odontogenic cysts, both developmental and inflammatory, represented the major category. Periapical cysts constituted 58.4% of all odontogenic cysts followed by dentigerous cyst (35.2%) and odontogenic keratocyst (4%). This finding was in accordance with the distribution of cysts in the general population in southern India, which showed a predominance of inflammatory cysts.[21] However, our findings were not in accordance with Dhanuthai et al,[12] Heera et al,[18] and Krishnan et al,[17] which showed highest prevalence of dentigerous cyst when compared with radicular cyst. We are of the opinion that increased prevalence of inflammatory cysts in pediatric population of north Kerala may be due to the unawareness of the general population about preventive measures and novel treatment modalities of dental caries. The lack of proper interventions at the appropriate times may be a contributing factor. This necessitates the need for conducting awareness classes at the community and school levels. Dentigerous cyst was the second cystic lesion followed by odontogenic keratocyst. The increased number of developmental cysts suggests the probable role of genetic factors in its formation.[18] A similar trend was observed in studies by Jones and Franklin[11] and Skiavounou et al[22] in which radicular cysts were the most common lesion.

Inflammatory/Reactive Lesions

The next major category was the inflammatory and reactive lesions. It is worth noting that the largest group in this category was mucocele (55.24%). This was similar to previous studies.[4,6,18] In our study, the lower lip was the most common site with female predilection. Lower lip, being a trauma-prone site, supports the role of trauma as an etiologic factor either in the form of sharp tooth cusp/biting habit in children. The greater number and density of salivary glands in the lower lip combined with downward force of gravity also play a role in the predilection of mucocele development in the lower lip.[18] The second most reactive lesion in our study was fibrous hyperplasia followed by pyogenic granuloma. However, pyogenic granuloma was the second most reactive lesion in studies from South India.[18] The toothbrushing techniques, which have not been mastered in children, may be considered as a significant cause of microtrauma and inflammation in the gingiva. Trauma to deciduous teeth, aberrant tooth development, and occlusal interferences may also be other precipitating factors.[18] Some other studies showed that peripheral giant cell granuloma and inflammatory fibrous hyperplasia were the commonest lesions.[10,19]

Odontogenic Tumors

In this study, there were 35 odontogenic tumors that constituted only 10.48% of all pediatric cases. This observation confirms the view of other researchers that odontogenic tumors are rare in children.[11] Odontome was the most common tumor, which accounted for 48.57% of all odontogenic tumors. This is in accordance with studies by Saxena et al,[23] Dhanuthai et al,[12] and Arotiba.[24] Ameloblastoma was the most common odontogenic tumor in a study from south India.[17] Etiology of odontome is unclear as infections or local trauma may be a cause.[18] In our study, ameloblastoma and peripheral odontogenic fibroma ranked in second and third positions followed by adenomatoid odontogenic tumor. Two cases of ameloblastic fibromas were also reported in the study group.

Soft Tissue Neoplasms

Among the soft tissue neoplasms, hemangioma and fibroma showed almost equal predominance followed by other benign neoplasms. This was in accordance with previous literature.[17,19] It is important to emphasize the fact that all hemangiomas may not always be biopsied. Therefore, occurrence of hemangioma might be

even higher than the number of actual cases.[18] On the contrary, malignant soft tissue neoplasms and salivary gland tumors were not reported in this pediatric cohort. Previous studies also reported very few malignancies in their study samples.[11,18]

Bone Pathologies

Among the bone pathologies, fibrous dysplasia was the commonest one. Juvenile ossifying fibroma, central giant cell granuloma, osteoma, and exostoses were the other lesions reported. Craniofacial fibrous dysplasia is commonly seen in the second and third decades of life. The present study included children up to 12 years and this may be the reason for the lesser number of fibrous dysplasia cases reported.[18] This is in accordance with the findings by Saxena et al.[23]

Minor Categories

Three remaining minor categories were classified as developmental conditions, autoimmune diseases, and miscellaneous/other lesions.

Developmental Conditions

Developmental conditions comprised 4.19% of all pediatric cases of which hyperplastic follicle was the commonest one followed by dentin dysplasia (n = 3) and dentinogenesis imperfecta (n = 2).

Autoimmune Diseases

Lichen planus (n = 1) and pemphigus (n = 4) were also reported in the sample, which comprised 1.5% of all cases.

Miscellaneous Other Lesions

Miscellaneous lesions constituted 1.2% of all pediatric cases. One case each of traumatic keratosis and melanin hyperpigmentation and two cases of moderate epithelial dysplasia were reported.

An important aspect observed when analyzing the results of the present study is that there are variations in the prevalence of individual lesions in any given population group. Several salient points regarding regional differences are highlighted by the data in this study. Moreover, it is worth mentioning that the data retrieved in the present study do not reproduce the actual prevalence of oral and maxillofacial lesions in this geographic area since some common pathologies occurring in children, such as herpes and aphthous ulcerations are diagnosed mostly based on their typical clinical features, while the present study was based exclusively on biopsied lesions. The results show a similar trend as well as contradictory findings in comparison with the reported previous literature. The important difference observed in the study was that the cystic group formed the major diagnostic category predominated by inflammatory cysts followed by the inflammatory/reactive group. The majority of the tumors were benign odontogenic tumors with high rate of odontomas. Hemangiomas and fibromas were the most frequent benign nonodontogenic tumors reported. Salivary gland tumors and malignant tumors were not reported.

CONCLUSION

In conclusion, little data of this nature have been reported from India and none from north Kerala. This is a large-scale study of pediatric oral and maxillofacial lesions conducted in northern Kerala, India. This type of study also contributes to the characterization of lesions in the pediatric population providing a solid background for diagnosis and treatment of these entities.

CLINICAL SIGNIFICANCE

This study will throw some light regarding the prevalence and characteristics of the lesions observed in the pediatric population in this specific geographic area, which, in turn, will be useful in treating these lesions appropriately. This information may be valuable in teaching and epidemiology.

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ORIGINAL RESEARCH

Comparative Evaluation of the Radiopacity of Bone Graft Materials used in Dentistry

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ABSTRACT

Introduction: Ample radiopacity in order to distinguish from the surrounding tissues is a desirable property of dental graft materials. A total of 15 bone graft materials' (BGMs) opacities were analyzed in this study.

Materials and methods: Graft materials were placed in the implant cavity (5 × 10 mm) in cadaver's mandible respectively. Cavity was exposed by using periapical film and a dental X-ray machine at 70 kVp and 8 mA. The optical density of the radiographic images was measured with a transmission densitometer. One-way analysis of variance (ANOVA) was conducted for statistical analysis.

Results: Among the materials tested, the most radiolucent bone grafts were Grafton and Allogenix with a statistical significance of $p \geq 0.05$. 4Bone and Bego Oss exhibited the highest radiopacity with a statistical significance of $p \geq 0.05$. Inadequate radiopacity of the dental graft materials may lead to confusion among clinicians in the radiographical follow-up. Among 15 BGMs tested, only three had higher density than bone tissue.

Conclusion: The radiopacity of the BGM was found to be higher than bone at only three of them.

Keywords: Bone graft, Cadaver, Densitometry, Radiopacity.

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INTRODUCTION

Bone graft materials are frequently used in orthopedics, periodontics, and in oral and maxillofacial surgery with effective clinical outcomes.[1] The BGMs that are presently used in dental clinics are autogenous bones, allogeneic bones, xenogeneic bones, and alloplastic materials.[2] Although autogenous bone grafts are thought to be the gold standard for bone grafting, it has some disadvantages, such as the formation of a second surgical region, causing morbidity in the donor region, and only being able to take a limited amount.[3] The need for an allogeneic source of bone arose from the need for increased donor material and the problems associated with autogenous bone procurement mentioned above.[4] Allogenic bone is usually processed as a freeze-dried graft or as a demineralized bone matrix (DBM). The former is usually placed with autogenous grafts due to the lack of osteogenic and osteoinductive capabilities.[1] Xenografts are more available in greater supply than allografts and have larger sizes. Most of the xenografts that are currently used have porcine and bovine origins, because of their similarity to the human bone regarding chemical composition (mainly carbonated hydroxyapatite and Type I collagen) and structure. Also, the interest in natural coral exoskeletons has been increasing.[1] Synthetic grafts are the other alternatives to the BGMs. The advantages of these materials include reduced morbidity of harvesting autogenous and/or allograft bone, increased availability, and decreased anesthetic/operative time and associated costs. Commercial materials differ in the tailoring of their size, form, osteoconductivity, osteoinductivity, and resorption kinetics.[5] Despite the increase in the number of procedures that require bone grafts, there has not been an ideal bone graft substitute.[6]

Due to the radiopacity of graft materials, it is possible to radiologically detect the form and voids within the material. Enough radiopacity in order to be distinguished from the surrounding anatomic structures is a desirable property for dental graft materials as well as all biomaterials. A number of studies focusing on the radiopacity of dental materials including direct restorative materials, cavity liners, denture base materials, elastomeric impression materials, endodontic sealers, posts and retrograde materials, adhesive systems, etc., have been reported.[7]

As a general rule, densitometers are used for reading optical densities on radiographic films, in accordance with the recommendations of the American Dental Association.[8] In the transmission densitometer, the obtained optical density is a logarithmic measure of the ratio of

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Table 1: Bone graft materials evaluated in this study and their detailed characteristics

Materials	*Manufacturer*	*Composition*	*Grain size*
Osteobiol Mp3	Tecnoss, Italy	Cortico-cancellous porcine bone mix	0.6–1 mm
Osteobiol Gel 40	Tecnoss, Italy	Cortico-cancellous porcine bone mix	≤0.3 mm
Osteobiol Putty	Tecnoss, Italy	Cortico-cancellous porcine bone mix	≤0.3 mm
Maxxeus	Community Tissue Services, Ohio, USA	Allograft, Cortico-cancellous	0.5–1 mm
Allogenix (Putty)	Biomet, Microfixation, Irvine, USA	Allograft contains porous ceramic granules	0.5 mm
K-Phate	Merries International Inc., Taiwan	Constituted by an ideal mixture of biphasic calcium phosphate ceramic, 60% hydroxyapatite and 40% β-tricalcium phosphate	0.5–1 mm
Suprabone	BMT Calsis A.S, Ankara, Turkey	β-tricalcium phosphate	1–2 mm
Puros	Tutogen Medical GmbH , Germany	Allograft, Cortico-cancellous	0.25–1 mm
Raptos	Community Tissue Services, Dayton, USA	Allograft, Cortico-cancellous	0.5–1 mm
Poresorb	Lasak Ltd, Praha, Czech Republic	Ceramic based on [β-$Ca_3(PO_4)_2$]	0.3–0.6 mm
Kasios Tcp	Kasios, ZI La Croix, Launaguet, France	β-tricalcium phosphate	0.5–1 mm
Mineross	Osteotech, Eatontown, USA	Allograft, Cortico-cancellous	0.6–1.25 mm
Bego Oss	aap Biomaterials GmbH, Dieburg, Germany	1 cm^3 ceramic consists of 0.6–1.1 gm hydroxyapatite (pentacalcium hydroxide trisphosphate) on average depending on the porosity of the ceramic	0.5–1 mm
Grafton Dbm (Putty)	Osteotech, France	Demineralized human bone matrix	Not available
4Bone	MIS Implant Technologies Ltd., Israel	Calcium phosphate ceramic consisting of 60% hydroxyapatite and 40% beta-tricalcium phosphate	0.5–1 mm

transmitted to incident light through the film image.[9] Radiopacity is usually expressed in terms of aluminum thickness and many researchers use aluminum stepwedges to compare the radiopacity of restorative materials under typical radiographic conditions.[7,10]

The aim of the present study is to detect the radiopacity of commercially available BGMs in cadavers' mandibles to mimic the *in vivo* conditions and compare them with each other and bone tissue.

MATERIALS AND METHODS

This study evaluated the radiopacity of 15 BGMs that are commercially available. Their specifications are given in Table 1. Of the BGMs tested, six materials were allografts, three materials were xenografts, and the remaining six were synthetic grafts. Eight BGMs' grain size was higher than 0.6 mm and 4 BGMs' grain size was lower than 0.6 mm.

A 5 × 10 mm-sized cavity was prepared with implant drill in the cadaver mandible (Fig. 1). The BGMs were prepared according to manufacturer's instructions and placed into the cavity respectively. After each implementation, parallel technique was utilized using a dental X-ray machine (Evolution X 3000-2C, New Life Radiology Srl, Italy) at 70 kVp and 8 mA for 0.2 s with a 20 cm film–target distance. Size 2, Kodak D-speed dental films (Eastman Kodak) with a 7-step stepwedge (from 1 to 7 mm) were exposed (Fig. 2). Films were processed using an automatic processor (Extra-x Velopex, Medivance

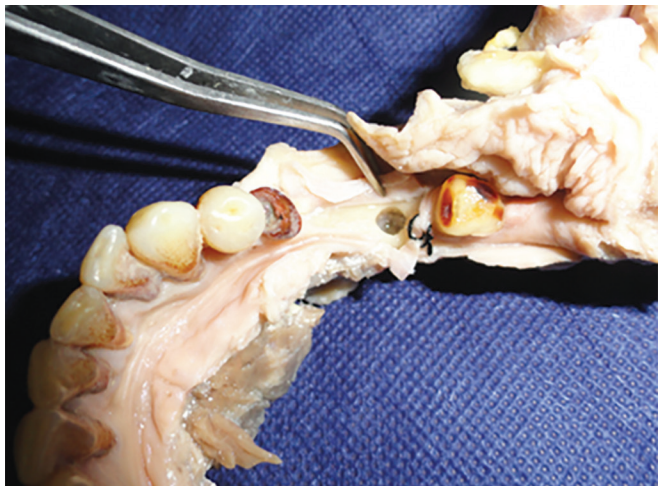


Fig. 1: 5 × 10 mm-sized cavity in cadaver's right mandible

Instruments Limited, London, England) with fresh solution (Hacettepe, Ankara, Turkey) mixed according to the manufacturer's instructions. For each material, three films were exposed and three readings were taken from each area and the mean was calculated. After exposure, the cavity was washed with distilled water and dried until all particles were removed. The radiographic densities of each step of the stepwedge, BGMs, bone, and enamel were measured using a densitometer (Densonorm 21 i, Phamed, Sulzbach, Germany) with a 1 mm aperture (Fig. 3). A graph of the optical density values for the entire stepwedge was plotted with the following equation: ($y = -0.664 \ln(x) + 1.909$, $R^2 = 0.987$) (Graph 1) and used

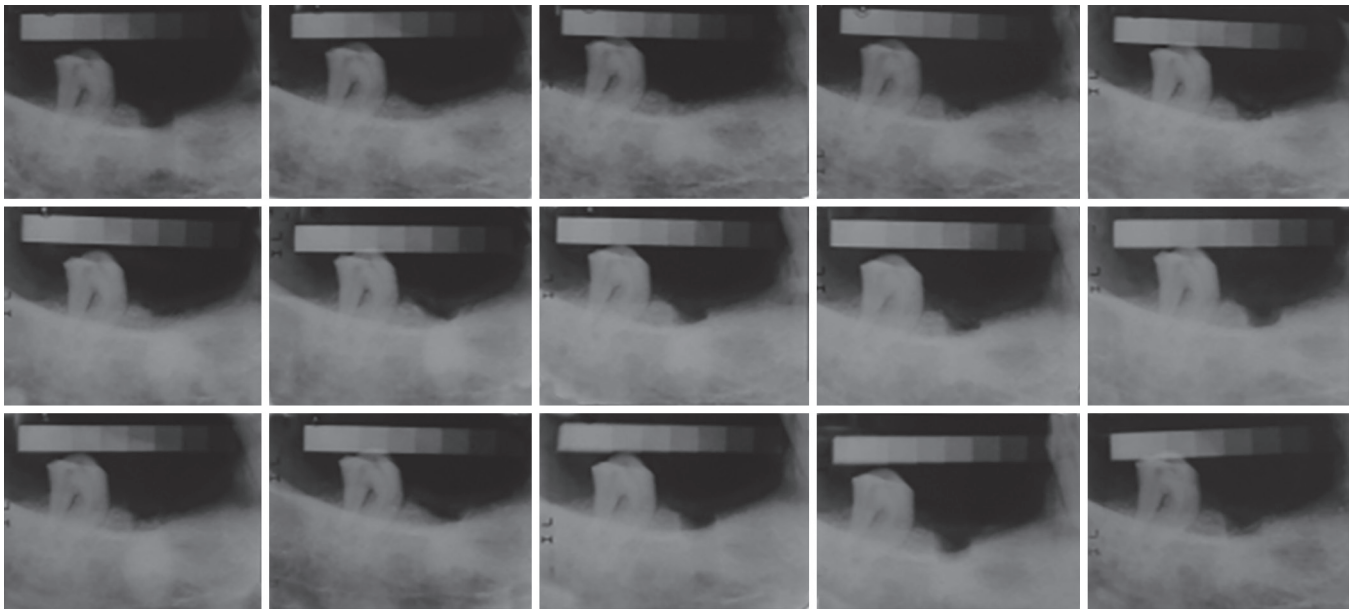
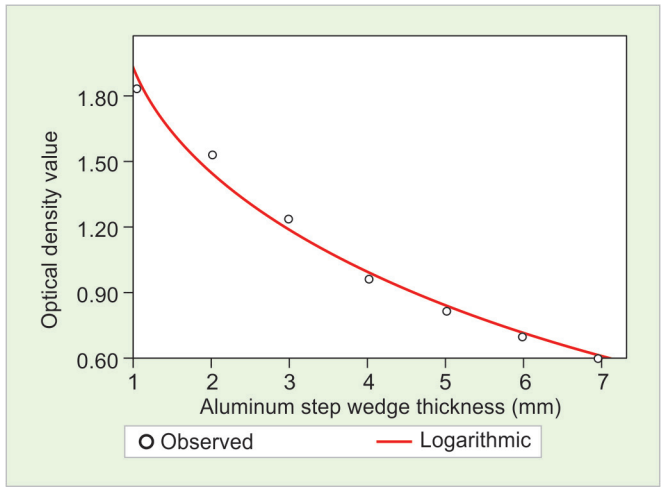


Fig. 2: Periapical radiographies of the cadaver's created cavity filled with BGMs, which were tested (upper line (from left to right): Grafton—Osteobiol Gel 40—Osteobiol Putty—Osteobiol MP3—Maxxeus middle line (from left to right): Kasios—Poresorb—4Bone—Raptos—Puros; lower line (from left to right): Bego Oss—K-Phate—Allogenix—Suprabone—Mineross)

Fig. 3: Transmission densitometer used in the present study



Graph 1: Optical density calibration curve

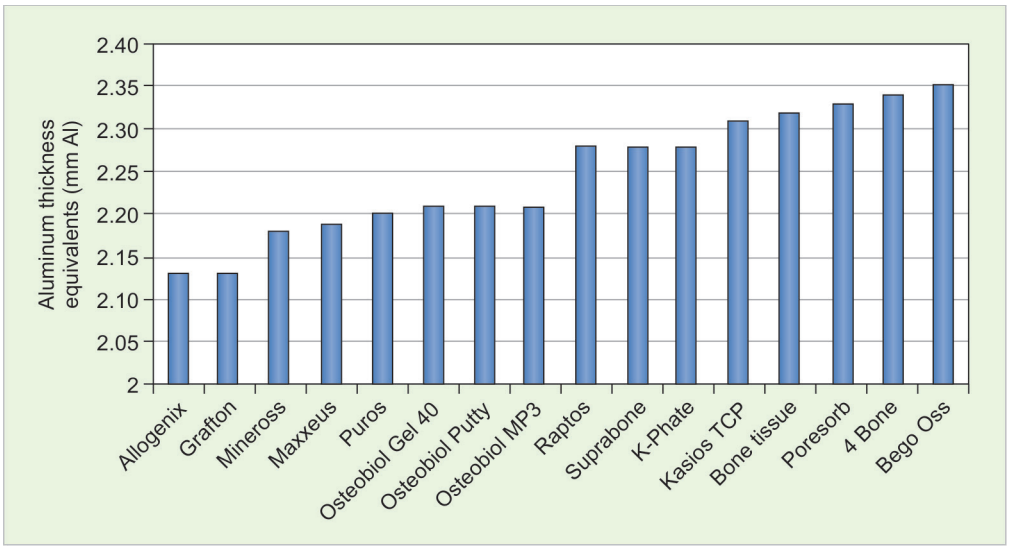
to determine the aluminum thickness equivalent values of the materials. The mean radiopacity values for each of the materials tested were compared using ANOVA and *post hoc* Tukey honest significant difference tests ($p < 0.05$).

