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President's message

Dear colleagues,

Warm regards to you all.

Unfortunately I don't think we will be able to do any worthwhile projects during this association year. The new normal is everything virtual. Online platforms can be used effectively to conduct meetings or to teach theory, but their usefulness to impart clinical knowledge is limited. Hope we will find some solutions to compensate for all the missed clinical postings for the students.

We are planning to conduct few online competitions like "Troll making competition" for undergraduate students, "Poster competition for post graduates" and "Cartoon competitions" for our member's children, along with the National Oral hygiene day. Hope we will get an overwhelming positive response.

I congratulate Dr Sameera G Nath, our Editor for promptly bringing out this second issue of SPIK journal this year.

The Covid -19 scenario in our state is much alarming now. With more and more health workers getting infected with the disease, the system is showing early signs of strain. Unless we change the present style of admitting all positive cases, the whole health care system might breakdown altogether. Anyhow the government is against another complete lockdown, which means we will be exposed to few asymptomatic Covid positive cases for sure, during our routine practice.

Our commitment, professionalism and discipline are crucial for the care we deliver to help our patients and for protecting our communities. Let us generate trust and confidence among the people that, we will be there for our patients and that we will protect our fellowmen. This should be the guiding principle during this difficult period. Since this scourge is not going to end in the near future, we can't shy away from providing necessary treatment for the needy patients. I urge you all to strictly follow the guidelines issued by the authorities and take utmost caution while treating patients and also during our social life.

"No matter what you're going through, there's light at the end of the tunnel"

Thank you and stay safe,

Dr Sabu Kurian
President, SPIK

Guest Editorial

Dr. Rosamma Joseph Vadakkekuttical

Designation: Professor, HOD Dept. of Periodontics, Govt. Dental College, Calicut
Qualification: BDS (1983), MDS 1986-under the guidance of Dr Rezy Cheru T (Govt Dental College, Thruvananthapuram, Kerala University
Work experience: 33 years
Academic Activities
Post Graduate Teacher:
From 2005 onwards (guided 30 dissertations, 26 dissertations were published in various international journals and national journals
Six Research works were abstracted in American Diabetic Association scientific conference.
Two Research works were cited in 13th edition of caranzas Clinical Periodontology
a. PhD guide Kerala University of Health Science
Administrative duties: served as
Chairperson board of studies (UG) faculty of dentistry Calicut University from 2007 to 2010
Member board of studies (UG) Calicut university 2010 -2013
Member board of studies (PG) KUHS (2011-2015.)
Member secretary institutional ethics committee Government Dental college Calicut from 2011 to 2018
Member institutional research committee Government dental college Calicut
Recipient of best doctor award 2010 (Govt of Kerala)(dental education category)
Papers Published:- Several International and National publications (53 papers with 341 citations)
Reviewer of several journals.

PERIODONTAL RESEARCH AND CLINICAL PRACTICE - TWO SIDES OF A COIN

"The common facts of today are the products of yesterday's research"

– Duncan Macdonald

Periodontal disease is one of the most common chronic diseases that affect mankind from the dawn of the history. Periodontitis is an infectious inflammatory disease triggered and aggravated by dysbiosis of subgingival microbiota. Multiple risk factors like environmental factors, systemic and local factors, and genetic predispositions may modify an individual's phenotypic response to the bacterial challenge and their response to periodontal therapy. Focus on clinical experience and research evidences will help in delivering advanced treatment options.

Research is vital for the progress of clinical practice, public health programmes and academic training. Doing research scientifically and systematically has paramount importance in evidence -based decision making in periodontal therapy. The ultimate goal of periodontal research is to prevent the occurrence of periodontal disease, control the disease progression, and deliver proper and advanced treatment. The Chronic nature and uncertainty in disease progression may pose problems in periodontal research. Research and clinical practice are the two sides of a coin that are interrelated and cannot be viewed separately. Evidence from good quality research should be included for the refinement of the treatment protocol and to justify the decision making in clinical practice. Systematic review and meta-analysis are the highest levels of evidence. A Clinician must be familiar with the literature and update himself with the recent advances; while a researcher should be keen to identify the lacunae of knowledge and gray areas in the field of research. A researcher/clinician must focus on ideal endpoints that are clinically meaningful with tangible benefits to the patient that will ultimately favour the overall quality of life.

In our scenario, although we have good research work, unfortunately the visibility and reach of our work amongst peers, and the citations of our publications are limited. High quality research with a novel hypothesis, proper study design, and accurate data analysis will improve our research profile. We have miles to go to keep our research at par with international standards and to recognize globally.

"Today's clinical observation may become tomorrow's research question".

Secretary's Message

Dear SPIK members,

"Nothing ever goes away until it has taught us what we need to learn" – Pema Chodron

The learning curve of the "new normal" seems to be still in its ascendancy as we are gradually adjusting to a new order of living. The COVID-19 scenario has affected people from all walks of life albeit in different ways. We, as Periodontists and Dental Surgeons at large, are among those who are experiencing a professional setback. At the same time, it is heartening to see that all our members are keeping safe and many of them have kept themselves engaged in various academic, social, artistic, and service activities, which is a great motivation for others.

Our planned activities for the year 2020 have also been affected to a major scale by the current scenario. Within our limitations, we could however, organize an online event in connection with National Oral Hygiene Day on August 1. In association with IDA Trivandrum and IDA Malanadu, we conducted online E-Poster competition for post-graduate students, troll making competition for under-graduate students and IDA members and a cartoon competition for kids. We had a fairly good participation in all the events. I thank Dr Harikumar Menon, Dr Baiju R M and Dr Ambili R for judging the posters. The efforts of our executive member Dr Manikandan in organizing this program are specially appreciated.

Let me sincerely appreciate our Editor, Dr Sameera for her continued efforts in ensuring the publication of JSPIK at regular intervals. Once again, I request all members and post-graduate students to utilize this platform for sharing their valuable clinical and research work.

SPIK salutes all frontline COVID warriors and pays homage to all those who departed us in this battle. Let's hope that this pandemic ends soon and normalcy is restored in all our lives. Stay safe

Regards

Dr. Jayan Jacob Mathew
Secretary, SPIK

JSPIK

Awareness on Periodontal Health among the Teaching Faculty in K.S.R Group of Colleges – A Questionnaire Study

Sonika S.[1], Esther Nalini H.[2], Arun Kumar Prasad P. [3], Renuka Devi R.[4]

ABSTRACT

Aim: To assess the awareness on periodontal health among the teaching faculty in K.S.R group of colleges and to compare their level of awareness in relation to gender and teaching experience. **Materials and methods:** This cross sectional study was conducted among the teaching faculty in K.S.R group of educational institutions using a questionnaire with fifteen closed ended questions related to periodontal health. **Results:** Among the 603 teaching faculty, 348 were males and 255 were females, 268 teachers has <5 years of teaching experience and 355 teachers has >5 years of teaching experience. Males showed a statistically significant awareness compared to females regarding harmful effects of smoking on periodontal health and oral cavity as a reflection of general health ($p<0.05$). Teachers with >5 years of teaching experience showed a statistically significant awareness compared to teachers with <5 years of teaching experience regarding their dental visit, role of microorganisms in causing periodontitis, harmful effects of smoking on periodontium ($p<0.05$). **Conclusion:** Dental health education programme has to be conducted among the teaching faculty of non-health care stream of colleges to enrich their knowledge about etiology, clinical features, complications of periodontitis and its interrelationship between systemic and periodontal health.

KEY WORDS: periodontitis, periodontal health, teachers, questionnaire, gender, teaching experience.

Introduction

Periodontitis is considered to be the multifactorial inflammatory disease affecting the quality of life.[1] It occurs irrespective of age, gender and race.[2] Preventing the occurrence of any particular disease is considered to be better rather than treating the disease. The occurrence of periodontitis can be controlled globally through proper oral health education. Oral health is the basic and indispensable part of general health and well-being.[3] Haleem et al[4] reported that dentist led, teacher led and peer led oral health education are equally effective in promoting oral health knowledge.

Teachers can successfully educate and train their students regarding the maintenance of oral health if they are properly instructed by dentist. Thus many studies have been conducted so far to evaluate the awareness on periodontal health among the college students[5-7] and especially school teachers[8-11] Promoting oral health education among the young energetic, matured college students through their teaching faculty instructed by dentist would be more effective to bring out improvement in the maintenance of their oral health. However only one study is available in the literature about the awareness on periodontal health among the teaching faculty of non-medical courses in Iraq.[12] Periodontal health awareness among teaching faculty of non-medical colleges in India, especially in Tamilnadu state has not been focussed in the literature. Thus this study was conducted primarily in order to determine the awareness on periodontal health among

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AWARENESS OF PERIODONTAL HEALTH AMONG THE TEACHING FACULTY IN K.S.R GROUP OF COLLEGES

NAME* (Not mandatory): S.NO:

AGE / SEX: DATE:

QUALIFICATION:

TEACHING EXPERIENCE: A) <5 years B) > 5years

NAME OF THE COLLEGE:

INSTRUCTION:

Read the questions carefully and tick (✓) the appropriate answer.

1. Have you ever visited a dentist?

A) Yes B) No

If yes what was the reason of your last visit?

A) Cleaning the teeth B) Filling the teeth C) Removing the teeth D) Replacing the lost teeth

E) Alignment of teeth F) Others (Specify) ……..

2. Do you think that there is a speciality in dentistry to deal specifically with your gum problems?

A) Yes B) No C) Do not know

3. Do you think that our mouth harbours millions of microorganisms?

A) Yes B) No C) Do not know

4. Do you think that food debri / soft deposits which contain microoganisms could cause gum disease?

A) Yes B) No C) Do not know

Figure 1 a: Part 1 of the questionnare

5. Do you think that bad breath could be due to gum disease?

A) Yes B) No C) Do not know

6. Do you think that bleeding gums while brushing / chewing is an alarming sign of presence of gum disease?

A) Yes B) No C) Do not know

7. Do you think that gum disease cause shaky teeth (Mobility) and lead to loss of teeth?

A) Yes B) No C) Do not know

8. Do you think that gum disease may cause receeding gums?

A) Yes B) No C) Do not know

9. Do you think that you need to get scaling (cleaning) done by dentist every six months to maintain healthy gums?

A) Yes B) No C) Do not know

10. Do you think that smoking may affect your gums?

A) Yes B) No C) Do not know

11. Do you think that stress may alter your oral health?

A) Yes B) No C) Do not know

12. Do you think that mouth is a mirror which reflect your general health?

A) Yes B) No C) Do not know

13. Do you think that gum disease increase the risk of heart disease?

A) Yes B) No C) Do not know

14. Do you think that there is a relationship between gum disease and diabetes?

A) Yes B) No C) Do not know

15. Do you think that there are risks / complications associated with gum disease in a pregnant women?

A) Yes B) No C) Do not know

Figure 1b: Part 2 of the questionnaire

the teaching faculty of K.S.R group of colleges.

Materials and methods

This cross sectional study was conducted among the teaching faculty in K.S.R group of Colleges which include Polytechnic, Arts and Science, Engineering and Technology at Tiruchengode, Namakkal district, Tamilnadu from February 2019- March 2019. The study tool used in this study was self- developed, administered and validated questionnaire. The questionnaire consisted of two parts (Figure 1a, b):

Part 1- Demographics which included age, gender, number of years in teaching practice.

Part 2- included 15 closed ended questions related to periodontal health.

The questionnaire were distributed among the teachers during their free hours and collected. Out of 700 teachers, 603 teachers had fully completed and returned the questionnaire and the response rate of this study was found to be 86.1%. The periodontal awareness was considered to be a dependent variable and gender and teaching experience were considered as independent variables.

Statistical analysis

The results are presented in numerical form, computed, analysed using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA,Version 20.0 for Windows). The test of association was done using chi square test with p value set at 0.05 significance level.

Part 1: Demographic characteristics

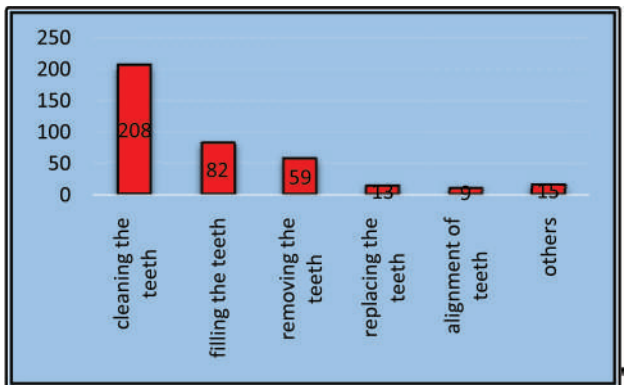
Among the 603 teaching faculty, 348 were males (57.7%) and 255 were females (42.3%). 268 (44.4.%) teachers has less than five years of teaching experience and 355 (55.6%) teachers has more than five years of teaching experience.

