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ORIGINAL RESEARCH ARTICLE

PERCEIVED RISK AND AWARENESS OF HEPATITIS B AMONG THE MEDICAL AND DENTAL STUDENTS IN KERALA

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ABSTRACT

Background: The endemic nature of Hepatitis B virus infection in India poses a greater occupational risk for the health care professionals. The study assess the perceived risk and awareness of Hepatitis B among undergraduate medical and dental students.

Methodology: A cross sectional study was conducted among 100 medical and dental students using a pretested questionnaire distributed during the class hours. Data was analyzed using SPSS version 16.0

Result: Adequate awareness regarding Hepatitis B was observed among both medical and dental students. Almost 63.8% of the medical students were aware that the infection can be asymptomatic ($p \leq 0.05$). The modes of transmission like mother to child, contaminated blood and blood products and unsterile syringes/ needles or surgical instruments were equally reported by the two groups. The chances of transmission of the disease through contaminated water is less as reported by more than half of the medical students(56.3%). An equal number of participants perceived occupational risk of getting the disease. Both the group expressed their willingness to treat a patient diagnosed with Hepatitis B.

Conclusion: The present study observed that adequate awareness, greater perceived risk about Hepatitis B and positive attitude towards the care of infected patients among the study population.

Keywords: awareness, Hepatitis B, perceived risk.

INTRODUCTION

Hepatitis B Virus (HBV) infection, a global public health issue has been reported endemically in all areas of the world with variable prevalence. The prevalence of HBV in South Asia is 2 to 7%¹. India has an intermediate endemicity of hepatitis B².

Health care professionals are at a greater risk of this common blood born infection through accidental sharp injuries and inadequate infection control methods³. Hepatitis B infections are common due to lapse in the sterilization technique of instruments or due to the improper hospital waste management as 10 to 20% health care waste is regarded hazardous and it may create variety of health risk⁴. Among the health care personnel, HBV is transmitted by skin prick with infected, contaminated needles and syringes or through accidental inoculation of minute quantities of blood during surgical and dental procedures. In health care settings, blood is an important vehicle of transmission as it contains the highest HBV titers of all the body fluids⁵. In India, the hospital staffs have higher HBsAg prevalence (10.87%) than in voluntary blood donors (6%) and in general population (5%)⁶.

Students of healthcare domain especially medical and dentistry, while acquiring new clinical and technical skills are more vulnerable to HBV as they are in direct contact with these patients requiring blood transfusions, invasive diagnostic and therapeutic

instrumentations⁷. The present study assess the perceived risk and awareness of hepatitis B among the medical and dental students.

METHODOLOGY

A cross sectional study was done at Amrita institute of medical sciences & Amrita school of dentistry, Ernakulam, Kerala. Ethical clearance was obtained from the institutional Ethics Review Board. The undergraduate medical and dental students from first year, second year, third year final year and interns were included. Data was collected using a pretested structured questionnaire and information regarding the perceived risk and awareness about the cause, symptoms, cure and mode of transmission of Hepatitis B was obtained. The questionnaire was distributed during the class hours with prior permission. For interns the questionnaire was distributed during the clinical hours. The purpose of the study was briefed and students were encouraged to participate. A total of 100 undergraduates; 50 medical and 50 dental students and were requested to fill in the questionnaire after signing an informed consent. The filled questionnaires were verified and taken back.

Data Analysis

The data was analysed using the Statistical Package

TABLES AND FIGURES

Table 1. Hepatitis B awareness— Cause, symptoms and cure

| | Correct response n (%) | | P value |
|-------------------------------------------|------------------------|-----------------|---------|
| | Medical Students | Dental Students | |
| 1. Cause of Hepatitis B - Viral | 49 (50.5%) | 48 (49.5%) | 0.558 |
| 2. Early symptoms similar to cold and flu | 24 (40.7%) | 35 (59.3%) | 0.250 |
| 3. Jaundice is one of the common symptom | 43 (50.6%) | 42 (49.9%) | 0.779 |
| 4. Can the disease be asymptomatic? | 37 (63.8%) | 21 (36.2%) | 0.001* |
| 5. Can the disease be self- cured? | 9 (69.2%) | 4 (30.8%) | 0.137 |
| 6. Can the disease be curable/treatable? | 42 (49.4%) | 43 (50.6%) | 0.778 |
| TOTAL | 50 (50%) | 50 (50%) | |

for the Social Sciences (SPSS) for windows (version 16; SPSS Inc; Chicago IL, USA). Descriptive statistics and Chi square test were done. Associations and differences were considered significant when $p \leq 0.05$. The percentage of correct responses were measured.

RESULT

Awareness of Hepatitis B regarding the causes, symptoms and cure was described in Table 1. A good knowledge was observed among both the medical and dental students about the etiology of Hepatitis B infection, as majority of them reported a viral etiology. There was no statistically difference in knowledge was observed among the medical and dental students regarding the early symptoms like of cold and flu and that jaundice as one of the common symptom. Almost 63.8% of the medical students were aware that the infection can be asymptomatic. The difference was statistically significant ($p \leq 0.05$). Only few of the undergraduate students both medical and dental were considered the disease self-limiting. An equal number of subjects reported that remedial measures are available for Hepatitis B.

Fig 1. Shows the possible mode of transmission of Hepatitis B as reported by the study participants. The chances of transmission of the disease through contaminated water is less as reported by more than

half of the medical students. Unsafe sex is considered to have more risk of HBV as reported by more than half of the medical students than the dental. The other modes of transmission like mother to child, contaminated blood and blood products and unsterile syringes/ needles or surgical instruments were equally reported by the two groups.

The perceived risk of Hepatitis B among medical and dental students is depicted in Table 2. An equal number of participants perceived occupational risk of getting the disease. 51% of the medical students were of the opinion that the disease is preventable by vaccination. Both the group expressed their willingness to treat a patient diagnosed with Hepatitis B.

DISCUSSION

The Professional training period entails higher occupational risk for Hepatitis B infection. Adequate knowledge is essential to minimize acquired infections in health care setting. The present study showed that both the medical and dental students had adequate knowledge regarding Hepatitis B. Similar finding was noted in a study done in Nepal⁸. However a study done in Chennai observed better awareness among medical students than dental students⁹. A poor knowledge among the medical students about Hepatitis B was noted in a study done in Ahmedabad².

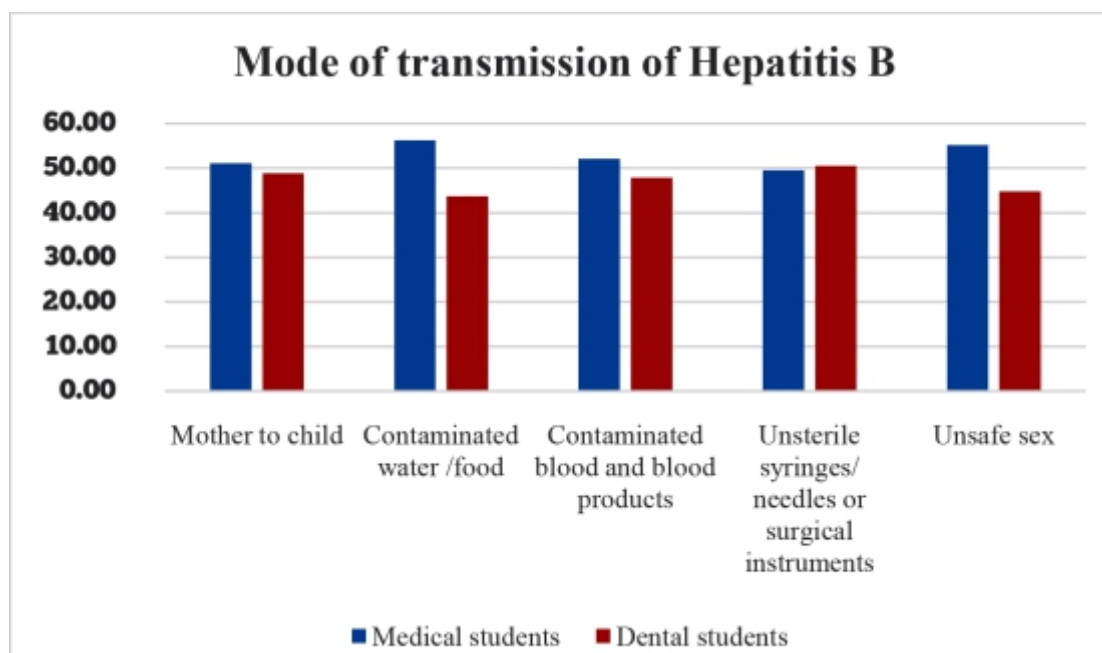


Fig 1. Awareness of mode of transmission of Hepatitis B among medical and dental students

Majority of the study participants reported that contaminated blood and blood products and unsterile syringes/ needles or surgical instruments as possible mode of transmission of the disease. Study done in Tamil Nadu reports a similar finding¹⁰. However some of the study participants wrongly identified the disease get transmitted through contaminated water. Such wrong perception might be due to confusion with Hepatitis A which get transmitted is through feco-oral route. Unsafe sex is considered to have more risk of HBV as reported by more than half of the medical students than the dental.