RESULTS

The transmission densitometry optical density values of BGMs varied from 0.51 (the most radiopaque) to 0.71 (the most radiolucent). The aluminum equivalent thicknesses of the BGMs ranged from 2.13 to 2.35 mm Al (Graph 2). Bego Oss (aap Biomaterials GmbH, Germany) exhibited the highest radiopacity of the materials tested, and Allogenix putty (Biomet, USA) exhibited the lowest (Table 2). The mandibular bone density was detected as 2.32 mmAl. No significant differences were found among Kasios (Kasios, France), Poresorb (Lasak, Check Republic), 4Bone (Mis, Israel), Bego Oss, and mandibular bone tissue ($p \geq 0.05$) (Table 3). The other BGMs exhibited less radiopacity than bone tissue with a marked significance ($p \leq 0.05$).

DISCUSSION

In addition to BGMs' biological, physical, and mechanical properties, the radiopacity should be considered in selecting the most suitable material for specific clinical situations. There have been numerous histologic, histomorphometric, physicochemical experimental *in vivo* and *in vitro* studies in order to assess BGMs characteristics.



Graph 2: Aluminum equivalent values of tested BGMs and bone tissue

Also, radiographic evaluation of the BGMs has been carried out in various studies.

Verhoeven et al[11] carried out the densitometric measurements on standardized oblique lateral cephalometric radiographs of the onlay grafts implemented to severe mandibular atrophy patients for a 1-year period. While there is a decrease in the density of the upper cortex of graft material, no significant change was observed in the upper spongeous part of the graft in the first 6-month period. An increase was detected in the radiographic density of the lower part of the spongeous bone in the second 6-month period.

Üngör[3] evaluated the radiographic density of the two forms of DBM (putty and powder) on panoramic radiographs after maxillary sinus floor augmentation procedure and no significant differences were detected between the materials.

The increase of radiopacity was investigated by Ajeesh et al[12] as a result of addition of nanoiron oxide to hydroxyapatite that has been widely used for a variety of bone filling and augmentation applications in dental and orthopedic field.

Bone mineral density measurements were also evaluated in numerous studies by dual-energy X-ray absorptiometry (DXA).[13,14] The DXA is known as the most accurate clinical method for identifying those with low bone mineral density.[15,16]

Some researchers compared the different donor bone types density with computed tomography (CT). Beckers et al[17] showed that the iliac crest was the most consistently implantable donor site. In the study of Myoung et al,[18] they evaluated the 120 bones from 20 Korean adults with CT. The cranial bone showed the highest cancellous bone density with statistical significance.

Table 2: Test results of BGMs used in the study

Tested materials	*Mean optical density*	*Aluminum equivalent value (mm Al)*	*Standard deviation*
Allogenix	0.71	2.13	±0.006
Grafton	0.71	2.13	±0.005
Mineross	0.66	2.18	±0.004
Maxxeus	0.65	2.19	±0.008
Puros	0.64	2.20	±0.006
Osteobiol Gel 40	0.63	2.21	±0.004
Osteobiol Putty	0.63	2.21	±0.004
Osteobiol MP3	0.63	2.21	±0.004
Raptos	0.57	2.28	±0.01
Suprabone	0.57	2.28	±0.007
K-Phate	0.57	2.28	±0.004
Kasios TCP	0.54	2.31	±0.006
Poresorb	0.53	2.33	±0.006
4Bone	0.52	2.34	±0.006
Bego Oss	0.51	2.35	±0.006

Dental materials are constantly reformulated and the desired goals are to make them radiopaque enough to enable a radiographical evaluation. Up to now, no published literature was found regarding the short-term radiopacity of BGMs after surgical procedure.

Pekkan et al[19] investigated the radiopacity of six BGMs by comparing them with bovine mandibular cortical bone. Among the tested materials, Apatite–Wollastonite had the highest radiopacity with 3.681 mm Al that was the nearest density to bovine mandibular cortical bone. The least radiopacity was exhibited by Bio Oss with 1.925 mm Al. The common material used in both studies was Kasios TCP. The equivalent thickness was found in the study of Pekkan et al[7] and in the present study, 2.912 mm Al, 2.31 mm Al respectively. The differences were attributed

Table 3: Double cross-check of BGMs used in this study according to radiopacity

	Allogenix	*Grafton*	*Mineross*	*Maxxeus*	*Puros*	*Osteobiol Gel 40*	*Osteobiol Putty*	*Osteobiol MP3*	*Raptos*	*Suprabone*	*K-Phate*	*Kasios TCP*	*Poresorb*	*4Bone*	*Bego Oss*
Allogenix			*	*	*	*	*	*	*	*	*	*	*	*	*
Grafton			*	*	*	*	*	*	*	*	*	*	*	*	*
Mineross	*	*			*	*	*	*	*	*	*	*	*	*	*
Maxxeus	*	*	*		*	*	*	*	*	*	*	*	*	*	*
Puros	*	*	*	*					*	*	*	*	*	*	*
Osteobiol Gel 40	*	*	*	*					*	*	*	*	*	*	*
Osteobiol Putty	*	*	*	*					*	*	*	*	*	*	*
Osteobiol MP3	*	*	*	*					*	*	*	*	*	*	*
Raptos	*	*	*	*	*	*	*	*				*	*	*	*
Suprabone	*	*	*	*	*	*	*	*				*	*	*	*
K-Phate	*	*	*	*	*	*	*	*				*	*	*	*
Kasios TCP	*	*	*	*	*	*	*	*	*	*	*			*	*
Poresorb	*	*	*	*	*	*	*	*	*	*	*			*	*
4Bone	*	*	*	*	*	*	*	*	*	*	*	*	*		
Bego Oss	*	*	*	*	*	*	*	*	*	*	*	*	*		

*p<0.05

to imaging conditions of each study while cadaver with soft tissue was used in this study.

This experimental study revealed that most of the tested BGMs showed less radiopacity than the bone tissue. Therefore, they are not recommended to be used in cases that have to be followed up radiographically in a short-term period postoperatively, as the cortical bone may mask the graft material when the defect is surrounded with the cortical bone.[19]

Contrary to other studies that deal with the radiopacity of dental materials, to the author's knowledge, this is the first study that evaluates comparative radiopacity of BGMs by simulating the oral environment conditions with the use of cadaver's mandible. This study was solely planned to ascertain the radiopacity of BGMs in the preliminary stage and compare them with each other. Further *in vivo* studies that reflect the clinical conditions will be designed in the following stages.

In the present study, majority of the materials llay below the bone tissue's radiopacity that would hamper the radiographic appearance when placed in the bone defect. Further studies should be conducted with commercially available BGMs to encourage their manufacturers to produce materials with more appropriate opacity levels.

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ORIGINAL RESEARCH

Comparative Evaluation of varying Photo-polymerization Time on Shear Bond Strength and Microleakage of Four Orthodontic Adhesives: An *in vitro* Study

[1]Prerana N Zanke, [2]Vivek Patni, [3]Marshal Maskarenj

ABSTRACT

Introduction: High early bond strength, extended working time for optimal bracket placement, and easy cleanup of excess adhesive are few advantages of visible light-cure orthodontic adhesives. However, the shorter duration of polymerization may lead to polymer shrinkage and eventually microleakage.

Objective: To observe and evaluate shear bond strength (SBS) and microleakage of orthodontic brackets bonded to enamel with four commercially available orthodontic adhesives, cured only from incisal direction at various polymerization times.

Materials and methods: A total of 160 bovine incisors were randomly assigned to four groups according to adhesive used. Group I: bonded with Transbond XT (3M Unitek™, USA); group II: Enlight (Ormco, USA); group III: Light Bond (Reliance Ortho, USA); and group IV: Discover (Prime Dental, USA). Each group was further divided into four subgroups of A, B, C, and D according to the polymerization duration of 5, 10, 15, and 20 seconds respectively. The bonded teeth were immersed in dye solution. Brackets were then subjected to SBS test on a Universal testing machine. Surface microleakage was observed with the help of optical stereomicroscope.

Results: The SBS was obtained within the range of clinically accepted values, with curing time for Enlight at 5 seconds, Transbond XT and Discover at 15 seconds, and Light Bond at 20 seconds. However, Enlight was demonstrated to provide optimum SBS at least curing time: Minimum duration of 5 seconds achieved adequate SBS ~11 MPa SBS for each of Transbond XT and Enlight. The surface microleakage observed is statistically insignificant among the groups.

Conclusion: From a clinical perspective, a composite resin that needs minimum curing time without compromising on the bond strength is most advantageous. The results for SBS tests showed a better performance for Enlight as compared with the other adhesives: it reached its bond strength of optimum value at curing time of 5 seconds.

Keywords: Microleakage, Orthodontic adhesives, Shear bond strength.

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INTRODUCTION

The development of bisphenol A-glycidyl methacrylate resins revolutionized adhesive dentistry, and these materials are now an integral part of many forms of treatment. High early bond strength,[1] extended working time for optimal bracket placement, and easier cleanup of excess adhesive are the advantages of visible light cure orthodontic adhesives. Light-emitting diode (LED) curing lights can cure the composite bonding resins in shorter time owing to higher intensity of the curing light.[2] Studies have shown that 3 to 5 seconds of light curing for adhesives beneath the brackets is adequate.[3] From a clinician's point of view, the composite bonding resins that need minimum curing time without compromising on the bond strength and depth of curing are most advantageous. Shorter curing times are often associated with polymerization shrinkage leading to microleakage.[4] Thus, the purpose of this study is to evaluate and compare variation in polymerization time on the SBS of four orthodontic adhesives and study of microleakage.

RATIONALE

While contemporary orthodontic bonding materials have the required SBS to merit effective use in clinical conditions, the method and duration of effecting the photopolymerization, as suggested by individual manufacturers, tend to differ a lot.

Duration of cure and recommended surface or surfaces to effect the cure are all a matter of contention. Maintaining the bracket at the desired location on the tooth for the minimum time without compromising on the availability of the necessary SBS to merit effective clinical use is the demand of the occasion. Incisal or occlusal surface of every orthodontic attachment is the most consistent area of effective exposure to photopolymerization notwithstanding the rotations or crowding

exhibited in most malocclusions. The present study aims to assess four commercial adhesives used for bonding orthodontic attachments over varying curing times to arrive at optimizing the variables studied to act as a guide for the clinician.

Arguably, one of the other disadvantages of using visible light-cured adhesives in orthodontic bonding is the shrinkage during polymerization, which may lead to marginal gaps and eventually marginal leakage at tooth–adhesive interface. This study aims to evaluate and compare the effect of varying photopolymerization time on SBS and microleakage of four orthodontic adhesives.

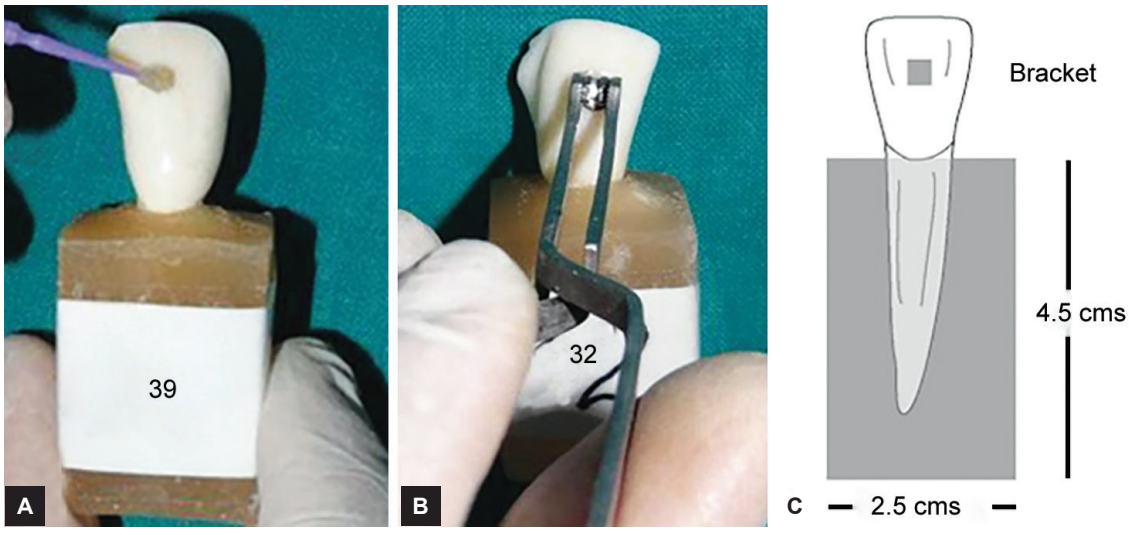
MATERIALS AND METHODS

- Four commercially available orthodontic adhesives:
  - Enlight (Ormco, USA)
  - Light Bond (Reliance Ortho, USA)
  - Transbond XT (3M Unitek™, USA)
  - Discover (Prime Dental, USA)
- Cold cure acrylic resin, Acralyn "R" (Asian Acrylates, Mumbai, India)
- Caries free and unfractured bovine incisors collected over a period of 48 hours
- Metal brackets (3M Unitek, Monrovia California, USA) for maxillary central incisors with slot size 0.022" × 0.028"; McLaughin, Bennet, Trevisi (MBT) prescription
- 37% phosphoric acid gel: PROetch etchant (SS White, USA)
- Disinfectant: 0.1% thymol solution
- Custom-made methylene blue dye (0.5% solution in deionized water v/v)

The bovine mandibular incisors[5,6] were procured from a government-recognized abattoir (Deonar, Mumbai) and gently scrubbed under constant flow of saline solution to detach debris and adhering periodontal ligament tissues. An ultrasonic scaler was used to remove the hard deposits from the tooth surface, before storing in plastic bottle containing 0.1% thymol solution (SD Fine-chem Ltd, Mumbai, India) at 0 to 14°C to prevent bacterial growth. Teeth samples were washed with distilled water to eliminate traces of thymol, prior to the experimentation; and horizontal notches for retention purpose were made on the root surface using a bur. The entire root of each tooth was embedded in a block made of cold cure acrylic resin extended until the cementoenamel junction. As such, the entire tooth crown portion was left exposed. The acrylic block dimensions were 2.5 cm (L) × 1.5 cm (B) × 4.5 cm (H) as demonstrated in Figure 1.

The specimens were then randomly divided into four main groups based on the adhesive used for bracket bonding: Transbond XT (3M Unitek™, USA), Enlight (Ormco, USA), Discover (Prime Dental, USA), and Light Bond (Reliance Ortho, USA) and further divided into four subgroups according to the polymerization time of 5, 10, 15, and 20 seconds. Each of these 16 subgroups, thus, had a sample size of 10 acrylic embedded teeth.

Exposed crowns were polished with a bristle brush and a fluoride-free slurry of pumice and water, and the accurate position for bracket placement marked with a Boone's Bracket positioning gauge (~5 mm from the incisal edge) postrinsing and drying of the samples. Samples were then etched with 37% phosphoric acid gel (PROetch, SS White) and again rinsed—dried until a frosty white appearance was appreciated on the surface. Samples were then coated with primer and thinned with a jet of air from an air water syringe. The brackets were loaded with one of the four types of adhesives and placed to fully contact the tooth, depending on the group allocated to the certain sample. Excess flash was removed from the sample–bracket interface.



Figs 1A to C: Acrylic-embedded tooth sample: (A) Etching; and (B) bracket placement; and (C) schematic

Figs 2A to C: Bovine teeth samples: (A) Crude; (B) placed in acrylic blocks; and (C) placed in dye

Photopolymerization was carried out for 5, 10, 15, or 20 seconds for each of the adhesives respectively, from the incisal surface based on the subgroup allocated for the sample. The specimens (Fig. 2) were then placed in a container of custom-made solution of methylene blue dye and deionized water for 6 days.[7]

After staining, the brackets were subjected to the testing of SBS with a Universal Testing Machine (UTM), Instron. The specimens were oriented as such the bracket-base was parallel to the blade delivering the debonding force. Debonding force was applied for effecting shearing of the bracket base in an incisogingival direction at a cross-head speed of 1mm/min as demonstrated in Figure 3. The results were recorded in kgF and were later converted to MPa.

Debonded specimens were then randomly examined by measuring deepest dye penetration on the tooth surface perpendicular to the bracket margin and rounding the nearest 0.2 mm. Observations were made at the tooth surface with 50× magnification with a grid with an optical stereomicroscope to observe the microleakage at the sample.

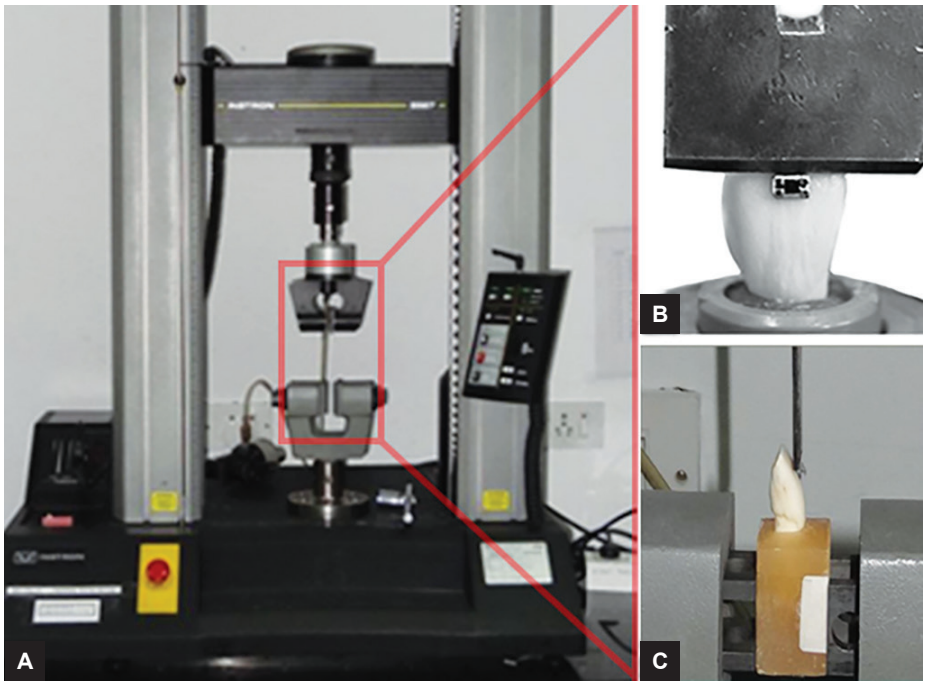
Evaluation Parameters

The SBS was measured in kgF and converted into MPa for each of the 160 samples and the data were statistically analyzed with an unpaired t-test.