Part 2: Response to the questionnaire

1. Dental visit by the teachers

Among the 603 teachers, 64% of teachers have visited the dentist so far and the remaining 36% of teachers have not visited the dentist. Male teachers (37.6%) and teachers with more than five years of teaching experience (39.6%) has visited the dentist more compared to female teachers (26.4%) and teachers with less than five years of teaching experience (25.2%).

Table 1 illustrates the dental visit of the teachers in relation to their gender and teaching experience, and Graph 1 shows the reason of their last visit to a Dentist.



Graph 1: Reason of the last dental visit

Table 1 : Dental visit by the teachers

Dental visit		Gender (Male /Female)			Experience (No of years)		
		Male	Female	Total	< 5 years	>5 years	Total
Visited	n	227	159	386	152	239	391
	%	(37.6%)	(26.4%)	(64%)	(25.2%)	(39.6%)	(64.8%)
Not visited	n	121	96	217	116	96	212
	%	(20%)	(16%)	(36%)	(19.3%)	(15.9%)	(36%)
p value		0.778			0.0*		

(n- number of teachers, % - percentage of teachers, p value –probablity value, * -Statistical significance)

2. Awareness about the speciality of Periodontics in dentistry

About 351 (58.2%) teachers were aware of the Periodontics speciality in dentistry. Male teachers 188 (31.2%) and teachers with more than five years of teaching experience 202 (33.5%) were found to be more aware compared to female teachers 163 (27%) and teachers with less than five years 149 (24.8%) of teaching experience. However there is no statistically significant difference in relation to gender (p-0.3) and experience (p-0.59).

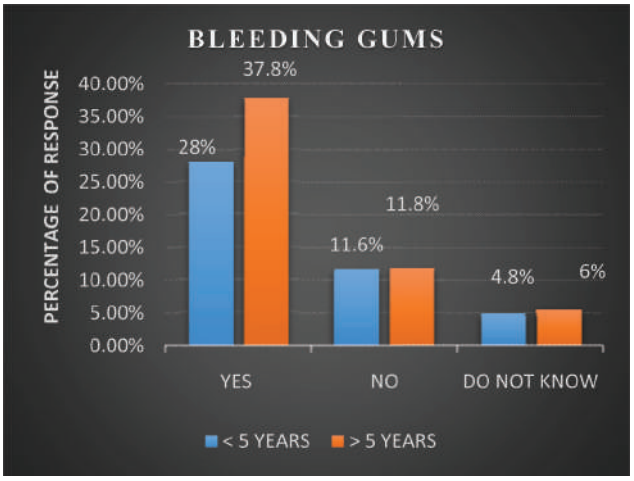
3. Awareness regarding the etiology of Periodontitis

About 421 (69.9%) teachers were aware about the presence of microorganisms in oral cavity. Male teachers 229 (38%) and teachers 249 (41.2%) with more than five years of teaching experience were more aware compared to female teachers 192 (31.8%) and teachers with less than five years of teaching experience 172 (28.7%).

About 437 (72.5%) of teachers are aware about the role of food debri / soft deposits in causing periodontal disease. Male teachers 247 (40.8%) and teachers with more than five years of teaching experience 247 (40.8%) were more aware compared to female teachers 190 (30.5%) and teachers with less than five years of teaching experience 190 (30.5%). This question has no statistically significant association in relation to both gender (p-0.2) and teaching experience (p-0.7). This is denoted in table 2.

4. Awareness regarding the clinical features of Periodontitis

a. Halitosis: 59.4% of teachers were aware about that halitosis could be due to periodontal disease. Male teachers 200 (33.2%) and teachers with more than five years of teaching experience 201 (33.3%) were more aware compared to female teachers 158 (26.2%) and teachers with less than five years of teaching experience 157 (26.1%). This question also showed no statistical significance in relation to gender (p-0.7) and



Graph 2: Bleeding gums

Table 2 : Illustrates the awareness of teachers regarding the etiology of Periodontitis.

Awareness on etiology of Periodontitis											
Q. 3: Mouth harbous - microrganisms						Q.4: Plaque –periodontal health					
Response		Gender		Experience		Response		Gender		Experience	
		M	F	<5yrs	>5yrs			M	F	<5yrs	>5yrs
Yes	n	229	192	172	249	Yes	n	247	190	190	247
	%	38	31.8	28.7	41.2		%	40.8	31.5	31.5	40.8
No	n	68	36	51	53	No	n	60	37	44	53
	%	11	6	8.5	8.8		%	10	6.1	7.3	8.8
Do not know	n	51	27	45	33	Do not know	n	41	28	34	35
	%	8	4	7.4	5.5		%	6.8	4.6	5.6	5.8
p-value		0.06		0.018*		p-value		0.2		0.7	

(n- no of teachers, %- percenatge of teachers, M- male, F- female, Q- Question * - p value significance)

teaching experience (p-0.7).

b. Bleeding gums: 65% (397) of teachers were aware of the bleeding gums as an objective sign of periodontal disease. Male teachers 214 (35.5%) and teachers with more than five years of teaching experience 228 (37.8%) were more aware compared to female teachers 183 (30.3%) and teachers with less than five years of teaching experience 169 (28%). This is not statistically significant in relation to gender (0.05). Graph 2 illustrates that there is a statistically significant difference about the awareness of bleeding gums among the teachers in relation to teaching experience. (p value- 0.02*).

c. Mobility: 338 (56.1%) teachers were aware about mobility of teeth as one of the consequences of the periodontitis. Male teachers 186 (30.8%) and teachers with more than five years of teaching experience 188 (31.1%) were more aware compared to female teachers 152 (25.3%) and teachers with less than five years of teaching experience 150 (25%) which are not statistically significant in relation to both gender (p-0.2) and experience (p-0.9).

d. Gingival recession: Only 265 (43.9%) of teachers [male- 153 (25.4%), female- 112 (18.5%), >5 years experience-24% and <5 years experience- 19.9 %] were aware about the receeding gums in periodontal disease.

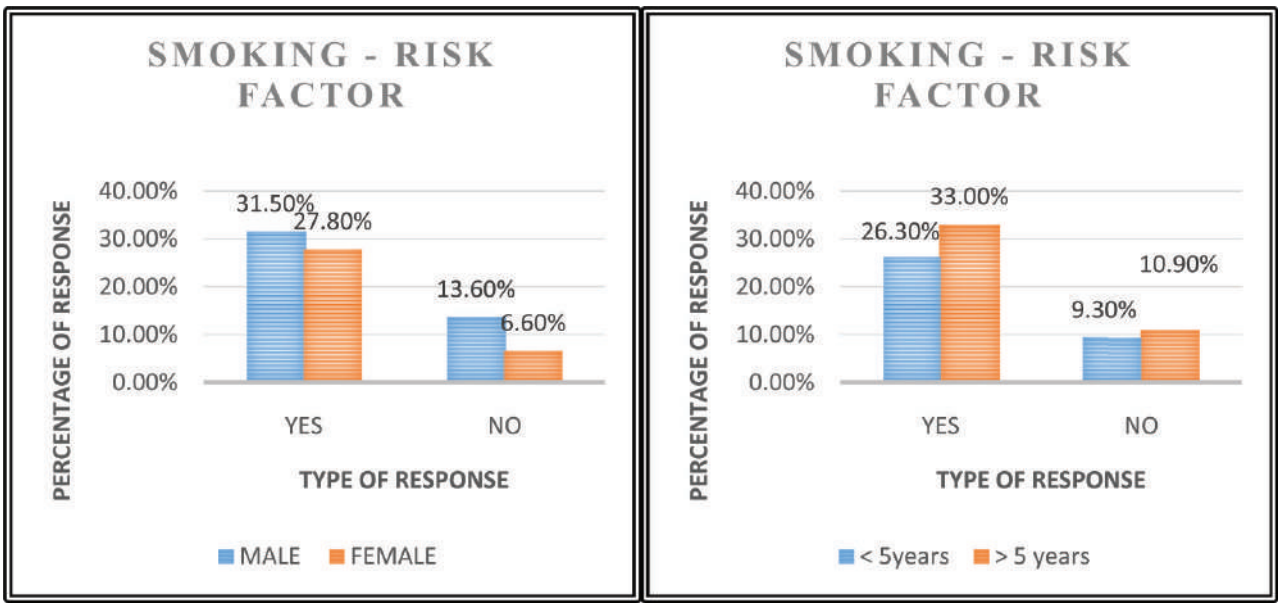
5. Awareness regarding the significance of scaling

325 (53.8%) of teachers were aware about the significance of scaling every six months to maintain healthy periodontium. Male teachers 178 (29.5%) and teachers with more than five years of teaching experience 174 (28.9%) were found to be more aware compared to female teachers 147 (24.4%) and teachers with less than five years of teaching experience 147 (24.4%) which was not statistically significant in relation to both gender (p-0.1) and experience (p-0.5).

6. Awareness regarding the effect of risk factors on periodontium

a. Smoking: 358 (59.3%) of teachers were aware about the harmful effects of smoking. Graphs 3a&b illustrates that male teachers 190 (31.5%) and teachers with more than five years of teaching experience 199 (33%) were found to be more aware compared to female teachers 168 (27.8%) and teachers with less than five years of teaching experience 159 (26.3%). It is statistically significant in relation to both gender (p-0.020*) and experience (p-0.001*).

b. Stress: 333 (55.2%) of teachers were aware about the influence of stress over periodontal health. Male teachers 173 (28.7%) and teachers with more than five years of teaching experience 174 (28.8%) were



Graph 3a, b : Smoking as a risk factor assessment based on gender & teaching experience

found to be more aware compared to female teachers 160 (26.5%) and teachers with less than five years of teaching experience 159 (26.4%).

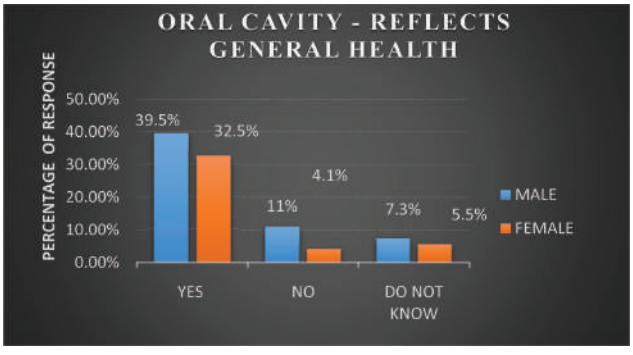
7. Awareness regarding the relationship between systemic health and periodontal health

a. Oral cavity – reflecting general health of an individual: 435 (72%) of teachers agree that mouth is a mirror which reflect the general health of an individual. Male teachers 238 (39.5%) were found to be more aware compared to female teachers 197 (32.5%) which is statistically significant (p-0.02*). Teachers with more than five years of teaching experience 248 (41%) were found to more aware compared to teachers with less than five years of teaching experience 187 (31%) which is not statistically significant (p-0.7).

b. Relationship between periodontitis and cardiovascular disease: Only 198 (32.8%) of teachers [(male-106 (17.6%), female- 92 (15.2%), >5 years experience- 111 (18.4%) & <5 years experience- 87 (14.4%)] were aware about the inter-relationship between the periodontal disease and cardiovascular disease.

c. Relationship between periodontitis and diabetes mellitus: Only 174 (28.8%) of teachers [male- 95 (15.7%),female- 79 (13.1%), > 5 years experience- 97 (16%) and <5 years experience- 77 (12.8%)] were aware about the two way relationship between the periodontal disease and diabetes mellitus.

d. Awareness regarding the risk/ complications associated with periodontitis during pregnancy: About 209 (34.7%) teachers [male- 108 (18%), female- 101 (16.7%), >5 years experience- 111 (18.4%) and < 5 years experience 98 (16.2%)] were aware about the risks associated with periodontal disease in a pregnant women.



Graph 4: Mouth – reflects the general health

Discussion

The teachers being trained persons and because of their close relationship to their students, play a determining role in disseminating knowledge on oral health and practice. They are known to exert a considerable influence on their pupils and to an extent in the society as well.[13] Many studies have been done so far among the students in colleges,[5-7] school teachers[8-11] regarding their awareness on periodontal health.

Andhare et al (2017)[6] conducted a study among the medical and dental undergraduates and they found statistically significant difference between the medical and dental undergraduates in brushing their teeth twice daily, routine dental visit for oral hygiene maintenance, self-perception for halitosis, and treatment taken for halitosis. The significant difference of oral hygiene practice in dental students is mainly due to their dental education experience. They concluded that medical undergraduates who lack oral health education should be motivated in near future about the maintenance of oral health.

Malla et al (2017)[7] conducted a study among 120 students of first, second and third year BDS students and they found that the 75% students were not practicing oral hygiene practices regularly in spite of having good knowledge about periodontal health (55%). The authors concluded that students failed in oral hygiene practice because of their lack of exposure into clinical practice during the first three year period of BDS course.