The undergraduate medical and dental students are at higher risk of accidental exposure as well as transmission of Hepatitis B infection during their training period. They must be aware of the potential risk involved in performing the procedures and appropriate measures to prevent transmission of the disease. Similar to a study done in Hyderabad, the present study showed a greater perception of occupational risk of HBV among both the medical and dental students¹¹. Majority of the medical students hesitated to take care of the patients diagnosed with HBV according to a study done in Greece¹². In contrary both the groups expressed their willingness to treat a patient diagnosed with Hepatitis B in the present study.

CONCLUSION

The study concludes that there is no observed difference in the knowledge level of Hepatitis B among the medical and dental students. Adopting healthy practices, developing good attitudes and acquiring knowledge about occupational diseases and its prevention is a prerequisite for undergraduate training in medical and dental colleges. Information regarding the vaccination coverage, prevalence of Hepatitis B and awareness on post exposure prophylaxis were not measured; which is noted as the limitation of the current study.

The study recommend compulsorily screening, vaccination and education of students for HBV at the time of admission by the institute management to reduce the future occupational risk.

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Table2. Perceived risk of Hepatitis B among medical and dental students

| | Correct response n (%) | | P value |
|---------------------------------------------------------|------------------------|-----------------|---------|
| | Medical Students | Dental Students | |
| 1. Occupational Risk of getting the disease | 35 (50.7%) | 34 (49.3%) | 0.829 |
| 2. Can the infection be prevented by vaccination? | 50 (51.0%) | 48 (49.0%) | 0.153 |
| 3. Will you treat a patient diagnosed with Hepatitis B? | 48 (51.6%) | 45 (48.4%) | 0.240 |
| TOTAL | 50 (50%) | 50 (50%) | |

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BIODENTINE- A REVIEW ARTICLE ON ITS CHEMICAL CHARACTERISTICS AND CLINICAL APPLICATIONS A REVIEW

ABSTRACT

Biodentine is a calcium-silicate based material that has drawn attention in recent years. It has been introduced by the Septodont Company in 2010 as the “the first all-in-one, bioactive and biocompatible material for damaged dentin replacement”. It is a second generation hydraulic calcium silicate material that is composed mainly of tricalcium silicate and it also contains zirconium oxide radiopacifier and some additives and has been advocated to be used in various clinical applications, such as root perforations, apexification, resorptions, retrograde fillings, pulp capping procedures. The purpose of this article is to review the clinical applications and advantages of biodentine over MTA in the operative endodontic procedures. Although number of materials like Amalgam, GIC, Composite and MTA are available in market for repair of dentin loss in tooth structure, none of these possesses ideal properties. Thus its major advantages and unique features gives biodentine, a great potential to revolutionize the different aspects of both the primary and permanent tooth in endodontics.

Key words: Biodentine; Dentine Replacement; Composition; Setting reaction; Clinical Applications; MTA

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INTRODUCTION

Calcium silicate based materials have gained popularity in recent years due to their resemblance to mineral trioxide aggregate (MTA)¹. However there exist some drawbacks of this material such as slow setting kinetics and complicated handling properties. The Minimal Intervention philosophy has seen a shift towards the biological non-operative management of teeth. Intervention when required has become more effective and predictable with the advent and development of technologies to support this approach. One such material is biodentine, known as “dentine in a capsule”, a biocompatible and bioactive dentine substitute which overcomes the draw backs of Calcium hydroxide and Mineral trioxide¹.

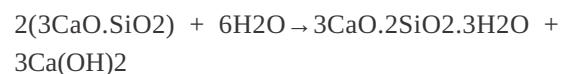
The preservation and protection of the dental pulp with specific emphasis on regeneration is the new treatment strategy in the fields of paediatric dentistry, endodontics and dental traumatology. The use of hydraulic calcium silicate cement apparently stimulates pulpal cell recruitment and differentiation, up-regulates transformation factors (gene expression), and promotes dentinogenesis². Compared to others calcium based cements, biodentine presents two advantages: i) a faster setting time of about 12 minutes and ii) higher mechanical properties. These physico-chemical properties associated with the biological behaviour suggest that it may be used as a permanent dentine substitute³.

CHEMICAL CHARACTERISTICS

Composition: The powder component of the material Biodentine consists of tricalcium silicate, dicalciumsilicate, calciumcarbonate and oxide filler, iron oxide shade, and zirconium oxide. Tricalcium silicate and dicalciumsilicate are indicated as main and second core materials, respectively, whereas zirconium oxide serves as a radiopacifier. The liquid, on the other hand, contains calcium chloride as an accelerator and a hydrosoluble polymer that serves as a water reducing agent. It has also been stated that fast setting time, one unique characteristics of the product, is achieved by increasing particle size, adding calcium

chloride to the liquid component, and decreasing the liquid content. The setting period of the material is as short as 9-12minutes. This shorter setting time is an improvement compared to other calcium silicate materials⁴. The material is characterized by the release of calcium when in solution⁵. Tricalcium silicate based materials are also defined as a source of hydroxyapatite when they are in contact with synthetic tissue fluid⁶⁻⁸.

Setting reaction: The reaction of the powder with the liquid leads to the setting and hardening of the cement. The hydration of the tricalcium silicate leads to the formation of a hydrated calcium silicate gel (CSH gel) and calcium hydroxide. The cement located in inter-grain areas has a high level of calcite (CaCO₃) content. The hydration of the tricalcium silicate is achieved by dissolution of tricalcium silicate and precipitation of calcium silicate hydrate. In general, it is designated by chemists as C-S-H (C=CaO, S=SiO₂, H=H₂O). The calcium hydroxide takes origin from the liquid phase. C-S-H gel layers formation is obtained after nucleation and growth on the tricalcium silicate surface. The unreacted tricalcium silicate grains are surrounded by layers of calcium silicate hydrated gel, which are relatively impermeable to water; thereby slowing down the effects of further reactions. The C-S-H gel formation is due to the permanent hydration of the tricalcium silicate, which gradually fills in the spaces between the tricalcium silicate grains. The complete hydration reaction is summarized by the following formula⁹.



CLINICAL APPLICATIONS

1. Pulp capping and dentine replacement

Biodentine is calcium ion releasing with the initial rate of release higher than other similar material types, thus it is ideal for use as a pulp capping material¹⁰. The Biodentine surface exhibits the thickest surface calcium concentration compared to ProRoot MTA, Dycal and Theracal. Dentine bridge formation is evident clinically when Biodentine is used for direct pulp capping. Clinical

cases showing evidence of irreversible pulpitis that were treated with Biodentine exhibited reduction in the sizes of the apical areas when evaluated with cone beam computed tomography¹¹. The pulpal reaction to Biodentine is similar to other similar material types like mineral trioxide aggregate with favourable cell proliferation and alkaline phosphatase activity of human dental pulp cells. The calcium releasing ability contributes also for the antimicrobial properties of Biodentine. This property is important since dental caries is a bacterial induced disease. Biodentine exhibits adequate antimicrobial properties and which were lower than calcium hydroxide pulp capping materials. However, the increase in the antimicrobial properties of calcium hydroxide was accompanied by higher cytotoxicity¹².

Furthermore its physical properties allow the material to be used in bulk thus avoiding unnecessary layering and interfaces that can allow micro-leakage and restoration failure. In fact Biodentine shows less micro-leakage than resin-based dentine replacement material. Placing a final restoration over Biodentine can be challenging as it is water-based. The final restoration should be delayed for at least 2 weeks and both total etch and self-etch adhesives can be used. Biodentine was shown to be able to restore teeth for up to six months and when overlaid with a composite resin it provided an effective dentine replacement material¹³.

2. Pulpotomy procedures

More advanced pulp involvement particularly in primary teeth will necessitate pulpotomy procedures to be undertaken. Biodentine exhibited better cytocompatibility and bioactivity than MTA Angelus, Theracal and IRM in contact with stem cells isolated from human exfoliated primary teeth¹⁴. Clinically, high success rates were shown in pulpotomy procedures performed with Biodentine in primary molars showing more favourable results than formocresol, which is the standard treatment methodology. When compared to calcium hydroxide in vital pulpotomies in primary molars the group treated with Biodentine revealed favourable regenerative potential along with clinical success sharing

both indications and mode of action with calcium hydroxide, but without its drawbacks of physical and clinical properties¹⁵. Pulpotomy with Biodentine resulted in a predictable clinical outcome similar to that of MTA. Biodentine was superior to less standard treatment methodologies like laser and propolis. Biodentine used for pulpotomy procedures does not cause tooth discolouration [16].