The microleakage was observed by penetration of the dye on the tooth surface with the help of grid of squares of dimension 1,000 µm. Each square was allotted a score of 1 from each of incisal, gingival, mesial, and distal surfaces.

RESULTS

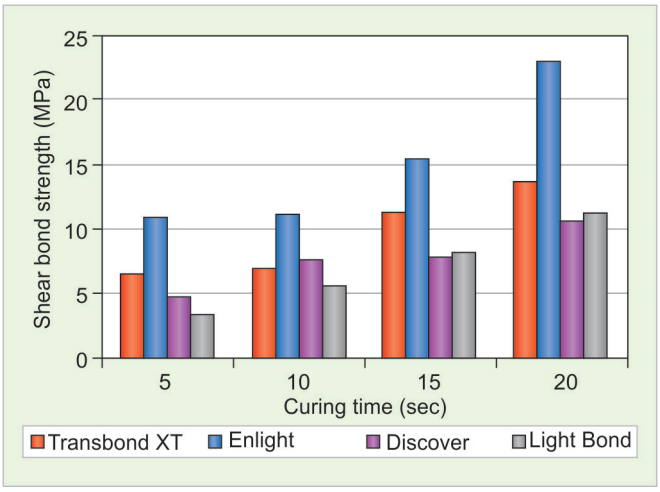
The mean SBS for various adhesives for various curing times are tabulated and presented in Table 1 along with



Figs 3A to C: Debonding forces applied on the tooth–bracket interface using universal testing machine (UTM): (A) UTM with fixed attachment for acrylic block placement and movable blade; (B) frontal view of blade at the edge of bracket base; and (C) side view

Table 1: Mean SBS and standard deviation for various adhesives for various curing times

	5 sec		10 sec		15 sec		20 sec	
Curing time Adhesive	*Mean (MPa)*	*Standard deviation*	*Mean (MPa)*	*Standard deviation*	*Mean (MPa)*	*Standard deviation*	*Mean (MPa)*	*Standard deviation*
Transbond XT	6.49	1.976	6.80	3.615	11.25	4.751	13.70	4.615
Enlight	10.87	4.196	11.16	2.730	15.40	2.054	22.86	5.333
Discover	4.68	1.570	7.66	4.023	7.91	1.919	10.64	11.893
Light Bond	3.39	1.062	5.49	1.061	8.14	3.479	11.27	3.055



Graph 1: Mean SBS for various adhesives at various curing times

standard deviation (SD) in values through the sample size of 10 per subgroup.

Enlight (Ormco, USA) demonstrated to provide optimum SBS of 10.87 MPa at a minimum curing time of 5 seconds. However, at low curing time, the high SD showed a lesser consistency between the samples. Low SD between sample readings showed a consistent performance at low curing time for almost all other adhesives. At a higher curing time, however, Enlight (Ormco, USA) showed a better performance as compared with Discover (Prime Dental, USA) with a huge inconsistency between samples at 20 seconds. Graph 1 shows a graphical representation of the data presented in Table 1.

Two-factor analysis of variance (ANOVA) was performed on the data to calculate the effect of adhesives and curing time on the SBS, individually and in tandem. Table 2 shows the tabulated value for the two-factor ANOVA.

At a confidence interval (CI) of 95%, the adhesive brand showed a very low p-value, and as such the null hypothesis had to be discarded: The brand of adhesive used had a significant impact on the SBS in these experimental data. Similarly, the curing time showed a very low p-value signifying the impact of curing time on the resulting SBS. However, the p-value for interaction between the two factors had a p-value of >0.05 demonstrating that the two factors simultaneously do not play a significant role at a CI of 95%.

Acceptable SBS was obtained within the range of each of manufacturer's recommendation, i.e., Enlight for 5 seconds, Transbond XT and Discover for 15 seconds, and Light Bond for 20 seconds.

CONCLUSION

Selection of orthodontic adhesive system may play an important role in achieving adequate SBS with minimum curing time. The most advantageous composite bonding resins for clinical purposes are those that need minimum curing time without compromising on bond strength, depth of curing, and microleakage. Enlight (Ormco) was demonstrated to provide optimum SBS at low curing time: Minimum duration of 5 seconds achieved adequate SBS ~11 MPa.

Regardless of the promising results presented in this study, care should be taken in the interpretation of the results, as well as applying into clinical situations as *in vitro* bond strengths are usually higher than those obtained *in vivo.*

Table 2: ANOVA: two factor with replication at 95% CI

Source of variation	*SS*	*df*	*MS*	*f-value*	*p-value*	*F crit*
Adhesive brand (a)	1584.203	3	528.0675	27.60854	3.65E-14	2.667443
Curing time (b)	1595.376	3	531.792	27.80327	3.04E-14	2.667443
Interaction of (a) and (b)	238.4072	9	26.48969	1.38494	0.200062	1.94545
Within	2754.282	144	19.12696			

The effect is not significant if p-value is >0.05 at 95% CI

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CASE REPORT

Use of a Disposable Self-adhesive Grid for Accurate Microimplant Placement

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ABSTRACT

Microimplants have ushered in the concept of absolute anchorage by intraoral means with the added benefit of being completely operator dependent. These factors ensure efficient anchorage control. However, these benefits come at the cost of precise placement considering the proximity of anatomically significant structures. It is of utmost importance to avoid damage to roots in case of interradicular placement. In order to overcome this difficulty, the following case report describes an innovative grid-guide template with an anti-inflammatory adhesive backing for accurate and easy microimplant placement. The assembly consists of a stainless steel grid mesh stuck on a micropore surgical tape with trioplast dental paste on the tissue-facing surface. It is an accurate, efficient, economical, and easy method of microimplant placement.

Keywords: Anchorage, Grid guide, Microimplant.

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INTRODUCTION

Anchorage plays a major role in deciding the outcome of an orthodontic treatment. Anchorage consideration and anchorage preparation are one of the vital steps in orthodontic treatment planning. Traditional modalities for anchorage conservation utilized intraoral or extraoral sources. The intraoral sources made absolute anchorage difficult to attain, while the extraoral much depends on the patient's compliance to be effective. The use of microimplants made the dream of absolute intraoral anchorage a reality with the added advantage of being totally operator dependent.[1-7]

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Microimplants are available in a variety of sizes and shapes. They can be used in different sites in the oral cavity for their required purpose. Their small size facilitates utilization in interradicular areas, thus expanding the horizon of their use. Microimplants also offer the advantage of being immediately loaded. The crucial factor to be taken into consideration with regard to their placement is the proximity of the surrounding anatomic structures. There is a possibility of damage to the roots, if placement site is interradicular.[8] Placement of a microimplant in close approximation of the root can result in insufficient bone remodeling around the screw and transmission of the occlusal forces through the teeth to the screw, which can lead to implant failure.[9]

There have been numerous implant placement guides described in the literature.[10-20] The shortcomings of these methods are that they are cumbersome and fabrication involves complicated soldering procedures, difficulty in stabilizing during radiographic process, poor tissue adaptation to the placement site, giving magnification errors or parallax errors in the radiograph, increased chairside time, and the need to sterilize after each use.

The present article describes a metal grid-guide with an adhesive base for accurate placement of microimplant. The guide has been fabricated with the help of easily available armamentarium. It can be prefabricated and stored in sterilized conditions for use in a patient and is discarded after use. This innovation helps precise placement with reduction in chairside time of microimplant placement.

CASE REPORT

A 20-year-old female patient reported to the Department of Orthodontics and Dentofacial Orthopedics with the chief complaint of forwardly placed upper front teeth. On diagnosis, the patient had a skeletal Class II maxillomandibular relationship with prognathic maxilla and retrognathic mandible with an anticlockwise rotational tendency, an Angle's Class I molar, and Class I canine relationship bilaterally, with proclination and protrusion of maxillary and mandibular anteriors, crossbite with 44, a convex soft tissue profile, an acute nasolabial angle, and protrusive lower lip. The treatment plan included extraction of all first premolars followed by levelling and alignment of the teeth. Retraction of the anteriors was

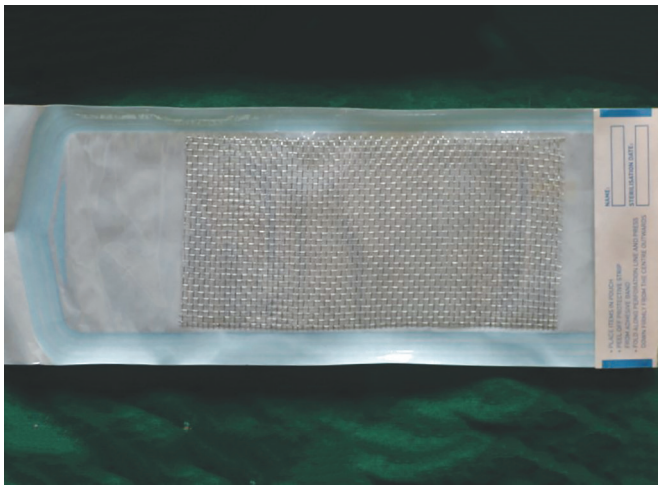


Fig. 1: Autoclaved stainless steel wire mesh

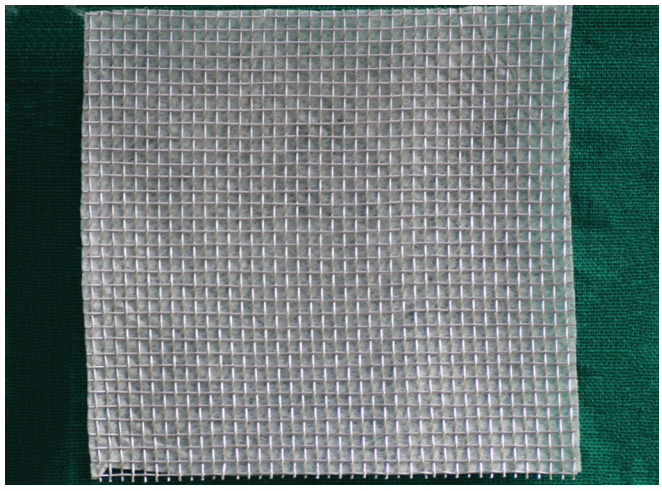


Fig. 2: Mesh with micropore surgical tape

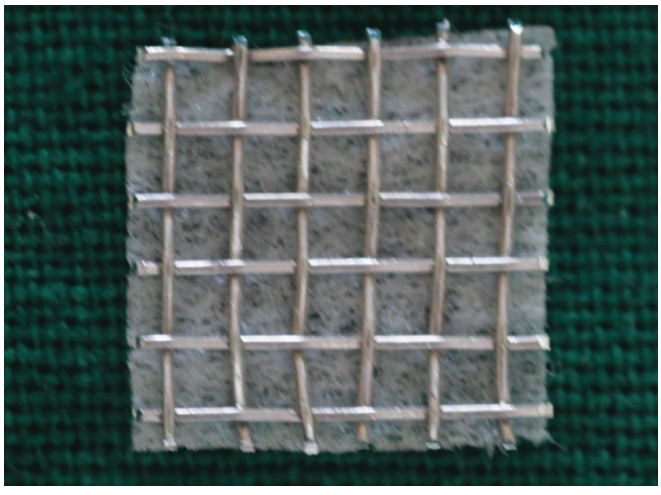


Fig. 3: Cut-out of the mesh

Fig. 4: Surgical tape and Trioplast dental paste

to be carried out using microimplants. The placement of microimplant is critically important in the interradicular area owing to the proximity of the roots. Therefore, to obtain a precise placement of the microimplant, a grid was designed. The description of the procedure is as follows.

Commercially available stainless steel wire mesh, easily procured from hardware suppliers was utilized. The mesh was selected such that the distance between the successive vertical and horizontal wire components was 2 mm. The mesh was autoclaved (Fig. 1). The next step involved sticking the micropore surgical tape over the mesh to make small cut-outs (Fig. 2). These cut-outs were appropriately sized in 1 cm × 1 cm to cover the area of interest and stored in a sterile container for use (Fig. 3). The grid can be made smaller if needed by cutting with scissors before use. After anesthetizing the area, wet cotton was used to moisten the temporary anchorage device site and also to slightly moisten surgitape for better adhesion of Trioplast dental paste (ICPA Health Products,

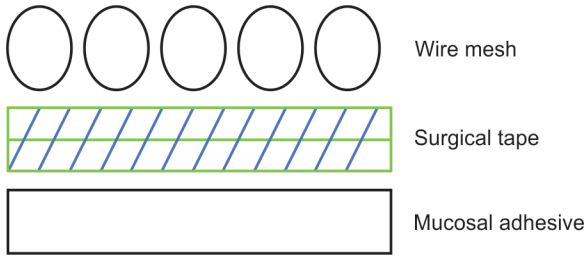


Fig. 5: Diagrammatic representation of the grid assembly

Mumbai, Maharashtra) on the grid (Fig. 4). The grid was adapted with finger pressure. A thin layer of Trioplast was applied on the tissue-facing surface of the surgitape. The paste acts as a mucosal adhesive, stabilizing the grid firmly in place. Thus, the grid assembly consists of the grid on a micropore surgical tape with ointment below the tape (Fig. 5). This assembly was then transferred in the right maxillary posterior region between the second premolar and first molar and was pressed firmly onto the mucosa (Fig. 6). This was followed by obtaining an intra-oral periapical radiograph of that area. The radiograph

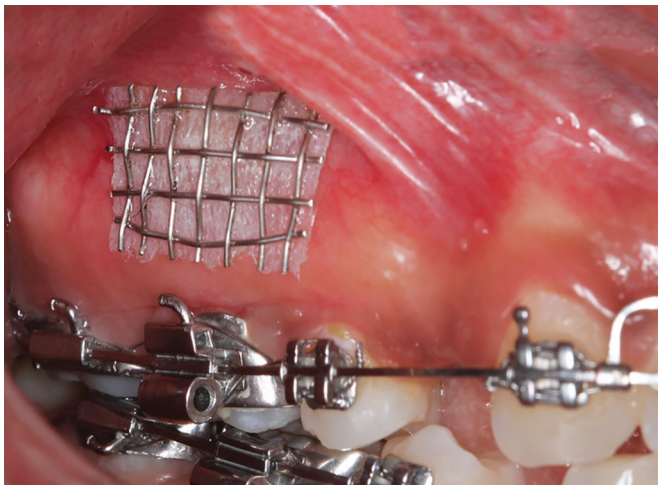


Fig. 6: Grid assembly at the intended site of placement

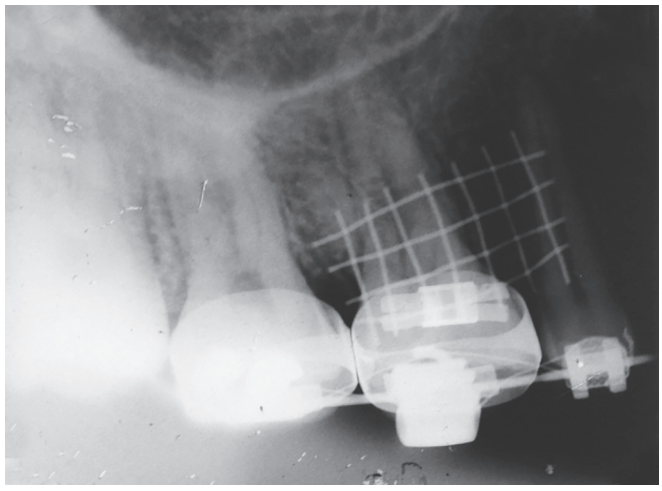


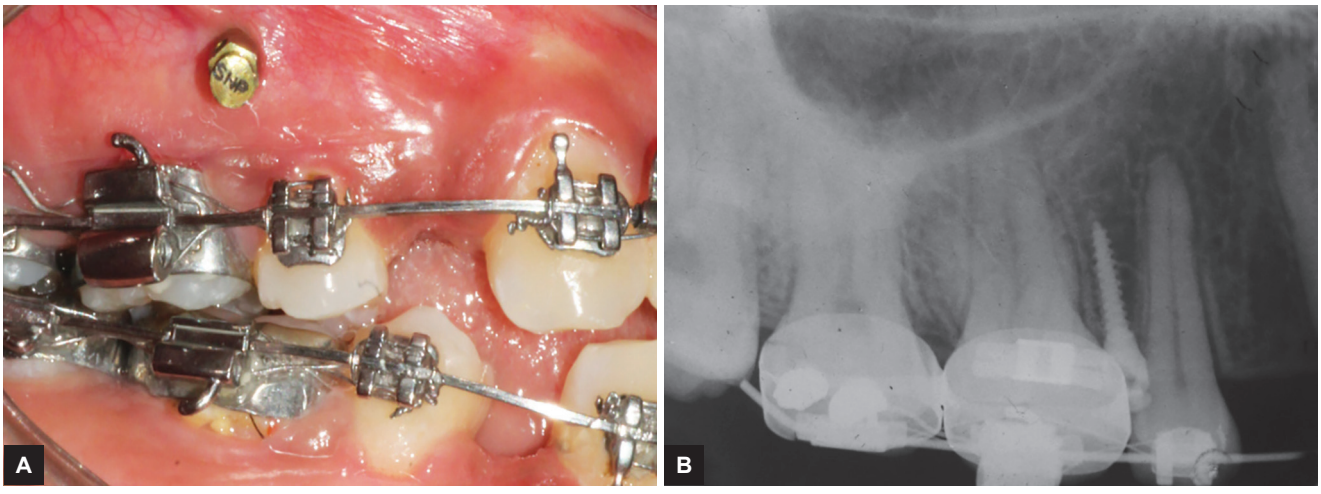
Fig. 7: Intraoral periapical radiograph of the grid at the intended site of placement

Fig. 8: Microimplant driven through the grid

showed the grid superimposed on the inter-radicular area between the second premolar and molar (Fig. 7). The appropriate square component of the guide corresponding to the exact height of placement of the microimplant was selected on the radiograph. The microimplant was then driven through that same square on the grid (Fig. 8). After insertion of the implant, the gird was removed by cutting it off with a pin and ligature cutter. The placement and orientation of the microimplant were successful (Fig. 9).