Azoda et al (2015)[8] conducted a study among 180 Nigerian primary school teachers and they found poor awareness among them regarding etiology, age, gender predisposition, manifestation and complications of periodontitis. They also found that 95.4% of teachers showed interest in knowing about periodontal disease in future through workshops and lectures.

Alsheri et al (2017)[9] did a study among 535 government primary school teachers in Aseer region, Saudi Arabia using a pretested questionnaire and found that teachers gained knowledge on periodontal health mainly through non reliable sources which include social media (44%) and television (39%) sources. Thus the authors concluded reliable dental health education should be promoted among them through dental pro-

fessionals for a better understanding of periodontal health and maintenance.

Tikare et al (2017)[10] conducted a study among 1186 primary school teachers from 61 primary schools in Saudi Arabia and they found that the teachers were found to be unaware about the consequences of Periodontitis due to certain barriers like, lack of material resources (21%), lack of professional training (25%), lack of availability of time (25%), lack of support from school administration (22%), and teacher's attitude (7%).

Jagan et al (2018)[11] conducted a study among 240 school teachers of Sullia taluk, Dakshina Kannada district, South India and they found a consistently better Comprehensive measure of oral health knowledge score among the primary school teachers {0.003(0.001-0.011)} compared to high school teachers {0.003(0.001-0.012)}. They concluded that primary school teachers are constantly trained, retained in the educational system and thus having a better knowledge on oral hygiene status compared to high school teachers.

There is only one study in the literature conducted by Hanau et al (2014)[12] which assessed the periodontal health awareness and behavior among 352 lecturers from non-medical colleges of Bhagdad city, Iraqi university. They concluded that only 27% of participants considered dental plaque as the main cause of periodontal disease, 47.1% agreed bleeding on brushing as the main sign of periodontitis. 52.8% were satisfied with the dental health services in Iraq and majority of them (82.4%) felt that the cost of dental treatment in Iraq was too high.

Hence this study was conducted to evaluate the awareness on periodontal health among the teaching faculty of Polytechnic, Arts and science and Engineering and technology colleges of K.S.R group of educational institutions in Namakkal district, Tamilnadu, India. Considering the dental visit by the teachers, male teachers (37.6%) has visited the dentist more compared to female teachers (26.4%) which is contrast to the studies conducted by Alsheri et al (2017),[9] Harikiran et al (2008)[14] in which they stated that females would tend to have a better oral health conscious than the males.

Male teachers 188 (31.2%) and teachers with more than five years of teaching experience 202 (33.5%) knew about the Periodontics speciality in dentistry. Hence more awareness about the specialities available in dentistry especially Periodontics has to be created among the teachers in future.

69.9% of teachers in the present study were aware about the role of micro-organisms in causing periodontal disease which is comparatively higher than the studies conducted by Hanau et al (2014)[12] and Manjunath et al (2019)[15] in which the percentage of awareness were found to be only 27% and 37.5% respectively. Thus teachers of this study have a sound knowledge about the etiology of periodontitis.

Percentage of teachers who were aware about the clinical features of periodontal disease were halitosis -59.4%, bleeding gums -65%, mobility -56.1% and gingival recession -42.1%. Thus majority of teachers considered bleeding gums as one of the important signs of periodontal disease which is similar to studies conducted by Hanau et al (2014)[12] and Abdulaziz et al (2017).[16]

52.7% of teachers were aware about the significance of oral prophylaxis in maintaining periodontal health which is comparatively less compared to the studies conducted by Sekar et al (2014)[17] in which about 59% teachers believed.

Among the environmental risk factors evaluated male teachers and teachers with more than five years of teaching experience considered smoking has a negative influence on periodontal health which is similar to the studies conducted by Sekar et al (2014)[17] and Alsheri et al (2017).[9]

The teachers of this present study lacked adequate knowledge about the relationship of systemic health to periodontal health in relation to cardiovascular disease, diabetes, pregnancy. Male teachers (108) were more aware compared to female teachers (101) about the risks associated with periodontal disease in a pregnant women which is controversial. Asaad et al (2015)[18] did a study among pregnant women in central and eastern regions of Saudi Arabia and he stated that women had limited knowledge about the relationship between periodontal disease and pregnancy. Thus

relationship between systemic health and periodontal health has to be emphasised among the teachers.

Limitations

Pilot study was not conducted in this study to assess the reliability of the questionnaire. Moreover the study is conducted among the teaching faculty of various educational streams of one particular institution. The awareness of teachers in different educational streams (polytechnic, arts and science, engineering and technology) on periodontal health was not compared. Thus in future multicentre studies has to be conducted by recruiting teaching faculty from different educational institutions to assess their overall awareness towards the periodontal health.

Conclusion

Teachers who are said to be the king makers of the upcoming modern society play a vital role in developing the moral values and practices among their students along with the basic curriculum. Thus teachers acts as a bridge between the dentist and students in promoting the dental health. Involvement of dental professionals in the supervision of teachers in the area of oral health may be helpful and should be advocated. Thus regular oral health care promotional activities has to be conducted in near future among the teaching faculty which would offer teachers to create a healthy smile among the students and thereby in the society.

Acknowledgement:

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Conflicts of interest: There are no conflicts of interest.

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Lasers in Implant Dentistry- A Blessing in Disguise

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ABSTRACT

Dental implants and lasers have revolutionized the field of dentistry over several decades. Dental implant as a treatment option in rehabilitation of edentulous arch is becoming a common practice worldwide. As a need of improvement in efficacy of implant dentistry lasers have been introduced as an adjunct for a better outcome. Laser systems have several applications in soft and hard tissues. Lasers primarily used in the field of implant dentistry are solid state lasers Nd:YAG, Nd:YAPEr:YAG, Er,Cr:YSGG, semiconductor diode lasers, and gas lasers such as carbon dioxide lasers. Applications of dental lasers in implantology have been proposed for clinical uses such as, removal of granulation tissue prior to implant placement, as haemostats, laser aided osteotomy, in second stage uncovering of implants, for decontamination of implant surface, laser irradiation to accelerate osseointegration, photodynamic therapy in implantology, laser welding of implant supported metal frameworks, laser applications in the dental laboratory, lasers to promote wound healing. The aim of this article is to introduce the reader to laser application and its use as an adjunct in implant dentistry.

Key Words: lasers, implant dentistry, osseointegration, photodynamic therapy.

Introduction

Laser is the acronym for "Light Amplification by stimulated emission of radiation" named by Gordon Gould in 1957. In 1960, Theodore Maiman developed the first working laser device, which emitted a deep red-coloured beam from a ruby crystal.[1] A laser primarily emits light through stimulated emission. The light, on reaching biological tissues, may get transmitted to surrounding tissues, reflected, scattered, or absorbed. The lasers primarily used in implantology are semiconductor diode lasers; solid state laser Nd:YAG, Nd:YAP, Er:YAG, Er, Cr:YSGG; and gas lasers, like the CO_2 lasers. Diode lasers, CO_2, and Nd:YAG and Nd:YAP lasers may be used for soft tissue applications having excellent coagulation.[2]

The advantages of using lasers in implant dentistry include increased hemostasis, improved visibility of surgical site, minimal damage to the surrounding tissue, reduced swelling, and decreased infection due to photo sterilization effect and in turn less pain postoperatively.[3] The aim of this review article is to brief about the use of lasers in implant dentistry.

Advantages of lasers

- It is painless, bloodless that results in clean surgical field, and fine incision with precision is

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possible.

- There is no need for anesthesia if at all anesthesia has to be administered, then it needs to be used minimally only.
- The risk of infection is reduced as a more sterilized environment is created as the laser kills bacteria.
- No postoperative discomfort, minimal pain and swelling, generally doesn't require medication.
- Superior and faster healing, offers better patient compliance.[4]

Disadvantages of lasers

- Lasers cannot be used to remove defective crowns or silver fillings, or to prepare teeth for bridges.
- Lasers can't be used on teeth with filling already in place.
- Lasers don't completely eliminate the need for anesthesia.
- Lasers treatment is more expensive as the cost of the laser equipment itself is much higher.[5]

Uses of lasers

In Implantology

1) Presurgical
   i) Lasers used for removal of granulation tissues.
   ii) Photodynamic therapy - Lasers for decontamination of implant surface.
2) Surgical
   i) Flap incision.
   ii) Lasers as Hemostats.
   iii) Osteotomy.
3) Postsurgical
   Lasers in second stage uncovering of implants.
4) Gingival retraction.
5) Gingival contouring.
6) Laser irradiation to accelerate osseointegration.
7) Lasers to promote wound healing.
8) Lasers in treatment of peri-implantitis.

The effects of Lasers in Implantology are mentioned in table 1:

Table 1: Effects of Lasers in Implantology

Study	Laser wavelength	Type of study	Effects
Kato et al[6]	Co_2	In vitro	Bacterial reduction.
Bach et al[7]	Diode (810 nm)	Clinical	Pocket reduction.
Romanos et al[8]	Nd:Yag	In vitro	Significant melting.
Romanos et al[9]	Co2	Clinical	Periimplantitis therapy.
Arnabat-Dominguez et al[10]	Er:YAG	In vivo	Second stage surgery.
Schwarz et al[11]	Er:YAG	In vitro	Reduction in bleeding on probing.
El Montaser et al[12]	Er:YAG	In vivo	No thermal damage.
Kesler et al[13]	Er:YAG	In vivo	Better osseointegration.
Lewandowski et al[14]	Er:YAG	In vivo	Better healing than the drill.
Pourzarandarian et al[15]	Er:YAG	In vivo	Initial faster bone healing.
Schwarz et al[16]	Er:YAG	In vivo	Safe (but not better) healing compared with the control.
Romanos et al[17]	CO_2, Er,Cr:YSGG	In vitro	Attachment of osteoblasts.
Deppe et al18	CO_2	Clinical	Periimplantitis therapy.
Dorbtbudak et al19	Photodynamic therapy	In vitro	Bacteria reduction.

Lasers used for removal of granulation tissues

Removal of granulation tissue and disinfection of the surgical area after extraction is the most important use of laser in implantology. Erbium lasers are used in cases where there was chronic infection before extraction regardless of implant or bone graft placement. The erbium laser can be used to only remove soft tissue by setting the parameters correctly (energy density, pulse duration, etc.). It is done without thermal side-effects on the bone, and with greater comfort to the patient while disinfecting the surface, since no force is applied, unlike with curettes.[1]

Photodynamic therapy

The light-induced inactivation of cells, microorganisms, or molecules is known as photodynamic therapy. Antimicrobial photodynamic therapy is a process of staining infectious bacteria with a photosensitizing dye, then a light of appropriate wavelength and intensity causes bacterial destruction. The photosensitive dye causes the activation of laser causing a build-up of singlet oxygen, which leads to the oxidation of membrane lipids and enzymes in the pathogenic bacteria, leaving healthy cells unharmed,[20] resistant to antibiotics. A significant reduction of periodontopathogenic bacteria on implant surfaces has been noted by in vitro microbiologic studies. Studies by Meisel and Kocher[21] have demonstrated the high bactericidal effects of photodynamic therapy.

Flap incision

Dental lasers have advantages of soft-tissue ablation, hemostasis and thus can also be used to make soft-tissue incisions. In comparison to surgical blade, it provides great hemostasis. Lasers which can be employed for this purpose are diode lasers, CO_2 lasers, and erbium lasers. Wavelength offering water cooling mechanism reduces the thermal effects and keeps the visual field clean.[22]

Lasers as Hemostats

The laser-tissue interactions and the absorption of the laser wavelength from the hemoglobin, shows the best hemostatic effect of the lasers is associated primarily with the Nd:YAG and diode lasers and later on the CO_2, or it is lower for the Er:YAG and Er, Cr:YSGG lasers. Nd:YAG has been very effective as it has penetration depth of 4mm in soft tissues. In a clinical study in 44 patients by Horch and Deppe, bare laser technique was used, and to reduce the thermal effects, a pulsed laser was used. It was concluded that intra-alveolar application of pulsed Nd:YAG laser energy can be considered safe.[2]

Laser Aided Osteotomy

Use of drills causes anxiety and discomfort to patients, so lasers can be of advantage. Kesler et al. showed that a higher level of platelet-derived growth factor is produced by erbium lasers compared to bur, and therefore, it enhances early healing.[22] Eyrich G compared the super-pulsed CO_2 laser at 9.6 µm to the Er–YAG laser and the conventional drill with regard to their respective thermal effects on human bone. The temperature rise during ablation of human bone was measured and the results of the study suggested that a maximum rise of mean temperature to 1.88°C (well below the critical range of 7°C) demonstrated the safety and tissue-preserving capability of the super-pulsed 9.6-µm CO2 laser.[1]

Lasers in second stage uncovering of implants

Using the laser for uncovering implants have advantages such as sterilization, depolarization of nerves, analgesia, and hemostasis. Diode lasers and erbium lasers can best be used for this purpose. This can be accomplished either in a circular fashion or with a buccal roll technique depending on the presence of attached and keratinized tissue.[23] Laser treated tissue margins do not recede after healing. The laser is tipped at a 45° angle toward the implant. The prime advantages of laser used in this procedure are hemostasis; facilitate easier visual access to the cover screw, production of a protective coagulum - an aid to healing and patient comfort during and after treatment.[3] As there is no harmful heating of the soft tissue, there is no retraction of tissue, so the impressions can be taken as soon as possible without delay.[1]

Gingival retraction

The aim of gingival retraction is to atraumatically allow access for the impression material beyond the abutment margins and to create space so that the impression material is sufficiently thick so as to be

tear resistant. The mechanical retraction of gingival tissues using cords, which were developed for application around natural teeth, can lead to ulceration of the junctional epithelium when used around implant restorations. The advantages of lasers in gingival retraction are excellent hemostasis, reduced tissue shrinkage, relatively painless procedure and sterilizes the sulcus. Er: YAG lasers with a wavelength of 2,940 nm are reflected by metal implant surfaces and minimally penetrate the soft tissues, so they are relatively safe to use.