3. Treatment of the immature apex

Once the pulp tissue is lost, it is necessary to fill the root canal space. Immature teeth present a problem due to their anatomy as the roots are short and thin and routine canal obturation is difficult due to the root canal configuration¹⁷. The thin dentine walls are also at risk of fracture. Apexification procedures allow the formation of a calcific barrier at the root apex thus closing off the root-end from the periapical space. A calcific bridge is created by providing an environment where calcium ions from the dentine form a calcific bridge. Such conditions are created by materials releasing calcium hydroxide. Apexification with hydraulic calcium silicate cements as apical plugs permits apexification procedures to be performed in two visits. The two visits were necessary since MTA has a long setting time and needs to set prior to the placement of the final restoration¹⁸. More recently it was shown that apexification with an apical plug of Biodentine a single visit is enough since wetting the surface of the material did not affect the material properties. This treatment methodology can be considered as predictable, and may also be an alternative to the use of calcium hydroxide. The hydraulic nature of these material types and the formation of calcium hydroxide make these materials ideal for such procedures. Biodentine has been shown to release more calcium ions in solution than MTA. Its hydration is optimised by the addition of calcium carbonate as a nucleating agent spiking up the reaction rate in the early stages. The addition of calcium chloride accelerator and the water soluble polymer allow low water/powder ratios. The fracture resistance of immature teeth with an apical plug of Biodentine was similar to that of MTA and higher than the control¹⁹. Biodentine has also been used success-

fully in cases of regenerative endodontics. The fracture resistance in the cases was also reported to be similar to that of MTA. Biodentine showed the least discolouration potential when used in these clinical cases, thus it is the material of choice for regenerative endodontics, especially for cases where aesthetics is a concern²⁰.

4. Root end filling and perforation repair

Materials used for root-end filling need to exhibit specific properties since they have to perform and attain clinical success under very adverse conditions. The hydraulic nature of all tricalcium silicate cements is thus a desirable property. In fact these material types were invented for this purpose. The main issue with the hydraulic cements is that they react with the environment they are placed in²¹. At the root-end the materials are placed in contact with blood as soon as they are placed. They are also in contact with the root dentine and remnants of gutta-percha and sealer used to obturate the root canal. The physical properties of Biodentine are not adversely affected by contact with tissue fluids and blood²². The bond strength of Biodentine was better than that of MTA when used as a root-end filling material. Both materials were adversely affected by blood contamination. Less bacteria in apical root dentine were found when cases were treated with Biodentine and compared to MTA indicating that the antimicrobial properties of Biodentine are superior too those of MTA²³. The biocompatibility of Biodentine was considered to be marginally better than that of MTA with better cell adhesion to the materials when it was used as a root-end filling material. Biodentine was also found to be adequate to repair root perforations producing a positive tissue response and mineral deposition at the perforation site. This response is related to the release of calcium hydroxide in solution. It also seals well the area since perforations are inadvertently highly infected thus an adequate seal is necessary²⁴. Root perforation repair materials are also subject to dislodgement during tooth restoration. Biodentine shows high early push-out bond strength which did not deteriorate in contact with blood. Furthermore it was not affected by the irrigating solutions used indicating material stability²⁵.

CONCLUSION

The clinical uses of bioceramics have increased exponentially over the years because of their wide range of applicability in restorative dentistry and endodontics. The introduction of MTA was considered as a major break-through in the history of material science and since then the properties of this material have been improvised in order to achieve its maximum benefits. However, there have been a few limitations of this material which have always compelled the researchers worldwide to look for its alternatives. Difficult manipulation, slow setting time and high cost are the ones to name a few. In order to overcome these limitations, a new bioceramic material named Biodentine was introduced in the year of 2010 which has proved to be a second major break-through. Relatively easier manipulation, low cost and faster setting is the major advantages of this material when compared to MTA. Studies have also proved that its compressive and flexural strength are superior to that of MTA. High biocompatibility and excellent bioactivity further go in favour of this dental replacement material. The good handling properties of Biodentine associated with its favourable biological, mechanical and physical properties indicate that material can be used efficiently in clinical practice as a pulp capping agent and as an endodontic repair material. The easy handling and fast setting time are the major advantages in comparison to other similar materials available commercially.

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POLY ETHER ETHER KETONE IN PROSTHODONTICS

ABSTRACT

With the introduction of computer aided designing and manufacturing techniques in dentistry, it has become possible to fabricate restorations, frameworks and appliances using modern biocompatible materials including alloys, ceramics and high-performance polymers. Poly Ether Ether Ketone (PEEK) is a colorless organic thermoplastic polymer in the Poly Aryl Ether Ketone (PAEK) family, with excellent mechanical and chemical resistance properties that are retained to high temperatures. It is highly resistant to thermal degradation as well as attack by both organic and aqueous environments. PEEK melts at a relatively high temperature (343°C) compared to most other thermoplastics. PEEK has the potential to be used in load-bearing dental applications as abutments, fixed prosthetic frameworks, removable partial denture frameworks including precision attachments, implants, maxillofacial prosthesis etc. The properties and various applications of PEEK as a viable alternative to conventional materials used in prosthodontics are thus described here.

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INTRODUCTION

Poly Ether Ether Ketone (PEEK) is an aromatic, linear, semicrystalline polymer synthesized from aromatic dihalides and biphenolate salts by nucleophilic substitution. It was initially created by a group of English researchers in 1978. In the 1980s, PEEK was popularized for modern applications, for example, airplanes and turbine edges. By the late 1990s, PEEK turned into a promising polymeric alternative to metal implant components, particularly in orthopedic and for traumatic applications. In the course of recent years, PEEK and its composites have furthermore garnered much enthusiasm from dental technologists and dentists. Besides aesthetics, the fundamental main thrust is given by PEEK's incredible biomechanical properties.¹

PROPERTIES

The elasticity of the material, which lies within the range of bone, makes it able to compensate for the torsion of bone, in particular for larger implant work. The aesthetic white shade supports its use in the field of prosthetics. Its insolubility in water makes it a biocompatible material, which is ideal for patients with allergies. PEEK has a great potential as

framework material, both for fixed and removable dental prostheses. They are lighter and easier to work with in dental laboratories compared to titanium or ceramics.

PEEK is resistant to mechanical forces and thermal and oxidative attacks, as well as high temperature,² which made PEEK an attractive biomaterial for medical use, especially due to its ability to be sterilized by radiation and heat without structural damage.^{3,4} This is a partially crystalline, thermoplastic high temperature-resistant high-performance plastic with a melting temperature of approximately 334°C. PEEK is therefore suited for processing in extrusion and injection moulding procedures, but can also be used to manufacture tense rotating parts and milling parts. The material is highly stable and can bear pressures of up to 3.6 GPa. Despite having desirable mechanical properties for dental prostheses, PEEK does not meet the aesthetic requirements. Thereby the opacity and color of the material require the application of a veneering material.⁶ To obtain adhesion to veneering resins and cements, the PEEK surface requires treatment since it has low surface energy.

Table 1. Properties of PEEK

| | |
|---------------------------|-----------------------|
| Density | 1320kg/m ³ |
| Young's modulus | 3.6 GPa |
| Tensile strength | 90-100 MPa |
| Elongation | 50% |
| Notch test | 55 kJ/m ² |
| Glass temperature | 143 °C |
| Melting point | ~343 °C |
| Thermal conductivity | 0.25 W/m.K |
| Water absorption, 24hours | 0.1% |
| Water solubility | Insoluble |
| Flexural Modulus | 4 GPa |
| Flexural Strength | 170 MPa |

PEEK IN PROSTHODONTICS

PEEK is quite new material in prosthodontics. Comparing to the metals used in dentistry, PEEK is more aesthetic, stable, biocompatible, lighter and has reduced degree of discoloration.¹³ However, due to its grayish-brown color PEEK is not suitable for monolithic aesthetic restorations of anterior teeth.⁷

Prosthodontic applications include veneers, dental implants, abutments, fixed prosthetic frameworks, removable partial denture frameworks, precision attachments, secondary and telescope restorations, attachment restorations, screw-retained and implant-supported superstructures, palatal section of obturator prosthesis etc.