DISCUSSION

Gainsforth and Higley[21] carried out distilization of maxillary dentition using Class II elastics with anchorage from metallic vitallium screws in dog ramus. However, all screws failed within 16 to 31 days. The next set of published reports with regard to the successful use of endo-osseous implants to move teeth was given forth by Linkow.[22] He used mandibular blade-vent implants in a patient to apply Class II elastics for retraction of maxillary incisors. Creekmore and Eklund[23] suggested the use of small-sized vitallium screws as anchorage for the intrusion of maxillary incisors. Kanomi[24] introduced microscrews for orthodontic anchorage. He showed that



Figs 9A and B: (A) Intraoral placement of microimplant; and (B) radiographic placement of microimplant

1.2 mm diameter of microscrew is enough for intrusion of anterior teeth.

In the case of interradicular placement of implant, the structure in close approximation would be the roots of the teeth. The microimplant may contact the root thus, leading to its failure. According to Kuroda et al,[9] root proximity is a risk factor in microimplant failure. Therefore, it is important to prevent root contact when placing microimplants into alveolar bone.

This particular grid design offers a variety of advantages. The mesh is easily available in the market. The squares in the gird are of dimension 2 × 2 mm^2. This selection was based on the fact that implants range in 1.4 to 2 mm diameter, the most common being 1.6 to 1.8 mm diameters. This is greater than the implant diameter, which, in turn, facilitates the placement of the implant through the gird while it is held in place. The application of surgical tape helps in holding the mesh wires in place, while cut-outs are being made. Making the cut-outs hardly requires a couple of minutes. The cut-outs can be made and stored. These can be used as and when required. Also, there are not much of technicalities to make the cut-outs, so even a dental assistant can prepare and store them. The use of surgical tape is not only for holding the wire mesh in place, but it also acts as a smooth uniform surface for adhesive placement. The material chosen was stainless steel, as it can be easily contoured according to the anatomy of the area where it is being placed. This was done to achieve an intimate contact with the area of placement. The cut-outs can be adjusted by the orthodontist as per the dimension of the placement area. The Trioplast dental paste (triamcinolone acetonide ointment in oraplast base contains gelatin 16.7% w/w, pectin 16.7% w/w, sodium carboxymethylcellulose 16.7% w/w) is a commonly prescribed over-the-counter remedy for the oral ulcerations caused by orthodontic appliances. This paste has the advantage of being adhesive to the oral mucosa. Mucosal adhesive pastes work on the principled of dessication of the mucosa. This helps in bringing about a close adaptation of the gird assembly on to the mucosa resulting in a more precise location on the radiograph without having to worry about the magnification factor. The immediate postoperative discomfort is less because of the anti-inflammatory properties of triamcilone acetonide. There is no cumbersome laboratory work required in its fabrication. After use, it can be discarded each time a new gird is used for the patient.

CONCLUSION

This technique utilizes readily available armamentarium available in an orthodontic setup. The utilization of mucosal adhesive gave a closer and better tissue adaptation. There were no cumbersome wire bendings required. The mesh pieces with surgitape backing can be kept in stock and Trioplast can be applied just before placement. The grid is to be discarded after use. Hence, it is a simple, cost-effective, and time-saving technique.

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CASE REPORT

Four Fourth Molars

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ABSTRACT

A supernumerary tooth is an additional entity to the normal series and can be seen in any of the quadrants of the jaw. Very often, they are associated with syndromes, such as Gardner syndrome and cleidocranial dysplasia. In the absence of any syndromes, occurrence of multiple supernumerary teeth is rare. Supernumerary molars can be in the form of paramolars or distomolars of which distomolars are relatively rare with a reported incidence of 2%. We present a rare nonsyndromic case of four fourth molars in addition to an impacted maxillary canine. The treatment of supernumerary teeth depends on the current and possible effects on the adjacent teeth, the position of the tooth itself, and the likelihood of the development of pathologic conditions. Very often distomolars are treated as one treats the third molars. We also suggest a possible association between macrodontia and hyperdontia.

Keywords: Distomolars, Fourth molars, Supernumerary teeth.

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INTRODUCTION

A supernumerary tooth is an additional entity to the normal series and can be seen in any of the quadrants of the jaw.[1] Brook[2] in their study on 2000 schoolchildren found the prevalence of supernumerary tooth to be 2.1% of permanent dentition and 0.8% in primary dentition.

Increased incidence of supernumerary teeth may be present in cases of cleft lip and palate, Gardner syndrome, cleidocranial dysplasia, Ehlers–Danlos syndrome, Fabry Anderson syndrome, incontinentia pigmenti, tricho-rhinophalangeal syndrome, and chondroectodermal dysplasia.[3,4] In the absence of any syndromes, occurrence of multiple supernumerary teeth is rare.[5]

Supernumerary teeth are classified according to the morphology as conical, tuberculate, supplemental, and odontome; as per the position as mesiodens, distomolars, paramolars, or parapremolars.[6]

Of these, conical form is the most commonly found form in permanent dentition, presenting usually as a mesiodens. The least common is the supplemental variety, which appears like one of the normal series of teeth, often found at the end of the tooth series.[7] Permanent maxillary lateral incisor is the most common supplemental tooth found.

Occurrence of supernumerary molars is rare. Cassetta et al[7] reported an incidence of supernumerary molars as 0.18% of which majority were paramolars and the rest were distomolars. Kara et al[8] reported an incidence of 0.33% for the same. Fourth molars are usually rudimentary in shape and impacted,[9] generally identified through radiographs.[10] Shahzad and Roth[11] studied 409 patients and found that fourth molars have an incidence rate of 2% and are most commonly seen unilaterally in the maxilla. We describe a rare case of supplementary supernumerary bilateral, upper and lower fourth molars (distomolars) along with an impacted upper canine in a nonsyndromic patient.

CASE REPORT

A 19-year-old male patient came to the outpatient department of A.B. Shetty Memorial Institute of Dental Sciences with the chief complaint of pain in the lower right and left quadrant of the jaw since 5 days. On clinical examination, 38 and 48 appeared impacted with a portion of mesial cusp visible in both. A retained deciduous canine was present in the upper left quadrant. Orthopantomogram (OPG; Fig. 1) revealed impacted

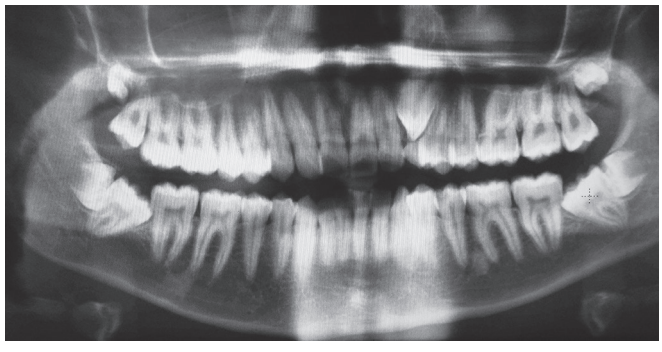

Fig. 1: The OPG showing four impacted fourth molars and an impacted left maxillary canine

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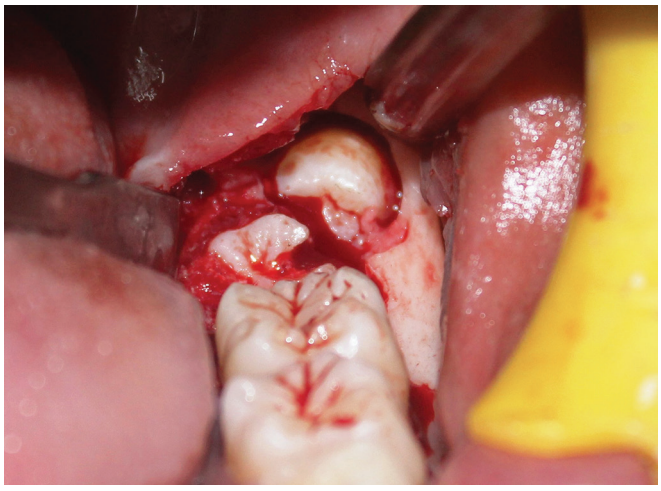

Fig. 2: Reflection of the mucoperiosteal flap reveals impacted third and fourth molars on the left side

lower third molars and distomolars bilaterally in the upper and lower arch. Also, an impacted upper left canine was present. It was decided to extract the lower third and the fourth molar bilaterally at an interval of 1 week. After the reflection of a mucoperiosteal flap, the bone over the third molar was removed, exposing the third and the fourth molars (Fig. 2). The crown of the fourth molar was distobuccal to and slightly overlapping the third molar buccally, making it necessary to first extract the fourth molar. This was followed by sectioning of the third molar along the long axis and elevation of the fragments. Morphologically, the fourth molar was of supplemental supernumerary type with only upper third of the root developed. A similar procedure was done on the left side after 1 week. Since the upper third molars were erupted and the upper fourth molars were asymptomatic, no surgical intervention was planned for the same. The unerupted canine was planned for orthodontically assisted extrusion. The patient was kept on a regular follow-up.

DISCUSSION

Paramolars are usually known to be in rudimentary form and occur buccal or palatal to the second, third, and rarely first molars. Distomolars as the name suggests occur distal to the third molars or may even occur distolingually. They are usually rudimentary and conical in shape. In the present case, both the mandibular fourth molars were supplemental in morphology and the upper fourth molars appeared to be conical in shape on OPG.

Grimanis et al[4] in their survey of supernumerary molars observed that supernumerary molars occurred majority in maxilla (79.7%) and only 23.9% occurred bilaterally. In the maxilla, they are more common anteriorly. They are also seen distal to third molars in the maxilla, mandibular premolar region, maxillary premolar region, maxillary canine region, and mandibular incisor region. Leco et al[12] in their study on 2000 patients found that maxillary posterior region was the most commonly involved region (38%) followed by maxillary anterior region(28.6%). They reported the incidence of lower distomolars as only 4.8%. Rajab and Hamdan[3] in their survey have shown that 72 to 77% cases show multiple supernumerary teeth, 18 to 27% show bilateral supernumerary teeth, and only 1 to 5% show three supernumerary teeth.[3] Nonsyndromic supernumerary teeth are uncommon entities and when present they often present singly and not in multiple numbers.[5]

Apart from causing a disturbance in the eruption and position of the adjacent teeth, supernumerary teeth increase the risk of pathological conditions, such as ameloblastoma, follicular cyst, and fistulae.[13] This fact is a significant factor in deciding the management of supernumerary teeth. Leco et al[12] in their previously mentioned study have reported complications, such as follicular cysts and displacement, failure of eruption, and lysis of the adjacent teeth which they termed as "mechanical accidents." Bereket et al[14] in their study of 1100 supernumerary teeth have reported a complication rate of 38.36%.

In cases where the related teeth have erupted satisfactorily, there is no associated pathology, no active orthodontic treatment has been planned, or removal may compromise the vitality of the adjacent tooth, observation has been the treatment of choice.[13,15] Some authors suggest that fourth molars should be managed in a manner similar to third molars.[9-11]

In this case, we also observed that the patient had an overall large teeth size. This observation emphasizes the possibility made by Seehra et al[16] that there may be a correlation between macrodontia and hyperdontia.

CONCLUSION

There is no rule of thumb regarding the management of supernumerary teeth, which depends on their position and associated conditions. When supernumerary teeth do not present any pathological, esthetic, or functional problems, they are best left alone with careful monitoring.

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CASE REPORT

Nonextraction Treatment of Class I Malocclusion having Anterior Crowding and Multiple Canine Impactions

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ABSTRACT

Canine impaction is a condition wherein the tooth is embedded in the alveolus and is locked in by bone, teeth, or other structures, leading to difficulty in eruption. In this study, we present a case report of a 15-year-old female patient with a straight profile, class I skeletal and dental relationship, over retained deciduous teeth, severe anterior crowding in both the arches, and impacted canine in maxillary arch on both the sides and in mandibular arch on the right side. Extraction of deciduous teeth was done prior to fixed appliance therapy. After leveling and alignment using fixed appliance, surgical exposure of impacted canines was done using open flap surgical technique. Canines were brought into occlusion using conventional orthodontic technique. In mandibular arch, space for lingually placed lateral incisor was created using nickel–titanium (NiTi) open coil spring. Results achieved after decrowding and getting impacted canines into normal occlusion are presented.

Keywords: Class I, Crowding, Impacted canines, Nickel–titanium open coil spring, Open flap surgical technique.

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INTRODUCTION

The second most common impacted teeth after third molars are the maxillary canine. Maxillary canines tend to have the longest developmental period, the deepest developmental zone, and the most difficult eruption path compared with the other teeth in the oral cavity.[1] Surgical exposure and orthodontic guidance during eruption are commonly required for such cases.[2] Incidence of maxillary canine impaction is higher in females (around 0.8–2.8%) and are impacted more often palatally.[3]

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The radiographic diagnosis of position of the canine is instrumental to the orthodontist's decision to both expose and orthodontically align or to remove the impacted maxillary canine.[4] Difficulty level of impacted or ectopically erupted maxillary canines depends on the position of the teeth.[5] Different treatment options for treating impacted teeth are available. Surgical reposition, tooth extraction, surgical-orthodontic management, and implant replacement all have been advocated in the literature.

The aim of this article was to present a case in which a combined surgical-orthodontic management impacted canines guiding it to normal occlusion.

CASE REPORT

A 15-year-old female patient reported to the Department of Orthodontics and Dentofacial Orthopaedics with the chief complaint of forwardly placed upper front teeth. On extraoral examination, the patient had a straight profile, normal nasolabial angle, and deep mentolabial sulcus. On intraoral examination, constricted maxillary and mandibular arches, mixed dentition, bilateral class I molar relation, and unerupted permanent maxillary and right mandibular canine, crowding in both arches with lingually erupting mandibular lateral incisors, overjet of 1 mm and overbite of 5 mm. The pretreatment extraoral and intraoral photographs were taken (Figs 1 and 2). The case was diagnosed as skeletal class I malocclusion with orthognathic maxilla and orthognathic mandible with impacted maxillary canines and mandibular right canine. Same-lingual, opposite-buccal technique was used to rule out the location of canines and all three were found to be placed labially. Cephalometric analysis (Table 1) confirmed diagnosis of class I skeletal base having average growth pattern and impacted canines (Fig. 3).

OBJECTIVES

- Decrowding in both maxillary and mandibular arch
- Eruption impacted canines in both arches
- Achieving correct overjet and overbite
- Maintaining class I molar relationship

TREATMENT PLAN

The treatment plan was extraction of overretained deciduous teeth in both arches followed by fixed appliance therapy. After leveling alignment, the impacted maxillary right

Figs 1A to C: Pretreatment extraoral photographs

Figs 2A to E: Pretreatment intraoral photographs showing mixed dentition with 53, 54, 55, 62, 63, 64, 82, 83

and left canine was surgically exposed using open flap surgical technique. Bonding attachments on exposed canine and applying traction force on canines brought it to normal occlusion followed by fixed appliance therapy. After leveling alignment, NiTi open coil spring was placed to create space for lingually placed lateral incisors. Bonding attachments on lateral incisors and traction force were applied to bring it in normal occlusion.

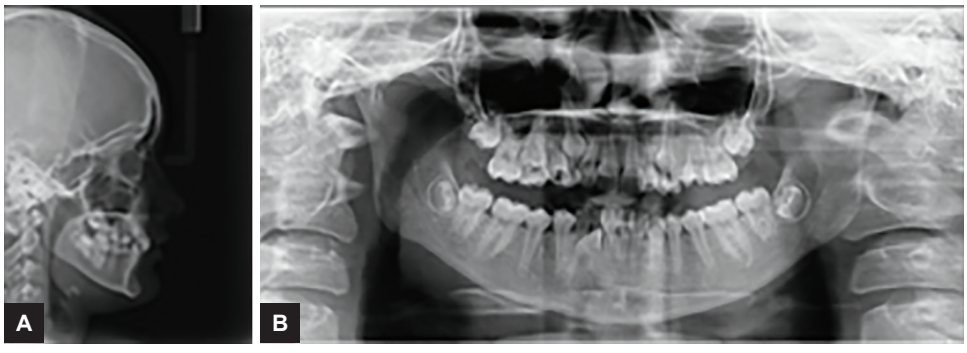
TREATMENT PROGRESS

All deciduous overretained teeth were extracted. Fixed appliance therapy using 0.022″ × 0.028″ appliance with MBT prescription was used. Maxillary teeth were bonded initially for correction of overbite and creation of space for impacted maxillary canines. After that, NiTi open coil spring was used to gain sufficient space. Surgical procedure was then performed for exposure of impacted

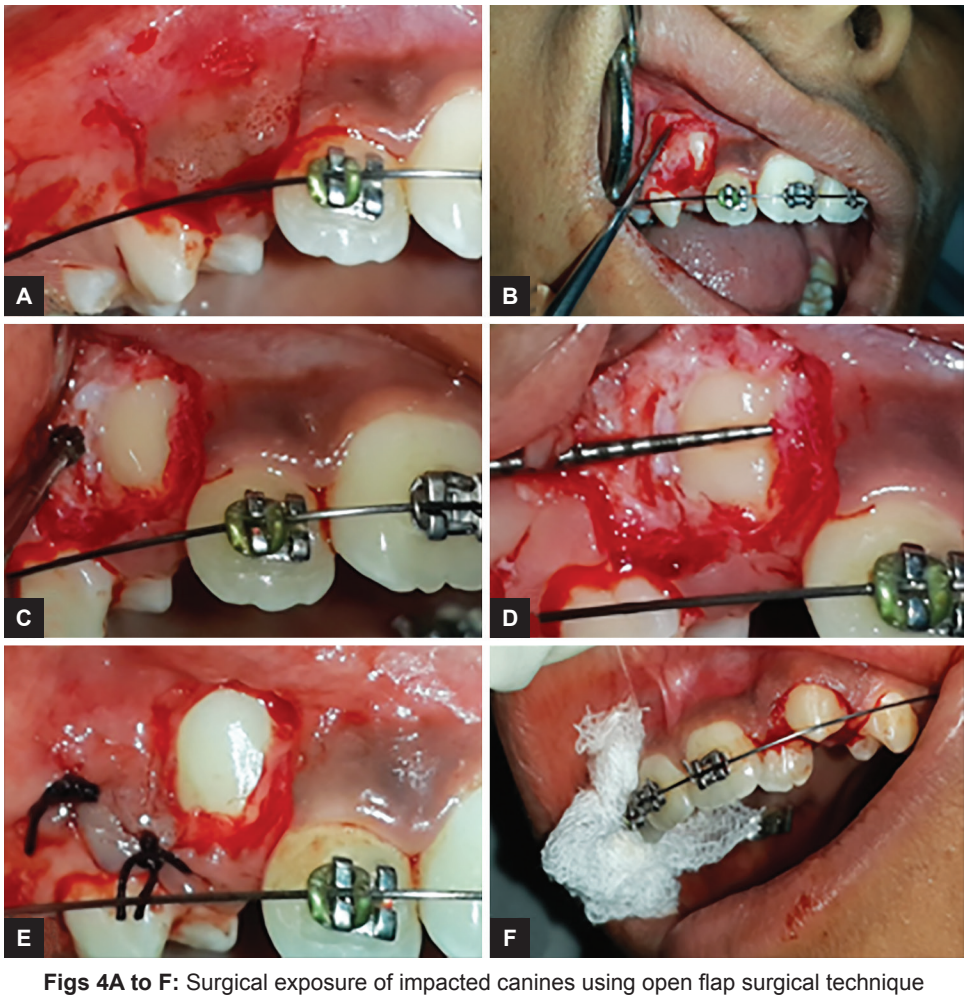
Table 1: Cephalometric values

Pre-treatment	
SNA	78°
SNB	80°
ANB	+2°
Wits appraisal	0.5 mm
IMPA	90°
GoGn to SN	35°
FMA	25°
U1 to NA	23°/4 mm
L1 to NB	24°/4 mm