The hemostasis achieved with the Er: YAG laser, however, is not as effective as that achieved with the CO_2 laser. Surgical wounds created by lasers heal by secondary intention, and incision lines show disorganized fibroblast alignment. This reduces tissue shrinkage through scarring, which helps preserve gingival margin heights.[24]

Gingival contouring

Gingival contouring of the soft tissue is indicated before the preparation or impression. Height or shape discrepancies can be easily corrected, and the gingival contours are maintained and the field can remain dry and clean, ready for impressions. The negligible tissue shrinkage after laser therapy is an advantage. The emergence profile of a restoration is the shape of the restoration in relation to the gingival tissues. The creation of a proper contoured restoration with a natural emergence profile and gingival architecture that harmonizes with the adjacent teeth is very important for esthetic and functional implant therapy.[25]

Laser irradiation to accelerate osseointegration

Osteoblast attachment to the surface of the titanium implants is important for new bone formation and better implant healing. Tissue response is better with the use of laser. This could be due to enhanced adhesion of blood cells, the stabilization of the clot at the periimplant interface, which may accelerate the healing process. The ultimate advantage of this could be used for earlier function and loading of the implant. Kesler et al have shown that use of laser has improved osseointegration around titanium implants when compared with traditional osteotomies.[2]

Lasers to promote wound healing

Many studies have been conducted to evaluate the healing process with the use of lasers. Fisher et al studied extensively a laser and conventional wounds histologically. Fewer myofibrils, formation of a protein coagulum, and the number of collagen formed was less and more irregular in the laser compared with the conventional wound (less risk for scar tissue formation).Study by Luomanen et al the wound-healing mechanisms using CO_2 and Nd:YAG laser application were evaluated. They noted that extensive tissue coagulation damage was caused by Nd:YAG. They also noted that reepithelization was complete for CO_2 laser wound in about 7 days and that for the Nd:YAG in about 3 weeks. When studied, the best healing was observed in CO_2-treated wound sites.[2]

Lasers in treatment of peri-implantitis

In the case of peri-implantitis, the implant surface is contaminated with soft tissue cells, bacteria and other bacterial by-products. Debridement and degranulation of failing and ailing implants can be done using a laser wavelength that is non injurious to bone. CO_2 lasers, diode lasers, and Er: YAG were shown to be able to effectively remove plaque and calculus on implant abutments without injuring their surfaces. Promising results in the treatment of periimplantitis have also been demonstrated histologically by Takasaki et al using the Er:YAG laser. A study by Schwarz et al has shown that Er:YAG lasers can be used effectively for decontamination of dental implants. Er: YAG laser has bactericidal properties even at low energy densities without damaging the implant surface. Study by Kreisler et al evaluated different lasers for implant decontamination. The lasers Nd: YAG, Ho:YAG, Er:YAG, CO_2, and diode (gallium-aluminum-arsenide) lasers were used. They found that Nd:YAG and Ho:YAG were not suitable for implant surface decontamination.[3]

Conclusion

The results of implant procedures carried out with lasers seem to be promising only when correct laser with correct wavelength and power settings is used. Clinicians should have a proper knowledge of basic laser physics, its properties, and its tissue inter-

actions for its significant benefits in dentistry. Proper knowledge about lasers will help promote future of implants to a higher level successfully with better treatment options.

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Emerging risk factors and its role in personalized periodontics: Review

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ABSTRACT

Personalized medicine is a model which involves the modifying of healthcare with medical decisions, practices, and products being customized to an individual patient. Here, diagnosis testing is carried out for selection of appropriate therapies based on the patient's genetic, epidemiologic, sociologic and cellular analyses. With the emergence of major advances in periodontal medicine, which includes genomic discoveries and greater understanding of the multifactorial nature of periodontitis, it seems that the time is all set to use personalized medicine as a model for personalized periodontics. This review explains how the new advances in our understanding of periodontitis within a medical model can progress into new treatment strategies tailor-made for individual patients and not merely based on wholesale treatment models.

Key words: Personalized periodontics, Periodontitis

Introduction

Periodontitis is the sixth common chronic inflammatory disease globally and the second most frequent cause of tooth loss. It is known for its universal susceptibility.[1,2] The aim of conventional periodontal therapy is to eliminate deep pockets, gingival bleeding, to prevent further progression of disease and if possible, to regenerate the lost periodontal structures. Despite its complex pathogenesis and progression, periodontitis may be prevented simply by plaque removal in majority of cases.[3] But there are a few nonresponding cases due to failure to understand the role of the individual and following a "one size fits all" treatment model. To overcome this, periodontal therapy has to be more focused and reduce all undesirable clinical findings to low levels as possible, practically, biologically, and individually. This can be achieved by treating the periodontal diseases as opportunistic infections modified by host inflammatory responses, controlling the inflammation and infection, reducing predisposing factors, controlling the modifying factors, and providing continuous assessment and supportive periodontal care. Even this model may be successful for some of the patients, for other patients, it is entirely unsatisfactory and does not produce the desired clinical effects of periodontal health.

Personalized treatment approaches deal with individual differences in people's lifestyle, genes, environments and their behavior. Separation of patients into different groups, with clinical decisions, practices, and products being customized to an individual patient is called as personalized periodontics. Here, diagnosis testing is carried out for selection of appropriate therapies based on the patient's genetic, epidemiologic, sociologic and cellular analyses. Effective diagnostic tests have been developed based on either proteomic

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or genetic assessment of body fluids which includes saliva and GCF.[4,5] This review explains how the latest advances in periodontal research can be translated into important aspects of personalized periodontics to preparetailor-made treatment plan for individual patients.

Changing trends in Periodontics

Periodontal diseases are complex diseases of multifactorial origin. The disease is interplay of microbes and host response and a debate is going on which factor precedes and dominate the other[6]. Other modifying and predisposing factors finally determine the clinical presentation and outcome of the different forms of periodontal disease. Disease progression is regulated by environmental and genetic factors specific to each individual. The practice of modern periodontics dictates that the unique inflammatory response and associated controlling factors must be taken into account when diagnosing and treating diseases. Emerging technologies will allow the combination of biologic responses, and factors affecting their efficacy and magnitude will become central to the practice of personalized periodontics.[7]

There is a need to move the field of periodontics forward through development of experienced models to determine individual risk.[8] As it is suggested that the field must move forward from diagnosis based on clinical presentation of biologic events that have occurred in the past toward stratification of individual patients using short-term challenge models and long-term intervention trials. The recent classification exemplifies this by eliminating the categorization of periodontitis into aggressive and chronic simply based on clinical presentation.[9] So it is imperative to identify individuals with advanced and complex disease which poses a significant threat to preservation of the dentition and determine the preventive strategies that can be applied into practice to control the oral and systemic complications of periodontal diseases. The currently proposed grading and staging system is a step towards this goal.

Emerging Risk Factors

Since the periodontal diseases are multifactorial and complex chronic diseases, both environmental factors and socioeconomic factors can have a significant impact on their clinical manifestation.[10] Effects of tobacco, alcohol, medications, uncontrolled diabetes, obesity, malnutrition, allostatic load, and psychological stress are considered in the condition of how different lifestyles must be factored into a personalized care model for the management of periodontal diseases.[11]

The use of tobacco in all forms adversely affects the manifestation and treatment outcomes for both periodontal disease and peri-implant conditions and is correlated with altered microbiology, host/inflammatory responses, and genetic characteristics which are unique for each patient using tobacco[12]. Heavy alcohol consumption may also worsen the adverse effects of tobacco use. So, personalized approaches for the management of periodontal disease must include tobacco-cessation programs and reduction in alcohol consumption using both traditional approaches and newer motivational and pharmacological approaches.

The wide use of drugs for both therapeutic and recreational purposes is well recognized and the effects of these drugs and their associated side effects have considerable significance in the circumstances of personalized management for individuals suffering from periodontal disease. The adverse effects of prescription drugs on the periodontium include drug induced gingival enlargement, increased gingival bleeding, and altered inflammatory responses. The effects of recreational drugs on the periodontium are only just beginning to be recognized and are based mainly on small case series or isolated case reports. There is requirement for larger, more robust, studies to be carried out to determine how recreational drugs can affect the periodontal tissues, because it is an emerging factor which must be taken into account in determination of periodontal health.

There are numerous systemic conditions which are associated with poor periodontal health, among them diabetes mellitus has been studied in detail.13The effects of prediabetes and poorly controlled diabetes on the periodontium is well explored in various studies and is important because it is now recognized that an umbrella diagnosis of diabetes may not be relevant and identifying the severity of hyperglycemia is the most critical issue. Once these determinants are recognized then meaningful studies can be carried out

to determine how periodontal treatment may assist in the management of prediabetes and poorly controlled diabetes and vice versa. In the context of a personalized approach to periodontal care, the potential role of dental health-care professionals in helping patients control the risk factors that are identical for periodontitis and diabetes is of considerable importance.

Smoking and diabetes are the well-recognized risk factors for periodontal disease. But there are many emerging associations which we have not still taken into consideration. Obesity is currently a worldwide epidemic and its health implications are huge 14. Evidences had shown a strong correlation of overweight and obesity with increased risk for developing periodontitis. In a meta-analysis done by Suvanet al 2018[15] of which 8 report on cross-sectional studies investigating the association between obesity and periodontal diseases, 4 include longitudinal studies, 5 address response to periodontal therapy, 5 report on studies investigating biomarkers, while 2 were related to pediatric population samples only. These studies indicate that obese individuals are more likely to develop periodontal diseases, which can be more severe than in non-obese individuals, and weight gain increases the risk for periodontitis onset and progression. These findings highlight the need to take into account over weight or obesity in risk assessment for individual patients to facilitate personalized approaches to prevent and treat periodontal diseases.

Dommischet al., 2018[16] studied in detail the role of vitamins (vitamin A, carotenoids, the vitamin B-complex, vitamin C, vitamin D, vitamin E, and coenzyme Q10) and minerals (calcium, magnesium, iron, zinc, potassium, copper, manganese, and selenium) and the impact of their deficiencies upon periodontal health and disease. Majority of these micronutrients have been associated with the prevalence of periodontitis. There are minimal number of studies which show their role in enhancing the outcomes of periodontal therapy. As many micronutrients can influence biologic functions such as innate and adaptive immunity, as well as wound healing, there is a clear need for assessment of micronutrient deficiency in individual patients to be an integral part of personalized periodontal assessment and management.

Another significant emerging area of research in personalized periodontics is the stress and allostatic load. Sabbahet al, 2018[17] examined the relationship between stress and periodontal diseases, and the various measures used to assess stress. It was reported that frequent and repeated exposure to stressors lead to systemic effects and result in allostatic load. Evidences to demonstrate the relationship between allostatic load and periodontal diseases is emerging and we have to incorporate these findings in providing personalized care.

Barros et al., 2018[18] Epigenetic factors are heritable genome modifications that have the potential to influence gene transcription and thus contribute to disease risk, extent, and severity. This is particularly relevant for periodontitis. Not only environmental and behavioral factors have the potential to interact and impact on the genome and gene expression, it is now becoming evident that many microbes associated with periodontitis can interfere significantly with the genome and gene expression. This emerging field is now paving the way to develop the mechanism to describe how environmental and behavioral factors can influence gene expression and modify individual risk for periodontitis. Recent advances in genomic technologies now allows analysis of complex interaction effects for individuals with multiple diseases. Like, how both periodontitis and type 2 diabetes interact in a bidirectional manner can be investigated through epigenome-wide association analysis. These advances now allow traits of epigenetic biomarkers, and pharmacoepigenomics, to be considered as potential novel diagnostic and therapeutic agents to influence periodontal disease status at the individual level.