PEEK AS REMOVABLE PROSTHESIS MATERIAL

The esthetically unacceptable display of metal clasps, the increased weight of the prosthesis, the potential for metallic taste, and allergic reactions to metals led to the introduction of a number of thermo-plastic materials in clinical practice such as nylon and acetal resins. The major disadvantage of nylon is the inability for a reline procedure and the lack of occlusal rests as well as rigid frameworks that could lead to occlusal instability. On the other hand, acetal resins lacks natural translucency and vitality.⁸ PEEK has been successfully used as an alternative material over the last years. A modified PEEK material containing 20% ceramic fillers is a high performance polymer which presents high biocompatibility, good mechanical properties, high temperature resistance, and chemical stability.⁹

Dentures can be constructed by using PEEK computer-aided design and computer-aided manufacture systems.³ Tan-nous et al.[10] has suggested that denture clasps made of PEEK have lower retentive forces compared to cobalt-chromium (Co-Cr) clasps. However, owing to the superior mechanical and biological properties of PEEK, it will not be surprising if dentures constructed from the polymer are routinely constructed in near future.

PEEK AS CROWNS

A variety of procedures have been suggested for conditioning the surface of PEEK in order to facilitate its bonding with resin composite crowns. Even though air abrasion with and without silica coating can result a more wettable surface,⁷ etching with sulphuric acid creates a rough and chemically altered surface which enables it to bond more effectively with hydrophobic resin composites.¹¹ Because the mechanical properties of PEEK are similar to those of dentin and enamel, PEEK could have an advantage over alloy and ceramic restorations.

PEEK CAD-CAM MILLED FIXED PROSTHESIS

Using CAD-CAM to manufacture restorations makes it possible to produce dental prostheses chair-side.[12] PEEK can be used an alternative to PMMA for CAD-CAM restorations. The fracture resistance of the CAD-CAM milled PEEK fixed dentures is much higher than those of lithium disilicate glass-ceramic, alumina and zirconia.¹³ PEEK has excellent abrasive properties. Considering good abrasion resistance, mechanical properties and adequate bonding to composites and teeth, a PEEK fixed partial denture would be expected to have a satisfactory survival rate.

PEEK AS AN IMPLANT MATERIAL

Titanium (Ti) and its alloys have been used as dental implants since Brånemark introduced them at the end of the 1960s. Titanium materials possess good physicochemical characteristics, mechanical properties, biocompatibility, and high resistance to fatigue stress and corrosion. However, Ti materials have an elastic modulus significantly higher than that of bone, that may result in inadequate stress-shielding, bone resorption, and implant fracture. Titanium has also been demonstrated to have occasional metal hypersensitivity and allergies, surface degradation and contamination related to peri-implantitis, and scattered radiation. The metallic appearance of titanium materials may also be problematic, as highly aesthetic restorations are becom-

ing important. Polymeric compounds, such as polyetheretherketone (PEEK), have been developed as additional substitutes. It can be applied to materials as a superstructure, implant abutment, or implant body.¹⁴

PEEK Reinforcement

The elastic modulus of PEEK is very low compared to those of cortical bone, titanium, and ceramic materials. Dental implant materials, those are used for abutments and superstructures requires higher elastic modulus that PEEK possess. Various reinforced PEEK composites developed include carbon fiber-reinforced PEEK (CFR-PEEK) and glass fiber-reinforced PEEK (GFR-PEEK). The elastic moduli of the material properties, including reinforced PEEK materials, are shown in Table 2.

SURFACE MODIFICATION

PEEK is chemically bioinert. Literature reports various surface modifications for improving bioactivity of PEEK which include: (i) plasma treatment, (ii) chemical surface modification and (iii) surface coating.

Plasma describes an ionized gas mixture in which highly reactive radicals are formed. These can cause different reactions with the substrate surface. There are different methods for plasma generation, which differ in energy supply and pressure conditions. Treating PEEK with plasma has been demonstrated with various modifications for obtaining significant changes in the surface properties. The hydrophilic character of the material is changed by the addition of polar groups resulting in a much better wettability and an increase in surface energy.¹

Chemical surface modification of PEEK is extremely challenging due to the very high physical and chemical stability of the high performance polymer.

The deposition of a thin layer of a bioactive material applied as a surface coating on implants presents a further modification process to improve the bioactivity of surfaces. Often this modification is combined with a previous plasma or chemical treatment to augment the bonding properties. Titanium and hydroxyapatite coatings are significantly useful for enhancing osseointegration. Various techniques are available for the application of bioactive coating.

Table 2. Elastic moduli of various materials. (courtesy: Dent. J. 2017, 5, 35)

| Material | Elastic Modulus (GPa) | References |
|---------------------|-----------------------|------------------------------------------|
| Titanium | 110 | Lee, 2012 |
| Cobalt-Chromium | 180-210 | Wiesli, 2015 |
| Zirconia | 210 | Lee, 2012 |
| Porcelain | 68.9 | Lewinstein, 1995 |
| PMMA | 3-5 | Vallittu, 1998; Zafar, 2014 |
| PEEK | 3-4 | Sandler, 2002 |
| CFR-PEEK | 18 | Sandler, 2002 |
| Continuous CFR-PEEK | 150 | Schwitalla, 2015 |
| GFR-PEEK | 12 | Lee, 2012 |
| Cortical bone | 14 | Martin, 1989; Rho, 1993 |
| Cancellous bone | 1.34 | Bouchas and Reichart, 1983 |
| Enamel | 40-83 | Staines, 1981; Rees, 1993; Cavalli, 2004 |
| Dentin | 15-30 | Rees, 1993; Chun, 2014 |

ings on PEEK: (i) spray-coating, (ii) dip-coating, (iii) spin-coating, (iv) aerosol-coating and (v) physical vapor deposition.¹

Surface modifications of PEEK has been summarized in table 3.

LIMITATIONS

PEEK reports to stimulate less osteoblast differentiation comparing with titanium. Its bioinertness results in not possessing any inherent osseointegrative properties. High temperatures involved in plasma-spraying have shown to deteriorate PEEK. Owing to their limited bond strength, thick calcium phosphate coatings on PEEK can delaminate when compared to coated titanium implants.

CONCLUSION

PEEK with its added benefits of greater biocompatibility, high strength and some exceptional material properties, has the potential for shifting paradigms in device design and performance. Its superior biocompatibility and ideal mechanical properties makes it attractive material for dental restorations and it is ideal for CAD/CAM framework fabrication in prosthetic dentistry. The unique combination of X-ray and CT translucency and MRI compatibility, adjustable mechanical performance, chemical resistance, sterilisation options and the ability to be easily thermally processed makes PEEK an interesting alternative material to titanium or other implantable materials. However, more clinical research is necessary to find out the situation, because most of the studies have been carried out in vitro.

Table 3. Surface modifications of PEEK (courtesy: Dent. J. 2017, 5, 35)

| Surface Modifications | Procedures | Material | References |
|-----------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| COATING | Plasma spraying | Hydroxyapatite (HA), titanium (Ti) | Rusi-Dawicki, 1995; Suska, 2014; Ha, 1994 |
| | Spin coating | Nanosized HA crystals containing surfactants, organic solvent, an aqueous solution of Ca(NO ₃) ₂ and H ₃ PO ₄ | Barkanno, 2012; Johansson, 2014 |
| | Electron beam evaporation (EBE) | Li, Silicate | Han, 2016; Wen, 2016 |
| | Plasma immersion ion implantation (PIII) | Titanium dioxide (TiO ₂), calcium (Ca), water (H ₂ O); Argon (Ar) | Wang, 2011, Lu, 2014, Lu, 2016; Chen, 2017 |
| SURFACE TOPOGRAPHICAL MODIFICATIONS | Acid etching | Sulfuric acid | Zhao, 2013 |
| | Sandblasting | TiO ₂ , alumina (Al ₂ O ₃) | Suska, 2014; Xu, 2015 |
| CHEMICAL MODIFICATIONS | Sulfonation | Sulfonic groups (-SO ₃) | Yeo, 2013 |
| | Amination | Amine functions | Henneuse-Dexus, 1998 |
| | Nitration | Nitrate functions | Conceição, 2009 |
| INCORPORATING WITH BIOACTIVE PROPERTIES | Dioctive inorganic materials | Nano-TiO ₂ (α-TiO ₂), nano-Titaniumhydroxyapatite (n-FHA) | Wu, 2012; Wang, 2014 |
| IMPROVING HYDROPHYLICITY | UV irradiation | U.V-A light, UV-C light | Qubani, 2015 |
| | Plasma gas treatment | Oxygen plasma | Waser-Althaus, 2014; Xu, 2015; Poulsson, 2011 |

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THE ART AND SCIENCE OF ERGONOMICS IN DENTISTRY: A REVIEW

ABSTRACT

Ergonomics is an applied science concerned with designing products and procedures for maximum efficiency and safety. Musculoskeletal disorders caused or aggravated by the presence of one or any combination of the following risk factors: repetition, awkward or static postures, high forces, and contact stress. In dental clinics, there are very few activities that can cause sudden injuries, rather it is an accumulation of harmless working positions over months and years, which are repeated so often that they cause irreversible injuries

Keywords: Ergonomics, Musculoskeletal disorders, Exercises.