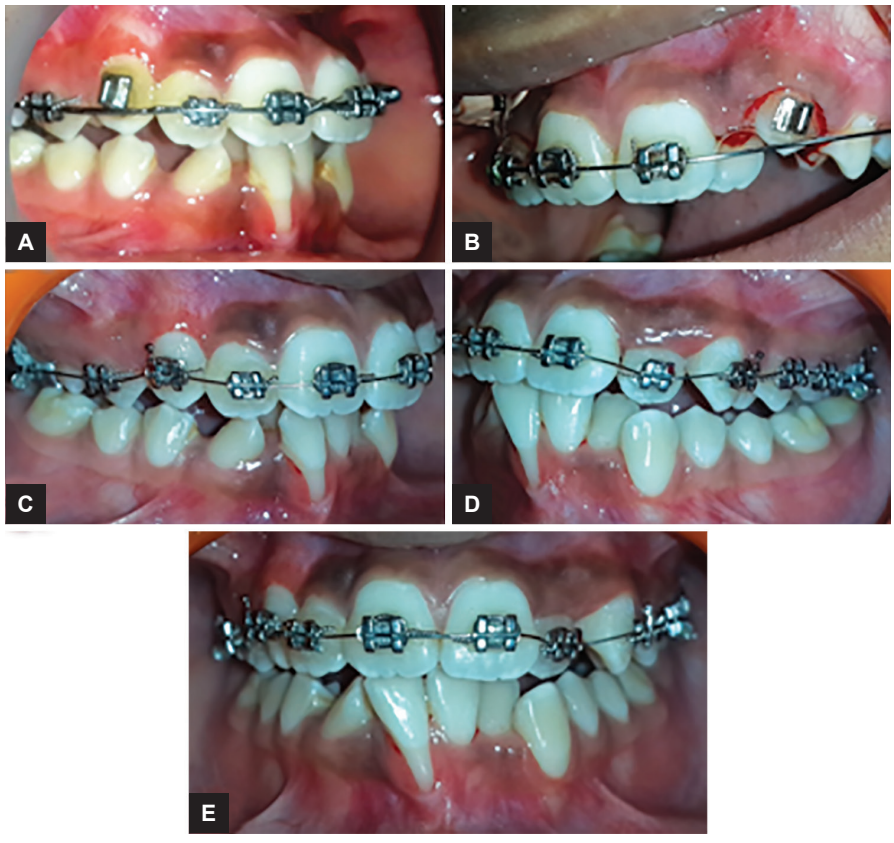
canine using open flap technique (Fig. 4). Begg's brackets were bonded on the exposed canine and elastic threads were used to apply traction on impacted canines. Once the canines were in sufficient occlusion, NiTi wires were used for its alignment. After 11 months of active treatment and overbite correction was achieved, lower arch bonding was performed. Sufficient spaces were created for the lower right and both lateral incisor using NiTi open coil spring (Fig. 5). Once sufficient spaces were achieved, lateral incisors were brought into alignment using NiTi wires. Finishing and detailing were performed on heavy archwire for achieving class I molar and class I canine relationship bilaterally. Total treatment duration was 18 months. Posttreatment results were satisfactory (Fig. 6).



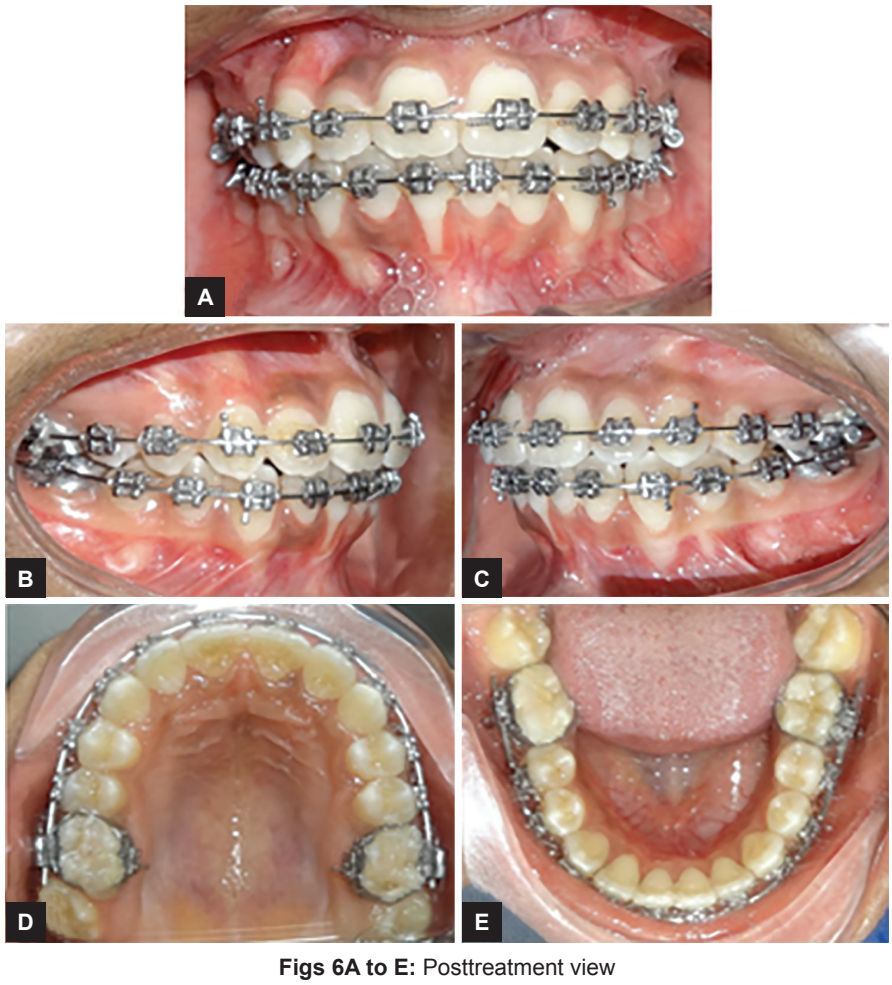
Figs 3A and B: Lateral cephalogram and orthopantomogram



Figs 4A to F: Surgical exposure of impacted canines using open flap surgical technique



Figs 5A to E: Treatment progress



Figs 6A to E: Posttreatment view

DISCUSSION

Orthodontic management of impacted canine is the most widely discussed topic in literature. Level of difficulty in managing impacted tooth cases depends on position and direction of canine in arch. Fournier et al[6] recommended that a labially impacted tooth in a favorable vertical position should be surgically exposed without the application of orthodontic traction in a young patient, whereas immediate traction is almost always needed in an adult patient. Labial impaction, on the contrary, is generally thought to be more difficult to manage.[7,8] Studies reporting the periodontal condition of buccally impacted canines after closed eruption exposure found excellent appearance, but a decrease in the width of attached gingiva.[9] Studies have directly compared open *vs* closed surgical outcomes in buccal canines alone, although mixed groups of palatal and buccal canines have been investigated.[10,11] According to Proffit et al,[12] there are three categories of problems when dealing with an impacted tooth: Surgical exposure, attachment to the tooth, and orthodontic mechanics to bring the tooth into the arch. The surgical procedure was longer in closed technique as compared with the open technique.[13] In this case, open flap surgical technique is used for exposure of impacted canine.

Nickel–titanium coil springs possess high resistance to permanent deformation and have potential relatively constant delivery of force during unloading.[14] In this case report, to create space for impacted canine and in-locked lateral incisors, NiTi open coil spring was used.

CONCLUSION

Early diagnosis of case and precautionary measures, such as primary teeth extraction, may prevent further complications and reduce patient treatment time, expense, and complex treatment procedures. A proper diagnosis and careful selection of orthodontic and surgical technique help to achieve successful impacted treatment of canines giving esthetically pleasant smile.

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CASE REPORT

Musculomucosal Flap: A Technique for Correction of Velopharyngeal Insufficiency by Palate Lengthening

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ABSTRACT

A small but significant percentage of patients have inadequate velopharyngeal closure, or secondary velopharyngeal incompetence, following primary palatoplasty. The use of the buccinator musculomucosal (MM) flap has been described for both primary palate repair with lengthening and secondary palate lengthening for the correction of insufficient velopharyngeal closure. The MM flap was first described in 1969 for the primary repair of a wide cleft palate by Mukherji, and it was Bozola et al in 1989 who first formally described it and gave first description of its anatomy. The first report on its use to lengthen the palate in secondary velopharyngeal insufficiency (VPI) was published by Hill et al in 1999. This case report presents a patient who had correction of secondary velopharyngeal incompetence using bilateral buccinator MM flaps used as a sandwich and also gives a brief review of the literature regarding its application in cases of secondary VPI.

Keywords: Buccinator musculomucosal flap, Cleft palate, Velopharyngeal insufficiency.

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INTRODUCTION

Persistent inadequacy of velopharyngeal closure occurs in a small but significant percentage of patients following primary palate repair.[1,2] Treatment of patients with consistent hypernasality, nasal airflow errors, passive cleft speech characteristics, and/or nasal regurgitation is usually surgical.[3] A large number of surgical techniques are described to address VPI. These can be grossly divided into two categories: Palatoplasties, which are aimed at increasing the length and/or the mobility of the palate, and pharyngoplasties, which are aimed at decreasing the velopharyngeal space.[4] The inability to achieve sufficient velopharyngeal closure may be a result of an unusually deep nasopharynx, poor lateral wall and palate mobility (which may be due to enlarged tonsils, or a structural insufficiency of the soft palate), or the lateral or posterior pharyngeal walls.[5] So, the treatment of VPI is directed at these causative factors. Over the years, the treatment for VPI has been either a sphincter pharyngoplasty or pharyngeal flap.[6] These procedures aimed at the correction of the lateral or posterior pharyngeal wall movements, thereby decreasing the diameter of the velopharyngeal port; however, in cases of a short palate, it did not address the length of the palate as such. The large number of techniques available perhaps best reflects that no one technique is ideal and that each patient may have one or more factors resulting in their velopharyngeal incompetence. In a clinical setting, the decision as to which factor is responsible for the VPI is confirmed by an objective speech assessment, a videofluoroscopy, or nasopharyngoscopy. A nasopharyngoscopy is being avoided in young patients with less tolerance to the procedure. We hereby present a case report of a patient that had presented with VPI and was operated with the MM flap.

CASE REPORT

A 6-year-old patient was brought to the maxillofacial outpatient department by his parents who complained that the patient had difficulty in pronouncing certain words and spoke with a distinct nasal twang. On examination, the patient had a scar on his upper lip on the left side extending throughout the length from the height of the Cupid's bow on the left side to the left nostril sill, suggesting a previous surgery to repair a left unilateral cleft lip (Fig. 1). The nostrils were asymmetrical and the nose tip had a slight deviation to the right. On intraoral examination, a scar was noted at the midline of the hard palate suggestive of a previous surgery to repair a cleft palate (Fig. 2). The palate length was found to be short by objective speech assessment. A videofluoroscopy or a nasopharyngoscopy was not deemed necessary to rule out VPI due to other factors because of the clinically apparent nasal emission that gave a clear indication that the short palate length was the primary factor. The treatment that was planned was a bilateral buccinator myomucosal flap for palate lengthening. The technique is outlined

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Fig. 1: Clinical photograph

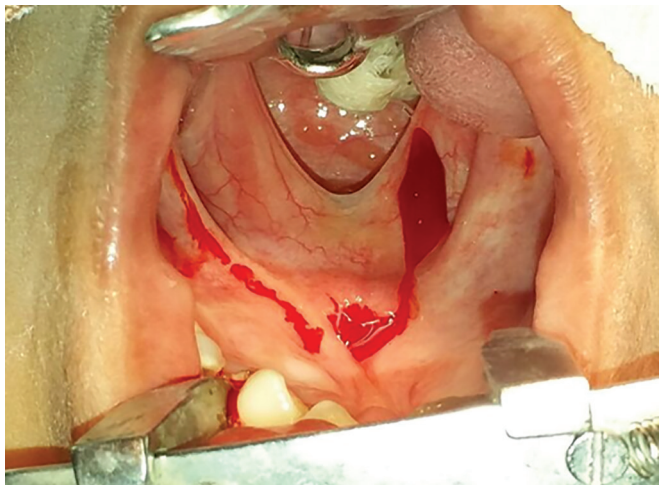

Fig. 2: Preoperative photograph showing short palate length

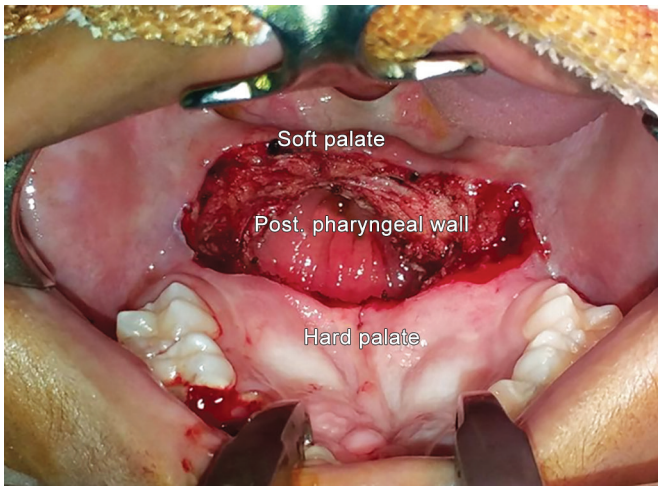

Fig. 3: Division of the hard/soft palate junction. Note that the soft palate drops posteroinferiorly, creating the defect

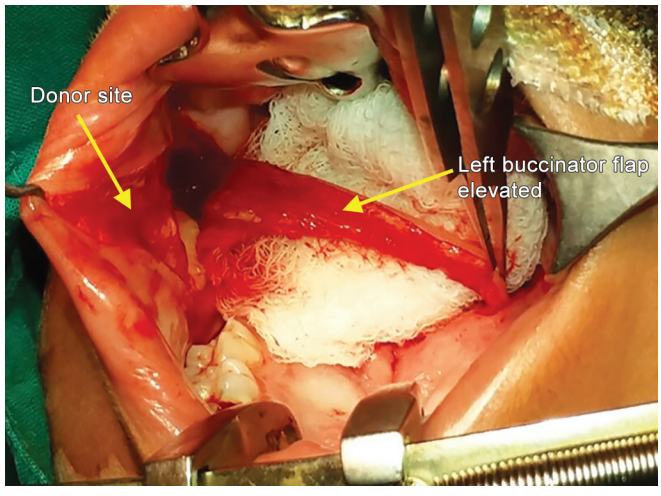

Fig. 4: Left buccinator flap elevated

as follows. The junction of the hard and soft palates is first marked and divided, detaching the soft palate and allowing it to move toward the posterior pharyngeal wall, creating the defect that will be reconstructed using bilateral buccinator flaps (Fig. 3). This flap is a random pattern flap based near the anterior pillar of the fauces. The flap is planned in the mid-part of the cheek, below the parotid papilla, adhering to a 2:1 width to length dimension; it is raised in an anteroposterior direction, including thickness of the buccinator muscle (Fig. 4). The flap can be islanded on a pedicle of buccinator muscle. The first flap raised is sutured mucosal surface upward into the nasal layer of the defect (Fig. 5); the opposite flap is then raised and sutured mucosal surface down into the oral layer of the defect (Figs 6 and 7). The donor sites on either cheek are closed directly with attention being paid to repair of the defect in the remaining buccinator muscle (Fig. 8). All patients are restricted to a strict fluid diet for a week after the surgery and are discharged when comfortable and able to manage adequate oral intake.