With an increasing aging population, the effect of age on diagnosis, etiology, and development of periodontal complications as a distinguished entity cannot be underestimated.[19] In addition to the biologic consequences of aging there are the added effects of comorbidities that need to be factored into a personalized program for patients with periodontitis. Periodontitis is a chronic inflammatory disease that is significantly modified and modulated by a number of risk factors, in which many are shared with other chronic systemic conditions that increase in prevalence

and severity with age. Progression of periodontitis with increasing age, sudden changes in general health and associated medications can lead to deterioration of the condition. Some medications, especially those used for management of cardiovascular disease, rheumatoid arthritis, and osteoporosis, may have a beneficial effect through their anti-inflammatory effects. A significant implication of aging is immune senescence, but how this affects the periodontium has been poorly studied. At present there are no diagnostic clinical tools that can distinguish between normal aging of tissues and pathological conditions. The presentation of periodontitis with aging most probably differs in several aspects from the way in which it presents in individuals of a young age, and treatment modifications for aging individuals are commonly neglected in practice. Routine standard approaches for the management of periodontitis in younger individuals may only partly be correct in older individuals challenged immunologically and by other systemic diseases.

Socioeconomic factors, including access and affordability to dental care, may prevent participation at older age in supportive periodontal care programs.[19] As individuals progress through older age there is an increased risk of senility and memory loss and other mental health issues that can be detrimental to aging individuals with a history of periodontal diseases, and these may be exacerbated through increased gingival inflammation associated with poor oral hygiene and tooth loss, as well as medical complications also.

Personalized periodontics is not an effective way of reducing the disease prevalence in the community because the presentation of occurrence of periodontitis in populations is socially patterned, whereby individuals of lower socioeconomic status tend to have poorer periodontal health and they are far less likely to be able to afford or to seek care. It is possible that individual social inequality could increase because a personalized health-care approach would be available only to those who can afford and access it, and perhaps those with the greatest need for such management would find this very difficult to access. If large-scale screening tools and associated low-cost tests can be developed, then the concept of personalized periodontics can be applied to even patients with low socioeconomic status.

Identifying and managing periodontal disease will have a larger impact than merely addressing an oral disease. Periodontal diseases are associated with a number of inflammatory systemic conditions and it has led to the development of a new field in periodontology, termed as "Periodontal Medicine".[20] The central hypothesis of Periodontal Medicine states that periodontal infection and inflammation results in a chronic inflammatory burden at the systemic level. Efforts have been made to understand if any, systemic effects arise from successful periodontal treatment. In the study by Sabharwalet al., 2018[21] the results of randomized clinical trials assessed the effect of periodontal interventions on at least one systemic outcome in human subjects. It was concluded that nonsurgical periodontal therapy provided to pregnant women is safe and improves periodontal status without preventing adverse pregnancy outcomes. Nonsurgical periodontal intervention was also found to provide a slight improvement in glycemic control in individuals with type 2 diabetes and periodontitis. Respiratory infections in chronic obstructive pulmonary disease patients can be prevented by controlling dental plaque biofilm formation. From the studies carried out to date no clinical trials have been reported that tested the effect of periodontal interventions on medical outcomes of atherosclerosis, cardiovascular diseases, stroke, rheumatoid arthritis, Alzheimer's disease, chronic kidney disease, or malignant neoplasia. Reduction of oral infection and reduction of inflammation must be considered as a primary treatment goal in the context of personalized periodontics for patients suffering from other systemic inflammatory conditions.

Conclusion

In summary, personalized periodontics could revolutionize the way we understand research and practice periodontology. There have been promising early developments in diagnostic and prognostic tests using noninvasive samples, such as saliva and gingival fluid.[4] These could help us to determine the susceptible patients who can develop periodontitis from gingivitis. Now it's time to integrate the research findings from association studies to our clinical practice. Recent evidences have shed light on many risk factors which could affect periodontal disease progression. We

should be able to rightly identify patients who are at risk and instead of an umbrella approach of treating everyone as though they all have the same risk and the same disease experience, necessary risk reduction or modification strategies should be incorporated to improve our clinical outcome. These simple steps may help to reduce not only periodontal disease burden but will improve the overall health of our patients.

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An Emerging Regenerative Trend – 3D Printed Scaffolds in Periodontal Regeneration

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ABSTRACT

Periodontitis is defined as an inflammatory disease of supporting tissues of teeth caused by specific micro-organisms or groups of specific micro-organisms resulting in progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession or both. The goal of periodontal therapy includes not only the arrest of periodontal disease progression, but also the regeneration of structures lost to disease. Conventional surgical approaches are capable of limiting the disease progression; however, true regeneration, characterized by perpendicularly oriented periodontal ligament fibre attachment to cementum on the root surface remains challenging. Tissue engineering approaches have been developed to enhance regeneration viamicro-engineered topographical features, purposely designed to guide the insertion of the regenerated ligament to the root surface. This review article gives an insight about the advancements in fabrication of scaffolds for the formation of a functional periodontal attachment.

Keywords: periodontal regeneration, tissue engineering, 3D printing, multi-phasic scaffolds

Introduction

The periodontium is a complex structure consisting of both hard and soft connective tissues that are hierarchically arranged in an organised manner. These supporting structures consist of gingiva, alveolar bone, periodontal ligament (PDL) and cementum. Regenerative periodontal therapy comprises procedures which are specially designed to restore parts of the tooth supporting apparatus which have been lost due to periodontitis. Current conventional surgical approaches, such as guided tissue regeneration (GTR), flap and/or osseous surgery[1,2] are efficient at removing the biofilm and reducing the disease progression, but they do not predictably achieve functional regeneration.[3] Furthermore, the healing following conventional periodontal therapy results in the proliferation of the epithelium along the tooth root surface, characterized histologically as a long epithelium junction. This scarring represents repair and has associated functional and aesthetic limitations.[4,5] Hence, true periodontal regeneration, characterized by perpendicularly oriented periodontal ligament fibre attachment to cementum on the root surface remains challenging for the clinician.

Periodontal lesions are mainly exposed to bacterial microflora and fluids of the oral cavity hence creating a biologically challenging microbial environment, a reduced vascularization potential due to the presence of an avascular root surface, and cellular competition between various progenitor cells that favours scarring (epithelial cells,gingival connective tissue cells) rather than regeneration (periodontal ligament cells, osteoblasts). So, a highly compartmentalized, spatiotemporally coordinated regeneration is necessary for cementogenesis, formation of new periodontal

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ligament and osteogenesis to occur in distinct, yet, overlapping phases.

The introduction of 3D printing of materials for dental and medical purposes has resulted in the possibility to print complex 3D scaffolds of different materials suitable for the attachment of different cell types as well as a way to personalize scaffolds for tissue engineering. The field of periodontal regeneration has moved from monophasic constructs[6] to multiphasic constructs,[7-9] whereby compartmentalization is generated in order to guide the healing process in a specific manner for each component of the periodontal tissue (bone, ligament and cementum). Multiphasic architectures should encourage tissue regeneration between the construct's subcomponents, thus improving intercalation and functional integration of the different tissues in order to replicate the architecture of the native periodontium. This is mediated by the manufacturing of scaffolds with fibre guiding properties.

Conventional Scaffold Fabrication Techniques

Thermally Induced Phase Separation (TIPS): Thermally induced phase separation (TIPS) allows production of porous anisotropic polymer scaffolds that can be easily controlled and which have a low probability of defects for tissues such as nerves, muscles, tendons, ligaments, the intestines, bones and teeth.[10] Their properties, e.g., pore morphology, mechanics, bioactivity and degradation rate, depend on polymer concentration and the volume of the secondary phase fraction. Generally, a polymer is dissolved in a solvent at a high temperature, and a porous polymer scaffold is obtained by cooling the homogenous solution, which causes phase separation, and a microporous structure arises after removal of the solvent. Park et al utilized a modified version of this technology in order to control the porous architecture of a gelatine scaffold featuring topographic micro-architecture via the presence of elongated pores.[11] This was achieved by inducing cooling from the apical, horizontal or coronal directions, or a combination thereof, on a mould containing the gelatine solution. The frozen mixture was thereafter freeze-dried in order to create a porous scaffold. Ultimately, the channels produced alignments with a close resemblance to native PDLs, as seen in Figure 1.

Electrospinning Techniques: Electrospinning technique uses a high electric field to produce submicrometer fibers or nanofibers by reduction of surface tension within the polymer fluids. A solution or melt of a synthetic or natural polymer is injected with an electrical potential to create a charge imbalance, which allows stable, steady deposition of electrospunfibers on any substrate. Electrospunfibre alignment is generally achieved using a rotating mandrel at high linear velocity or by using a complex collector geometry with alternating conductive and non-conductive areas. This ability to align fibres has been in periodontal tissue engineering.[12]

Jiang et al, developed a composite monophasic scaffold characterized by nano-topographic features for controlling cellular alignment.[13] The three-dimensional construct comprised of a blend of synthetic-copolymer polyethylene glycol and polycaprolactone (PCE) nanofibermats "glued" together by a chitosan solution and subsequently freeze-dried. The scaffold

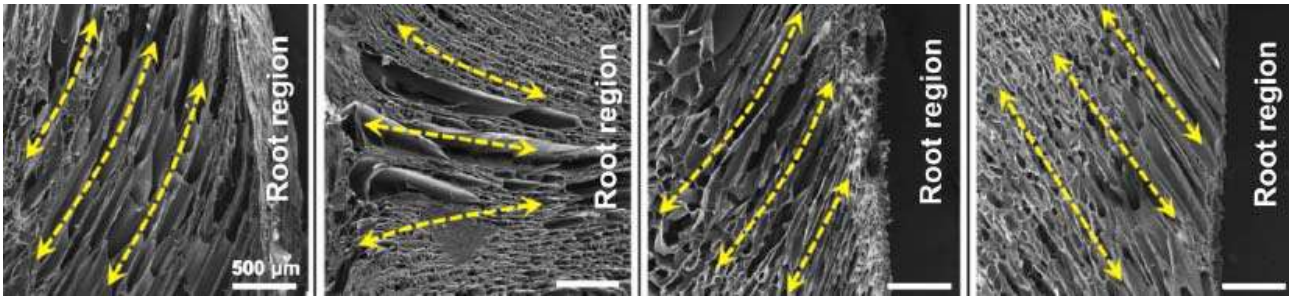

Figure 1: Pore morphology generated by the directional freeze casting method displayed via scanning electron microscope (SEM). Yellow dashed arrows show specific pore directions.

was assembled by manually stacking several electrospunnanofibre mats into a chitosan solution which was subsequently cross-linked and freeze-dried. The alternating layering between the electrospun mats and the chitosan sponge created microscaled channels providing topographical guidance (Figure 2). Thus, the specific organization of the construct was designed to improve cellular guidance and enhance the alignment of new periodontal tissues.

A new generation of 3D printing and additive manufacturing technologies has permitted the development of scaffolds with numerous advantages over traditional designs. The advantages of 3D printing include high precision and customisability, rapid production and low material wastage, in turn enabling the creation of highly complex scaffold designs,which has been recently utilized for the creation of scaffolds with fibre guiding capacities.