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INTRODUCTION

Ergonomics is essential in dentistry so that work capability, efficiency and high clinical level of treatment can be maintained throughout the working life of dental professionals. A healthy dentist is one of the most important component in a successful dental practice.¹ In our daily practice there is always very high incidence of musculo-skeletal disorders (MSDs).

Common stressors in daily routine dental practice are¹:

- Sustained/ awkward postures.
- Repetitive task
- Forceful hand exertions
- Vibrating operational devices
- Coping with patient anxieties
- Precision required with work

Musculoskeletal disorders (MSD)

MSDs are injuries and disorders of the musculoskeletal system. MSDs may be caused or aggravated by the presence of one or any combination of the following risk factors: repetition, awkward or static postures, high forces, and contact stress.

Signs & Symptoms of Musculoskeletal disorders (MSDs)²:

- Excessive fatigue in the shoulders and neck
- Tingling, burning, or other pain in arms
- Weak grip, cramping of hands
- Numbness in fingers and hands
- Clumsiness and dropping of objects
- Hypersensitivity in hands and fingers
- Decreased range of motion
- Loss of normal sensation
- Decreased grip strength
- Loss of normal movement
- Loss of co-ordination

Applying Ergonomics To Dentistry^{3,4}:

- a. Provide Sufficient Space: Awkward bending, twisting and reaching places stress on the musculoskeletal system and can lead to discomfort. Permanently place equipment used in every clinical procedure within comfortable reach (within 20 inches in the front of the body).
- b. Reduce Physical Effort: Equipment should allow us to work in a relaxed and well-balanced position and avoid bent or unnatural postures to minimize sustained effort.
- c. Scheduling: Provide sufficient recovery time to avoid muscular fatigue by increasing treatment time for more difficult patients
- d. Instrument Design: Reduce force exertion and maintain hand/ wrist in neutral position (no wrist bend).
- e. Lighting and magnification: Should produce even, shadow free, color-corrected illumination concentrated on operating field
- f. Operator stool and patient chair: promote patient comfort; maximize patient access and stability

Stretching exercises⁵

- Stretching should be gentle and gradual.
- Do not stretch a muscle to the point of pain.
- Stretches can be held up to 10 seconds and repeat 3-5 times.
- Breath normally while stretching.
- Resting hands frequently is believed to be one of the most important factors in preventing carpal tunnel syndrome.
- To relieve eyestrain caused by focussing intensely at one depth of vision for long periods, look up from the task and focus eyes at a distance for approximately 20 seconds.
- Pull the shoulders up toward the ears, roll them backward and then forward in a circular motion.
- Try head rotation for neck stiffness. Head rotation involves tilting the head from right to left, as well as forward and backwards without forcing the motion beyond a range of comfort.

- If you suffer from a musculoskeletal condition consult a physician.

Stress management⁵:

Stress is inherent in dental practice our common stressors were time management, staying on schedule, coping with difficulties or uncooperative patients, the workload, and a constant drive for technical perfection. Unhealthy stress level causes fatigue, depression, and increase susceptibility to stroke, heart disease, asthma, arthritis and irritable bowel syndrome. You cannot eliminate all stressors; however you can manage to lessen it. Dentists should learn coping strategies to minimize the effects of stress. Stress relievers such as progressive relaxation techniques, exercises, meditation and yoga minimize stress.

CONCLUSION

Prolonged static posture is inherent in dentistry. Serious detrimental physiological change in the body can result from these abnormal postures, including muscle imbalances, muscle necrosis, trigger points, hypomobile joints, nerve compression and spinal disk herniation.

Preventing chronic pain in dentistry may require a paradigm shift within the profession regarding clinical work habits, including proper use of ergonomic equipment, frequent short stretch breaks and regular strengthening exercises.

“It’s ain’t what you do, it’s the way that you do it”.

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FIBROLIPOMA OF BUCCAL MUCOSA: - A RARE CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

Lipomas are benign connective tissue tumors characterized histologically by presence of mature adipocytes. Fibrolipoma is one among the variants of lipoma, which is a rare tumor in the orofacial region. Etiology of this lesion is still controversial. We are reporting a case of fibrolipoma of buccal mucosa with literature review of its clinical and histological features. The diagnosis and differentiation of fibrolipoma with similar lesions is necessary for the accurate treatment.

Key Words: Lipoma, Fibrolipoma

INTRODUCTION

Lipomas are benign mesenchymal tumors composed of mature fat tissue and often a contingent finding¹. This lesion account for 1%-4% of all benign tumors of oral cavity². Fibrolipoma is an extremely rare subtype which accounts for 1.6% of all facial lipomas. They can occur anywhere in the body and is titled as “universal tumor” or “ubiquitous tumor.”³ The first description of oral lipoma was given by Roux in 1848 and referred to as “yellow epulis.”⁴

This is a case report of a rare variant of lipoma known as fibrolipoma which was treated by surgical excision. The aim of this paper was to recapitulate the clinical, histopathological, and therapeutic features of this type of lesion.

CASE REPORT

A 49 Year old female patient reported with a complaint of small out growth in the oral cavity on left cheek region since 6-8 months. The swelling grows to present size over 6-8 months time and there is no change in size noted since last 1-2 months. The lesion was asymptomatic and occasional biting on the enlarged lesion was the only complaint. She didn't have any history of any cheek biting habit. No history of bleeding or discharge noticed associated with growth noticed.

Intraoral examination revealed a solitary pink, sessile, exophytic nodule with a smooth glossy surface on the occlusal line of the left buccal mucosa with respect to 26 and 36 region. It was measuring 1x1x1 cm and the margins were well defined [fig-1]. On palpation the lesion was soft, non-tender, not fixed to the underlying structure. On the basis of clinical history and examination a provisional diagnosis of lipoma and a differential diagnosis of fibroma was established.

Informed consent of the patient was taken and laser excision under local anaesthesia was performed. The tissue was fixed using 10% neutral buffered formalin and send for histopathological examination. The macroscopic examination revealed a small bit

of soft tissue, measuring about 1 X 1 X 1cm in diameter, creamish white in colour, firm in consistency and round in shape [fig-2].

Upon microscopic examination the hematoxylin and eosin stained soft tissue section showed epithelium supported by connective tissue. Epithelium is of stratified squamous variety with spongiosis of the superficial cells. The connective tissue exhibited the lobular architecture of adipose cells with significant fibrous component. Artefactual cleaving was noted between the epithelium and connective tissue and necrotic tissue towards the deeper border due to laser excision [fig 3&4]. A histopathological diagnosis of fibrolipoma was ingrained.

DISCUSSION

Lipomas are relatively aberrant benign mesenchymal tumors that originate from mature adipocytes.⁵ In the head and neck region the occurrence of lipoma is reported to be 15-20% where as in the oral cavity it is only 1-4%.⁶ On a histological point of view, lipomas can be classified as classical lipomas and variants, such as fibrolipomas, spindle cell lipomas, intramuscular or infiltrating lipomas, angioliipomas, salivary gland lipomas, pleomorphic lipomas, myxoid lipomas, and atypical lipomas. In large case series studies about variants of lipoma of the oral cavity, it was found that fibrolipoma accounted for 8.3%⁷ of all variants of lipoma. As the lesion appears as painless and slowly growing on a clinical basis, it was difficult to evaluate the actual incidence of fibrolipoma. Many at a times the patient reports to the clinician only when the lesion become symptomatic or due to functional or aesthetic reason.

The etiopathogenesis of lipoma and fibrolipoma remain unknown. Previous studies suggest that fibrolipoma⁸ could be arising due to a congenital abnormality caused by an endocrinal imbalance⁹, or arises via the degeneration of a fibromatous tumor¹⁰, or from the maturation of lipoblastomatosis¹¹. Mild repeated trauma is also one of the suggested cause which can trigger the proliferation of fatty

tissue⁹. Also, few authors suggest that they arise due to rearrangement of chromosome numbers 12q, 13q, and 6p¹². We consider that the present case involved a fibrolipoma caused by repeated chewing-related trauma.

Lipomas variants differ from classical form in its clinical presentation as well as in its histological features. Depending on the quantity and distribution of fibrous tissue and the depth of the tumor the fibrolipoma varies from soft to firm⁸. When seen in the oral cavity, it has been noted on the cheek, lip, palatal mucosa and buccal mucosa being the most common site¹³. Oral lipoma and its variants have been reported to occur in all age groups but are most frequently seen in patients ranging in age from 40 to 60 years^{7,10}. Previous studies have reported that lesions in the oral cavity exhibit a mean diameter of 2 cm¹⁰. Therefore, the present case did not involve any particularly unusual clinical findings.