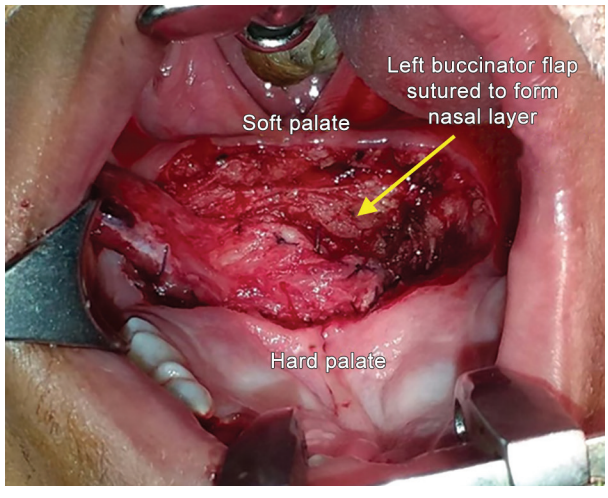

Fig. 5: Left buccinator flap with the anterior edge sutured. The mucosal surface faces superiorly to reconstruct the nasal layer defect

DISCUSSION

Palate lengthening for the correction of velopharyngeal incompetence has a long history. The buccal mucosal flap

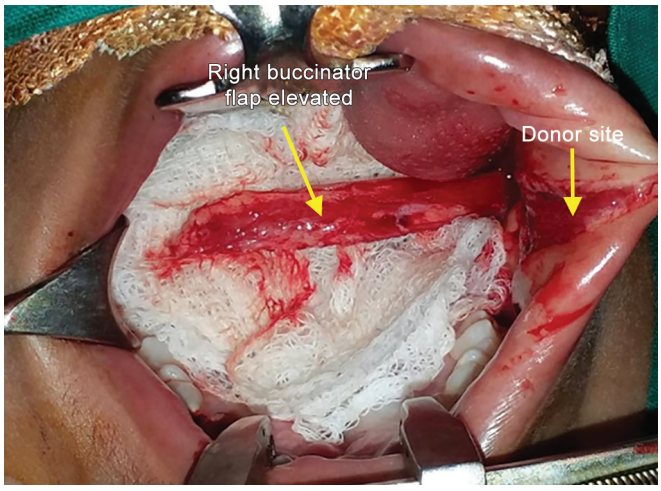

Fig. 6: Right buccinator flap elevated

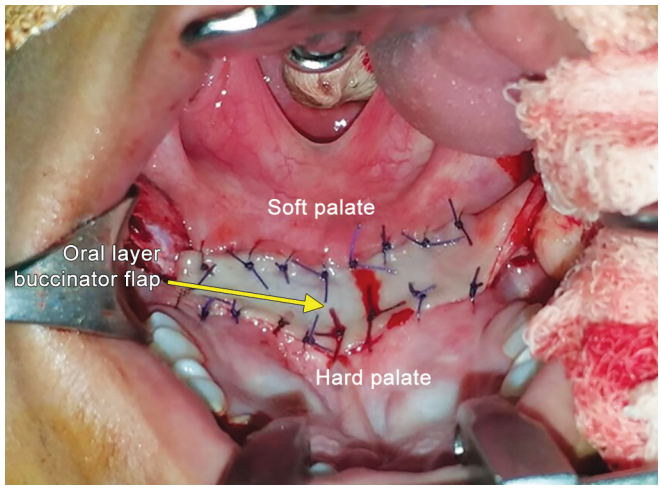

Fig. 7: Oral layer flap completely sutured in place prior to closure of the secondary defect on the right cheek

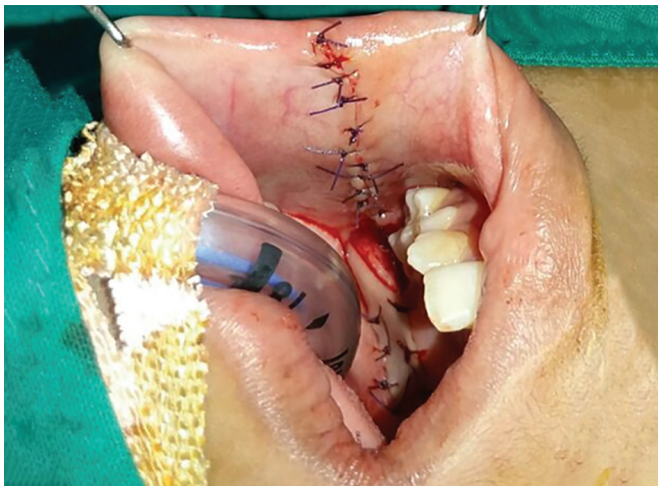

Fig. 8: Primary closure of the donor site

was described as early as the 1930s by Padgett,[7] who used the flap in salvage procedures as well as for the raw nasal layer in a Dorrance-type pushback. Blair has been cited by Padgett and others as having described the flap for similar use as early as 1922. Pushback operations were reported as early as the 1800s, but were championed by Dorrance,[8] who first reported his technique in 1925. He described an anterior incision with elevation of the mucoperiosteum of the hard palate and division of the palatine aponeurosis to allow posterior displacement of the hard and soft palate. He reported a gain in length of "one-half to three quarters of an inch." His technique was widely adopted. Its effectiveness was limited by the tethering effect of the palatine vessels and by the raw nasal surface with resultant healing by secondary intention and contracture. As a result of these drawbacks, the technique was subject to a number of subsequent modifications. Brown[9] described dissection of the palatine vessels from their foramina as a means of obtaining increased length. This was extended further by Conway,[10] who removed the posterior wall of the bony palatine canal to lengthen the vessel further. Conway also addressed the problem of the raw nasal surface using a pharyngeal flap for cover. Prior to this description, the raw nasal surface was either allowed to heal by secondary intention or grafted. Padgett[7] described the use of a cheek flap for cover of the raw nasal surface. This was, in essence, a buccinator flap but prior to its anatomy being delineated or understood. Cronin[11] elevated flaps from the nasal floor slid posteriorly, effectively moving the raw surface anteriorly onto the superior surface of the hard palate. Though the use of myomucosal buccinator flaps in cleft surgery was first described in 1969 for the primary repair of a wide cleft palate by Mukherji,[12] it was Bozola et al[13] who first formally described it and gave first description of its anatomy. The first report on the use of myomucosal buccinator flaps to lengthen the palate in secondary VPI was published by Hill et al.[14] In this prospective study carried out between 1995 and 1998, a group of 16 patients with insufficient velopharyngeal closure were managed by bilateral buccinator myomucosal flaps. According to this study, 86% of the patients had normal resonance and no patients were hyponasal postoperatively. The audible nasal escape was also significantly improved by surgery. In 2008, Robertson et al[15] described their experience with the addition of a single myomucosal buccinator flap to a palate re-repair in secondary cleft palate surgery in 20 patients with VPI or palatal fistulas. They reported a significant improvement in nasal resonance, nasal emission, and intelligibility, based on a chart review. However, their results are difficult to interpret because of the small number of patients, the absence of a blind, independent speech analysis, and the mixed indication of VPI and fistulas. Recently, Mann et al[16] published their experience with using bilateral buccinator myomucosal flaps for VPI in a retrospective review of 27 patients. The

authors described a postoperative improvement in both resonance and intelligibility. However, no blind independent speech analysis was performed, and they failed to report the nasal airflow errors of nasal air emission and nasal turbulence. In a retrospective study conducted by Hens et al,[17] 32 consecutive patients underwent the buccinator flap procedure; in 81% of patients, speech outcome was such that no further velopharyngeal surgery was considered necessary at the time of follow-up. The buccinator flap procedure resulted in a mean palate lengthening of 7.5 mm. After the operation, there was a complete elimination of the velopharyngeal gap on lateral videofluoroscopy in 77% of patients. It was also found that there were significant decreases in hypernasality ratings and passive cleft type articulation errors postoperatively.

CONCLUSION

The buccinator flap procedure is a relatively safe and easy procedure. It is an appropriate surgical option in patients in which short palate length is the primary factor in VPI.

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CASE REPORT

Postsurgical Epidermal Inclusion Cyst in the Cheek Region

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ABSTRACT

Epidermal inclusion cyst (EIC) is one of the common conditions usually associated with trauma. This cyst commonly presents on the scalp, face, neck, trunk, and extremities. Epidermal inclusion cyst is believed to originate through implantation of epidermal element by either surgical or accidental trauma into deeper mesenchymal tissue and its subsequent cystic transformation. The EICs are indolent in nature, slow to progress, and remain asymptomatic unless secondarily infected. The authors report a case of EIC that occurred in a 35-year-old female after surgery of squamous cell carcinoma.

Keywords: Epidermal inclusion cyst, Epidermoid cysts, Mesenchymal tissue.

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INTRODUCTION

Epidermal inclusion cysts are rare, slowly growing, benign, and developmental or acquired cysts which are derived from abnormally situated ectodermal tissue.[1] The terminology and nomenclature of EIC is numerous, which includes epidermal cyst, epithelial cyst, keratin cyst, follicular infundibular cyst, seborrheic cyst, milia, and so on.[2] The mainly reported cases are from the sites of face, trunk, neck, extremities and the scalp, genitals, behind the ear, fingers, palm, and soles.[3] About 7% of them are located in the maxillofacial region.

The EIC arises from traumatic implantation of epithelium or entrapment of epithelial remnants during embryonic fusion or by the surgical trauma.[4] The EIC is described as a dermal cystic enclosure of keratinizing squamous epithelium that is filled with keratin debris. The EIC usually presents as a firm, slow-growing, smooth, freely movable, painless mass or lump underneath the skin at the subcutaneous dermal level, with an intact skin surface but no apparent drainage point. It is indolent in nature, slow to progress, and remains asymptomatic, unless secondarily infected. It contains soft, cheesy-like skin secretions. The EICs are approximately twice as common in males than females, can occur at any age, but the third and fourth decade is the most common. Epidermoid cysts are the part of features of certain syndromes like Gardner syndrome, basal-cell nevus syndrome, pachyonychia congenita, which do not demonstrate cysts of the oral mucosa, but facial cysts may occur. They are treated by simple pericapsular excision.[2,3]

In the present study, we report a case of EIC, at surgically operated site of oral squamous cell carcinoma in left cheek region, whose features were rather unusual, in that, it presented as a painless fixed swelling, yellowish black in color, associated with foul smell mimicking an infection.

CASE REPORT

A 35-year-old female patient presented with swelling over left cheek area of face since 2 months (Fig. 1). It had gradually increased to the present size measuring approximately 2 × 1 cm. The patient gave the history of surgery of oral squamous cell carcinoma 9 months back in the same area. The lesion was a diffuse swelling over the left cheek, yellowish black in color with irregular overlying surface. The swelling was tender and firm on

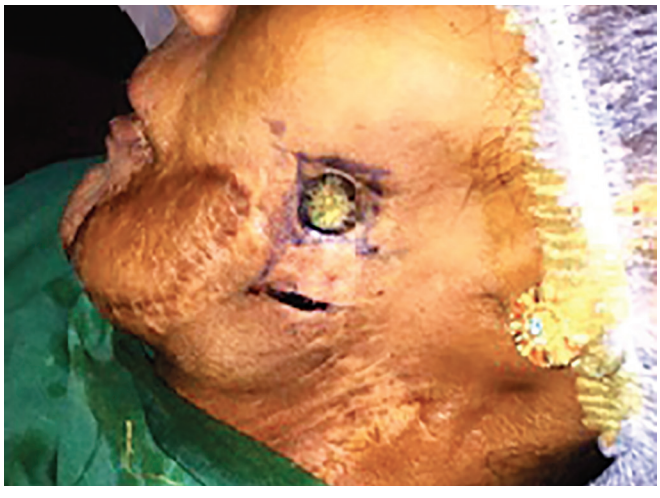

Fig. 1: 35-year-old patient with diffuse swelling over the left cheek area of the face

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palpation. A provisional diagnosis of furuncle of left cheek area was given.

Excisional biopsy of lesional tissue was performed. Gross specimen comprised a single bit of rhomboidal-shaped soft tissue, yellowish black in color having irregular surface, firm in consistency, and approximately measuring 1.8 × 1.2 × 0.6 cm in size (Fig. 2). Histopathologically, hematoxylin and eosin (H&E)-stained soft tissue section showed a cystic lumen with abundant keratin flakes lined by orthokeratinized stratified squamous epithelium of varying thickness having a distinct granular cell layer. The connective tissue capsule showed dense collagen with the subepithelial layer of chronic inflammatory cells. There was a transition from normal skin to lesional tissue. No evidence of malignancy was seen in the present section. The histopathological features confirmed the diagnosis of EIC.

DISCUSSION

The epidermal cyst is indolent, slow to progress, and asymptomatic unless secondarily infected. The oral cavity involves about 1.6% of cases, mainly in the soft tissue of the tongue and floor of mouth. The size of the cyst varies from 1 to 5 cm in diameter. Epidermal inclusion cysts usually presents as a firm, slow-growing, smooth, freely movable, painless mass or lump underneath the skin at the subcutaneous dermal level, with an intact skin surface but no apparent drainage point. They contain soft, cheesy-like skin secretions.[2] Rarely, it may cause secondary malignancy like basal cell carcinoma, Bowen's disease, squamous cell carcinoma, and even mycosis fungoides. The EICs are twice as common in men as in women.[3] In our case, swelling was diffuse, firm, and fixed to the underlying tissue with yellowish black in color and foul smelling discharge mimicking an infection. Jeyaraj and Sahoo[2] reported a similar case of EIC of the chin in a 72-year-old male patient, mimicking a submental space infection. There was recurrence within a month after excision.

The EIC cyst is one of the common condition that commonly results from the trauma to the pilosebaceous unit in the hair bearing area. However, in areas without hair, the EIC arises from epidermal inclusion secondary to trauma like sewing needle, crush injuries, or human papilloma virus infection, which results in implantation and proliferation of squamous epithelium into the dermis.[1] In our study, the cyst appeared 9 months postsurgery of the squamous cell carcinoma.

Epidermoid cysts are benign lesions, characterized by cystic spaces lined by simple squamous epithelium (epidermoid cyst), containing skin adnexa ("true" dermoid cyst) or tissues of all three germ layers (teratoid cyst).[5] On H&E examination, the cystic lining is composed of stratified squamous epithelium with glandular differentiation. The lining is filled with desquamated keratin and disposed in a laminar pattern. In the capsule, dystrophic calcification and reactive foreign body reaction are present.[3] Our study showed a cystic lumen with abundant keratin flakes (Fig. 3) lined by orthokeratinized stratified squamous epithelium of varying thickness, with a distinct granular cell layer (Fig. 4). The connective tissue capsule showed dense collagen with the subepithelial layer of chronic inflammatory cells. The lesional tissue showed transition into normal skin on either side. No malignancy was seen in the present section. The histopathological features confirmed the diagnosis of EIC.

Treatment modalities include incision and drainage but the recurrences are frequent if the keratin is not removed. The more definitive treatment of choice is surgical excision. The complications of EIC are the risk of scarring and recurrence.[2] Malignant transformation of epidermoid cyst into cutaneous squamous cell carcinoma

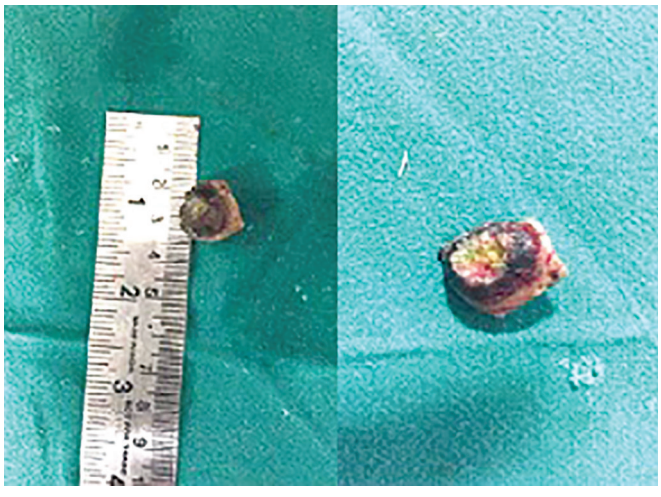

Fig. 2: Surgically enucleated specimen

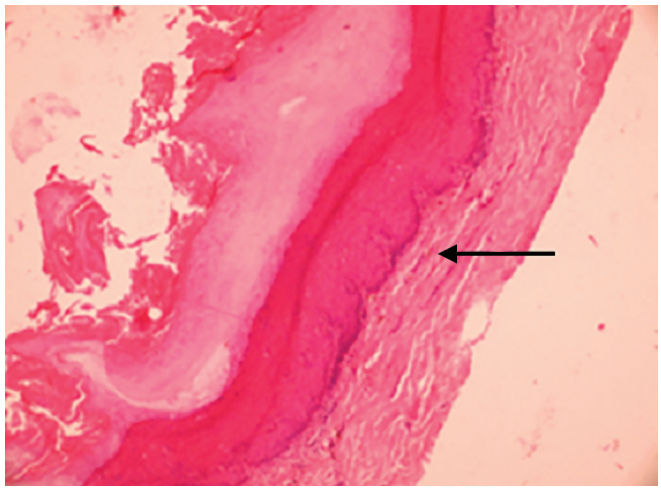

Fig. 3: H & E stained soft tissue section shows a cystic lumen with abundant keratin flakes, lined by orthokeratinzed stratified sqamous epithelium of varying thickness. (100x)

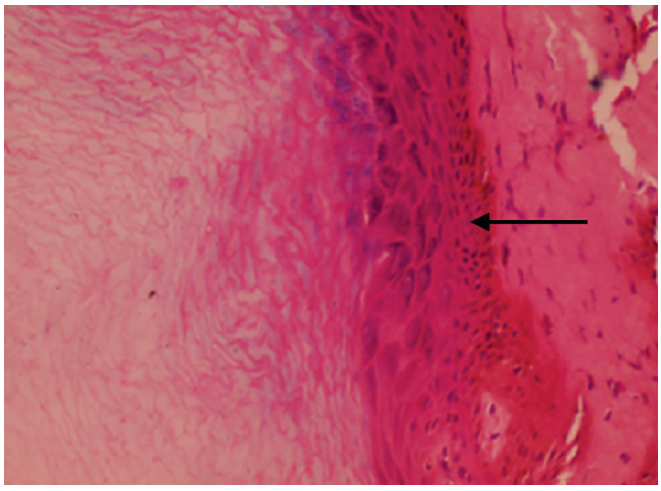

Fig. 4: H & E stained soft tissue section shows orthokeratinzed stratified sqamous epithelium, with a distinct Granular cell layer. The connective tissue capsule showed dense collagen with subepithelial layer of chronic inflammatory cells

range from 0.011 to 0.045%.[6] In our case, surgical excision was done and a 7-month follow-up showed no recurrence.

CONCLUSION

The EIC arises from epidermal inclusion secondary to postoperative trauma, which results in implantation and proliferation of squamous epithelium into the dermis. So care has to be taken to excise it *in toto*, along with the overlying skin and the punctum involved, in order to prevent recurrences from the residual keratin-producing lining of these cysts and to prevent possible malignant transformation.

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CASE REPORT

Fibrolipoma of Lip in a Young Individual: A Rare Presentation

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ABSTRACT

Lipomas are tumors of mature adipose tissue. They are commonly seen in the upper extremities, neck, shoulders, and trunk region. However, oral lipomas are relatively rare. They particularly occur in the areas of fat accumulation, especially the cheek, followed by the tongue, floor of the mouth, buccal sulcus and vestibule, lip, palate, and gingiva. Lipomas can be histopathologically classified into classic lipoma and its variant forms, such as fibrolipomas, spindle cell lipomas, intramuscular lipomas, angiolipomas, salivary gland lipomas, pleomorphic lipomas, myxoid lipomas, and atypical lipomas. There have only been a few cases reported on fibrolipoma involving the lower lip in young individuals. Herein, we present a case report on oral fibrolipoma of the lower lip in a 20-year-old female.

Keywords: Fibrolipoma, Lipoma, Lower lip

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INTRODUCTION

Lipomas are relatively rare in the oral cavity, accounting for 1 to 4.4% of all benign tumors.[1,2] Fibrolipoma is a variant of conventional lipoma. Most patients with this lesion are 40 years of age or older.[3,4] It usually presents as soft, smooth-surfaced nodular masses that can be sessile or pedunculated.[4] It is an uncommon histological variant of the classic lipoma, in which neoplastic fat cells are embedded within dense collagen.[5]

Their etiology and pathogenesis remain unclear, although mechanical, endocrine, and inflammatory influences have been reported.[6] It is suggested that the precursors of adipose cells resemble fibroblasts and that their fat content is acquired by the imbibition of soluble fat or by intracellular elaboration.[4] It is also believed that the fibroblastic component develops, independently from the fat cells, from mesenchymal cells as an intrinsic component of the lipomatous tumour. If fat cells and fibroblasts arise from the same prototype cell, this variant of a lipoma is explicable. Other combinations between lipoblastic tissues and mesenchymal structures are also possible.[4]

Histologically, lipomas are classified as simple lipoma or variants, such as fibrolipoma, spindle cell lipoma, intramuscular or infiltrating lipoma, angiolipoma, salivary gland lipoma (sialolipoma), pleomorphic lipoma, chondroid lipoma, osteoid lipoma, and atypical lipomas.[5,7]

Thus, in this article, we report a case of a fibrolipoma of the lower lip occurring in a young individual.

CASE REPORT

A 20-year-old female patient reported to the Department of Oral Pathology and Microbiology, Mahatma Gandhi Mission's Dental College and Hospital, Navi Mumbai, Maharashtra, India, with the chief complaint of a painless swelling in the right lower lip region. The swelling was noticed by the patient 2 to 3 years earlier, which gradually increased to the present size. The patient gave a history of lip biting; there was no relevant medical history. Intraoral examination revealed a solitary sessile swelling on the right labial mucosa, which was pink in color, soft-to-firm in consistency, and measuring approximately 3 × 2 cm (Fig. 1).