Advanced Fabrication Technologies

3D-printed scaffolds: To replicate the complexity of native tissues and precisely con¬form to the shape of a certain defect, the introduction of solid free form fabrication (SFF) techniques, also known as

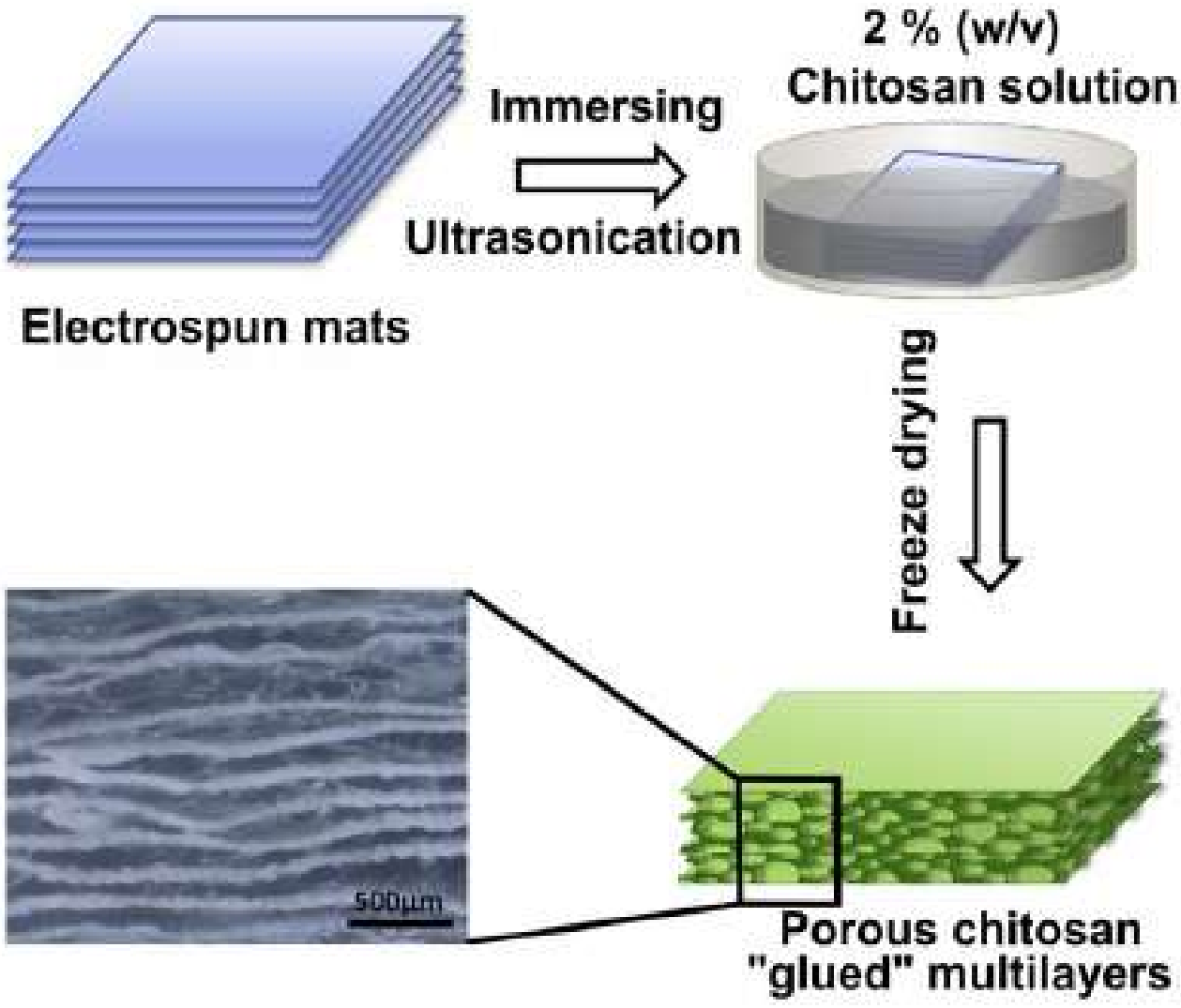

Figure 2: Polyethylene glycol and polycaprolactone/chitosan scaffolds fabrication process

rapid prototyping (RP), in scaffold creation came into being. These technologies represent additive manufacturing by "3D printing" through one of the following techniques: inkjet printing, laser-assisted printing (e.g., selective laser sintering "SLS" and stereolithography "SLA"), and extrusion printing (e.g., fused deposition modeling "FDM")[16].

These new techniques utilize computer-aided design (CAD) and computer-assisted manufacturing (CAM) technologies to 3D-print a desired structure based on a CAD file that has already defined the exact dimensions of a scaffold. In a typical clinical case scenario, CAD models are obtained based on images from computed tomography (CT) scans of a patient-specific tissue defect to develop an "image-based custom-made" scaffold, which could be helpful in regenerating defects with complex geometry.

Recently, 3D-printed scaffolds have emerged in the field of periodontal tissue engineering, to ensure a "multiphasic" configuration of the scaffold. A multiphasic scaffold has variability in its architectural and chemical composition, which closely captures the structural organization of native tissue and/or its cellular and biochemical composition and aims at regeneration of different tissue interfaces, i.e., reconstruction of soft and hard tissues. In this case, "compartmentalization" is essential for controlling the spatiotemporal events, resulting in effective periodontal regeneration and preventing tooth root ankylosis. This can be achieved by ensuring a compartmentalized bone and periodontal attachment tissue formation that are integrated over time. This is similarly important for promoting the formation of cementum and functionally oriented periodontal ligament fibers (PDL), which are inserted into newly, formed bone and cementum tissues. Based on the number of phases included in the scaffold architecture, multiphasic scaffolds are divided into biphasic (i.e., PDL and alveolar bone compartments) and triphasic (i.e., PDL, alveolar bone, and cementum compartments) as explained below.

Biphasic scaffolds: Park et al reported the first attempt at guiding periodontal fibre orientation and attachment using a biphasic scaffold fabricated by additive manufacturing.[8] This construct consisted of two structurally and compositionally unique compartments, specifically designed for bone and periodontal ligament regeneration. Each compartment was separately manufactured utilizing a lost wax method, whereby a polymer solution was cast and later evaporated into customized 3D-printed sacrificial moulds utilized as a negative image of the targeted geometry. The periodontal compartment featured several perpendicularly arranged columns designed for maintaining the periodontal ligament gap and for inducing macroscopic fibre guidance in a subsequent in vivo application as shown in Figure 3.

In a subsequent study, Park et al endeavoured to resolve the potential translation limiting issue of using transfected cells by employing primary hPDL cells in the fibre guiding construct.[15] Similar to the previous studies, the combination of micro-grooved channels and hPDL cells resulted in the formation of periodontal ligament-like fibres intercalated between newly formed cementum and bone. This connective

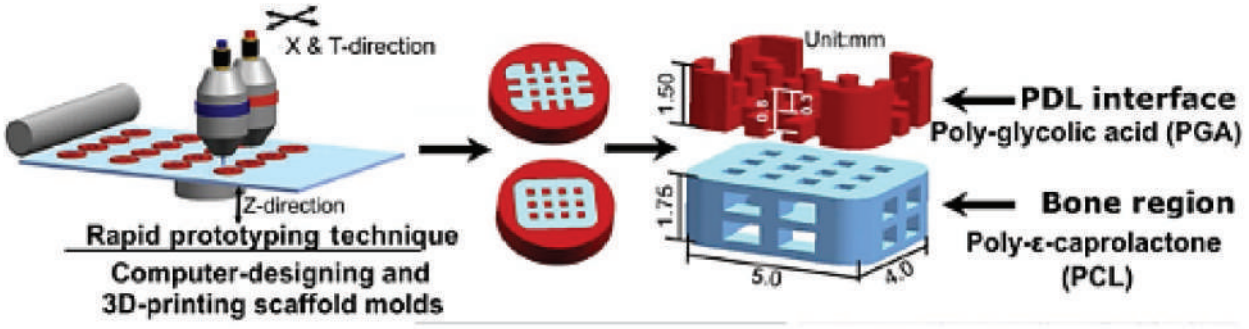

Figure 3: Schematic diagram of the additive manufacturing 3-D wax printing methodology

tissue complex resembled a functional periodontal ligament as it facilitated the oblique orientation of fibres to the root surface.

As a next step, Park et al.[17] created 3D-printed architectures with angulated patterns on spatial scaffolds, to better control the oblique angulations of the fibrous bundles for physiologic functioning. Specifically, a digital slicing procedure was utilized to fabricate angulated microgrooves on ligament-guiding architectures followed by an additive 3D printing system to manufacture PCL scaffolds. Within this system, the artifactual topographies (microgrooves) were utilized

Table 1: Studies utilizing 3D printed scaffolds for periodontal tissue engineering

References	Study type	3D Scaffold used		Conclusions
		Bone Compartment	PDL Compartment	
Park et al 2010[14]	In vivo nude mice	A porous poly glycolic acid (PLGA) structure is created by 3D wax printing and seeded with human human PDL cells (hPDL)	A porous poly caprolactone(PCL) structure is created by 3D wax printing and seeded with adenovirus encoding murine bone morphogenetic protein-7(Ad-BMP-7)	Newly formed tissue demonstrated the interfacial generation of parallel and obliquely oriented fibers that formed human tooth-dentin-ligament complex.
Park et al 2012[8]	In vivo athymic rats	A PCL scaffold is created by 3D wax printing and seeded with hPDL cells/ hPDL cells transduced with Ad-BMP-7	A fiber-guiding scaffold is manufactured and seeded with hPDL cells.	The use of fiber guiding hybrid scaffold system resulted in triphasic tissue regeneration.
Lee et al 2014[7]	In vivo, mice	Fused deposition modelling is used for fabricating a triphasic scaffold made of PCL/ hydroxyapatite. The construct is compartmentalised by creating microchannels of varying diameters of 3 phases (100,600 & 300µm for cementum, PDL and bone respectively). PLGA microspheres loaded with biological cues like amelogenin, connective tissue growth factor and BMP-2 are added into different compartments, which further aid in differentiation. Dental pulp stem cells are also seeded into the construct with type-1 collagen gel.		A single stem cell population differentiated into respective periodontal tissues compartments by using the construct's biophysical characteristics, combined with the spatially delivered bioactive cues.
Rasperini et al 2015[20]	First reported human case (Case Report)	Individualised PCL 3D printed scaffold created. Scaffold contained internal pegs to provide guidance for PDL formation and an internal compartment for the delivery of rhPDGF-BB.		Scaffold was intact without signs of inflammation or dehiscence for a period of 12 months. This resulted in a 3mm clinical attachment level (CAL) gain and partial root coverage. However, the scaffold was exposed at 13 months. Hence a rapidly dissolving scaffold with less bulkier design may be a better option.

by additive manufacturing technique to optimize spatiotemporal cell organization. The programmed digital slicing procedure allowed for the formation of structural units predictably similar to the orientation of PDL fibers. The authors concluded that different angulated microgroove patterns on 3D-printed scaffolds could precisely control the orientation of PDL bundles with high manufacturing predictability.

Other studies have explored the potential of biphasic scaffolds in regenerating periodontal tissues. Vaquette and colleagues[18] created a biphasic PCL scaffold using two different techniques: fused deposition modeling (FDM) for the bone compartment, to create a macroporous structure necessary for neovascularization and blood clot stabilization, whereas the PDL compartment was made by electrospinning, creating a microporous, partially occlusive membrane, which is important for fibroblast attachment. Using two different techniques to create a one unique scaffold ensures its high level of compartmentalization. Although the deposition of cementum-like tissue was high, there was a poor integration between the bone and ligament compartments.

Triphasic scaffolds: Triphasic scaffolds differ than biphasic ones in the fact that they include three compartments in their design and architecture instead of two; i.e., PDL compartment, alveolar bone compartment, and cementum compartment. Because of the more complexity and precision in the design, triphasic scaffolds have not been widely explored in periodontal tissue regeneration as their biphasic counterparts. In a recent investigation, Lee and colleagues[19] were able to achieve multiphasic periodontal tissue regeneration with a PCL/HAp triphasic scaffold that allowed for spatiotemporal delivery of multiple proteins, in vivo. The scaffold was 3D-printed, using FDM method, into three phases. Although these compartments, which were directed at regenerating PDL, alveolar bone, and cementum, had the same chemical structure, they differed in the diameters of their microchannels, to promote the differentiation of cells into different phenotypes. Each phase was loaded with the suitable biologic factors corresponding to the desired phenotype (i.e., connective tissue growth factor for PDL, BMP-2 for bone and amelogenin for cementum). This strategy showed that a single stem/progenitor cell population appears to differentiate into putative dentin/cementum, oriented PDL fibers, and alveolar bone complex by scaffold's biophysical properties and spatially released bioactive cues.

3D printed scaffold in periodontal regeneration

Applications of 3D printed scaffolds have been recently studied in various periodontal applications. Studies utilizing 3D printed scaffold for periodontal tissue engineering are summarized in Table 1.

Conclusion

The concept of multiphasic constructs for periodontal tissue engineering is in the preliminary stages of development. There are some limitations with new scaffold fabrication techniques, such as lack of sufficient resolution to fabricate nano- and submicrometer structures, evaluation of different technique combination must be investigated, as a promising modality for producing scaffolds with clear-cut scales on different levels. Up to date, only one case report in humans is published,[20] exploring the potential applicability of scaffolds in periodontal tissue regeneration. Translation of the favourable preclinical results into clinical realities may be a major breakthrough in the field of regenerative periodontal therapy.

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Peripheral Ossifying Fibroma –A Case Report

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ABSTRACT

Gingival overgrowth is the most common lesion in oral cavity. It is one of the non-neoplastic gingival over growth which is customarily seen on the interdental papilla and also it is reactive, hyper plastic and inflammatory in nature. Peripheral ossifying fibroma (POF) exhibits the characteristic by ossification or calcification,especially the dystrophic calcification. It is also known as ossifying fibrous epulis caused by local irritation such as dental calculus,plaque,microorganisms, dental appliances, restoration and minor trauma. This case report highlights a case of peripheral ossifying fibroma, along with a brief review of literature of its management clinically and to differentiate from pyogenic granuloma.

Key-words: Gingival enlargement, Reactive lesion, Peripheral ossifying fibroma (POF), Pyogenic granuloma (PG).