According to WHO, fibrolipoma was a microscopic variant of lipoma. Characteristic feature of fibrolipoma was of mature adipocytes interspersed with dense connective tissue. The growth rate of fibrolipoma is faster than classic variant. Occur mostly on buccal mucosa and buccal vestibular region with slight female predilection.

Although liposarcoma in the oral cavity is rare, on clinical basis it was difficult to differentiate from its benign counterpart. In order to differentiate liposarcoma from fibrolipoma, histopathological examination is mandatory and the diagnosis can be achieved by lack of lobular architecture, areas of prominent fibrosis and by presence of multiloculated adipose tissue having an indented nucleus in liposarcoma in variable proportion. A recurrent fibrolipoma should be viewed with suspicion and instead, a low-grade liposarcoma should be suspected¹⁴.

Often solitary, but multiple head and neck lipomas are associated with several disease conditions which include multiple familial lipomatosis and proteus syndrome, Cowden syndrome, neurofibromatosis, Gardner syndrome, Multiple Hamartoma syndrome, Encephalocranio cutaneous lipomatosis, Dercum's diseases. Some complications associated with esophageal fibrolipoma is reported in long lasting cases which include upper airway obstruction leading to esophageal disease.



Fig-1: Clinical appearance of the lesion



Fig-2: Surgical gross specimen

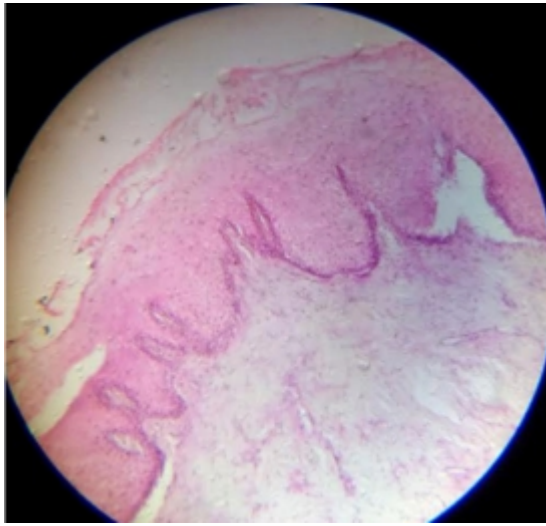


Fig-3:
Photomicrograph showing laser artefact as clefting between the epithelium and connective tissue (H&E, 4x)

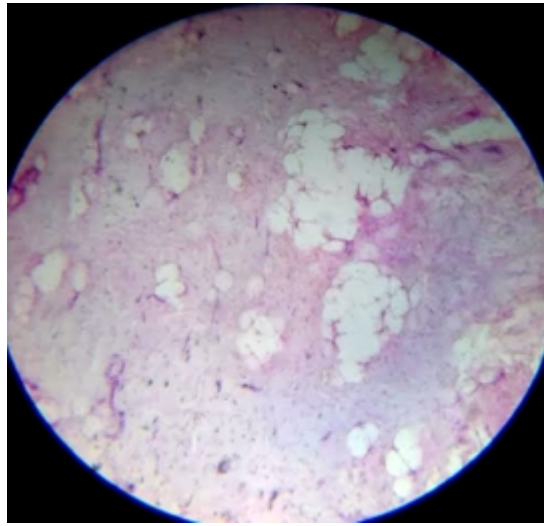


Fig-4:
Photomicrograph showing mature adipose tissue and intervening fibrous bands (H&E, 4x)

CONCLUSION

Fibrolipomas are rarely seen in oral cavity. The case presented hereshowed typical clinical and histopathological findings of afibrolipoma. It has a greater proliferative rate than other simple variants, which indicates the need for accurate diagnosis of such variants¹⁵. The treatment of lipomas including fibrolipoma is usually surgical excision.

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ORTHOPAEDIC CORRECTION OF SKELETAL CLASS III IN AN 8 YEAR OLD WITH PETIT FACE MASK AND PALATAL EXPANSION - A CASE REPORT

ABSTRACT

The orthodontic treatment of class III malocclusion with a maxillary deficiency is often treated with expansion. The following case report outlines the management of an 8 year old female patient with maxillary deficiency and a reverse overjet. Treatment was carried out with Petit face mask along with hyrax screw incorporated in maxillary acrylic plate followed by retention of Frankel III appliance.

Keywords: Face mask, maxillary deficiency, Palatal expansion.

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INTRODUCTION

The Prevalence of Class III malocclusion varies in different population and races and in variable among different ethnic groups. Gauba et al in 1998 reported the incidence of Class III malocclusion in India as 18 %¹.

Young patients with skeletal class III dentofacial deformities present with maxillary skeleton retrusion, mandibular skeletal protrusion or a combination of two.

Therapeutic regimens designed to improve the facial morphology in class III Skeletal malocclusion during the growth period include extraoral traction with face mask, functional regulator (FR-3), the chin cup, modified tandem appliance and so on². Surgical treatment is more effective to eliminate skeletal problem but this treatment modality also involves higher risk and greater costs.

It is well established that sutural growth can be stimulated in young patients.^{3,4} For these reason and because mandible prognathism is more often due to maxillary deficiency than mandibular excess, maxillary protraction can be a favourable treatment for cases with class III malocclusion.⁵ The principle of maxillary protraction is to apply tensile force on the circumaxillary suture and thereby stimulate bone apposition on the suture areas.⁶ These changes can be brought about with the use of face mask along with hyrax screw incorporated into maxillary splint.

This paper highlights the treatment of an 8 year old female patient with a skeletal midface deficiency/ maxillary deficiency managed exclusively in the Department of Paediatric Dentistry with a petit face mask and maxillary expansion splint.

CASE REPORT

An 8 year old girl child reported to the outpatient of Paediatric Dental OP clinic with a chief complaint of lower teeth overlapping upper teeth. Extraoral examination revealed a mesoprosopic face with a concave profile and a apparently deficient maxilla and flat

malar eminences. Intraoral examination revealed the patient to be in mixed dentition period. She had anterior and bilateral posterior crossbite (Figure 1). The cephalometric analysis revealed a deficient maxilla. After diagnosis of maxillary deficiency and constricted maxillary arch was established. A maxillary rapid palatal expansion appliance (hyrax screw) with face mask hooks (Figure 2) was bonded to the upper teeth. The hyrax screw was activated once daily (one turn or 1/4 mm per day). After two weeks of expansion a petit face mask with two acrylic pads lined with soft foam that contact the soft tissues in the forehead and chin region connected by a midline frame work to which a cross bar is attached was delivered (Figure 3).

The face mask was secured to the intraoral appliance by stretching 14oz 1/2 inch elastics from the hooks on the maxillary splint to the cross bar of the face mask generating 300gms of force. The post insertion angulations of the elastics were at around 30° so as to achieve a forward and downward pull of the maxilla. The patient was advised to use the face mask for 14 hours a day. Eleven months into the treatment a positive overjet was established and the posterior crossbite were relieved (Figure 4). Extra orally a significant improvement was noted in her profile. Lateral cephalogram (pre and post Figure 5) and their analysis indicate favourable treatment outcome (Table 1).

After active treatment the maxillary splint and the face mask was removed and Frankel III was inserted for active retention (Figure 6).

DISCUSSION

The face mask was first described more than 100 years ago⁷ Soon after modification started appearing over a period of time.⁸ After Delaire contributed the Delaire face mask. Petit modified the face mask to petit face mask with increased force and lesser treatment time.⁹



Figure 1



Figure 2



Figure 3



Figure 4



Figure 6



Figure 5

Table 1: Cephalometric Analysis

| Parameters | Pre-Treatment | Post-treatment |
|--------------------|---------------|----------------|
| Co - point A | 83mm | 89mm |
| Facial Angle | 90° | 91° |
| Angle of Convexity | 0° | 7° |
| SNA | 79° | 82° |
| SNB | 81° | 80° |
| ANB | -3° | 1° |

In the present case a version described by McNamara was used. A maxillary splint to which an expansion screw (hyrax screw for RME) was incorporated was bonded to the posterior teeth. The splint was fitted with two hooks which lie adjacent to the canine or first deciduous molars. A Petit face mask was secured to the splint with elastics¹⁰ which provides 300 to 600 g of force per side for 14 hours a day. Activating the expansion appliance leads to opening of faciomaxillary sutures thus enhancing the effect of orthopaedic effect of face mask.¹¹

The rapid maxillary expander also produces a forward movement of point A and a downward and forward movement of maxilla.¹² which had a favourable result on the correction. The treatment timing has a huge impact on the results. The mid palatal and circumaxillary sutures are smooth and broad during the mixed dentition ages and react favourably to treatment. During the pubertal age inter-digitation and areas of bony bridging across the suture develop to the point that maxillary expansion becomes difficult.¹³ Studies point to evidence that greater orthopedic effect is observed when the therapy was applied before or during the pubertal growth spurt (7-12 yrs)¹⁴. The present case was treated at 8 years.