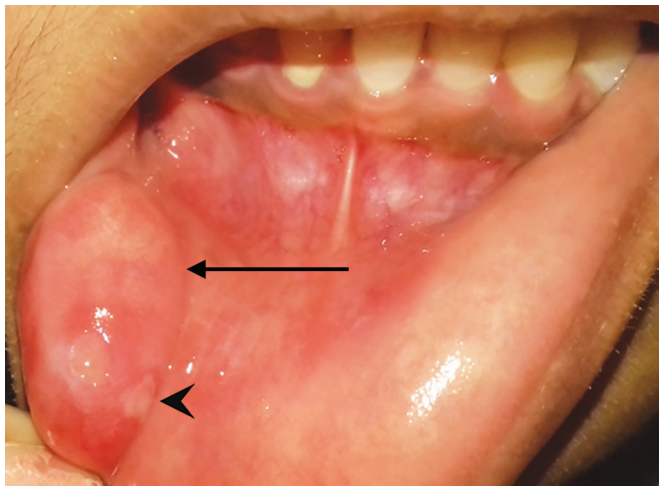

Fig. 1: Intraoral view of solitary sessile swelling on the right lower lip (arrow) showing traumatic ulcerations (arrowhead)

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Fig. 2: Intraoperative view

Fig. 3: Macroscopic view of gross specimen showing lobulated mass with a smooth surface

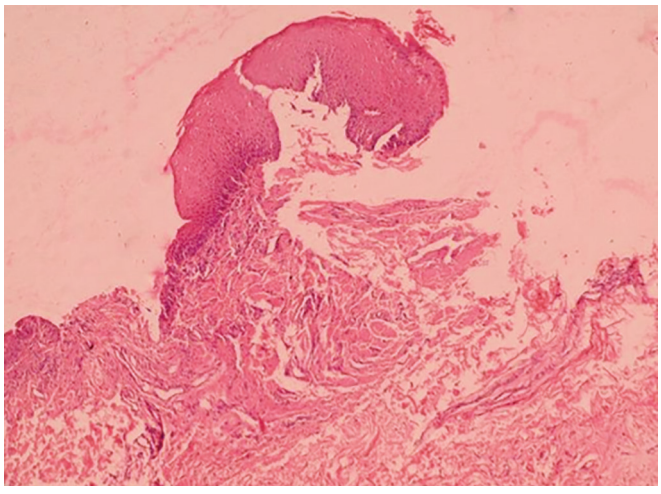

Fig. 4: H&E-stained section (100× magnification) showing a bit of parakeratotic stratified squamous epithelium with underlying dense fibrous connective tissue stroma. Denudation of the overlying epithelium is also evident

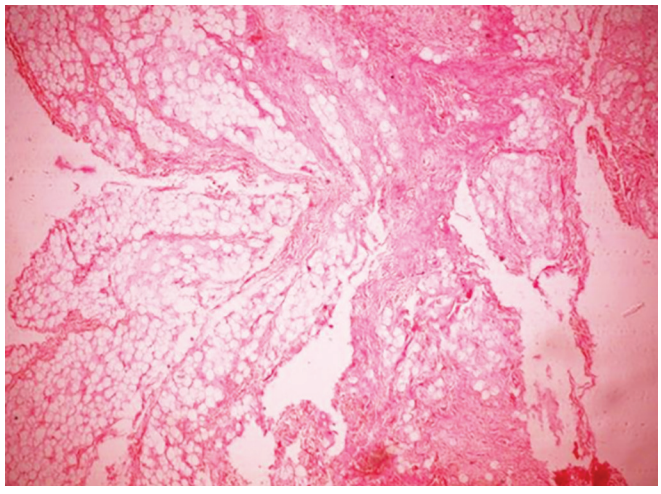

Fig. 5: H&E-stained section (100× magnification) showing connective tissue stroma with diffuse aggregates of mature adipocytes and intervening areas of fibrosis

The mucosa over the lesion showed ulcerations. A clinical differential diagnosis of fibroma, mucocele, and lipoma was made. However, other rare lesions of the lower lip reported in literature, which include schwannoma,[8] traumatic neuroma,[9] and salivary gland neoplasms,[10,11] were also considered in the clinical differential diagnosis.

The lesion was surgically excised under local anesthesia (Fig. 2) after performing routine blood investigations. After the excision, the tissue was fixed in 10% neutral buffered formalin and sent for histopathological examination.

On macroscopic examination, the single bit of tissue was oval in shape, lobulated with a smooth surface, and soft in consistency (Fig. 3). On histopathological examination (Figs 4 to 6), the hematoxylin and eosin (H&E)-stained soft tissue sections showed parakeratotic stratified

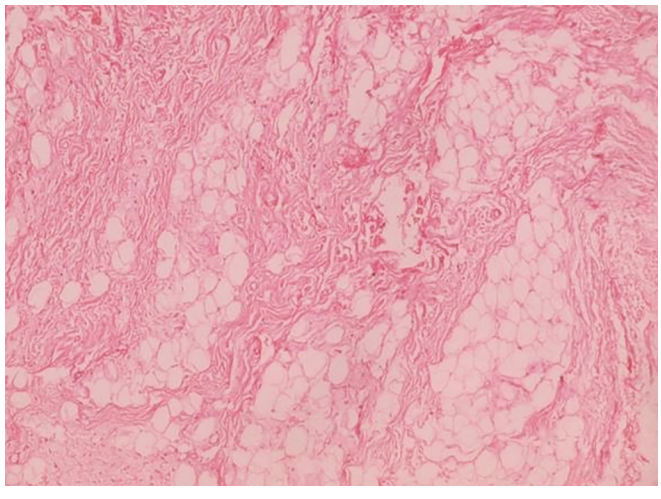

Fig. 6: H&E-stained section (400× magnification) showing mature adipocytes and intervening areas of fibrosis

Table 1: Review of cases of fibrolipoma involving lip

Author	*Year*	*Age*	*Sex*	*Site of lesion*	*Management and follow-up*
de Visscher[4,12]	1982	63 years	Male	Upper lip	Surgical excision, no recurrence
		NA	2 male patients and 1 female patient	Lip	Surgical excision, no recurrence
Bandeca et al[13]	2007	42 years	Male	Lower lip	Surgical excision, no recurrence
Capodirreo et al[14]	2008	43 years	Male	Lower lip	Surgical excision, no recurrence
Shi et al[15]	2014	6 months	Male	Dorsum of tongue and lower lip (case of cleft lip)	Surgical excision, no recurrence
Mishra et al[16]	2017	30 years	Male	Lower lip	Surgical excision, no recurrence
Present case	2017	20 years	Female	Lower lip	Surgical excision, no recurrence

squamous epithelium. The underlying connective tissue stroma showed diffuse aggregates of mature adipocytes with intervening areas of fibrosis. Thus, a diagnosis of fibrolipoma was ascertained.

DISCUSSION

Lipomas are benign, soft tissue neoplasms of adipose tissue origin and are relatively uncommon in the oral cavity, representing about 1 to 4.4% of all benign oral lesions.[1,2] Fibrolipomas are a rare histopathologic variant of lipoma. They exhibit excessive fibrosis between the fat cells and thus, are termed as fibrolipoma.[17] Most patients with fibrolipoma are of an older age.[3,4] Our case report presents a lower lip fibrolipoma in a 20-year-old female patient making it a rare presentation. The site of the lesion was also unusual, presenting on the lower lip. To the best of our knowledge, there are eight case reports in the literature in which lip fibrolipomas have been reported, out of which four have been reported to be involving the lower lip, one case involving the upper lip, and three cases where only the lip as the site is mentioned. A brief review of fibrolipoma of the oral cavity involving the lip is summarized in Table 1.

Histologically, lipomas are classified as simple lipoma or variants, such as fibrolipoma, spindle cell lipoma wherein spindle cells are observed, intramuscular or infiltrating lipoma often are more deeply situated and have an infiltrative growth pattern that extends between skeletal muscle bundles, angiolipoma in case of excess vascular channels, salivary gland lipoma (sialolipoma), pleomorphic lipoma, myxoid lipoma exhibiting a mucoid background, chondroid lipoma when chondroid stroma is evident, osteoid lipoma when osseous metaplasia is present, and atypical lipomas.[3,5,7] In our case, diffuse aggregates of mature adipocytes with intervening areas of fibrosis were seen histopathologically. Thus, it was diagnosed as a fibrolipoma.

The pathogenesis of fibrolipoma remains unclear, although various hypotheses are put forward. It has been thought to be congenital, to be caused by endocrine imbalance, or to be the product of a degenerated fibromatous tumor, arising from maturation of lipoblastomatosis.[4] In the literature on etiology of fibrolipoma of the tongue,[18] an alteration of the lipid metabolism or an anomalous localization of the fatty-fetal tissue in the tongue has been suggested. Ashley (1978) believed the fibroblastic component develops, independently from the fat cells, from mesenchymal cells as an intrinsic component of the lipomatous tumor.[4] It is thought that repeated mild trauma may trigger fatty tissue proliferation[4] as described by Kiehl[19] beneath a complete mandibular denture. Our case was in accordance to this theory as it was associated with history of lip biting.

Fig. 7: Six-monthly follow-up showing no recurrence

Surgical excision is the line of management in case of lipomas and its variants. Histopathological examination of the excised tissue is a must to determine the correct diagnosis. Prognosis of fibrolipoma is good. Recurrence is quite rare. In our case, surgical excision of the lesion with a follow-up of 6 months showed no recurrence (Fig. 7).

CONCLUSION

According to the literature, fibrolipoma of lower lip in a young individual is quite rare. Since the lower lip is composed of heterogeneous mass of tissues that can give rise to diverse lesions, surgical excision with histopathological examination is paramount in the final diagnosis.

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CASE REPORT

Diffuse Lipomatosis of Face

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ABSTRACT

Congenital infiltrating lipomatosis is a distinct clinicopathological entity. It is a type of lipomatosis that is usually found at birth or early after birth. It is designated by a collection of nonencapsulated, mature adipocytes that infiltrate local tissues, leading to craniofacial deformities. Due to its diffuse infiltration and involvement of important facial structures, a complete surgical excision is often impossible. We report a case of a 5-year-old female patient presenting with a painless swelling on the left side of her face.

Keywords: Diffuse lipomatosis, Infiltrating lipomatosis, Lipomatous tumor.

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INTRODUCTION

Congenital infiltrating lipomatosis is a distinct clinicopathological entity. It is a type of lipomatosis that is usually found at birth or early after birth.[1] It comes under the subset of lipomatous tumor-like lesions and is designated by collection of nonencapsulated, mature adipocytes that infiltrate local tissues, leading to craniofacial deformities and is prone to recur postsurgery.[2] The tumor-like lesion is congenital in origin and presents in infancy or early childhood as unilateral facial asymmetry.[3] Until date, fewer than 50 cases have been reported in English literature.[2,4] We report a case of a 5-year-old female patient presenting with a painless swelling on the left side of her face.

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CASE REPORT

A 5-year-old female patient reported to our department with a chief complaint of a painless swelling on the left middle and lower third of the face. The swelling was noticed by her parents at birth and was gradually increasing in size with age. Patient did not have any difficulty in speech or loss of hearing. There was no other relevant history.

Extraoral examination revealed gross facial asymmetry due to a solitary diffuse swelling on the left side of the face, extending from left zygomatic arch up to the left inferior border of the mandible (Fig. 1). Borders were indistinct and the skin over the swelling was normal. On palpation, there was no increase in surface temperature and the swelling was soft, nontender, noncompressible, and nonpulsatile. No lymph nodes were palpable. Magnetic resonance imaging of the patient showed hyperintense lesion obliterating left maxillary sinus in T1 images with subcutaneous fat deposition. Based on these findings, a provisional diagnosis of congenital diffuse lipomatosis was made. Patient was referred to the Department of Oral & Maxillofacial Surgery for biopsy.

Grossly, several bits of soft tissue were received with the largest rectangular bit, blackish white color, measuring 2.5 × 1.0 × 1.0 cm. Histopathological examination revealed hematoxylin and eosin-stained soft tissue section showing sinus lining comprising ciliated pseudostratified squamous epithelium with focal hyperplasia. The underlying connective tissue stroma showed varying degrees of inflammatory cell infiltration, minor salivary

Fig. 1: Clinical photograph of a patient with unilateral facial swelling on the left side

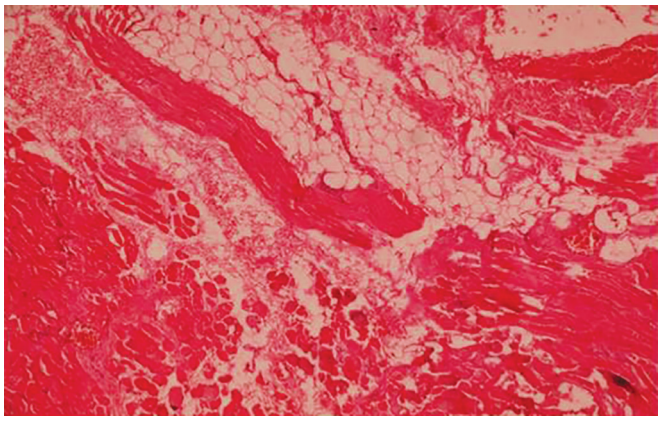

Fig. 2: Low-power photomicrograph showing mature adipocytes infiltrating surrounding structures

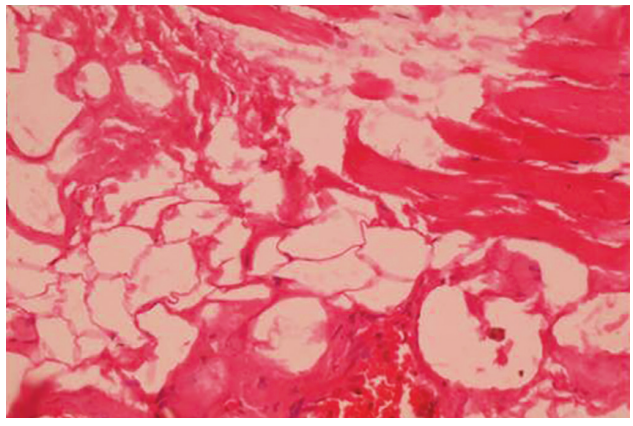

Fig. 3: High-power photomicrograph showing mature adipocytes infiltrating muscle

gland ducts with squamous metaplasia, and hemorrhage. The lesional tissue showed uncapsulated subcutaneous fat comprising lobular arrangement of adipocytes with infiltration to surrounding structures like muscle (Figs 2 and 3). The lesional fat cells with varying amounts of lipid inclusion vacuoles, peripheral rim of eosinophilic cytoplasm, and inconspicuous nucleus were intimately placed with the neuromuscular bundles. Based on these findings, the lesion was histopathologically diagnosed as diffuse lipomatosis of face, which was compatible with the clinical diagnosis. Excision of the lesion was done. However, recurrence could not be assessed as the patient was lost to follow-up.

DISCUSSION

Diffuse or infiltrating lipomatosis was defined by Enzinger and Weiss[5] as a rare, diffuse overgrowth of mature adipose tissue that usually affects large portions of an extremity or the trunk.[5] Classification given by Enzinger and Weiss composed of six entities: Diffuse lipomatosis, pelvic lipomatosis, symmetric lipomatosis (Madelung's disease), adiposis dolorosa (Dercum's disease), steroid lipomatosis, and nevus lipomatosus. Congenital infiltrating lipomatosis of the face (CIL-F) was not included in the classification by Enzinger and Weiss, and it was first described by Slavin et al[3] in 1983, as a particular entity termed "congenital infiltrating lipomatosis of the face." It differentiates from the other lipomatosis in its exclusive facial location, effects on adjacent structures, congenital nature, and specific histological characteristics.[6]

Earlier studies by Slavin et al[3] and de Rosa et al[7] have described the following characteristics of CIL-F: (1) nonencapsulated proliferation of mature adipose tissue, (2) diffuse infiltration of muscle and adjacent soft tissue, (3) presence of fibrous tissue, various nerve bundles, and vessels with thickened wall, (4) the absence of lipoblasts and signs of malignancy, despite having a fast growth rate, (5) hypertrophy of adjacent bone, and (6) being congenital in origin with a propensity to recur after surgical excision.

Etiological factors contributing to this condition, which were proposed in the previous literature, include hamartomatous origin,[3] degenerative processes with fatty transformation,[1] cytomegalovirus infection,[8-10] alterations in the neural tube during embryo development,[11] trauma, and chronic irradiation.[12] Sporadic or spontaneous somatic mutations at a mosaic state may possibly be responsible for giving rise to adipocytic stem cell to produce infiltrated lipomatosis. These mutated cells may alter the production of tissue growth factor or change the response to the receptor response, leading to aberrant formation of mucosal neuroma, bony growth, and tooth development.[10] Abnormalities in chromosome 12 also may be implicated in lipomatous change in CIL-F.[10] However, the exact pathogenesis of the condition is unclear.[12]

The CIL-F is a disorder that typically presents at birth or in early childhood as a unilateral swelling of the cheek with ill-defined borders. Though congenital, it is not hereditary. Diagnosis of the majority of the cases occurs within 2 years of life. The age of presentation varies from 3 months to 53 years. No gender predilection is noted. Slight predilection for occurrence on the left side.[13] Patients usually present with a diffuse large swelling on one side of the face that is soft, fluctuant, and nontender. The clinical presentation of facial lipomatosis is usually in the form of unilateral hypertrophy of soft tissues of the face, most commonly the cheek, with underlying fat infiltration and skeletal overgrowth,[1,3,7,12,14] macrodontia on the affected side,[3,14-16] abnormal root formation,[15] early eruption of deciduous and permanent teeth on the affected side,[14,17] macroglossia,[14,17] and protuberances on the tongue and buccal mucosa, which are representative of underlying mucosal neuromas.[14,17] Our patient was a 5-year-old female showing unilateral hypertrophy of facial soft tissues.

The histopathologic features include a nonencapsulated lesion with proliferating mature adipose tissue, which is surrounded by a dense capillary network. There is diffuse infiltration of adjacent soft tissue and presence of fibrous tissue with various nerve bundles and thickened wall vessels. The absence of lipoblasts and signs of malignancy despite a rapid growth rate is observed. It may also show hypertrophy of subjacent bone.[1,3,7] Our case also revealed uncapsulated lesional tissue comprising lobular arrangement of adipocytes with infiltration to surrounding structures.

The treatment options available are liposuction and surgical excision. Treatment is primarily for esthetic reasons.[11,18,19] Although the tumors are benign, the rate of recurrence is very high, up to 58.6% after surgical excision.[10]

CONCLUSION

Congenital infiltrating lipomatosis of the face is a rare benign disorder of lipomatous tissue in infancy or childhood. When patients with facial asymmetry are reported, this should be considered. Thorough clinical examination, imaging studies, and histopathological examination help in the appropriate diagnosis. The chief motive of surgery is to improve the cosmetic appearance of the face rather than to eradicate the tumor.