The term of "ossifying fibroma" was given by Montgomery in 1927.[1] It was described as uncommon, solitary, non-neoplastic over growth. It can be classified as i) central ossifying fibroma ii) peripheral ossifying fibroma. Central ossifying fibroma (COF) arises from endosteum whereas peripheral ossifying fibroma (POF) arises from soft tissues.[2,3] In 1982, Gardner coined the term of "Peripheral ossifying fibroma". It is a slow growing, solitary mass which is usually, sessile with smooth or ulcerated surfaces.[4] Generally, adjacent teeth are unaffected, but sometimes adjacent teeth also affected.[5]

Case History

A 55-year-old male patient reported to our department with chief complaint of swelling in relation to upper right back tooth region since 17 years. The swelling started as a small nodule that progressed gradually to the current size. Since the swelling interfered with his chewing habits, patient reported for management of swelling. There was no relevant family, medical and surgical history. Upon intra oral examination, a well-defined lobulated growth was seen extending mesio-distally, from mesial surface of 15 to mesial surface of[18], apico-coronally from the attached gingiva to occlusal surface of the crown. It measured about 9 cm x 8 cm in size (figure 1a) and the swelling was tender on palpation, fibrotic in consistency, mobile, pedunculated (figure1b). OPG revealed generalized horizontal bone loss and severe vertical bone loss was seen from distal surface of 14 to distal surface of 1 (figure 2).

Patient was provisionally diagnosed as pyogenic granuloma and the differential diagnosis consisted of irritation fibroma and peripheral giant cell granuloma.

Surgical procedures

After adequate anaesthesia, excisional biopsy was done with number 15 BP blade and sent for biopsy (figure 3a). A full thickness muco-periosteal flap was

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elevated in relation to 15 to 18 region. After removal of granulation tissue, the teeth involved were extracted. The diseased bone was removed until presence of healthy bone was noticed (figure 3b). Collagen membrane was placed in extracted region and the area was sutured with simple interrupted sutures (figure 3c). Patient was reviewed after 1 week and sutures was removed. Healing was satisfactory after 3 months (figure 3d).

Histological examination

Histology of the lesion (figure 4) revealed increased number of fibrocytes, inactive and active plump (cigar-shaped) fibroblasts were evident. Presence of minimal inflammatory cells were seen. Blood vessels whose lumen was filled with RBC's and an area of basophilic immature woven bone, with lacunae like spaces were also seen, few other basophilic areas


Figure 1a,b: The dimensional extend of the swelling

Figure 2: OPG of the patient

Figure 3a,b,c,d: The surgical procedure and the post surgical healed site

were evident which showed basophillia, suggestive of dystrophic calcification in a long-standing lesion.

Discussion

Gardner gave the term "peripheral ossifying fibroma", as a reactive lesion. It is not associated with osseous lesion and also stated that the cellular connective tissue of POF is unique despite the presence or absence of calcifications.[4] Due to the similar clinical features and site predilection, Eversole and Rovin concluded that these lesions were said to have different histological response to local irritation when compared with pyogenic granuloma.[6]

In the present case, the etiopathogenic mechanism of POFs is attributed to inflammatory hyperplasia of cells of periosteum and periodontal ligament. Chronic irritation of periosteal and periodontal tissues induces metaplasia of connective tissue leading to bone formation or dystrophic calcification.

POF most commonly occurs in first and second decades of life with peak prevalence between 10-19 years. The female to male ratio which is reported in the literature varies from 1.22:1 and 1.7:1 to 4.3:1.7, 10

The size of POF is generally <2cm in diameter. They can also vary at a range from 0.2 to 3cm to 4 to 8cm. Larger lesions about 9 cm in diameter have also been reported, though some cases with tooth migration and bone destruction have been reported, they are not common.[9] In the present case, the size of the lesion was 9 cm x 8 cm, which is very similar to the reported cases earlier.

POF usually appears as a solitary mass that is either pedunculated or sessile. The colour may range from red to pink, and most commonly the surface appears ulcerated. Lesion is more common in maxillary arch (about 60%) and in incisor cuspid region consti-

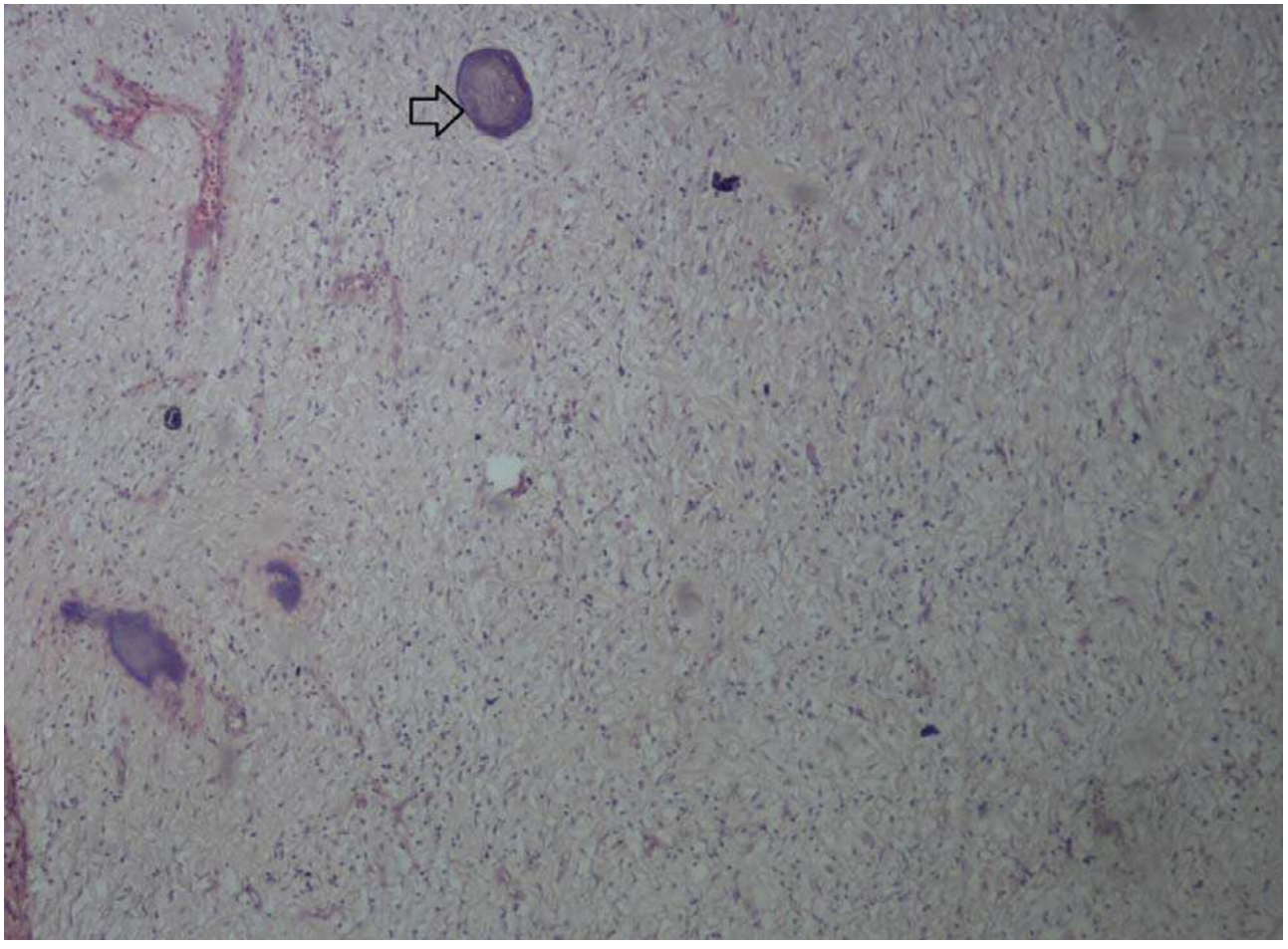

Figure 4: Histopathologic view

tutes about 50%. It arises from interdental papilla. In the present case which is a rare entity where the POF was seen in the posterior maxilla.

Radiographically, certain cases do not show any significant changes.[8] However, in some cases varying radio density with in the lesion is seen depending on the degree of mineralization. In rare cases superficial bone loss, cupping effect and focal areas of calcification have been reported. In the present case, severe vertical bone loss was seen in relation to 15 to 18. Computed tomography and MRI can also be helpful in investigation.

In recent times, role of genetics plays a possibility in etiopathogenesis of this disease. Multi centric lesion is seen in condition like nevoid basal cell carcinoma, neurofibromatosis and Garner's syndrome.[11] All of these conditions are being associated with inherited genetic mutation. There is a possibility that POF can also be due to genetic mutation which may leads to gingival soft tissue over growth.

Conclusion

A thorough correlation between clinical and histopathological presentation will help in making an accurate diagnosis of peripheral ossifying fibroma. Not all gingival over growth can be diagnosed as POF. POF should be differentiated from pyogenic granuloma. Further genetic analysis must be done to rule out the genetic abnormalities related to POF. Close postoperative, follow up is required in all such cases because of high recurrence rate in an incompletely removed lesion.

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Rare Case of Peripheral Ossifying Fibroma on the Gingiva– A Clinico-Histopathological Report

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ABSTRACT

Gingival overgrowths are most commonly encountered lesions in a day-to-day clinical practice which causes discomfort to the patient. They can either be focal or generalized. One such focal overgrowth occurring on gingiva is peripheral ossifying fibroma, which can easily be misdiagnosed and can be confirmed only after appropriate clinical and histopathological examination. Peripheral ossifying fibroma, a benign lesion with its most common occurrence in gingiva is often encountered in all age groups. As the name suggests there will be calcifications in the form of one or more interconnecting trabeculae of bone. The treatment requires complete excision of the lesion up to the base and patient should be monitored closely due to high rate of recurrence. The present case report enlightens the importance of biopsy in gingival overgrowths especially in the case peripheral ossifying fibroma which can easily be undiagnosed or left untreated.

Key words: peripheral ossifying fibroma, gingival overgrowth, benign, excision

Introduction

Gingival overgrowth with varied clinical presentations is often encountered in dental practice. One such lesion which can easily be misdiagnosed, without proper clinical and histopathological diagnosis, is peripheral ossifying fibroma.[1] Peripheral ossifying fibroma (POF), a rare clinical entity comprising 9% of all reactive gingival overgrowth is most often observed in the interdental region in response to trauma or irritation. POFs peak in the second decade of life, but are diagnosed at any age.[2] The etiopathogenesis of POF is not clear while some authors have hypothesized it as a reactive lesion originating from the periodontal ligament as a result of irritants.[3] A fascinating clinical feature of POF is its high rate of recurrence which ranges from 8% - 45%.[4] The present case report describes the gingival enlargement which was eventually diagnosed as peripheral ossifying fibroma after histopathological analysis.

Case Report

A male patient aged 23-years reported to department of Periodontics with a chief complaint of swelling and discomfort while chewing food in the lower right back tooth region for 10 days. Patients had a dislodged restoration in the right lower back tooth region 3 weeks ago and gradually developed a painless enlargement in the gingiva due to impingement of the restoration which occupied the whole space of the cavitated defect. Patient was systemically healthy with no adverse habits and vitals were normal. Intra oral examination revealed a pink, solitary, pedunculated mass involving the buccal interdental papilla and marginal gingiva of 46 with no associated ulcers. (Figure 1a) Patient did not elicit any pain on palpation. As the patient did not elicit any pain and the tissue was under constant irritation, it was thought to be Chronic localised grade III gingival enlargement. Based on the

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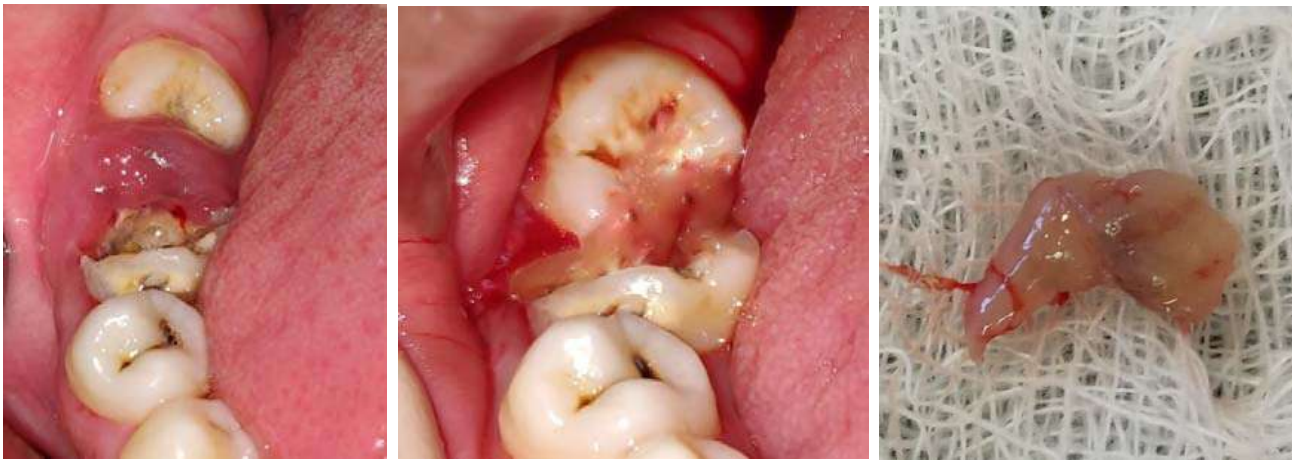
clinical parameters, it was provisionally diagnosed as reactive inflammatory hyperplasia of gingiva. The case was planned for surgical excision of the lesion. The procedure was explained to the patient and a written consent was obtained before the initiation. Patient was administered with 2% lignocaine (adrenaline 1:80,000 dilution) and an external bevel incision has been given till the crest of the bone with no.15 blade. A tissue approximately 0.8×1×0.3 cms in size was stored in formalin and sent for routine histo-pathological examination (Figure 1b,c).