A functional appliance (Frankel III) was used as a retention appliance. There has been supporting evidence that over correction and use of functional appliance as a retainer led to stable positive results¹⁵. The patient continues to be on follow up every three months. The result remains stable till date.

This article described the combination of a bonded maxillary splint with a rapid maxillary expander and an orthopaedic petit face mask using elastics to correct a developing skeletal class III malocclusion. The successful resolution of this case indicates that this therapeutic combination can be effective in class III patients who present in the skeletal and dental imbalance.

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ADENOSQUAMOUS CARCINOMA OF HARD PALATE: A CASE REPORT

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ABSTRACT

Adenosquamous carcinoma of the head and neck (ASC) is a rare and aggressive variant of squamous cell carcinoma, a locally aggressive malignancy characterized by the presence of two distinct components: a squamous cell carcinoma and an adenocarcinoma. The purpose of this article was to report an additional rare case of adenosquamous carcinoma affecting the maxilla.

Keywords: Adenosquamous carcinoma, oral cavity, hard palate, maxilla.

INTRODUCTION

Adenosquamous carcinoma (ADSC) is a rare entity of head and neck squamous cell carcinoma (SCC) which is characterized by mixed differentiation, with both SCC and true adenocarcinoma, as stated by the World Health Organization¹. It has been described in various body sites, including the uterine cervix, lung, and pancreas. The extent of ADSC of the head and neck as a distinct entity was somewhat argumentative for many years as some investigators considered it to be a high grade mucoepidermoid carcinoma². It was first defined in the head and neck by Gerughty et al. in 1968 where it showed extreme aggressiveness and highly malignant nature, with 80% of the patients having proven metastases³. The distinctly worse prognosis of ADSC as compared to mucoepidermoid carcinoma (MEC) necessitated the separation of these entities.

CASE REPORT

A 73-year-old male had been referred to our outpatient department with a chief complaint of an ulcer on hard palate noticed about two months before. The patient had a habit of smoking and drinking alcohol for a period 50 years with unremarkable medical history, had an ill-fitting maxillary complete denture. On examination a well-defined ulcer of size 1.5 cm in diameter with everted margins extending to soft palate (fig 1) was noted. The lesion is erythematous and oval in shape. On palpation it is painless, indurated and no lymph nodes noted. Based on these findings, a provisional diagnosis of carcinoma of palate was given. Incisional biopsy of the lesion was done under local anesthesia using 2% lignocaine and 1:80,000 adrenaline.



Figure 1 : Lesion in palate

Histopathological examination of incisional biopsy specimen showed dysplasia and marked hyperplasia, from which apparently an epithelial neoplasia had developed (Fig. 2A). This neoplasia was characterized by proliferation of atypical keratinocytes, forming islands of neoplastic cells infiltrating the connective tissue in the lamina propria, consistent with well-differentiated squamous cell carcinoma (Fig. 2B). Often, in the center of these islands, keratin pearls were observed, occasionally with superposed dystrophic calcification. Also in the central portions, some islands presented acantholysis producing pseudoluminae that were empty or contained cellular debris. Individually, neoplastic cells showed moderate pleomorphism, mitotic figures, multiple evident nucleoli, and marked dyskeratosis.

In deeper portions of the lesion, a distinct glandular neoplasia could be observed (Fig. 2C), showing tubular structures limited by two or more layers of epithelial cells, frequently containing eosinophilic pale material (Fig. 2D). The stroma consisted of dense connective tissue with capillary blood vessels, showing diffuse mononuclear inflammatory infiltrate and, in some areas, myxoid features. The lesion margins were poorly defined, with highly infiltrative aspect in the deeper front of invasion. Peripheral portions of the specimen showed minor salivary glands apparently not affected by the tumor.

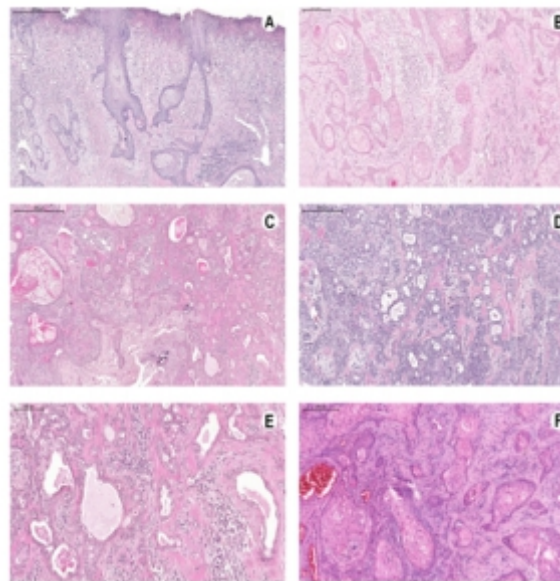
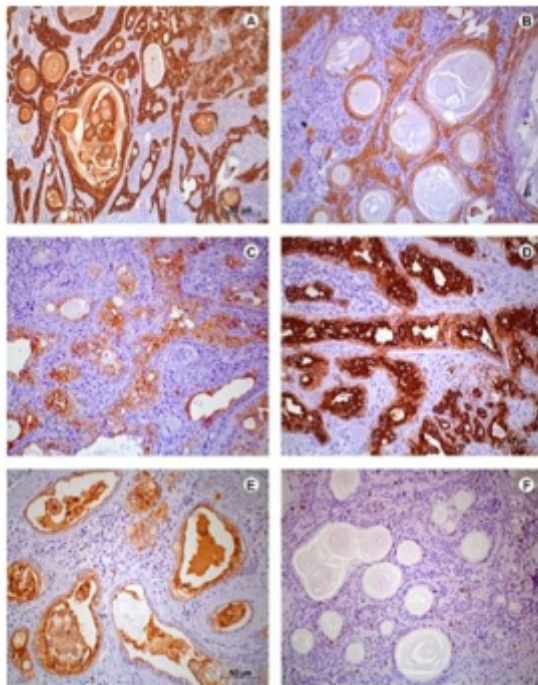


Figure 2: Histopathologic evaluation showed dysplastic stratified squamous epithelium proliferating into connective tissue in a nest, island and duct like

The histological hypothesis included squamous cell carcinoma, mucoepidermoid carcinoma, and pleomorphic adenoma. Throughout the diagnostic process, the hypothesis of acantholytic squamous cell carcinoma and of adenosquamous carcinoma were also included.

Histochemical staining with PAS, PAS-diastase, and mucicarmine only evidenced the content of the pseudoluminal structures. Immunohistochemical and histological features rendered the diagnosis of adenosquamous carcinoma. All immunohistochemistry reactions were done using humid heat for target retrieval and streptavidin-biotin-peroxidase system for detection (fig 3). Positive and negative controls for every antibody were also included.

Figure 3: Immunohistochemistry showed intraductalsialomucin positivity with mucicarmine special stain.



DISCUSSION

This case conferred very distinct clinical and microscopic features, hence several diagnostic hypothesis were arrived both at clinical and histological examination. Our first clinical hypothesis was squamous cell carcinoma as there are no other cases of adenosquamous carcinoma reported in hard palate with clinical findings similar to the one reported in our department. Even though in our case the evi-

dence of malignancy has not been found clinically, the hypothesis of mucoepidermoid carcinoma could be raised, since this entity occurs frequently in hard palate and in a wide range of ages. Mucoepidermoid carcinoma, other than the classical submucosal bluish growth with fixed borders may present with several clinical appearances such as benign lesions. The benign salivary gland tumour with highest incidence in hard palate is certainly pleomorphic adenoma affecting young to middle-aged adults, presenting as a painless, slow growing mass. These are frequently located laterally in posterior hard palate and the mass usually presents regular surface⁴. In the present case, the mass was lobulated and located centrally in hard palate with an ulcerative component in the centre.

On histopathological assessment, the initial diagnosis of the lesion was a well-differentiated squamous cell carcinoma, since almost all features under light microscope were consistent with that. This diagnosis was not concluded due to the deeper part of the specimen showing adenoid neoplastic components which were obviously not part of the surrounding normal minor salivary glands.