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CASE REPORT

Cleft Rhinoplasty: A Surgical Technique

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ABSTRACT

Nasal deformity, a common occurrence in unilateral and bilateral cleft lip and cleft palate patients, is a formidable challenge for the cleft surgeon. The underlying abnormal anatomy, aggravated by tissue scarring and loss of facial planes after primary procedures, makes secondary rhinoplasty a difficult procedure for even the most experienced. Over the past years, numerous techniques for secondary cleft rhinoplasty have been described in literature. Regardless of the technique adopted, the fundamental goal of cleft rhinoplasty is to achieve a nose that would be esthetically accepted in society as well as functionally accepted by the patient. The correction of nasal deformity can be performed with a closed or an open technique. This article highlights the open technique used for secondary rhinoplasty for a challenging case of unilateral cleft lip nasal deformity in an adult patient.

Keywords: Cleft rhinoplasty, Open rhinoplasty, Rhinoplasty, Rhinoplasty technique.

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INTRODUCTION

The nose is the most prominent part of the face, and so a properly executed cleft repair directs the beholders' eyes from the deformed lip to the deformed nose. A deformed nose that results from unilateral cleft of the lip and palate is likened to a tent whose one side is depressed.[1] Surgery for the primary cleft nose presents a major responsibility and challenge, which has a potential magical reward for the infant, family, and surgeon. Achieving an acceptable result is the prime responsibility of the surgeon. The cleft nasal deformity involves the skin, cartilage, mucosa, and skeletal platform.[2] Theories regarding the origin of cleft nasal deformity have been discussed extensively and continue to be debated until today. The anatomic abnormalities have been measured and documented. The proper understanding of abnormal anatomy in unilateral and bilateral cleft noses is essential in achieving satisfactory esthetic and functional results.[3]

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CASE REPORT

A 23-year-old male with a chief complaint of depressed and asymmetrical nose presented to the Department of Oral and Maxillofacial Surgery. Past medical history revealed that he was operated for cleft lip repair at 3 years of age and palate at 5 years. On extraoral examination of the nose, the septum was deviated toward the noncleft side (Fig. 1). There was short columella, and the columellar base was deviated toward noncleft side. The nasal tip was displaced and the nostrils were asymmetrical. The ala on the cleft side was flared and flattened as compared with the ala on the noncleft side and base of the ala was displaced posteriorly and inferiorly (Fig. 2).

Fig. 1: Clinical picture showing deviated dorsum of nose and ill-defined nasal tip

Fig. 2: Clinical picture showing asymmetrical nostril, short columella, and flared ala on cleft side

Fig. 3: Clinical picture showing palatal fistula 1 cm posterior to 21 and absent lateral incisor

Fig. 4: Clinical picture showing fistula in buccal vestibule

Intraoral examination revealed a palatal fistula 1 cm posterior to 21 (Fig. 3). A second fistula was noted over the buccal vestibule and absent lateral incisor (Fig. 4). Scarring of the palatal tissue was noted suggestive of previous cleft palate repair surgery. There was reverse overjet in the anterior region with crowding in premolar region and class III molars in relation to the left and the right sides.

SURGICAL TECHNIQUE

A definitive open rhinoplasty was planned for the cleft nasal deformity. The surgery was carried out under general anesthesia via South Pole endotracheal intubation. The entire face and one of the ears were prepped and draped. Oxymetazoline wet ribbon gauze was packed in both the nostrils and bilateral infraorbital nerve block was given using 1% lignocaine with 1:1,00,000 epinephrine. Local infiltration was given at lateral wall, dorsum, septum, ala, and base of the nose. An inverted "V" transcolumellar skin incision was made, at the narrowest part of the hourglass-shaped columella. Bilateral marginal incisions or infracartilaginous incisions were made just below the lower part of lower lateral cartilage, and the two incisions were joined. Blunt dissection was carried out without disrupting the footplates of lower lateral cartilage, separating the suspensory ligament.

The anterior septal angle was identified and the perichondrium was scored 3 mm posterior to the anterior septal angle until the underlying cartilage was exposed. This submucoperichondrial plane was identified by the distinct gray-blue appearance of the cartilage. Bilateral submucoperichondrial tunnels were dissected (Fig. 5), and the upper lateral cartilages were separated from the dorsal septum, releasing the entire quadrangular cartilage until the glabellar region superiorly and until the maxillary crest inferiorly. Then, an incision was

Fig. 5: Intraoperative picture showing subperichondrial dissection

made parallel to the anterior edge of the septum, from the junction of the dorsal L-strut with the perpendicular plate of the ethmoid to the junction of the caudal L-strut with the maxillary crest keeping 1 cm of nasal septum superiorly and 1 cm of nasal septum inferiorly. Using a swivel knife, septal cartilage was disarticulated from its position and then elevated using Cottles elevator. This harvested septal cartilage could be used as various grafts for dorsum, radix, ala, and base of the nose. In this case, it was used as columellar strut graft to support the septum and project the tip. To give a proper shape to the tip, an onlay graft was given, which also gave proper contour and support to the ala. To prevent septal hematoma, quilt sutures were given along the septum. Grafts were secured using Vicryl 4-0, and the cartilage was sutured back to the septum using prolene 6-0 (Fig. 6), and skin closure was done using chromic catgut 5-0 (Fig. 7). Nasal packs were given in both the nostrils. Postoperative care included head elevation, and cold compression for the first 48 hours. Strenuous activities and exercise were

Fig. 6: Intraoperative picture showing mattress sutures given at bilateral lateral cartilage and septum

Fig. 7: Immediate postoperative closure showing improved nostril symmetry

Fig. 8: Clinical picture showing 1 year follow-up

restricted for at least 2 weeks, and heavy lifting of objects was avoided for 4 to 6 weeks after surgery. Patient was advised not to sniff or blow the nose for the first 2 weeks after surgery. Instructions were given to the patient to try not to sneeze, but if it was unavoidable, sneezing through the mouth was allowed without any trauma or pressure on the nose for 6 weeks postoperatively. Patient was followed up for 1 year (Fig. 8).

DISCUSSION

Blair and Brown[4] were the first to describe the cleft nose in 1931, critically identifying the nuances of this pathology. The deformity of unilateral cleft nose involves the structural framework of the nose as well as the soft tissue envelope. The aberrant attachment of orbicularis oris muscle insertion results in an imbalance that is further compounded by the maxillary skeletal hypoplasia.[5] The orbicularis oris muscle inserts in a discontinuous manner into the columella on the noncleft side, rather than horizontal insertion and continuous decussation with the contralateral orbicularis oris as seen in the normal lip. The aberrant attachment creates an unopposed force that pulls the columella and caudal nasal septum to the noncleft side.[6] On the cleft side, the orbicularis oris muscle inserts into the nasal base, retracting it laterally and inferiorly. In addition to it, due to poor maxillary skeletal support at the alar base, the ala is further displaced posteriorly. The goals of definitive rhinoplasty include creation of nasal symmetry, definition of nasal base and tip, relief of nasal obstruction, if any, and management of nasal scarring. According to timing of surgery, cleft rhinoplasty can be classified as primary, intermediate, and secondary repair. Previously, it was believed that the early manipulation of the nasal cartilage interferes with the growth, but now multiple studies have disproved this belief.[7] McComb and Coghlan overturned the philosophy that the large submucous resections of the nasal septum affect subsequent nasal and midface growth, by demonstrating in an experimental study that repositioning of the lower lateral cartilage without cartilage resection did not interfere with subsequent nasal and midfacial development.[8]

Because of these findings, primary cleft rhinoplasty is done by the cleft surgeon at the time of initial cleft lip repair itself.[9] This early intervention benefits the surgeon for an earlier restoration of nasal shape with the potential for more symmetric nasal growth. It is important to note that any surgery done at an early age will subsequently result in scar tissue and consequently affect future surgeries. Intermediate rhinoplasty is usually performed before the cleft patient enters school, between the age of 4 and 6 years.[10] This allows the surgeon to perform any minor lip revisions, if necessary, as well as achieve better nasal tip symmetry.

Secondary rhinoplasty occurs after facial growth is completed. This is around 14 to 16 years of age in female patients and 16 to 18 years of age in male patients.[11] Surgical techniques followed rely on the well-accepted rhinoplasty principles and are applied for unilateral or bilateral cleft nasal deformities.[12] Rhinoplasty can be done either by a closed technique or an open technique. The difference between the two techniques is if the incision is taken over the columella, it is an open technique, and, if not, it is a closed technique. Since the incision is taken over the columella, the open approach is preferred for better exposure and visualization. It is a good teaching tool and yields manipulation of the nasal elements. Placement of grafts for support and reinforcement is a major component of the cleft rhinoplasty operation. Use of cartilage grafts reinforces the structural support of the nose, allowing for better tip definition, and preventing wound contracture and collapse. Some surgeons also use autologous osseous grafts like calvarial or rib graft, or alloplastic osseous grafts for better bony support. There are various incisions that can be used in open and closed rhinoplasty like columellar, Kilian, transfixion, hemitransfixion, sill incision, wedge, rim, and marginal incisions. Columellar incision is made midway between the nostril and base of the columella, at the narrowest part along the length of columella (Fig. 9).[2] Kilian incision is taken to approach the nasal septum, where an incision is made 1 to 2 cm posterior (behind) the caudal edge of the cartilaginous septum. Kilian incision is considered to be less disruptive to the nasal tip support-mechanism structures. Wedge incision is made between the nose and cheek region to narrow an alar base. Intercartilaginous incision is made at the junction of the upper lateral cartilage and the lower lateral cartilage. Sill incision is a nonspecific term used to describe an incision that narrows the alar base. Rim incision is an incision made along the rim of the nostril, and marginal incision is an incision made at the caudal (lower) end of the lower lateral cartilage (Fig. 10). In this surgical technique, the incisions used were transcolumellar and infracartilaginous or marginal incision bilaterally.

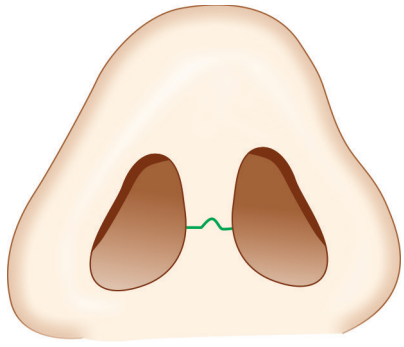


Fig. 9: Diagrammatic picture showing columellar incision

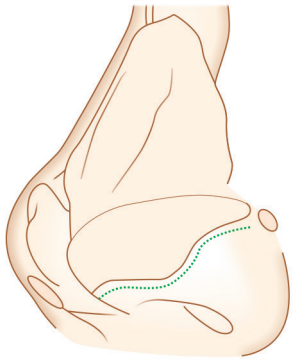
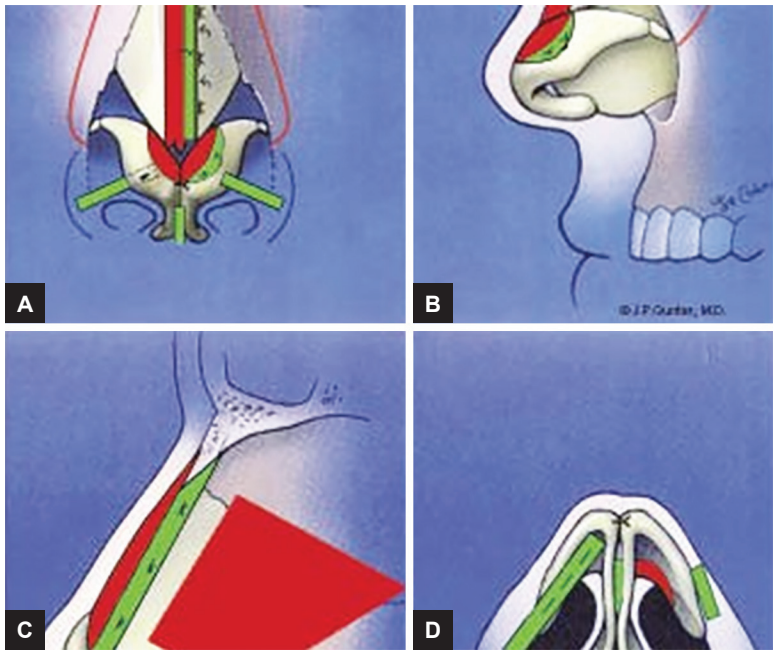


Fig. 10: Diagrammatic picture showing marginal incision

Table 1: Various grafts according to anatomic description

Dorsum	Autospreader flap
	Dorsal onlay graft
	Dorsal sidewall onlay graft (lateral nasal wall graft)
	Radix graft
	Spreader grafts
	Septal extension graft
Tip	Anchor graft
	Cap graft
	Columellar strut graft (fixed)
	Columellar strut graft (floating/fixed floating)
	Extended columellar strut-tip graft (extended shield graft)
	Onlay tip graft
	Shield graft (Sheen or infralobular graft)
	Subdomal graft
	Umbrella graft
Alar region	Alar batten graft
	Alar contour graft (alar rim graft)
	Alar spreader graft (lateral crural spanning graft)
	Composite alar rim graft
	Lateral crural onlay graft
	Lateral crural strut graft
	Lateral crural turnover graft
Base	Alar base graft
	Columellar plumping grafts
	Premaxillary graft

There are various grafts that can be used to achieve proper esthetics and function of nose (Table 1). Grafts with the help of the Gunter Rhinoplasty Diagrams (Fig. 11) are described and listed according to their intended location on the nose, and in alphabetical order within each group. The shapes, position, and usage of grafts vary depending on the situation and the desire of the surgeon. According to their intended use and anatomical location, grafts can be classified as dorsum, radix, ala, and base. In this surgical technique, the grafts used were columellar strut, onlay tip, and alar base graft. The grafts can be harvested from nasal septal cartilage, auricular cartilage, or rib cartilage. The most commonly used is septal cartilage,



Figs 11A to D: Gunter Diagram System showing color coding. Green: autologous grafts, black: sutures and outline of anatomic structures, red: incisions and excisions, orange: previous incisions or excisions, blue: implants

as it can be harvested from the same area and there is no second surgical site that automatically cuts off the duration of surgery. The only problem with septal cartilage is septal hematoma and, sometimes, the septum itself is rudimentary in severe cleft cases. With rib cartilage, there are chances of pneumothorax and also a second surgical site. Also being costochondral cartilage, it has a tendency to warp and it grows continuously, which can pose a problem later. Given the flaccidity and the convolutions inherent to auricular cartilage, it is ideal for reconstructing the lower lateral cartilages. Demerits are second surgical site and auricular hematoma. In this technique, nasal septal cartilage was used as grafts, as the amount of graft required was less, and it could be harvested from the same surgical site.

CONCLUSION

The primary concern of patients having cleft nasal deformity is unesthetic appearance, along with a constant psychological fear of being unaccepted by the society. The primary goal of rhinoplasty procedure is to restore normal form and function, thereby restoring symmetry and repositioning the nasal structures, so that further growth will not exacerbate the deformities. Cleft nasal deformity is a complicated problem that should be addressed during multiple stages of the patient's life. The cleft nasal deformity will continue to remain a challenge to the surgeons, as it requires a thorough and detailed understanding of the anatomy of cleft pathology, and accurate assessment of both esthetic and functional impairments.

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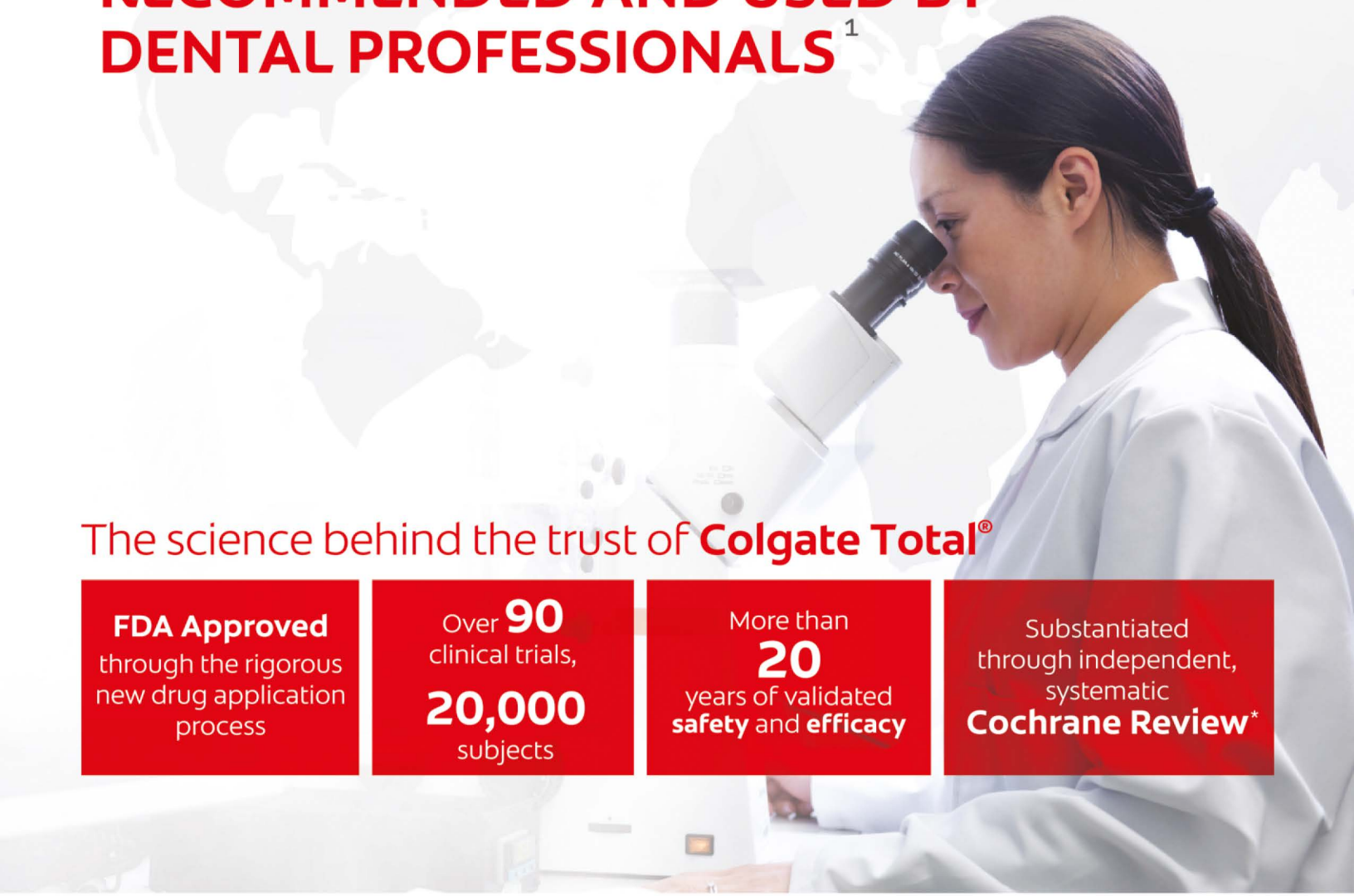

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