Histological Features

On histological examination, hyperplastic epithelium with areas of ulceration were noticed. Dense inflamed connective tissues with varying sizes of ossifications were seen within the connective tissue with plump fibroblasts and dense mixed inflammatory cells. The lesion also showed rich vascularity that extends high into the connective tissue papilla suggestive of peripheral ossifying fibroma (Figure 2a, b,c).

Discussion

Peripheral ossifying fibroma, a benign connective lesion which is most often encountered in the gingiva and rarely on lingual mucosa.[5] Shafer described the lesion as a well-demarcated mass of tissue, having a sessile or pedunculated base, located on the gingiva, and being the same colour as normal mucosa or slightly reddish. The surface may be either ulcerated (66%) or intact (34%). It consists of one or more mineralized tissues, including bone, cementum-like material, or dystrophic calcification within a matrix of cellular fibroblastic tissue.[3] POF has also been termed as, cal-



Figures 1 a, b, c: The localised swelling, the surgical excision, the excised tissue

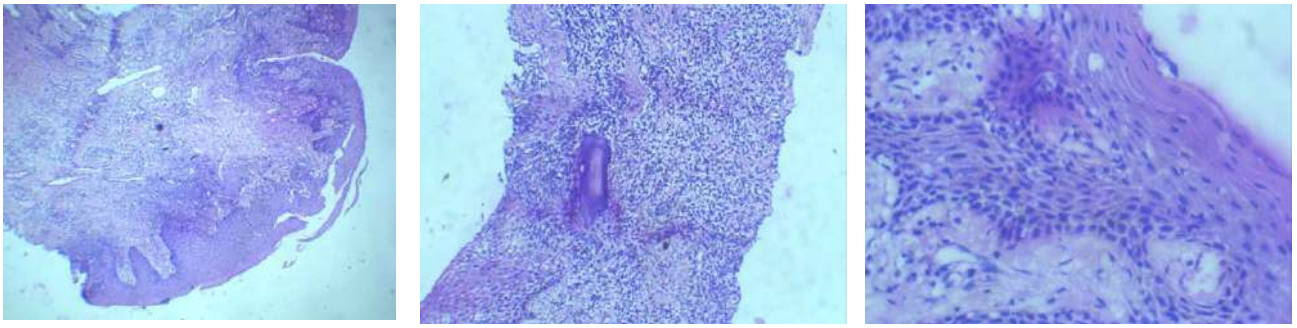


Figure 2 a,b: Histopathological view -4x view – the ulcerated epithelium can be seen; 10x view –the ossification can be noted

Figure 2c: 40 x view - Inflammatory cells and Ulcerated epithelium

cifying fibroblastic granuloma, peripheral odontogenic fibroma (PODF) with cementogenesis, fibrous epulis, peripheral cemento-ossifying fibroma, peripheral fibroma with calcification, peripheral fibroma with osteogenesis.[1,6] The lesion is usually smaller (<1.5mm) but can reach a maximum size and can cause displacement of the adjacent teeth, crestal resorption, bone loss and structural asymmetry.[7]

The term Peripheral ossifying fibroma is a misnomer. In fact, the term fibroma means tumor of fibrous connective tissue (from Latin fibra, "fiber" + Greek oma, "tumor"), but POF is not a true neoplasm.[8] POF should be distinguished from the central ossifying fibroma, which is instead a true neoplasm with significant growth potential.[3] The term POF should not be misinterpreted with peripheral odontogenic fibroma (PODF), an uncommon peripheral analogue of central odontogenic fibroma. The evidence about its origin is still debatable since it is partly based on the presence of oxytalanfibers within its calcified structures on gingiva[9] POF is more commonly seen in anterior maxilla and in females, but PODF has a slight male predilection which is often observed in posterior mandible.[10] A rare clinical entity of a POF associated with dental pulp has been reported in literature.[11]

Treatment of such lesions requires precise surgical excision of the overgrowth along with the periosteal layer. If the lesion is localized in an aesthetic area, reconstructive surgery should be performed to repair the defect.[12] Thorough scaling and root planning along with the removal of irritants, reduces the chances of recurrence. In children, reactive lesions on gingiva exhibits a rapid growth rate and attains maximum size in a shorter span. In addition, the POF can cause bony erosion, teeth displacement, and can lead to delayed eruption. Early diagnosis and timely surgical intervention reduce the chances of teeth and bone loss.[13] Extraction of adjacent teeth is seldom required. The rapid recurrence of the lesion has been reported in one of the cases which could be attributed to its incomplete excision.[14]

Conclusion

POF presents with varied clinical features but its etiopathogenesis is still unknown. The lesion can easily be misdiagnosed or undiagnosed which can eventually go untreated. Luckily for clinicians, POF is benign in nature with no serious complications. Appropriate histopathological analysis and correlation with clinical features is required for proper diagnosis of lesion. This case report shows the importance of biopsy in gingival lesions, especially gingival overgrowths, which helps clinicians to achieve proper diagnosis and treatment planning.

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Management of inflammatory fibrous hyperplasia of gingiva using conventional gingivectomy and diode laser

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ABSTRACT

Chronic inflammatory gingival hyperplasia represents a non- neoplastic, reactive lesion of the gingiva. Various treatment modalities should be evaluated for treating such cases. Here we report a case of chronic inflammatory hyperplasia in a diabetic patient. The present case was surgically managed using both conventional gingivectomy and diode laser, followed by biopsy of lesion and the lesion did not show any sign of recurrence during the follow-up period of 3 months.

Key words: chronic inflammatory gingival hyperplasia, fibroma, diode laser, external bevel gingivectomy.

Introduction

Some of the most frequently encountered lesions in oral cavity are exophytic and gingival in nature. Chronic inflammatory gingival hyperplasia originates as a slight ballooning of the interdental papilla and marginal gingiva. In the early stages it produces a life saver shaped bulge around the involved teeth. This bulge can increase in size until it covers part of the crown. Hyperplasia may be localised/generalised progresses slowly and painlessly unless it is complicated by infection/trauma.[1]

Occasionally chronic inflammatory gingival enlargement occurs as a discrete sessile or pedunculated mass resembling a tumour. It may be interproximal, on marginal or on the attached gingiva. The lesions are usually slow growing and painless. However final diagnosis can only be made by combining histopathological and clinical findings. We report an unusual case of inflammatory fibrous hyperplasia of the gingiva in an uncontrolled type-2 diabetic patient, which was treated by a combination of conventional surgical gingivectomy,[1] diode laser and under follow up.[2]

Case Report

A 48 year old female patient reported to the Department of Periodontology, Government dental collage, Kannur with chief complaint of painless growth in relation to maxillary right canine region for 6 months. The lesion was initially small, and gradually increased in size. Intraoral examination revealed 1.3x0.6x0.4cm sized sessile smooth surface, pink nodular mass involving marginal gingiva, attached gingiva, interdental papilla and alveolar mucosa (figure 1a) extending mesiodistally from the distal aspect of lateral incisor to mesial aspect of first premolar. On visual examination,it appeared pink, soft to firm on palpation with intact surface without bled spot or ulceration. Oral hygiene and periodontal status were satisfactory. IOPAR revealed mild horizontal bone loss (figure 1b). Routine blood investigations were done. Patient was referred for the physician for assessing the diabetic status and consent to proceed with the surgical procedure. 2 weeks later, after clinical assessment, the patient was scheduled for surgical excision.[3-6]

As the initial phase of treatment thorough oral prophylaxis was carried out. Excision of the gingival

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lesion was done by means of an external bevel gingivectomy under local anaesthesia (figure 2a). The area was thoroughly curetted and debrided. Diode laser was also used for debridement, irrigated with betadine and saline. Vitamin E was topically applied, followed by periodontal dressing with coepack (figure 2b). On the 5th day periodontal dressing was removed and irrigated (figure 2c). The surgical site healed uneventfully and a near normal appearance of gingiva was seen after 3 weeks (figure 2d).

Histopathology report revealed stratified squamous epithelium with irregular acanthosis with marked spongiosis. Sub epithelium shows fibrosis with collagenization. Vessels showed endothelial proliferation. Mucinous material seen in between the collagen fibres. Numerous plasma cells seen scattered (Figures 3 a,b,c,d).

Discussion

Majority of mesenchymal soft tissue tumours as well as tumour of the lesions of the oral cavity is

Figure 1a,b: Intraoraal view of the swelling along with the IOPAR

Figure 2a,b,c,d: Excision of the swelling, the periodontal dressing placed immediately, 5 days after the pack was removed, 3 weeks post-operative view

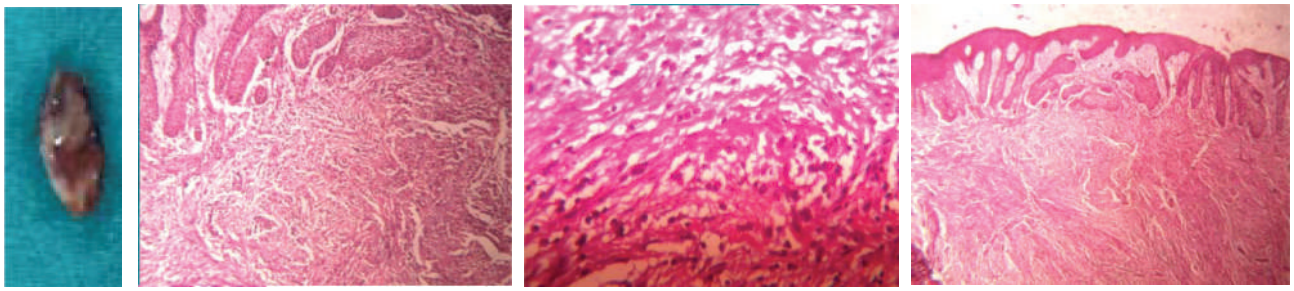

Figure 3a,b,c,d: a)The specimen sent for biopsy, b)histopathological section – low power, c) histopathological section – high power, d)Histopathological section – Low Power: Reveals mucosa with irregular acanthosis with marked spongiosis. Sub epithelium shows fibrosis with collagenisation

benign. True Fibromas of oral mucosa are exceedingly rare and cannot necessarily be distinguished with certainly from non neoplastic fibrous hyperplastic lesions. Rarely fibromas may confuse with neurofibromas or with well differentiated fibrosarcomas. Four major type of fibrous swelling are fibrous hyperplasia, peripheral ossifying fibroma, pyogenic granuloma and peripheral giant cell granuloma.[7] Hyperplastic fibrous nodules are the most common tumour like swelling in the oral cavity, mostly appear to result from low grade trauma.

Elimination or correction of injurious agents, effective plaque control, good patient motivation and precise surgical excision is the key for successful management of reactive gingival lesion.[8-10] Various treatment modalities such as conventional scalpel, electrosurgery, cryosurgery, etc., for the surgical excision of overgrowth, are being used for decades. Introduction of the laser is an innovative approach for surgical management of such lesions.

Diode laser has 'haemoglobin' as one of their target chromophores; hence they provide effective hemostasis at the surgical site. In the present case we used a combination of conventional technique and diode laser. A good hemostasis could be achieved in the present case using diode laser.[8,9,10]

Definite step should be practiced to safeguard the use of lasers. Wavelength specific eye gears should be used by operator, assistant and patient to prevent the retinal damage.

Conclusion

The present case report highlights the advantage of diode laser-assisted overgrowth excision. The various treatment modalities should be evaluated for treating such cases. The authors emphasised the ease of using diode laser with better predictable result, without any recurrence of growth. Nevertheless, more cases with longer followup should be carried out to establish the outcome. Hence lasers are valuable and promising treatment modality in excision of lesions.

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