Mokhtari et al.⁵ reported a similar situation, in which the initial histopathological diagnosis was squamous cell carcinoma and on further evaluation the adenocarcinomatous component was noticed in metastatic cervical lymph nodes. In the same report the diagnosis was then changed to adenosquamous carcinoma when discrete neoplastic gland-like structures were identified using specific histochemical tests. Likewise, Fonseca et al. described a lesion initially diagnosed as epithelial dysplasia with focal microinvasive well-differentiated squamous cell carcinoma and after 12 months of follow-up a local recurrence was noted which presented with clinical appearance different from the initial lesion and it showed features consistent with adenosquamous carcinoma⁶.

The most common site of occurrence for adenosquamous carcinoma in the head and neck region is larynx with 48.4% followed by the oral cavity at 30%⁷. The most common locations in the oral cavity are the floor of the mouth, tongue, alveolus, palate and upper lip [8] with 6:1 male to female ratio. Differential diagnosis for adenosquamous carcinoma comprises of mucoepidermoid carcinoma, acantholytic squamous cell carcinoma, basaloid squamous cell carcinoma, conventional squamous cell carcinoma and necrotizing sialometaplasia.

The main histological differential diagnosis associated with this is mucoepidermoid carcinoma. In mucoepidermoid carcinoma gland-like structures and squamous cells tend to be intermingled while in adenosquamous carcinoma these two components are often separate and appear as two distinct areas of the tumor⁷. Pleomorphic adenoma was also considered in the histological differential diagnosis, due to areas presenting tubular structures limited by two or more layers of cells, often presenting a mucinous content. However, this hypothesis was discarded with the observation of clear and exuberant cellular pleomorphism, mainly seen in the squamous component of the analyzed specimen.

In this case the diagnosis of squamous cell carcinoma seemed to be appropriate other than the two minor features observed under light microscope, which includes: acantholysis in a small number of neoplastic squamous islands forming pseudoluminae, containing or not cellular debris, and the adenocarcinomatous component, which apparently is not a part of the normal minor salivary glands of the hard palate. Hence, two other histological hypotheses were then considered: acantholytic squamous cell carcinoma and adenosquamous carcinoma, respectively. Acantholytic squamous cell carcinoma is another uncommon variant of squamous cell carcinoma, characterized by acantholysis of neoplastic squamous cells, creating pseudoluminae and a false appearance of glandular differentiation⁸. In the present case a few areas were seen with these pseudoluminae.

Likewise, in immunohistochemical analysis, the present case was immunopositive for carcinoembryonic antigen, excluding acantholytic squamous cell carcinoma and emphasizing the final diagnosis of adenosquamous carcinoma⁸. In the present case immunohistochemical findings were crucial to reach the final diagnosis of adenosquamous carcinoma. AE1/AE3 stained positive in all neoplastic cells and in the surface epithelium, indicating the epithelial origin of the lesion (fig 3A). However when considering different molecular weight keratins separately, it became obvious the dual histomorphogenesis of the neoplastic cells. That was confirmed by the positive staining for CK5 (high weight) in the squamous component (fig 3B) and the positive staining for CK8/18 (low weight) in the adenocarcinomatous component (fig 3C). Staining to CK7 (low weight) was strongly positive

in the cells in proximity with the luminae (Fig. 3D). Carcinoembryonic antigen is a marker largely used for the final diagnosis of adenosquamous carcinoma. The present case showed scarce positivity in the squamous component and intense positivity in the adenocarcinomatous component (Fig. 3E). The proliferation index based on Ki67 immunostaining was considered low (approximately 10%) for a malignant lesion of known aggressive behavior (Fig. 3F). Study conducted by Keelawat et al.⁹ noted 47% of patients with local recurrence, 65% nodal metastasis and 23% distant metastasis and 42.9% died of their disease at a mean follow-up period of 24.7 months. Treatment strategy varies with chemotherapy, surgery and radiotherapy based on the site and stage of disease. After achieving a diagnostic conclusion our case was referred to Regional cancer centre for appropriate treatment and follow up.

CONCLUSION

Adenosquamous carcinoma represents a diagnostic challenge due to its diverse range of clinical presentations and histological features as adenocarcinomatous component may be, at times, difficult to identify. The recognition of the specific subtype of squamous cell carcinoma is of great significance.

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IDIOPATHIC FACIAL PARALYSIS AND TENS THERAPY - A CASE REPORT

ABSTRACT

Idiopathic facial paralysis, also known as Bell's Palsy is one of the common facial nerve . It is the neuropathy of the peripheral branch of seventh cranial nerve (facial nerve) which has a sudden onset. It usually results from trauma, compression, infection or any metabolic abnormalities. However, in most of the cases no etiology is identified and the conclusive diagnosis is idiopathic. Here we report one such case of facial paralysis with defective speech and heaviness of left side of the face and application of transcutaneous electrical nerve stimulation [TENS] therapy on this patient.

Key Words: Idiopathic facial paralysis, TENS therapy

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INTRODUCTION

Bell's palsy is a clinical condition which can be defined as an acute, idiopathic, unilateral paralysis of any branch of facial nerve without any associated disorders¹. This condition is named after Dr Charles Bell, who pointed out a complete facial nerve paralysis after injury of the stylomastoid foramen in 1821². Facial nerve paralysis is relatively rare with annual incidence of around 30 in 100000 in a population. The etiology may be varied starting from head injury to an idiopathic palsy but may also occur due to an injury to central or peripheral nervous system³. Treatment options for the above pathology are pharmacologic and physiotherapeutic. Pharmacologic therapies have shown better results when compared with control group or other treatments⁴. There are less number of reports in literature mentioning the use of transcutaneous electrical nerve stimulation in reducing the symptoms of facial palsy, despite their actual use⁵. Also, there are certain random and controlled studies that test the efficacy of electro-stimulation^{6,7}. Here we present a case of 21 year old male patient with signs of facial paralysis and application of TENS therapy as part of management.

CASE REPORT

A 21 year old male patient, reported to our department with chief complaint of asymmetry of face. In the history of presenting illness, he gave a history of facial asymmetry which he noticed since birth. He also reported about the limited facial movements. However mastication was normal, there was no previous history of trauma, no pain and no history of swelling over the orofacial region or elsewhere. There was also no history any viral infection during the first and second year of birth. There was no difficulty in mouth opening. Regarding his past medical history, he consulted physician for the same problem, who found out that third branch of seventh cranial nerve is affected. Also there was a history of eye surgery done 2 years back (due to excessive lacrimation). His past dental history, he underwent extraction 2 years back and restoration 1 month back. About his family history, there was no history

of maternal infection during the time of pregnancy. He had a normal gait. On general physical examination he was conscious, co-operative, moderately built and nourished. All his vital signs were within the normal limits.

Extraoral examination revealed facial asymmetry on the left side of face. Ears showed no abnormality. Nose, lips and eyes were abnormal. TMJ also showed no abnormality with no clicking or any tenderness and the lymphnodes were not palpable.

On intra oral examination of the soft tissues, the labial mucosa, buccal mucosa, tongue, vestibular area and floor of the mouth showed no abnormality. Gingiva was soft and edematous. On hard tissue examination, there were decayed teeth 27,28,35 and 48, missing teeth 24,26 & 4. The oral hygiene index was calculated to be fair with mild stains and calculus and moderate plaque.

On local extraoral examination, on inspection facial asymmetry (figure 1) was appreciated over the left side. There was deviation of nasal septum to right side along with facial midline shift to right. On examining the skin over the forehead, absence of wrinkling (figure 2) was appreciated. Watering of left eye was evident. Blinking was not seen with respect to the left eye. Patient was unable to close his left eye completely, resulting in a "heavenly look" however eye movements were normal over the right side (unaffected side). Also, while smiling there was drooping of lips to the affected side (left). He had a prognathic mandible and there was absence of facial contraction. On palpation, there was no swelling or any tenderness over the area. No signs of scars, bleeding spots or any discharge were present.

On intra oral examination, on inspection midline shift was appreciated. In addition, upper and lower teeth crowding were present. He had Angle's class III malocclusion (figure 5). Due to mandibular prognathism, there was bilateral crossbite (figures 3, 4). Uvula was shifted to the affected side (left) (figure 6). However tongue movements were normal, there was no deviation during protrusion of tongue. But while speaking, deviation of corners of lip was appreciated. On palpation, no tenderness was pres-



ent. Also there were no trigger zones present over the region.

Based on the history given by the patient and the clinical examination carried out, a provisional diagnosis of Bell's palsy on left side was given along with chronic generalized gingivitis, dental caries in relation to 27,28,35,48, Angle's class III malocclusion with bilateral crossbite & Partially edentulous space in relation to 24, 26 & 46.

Differential diagnoses considered were:

1. Unilateral central facial weakness may be due to a lesion of the contralateral cortex, subcortical white matter, or internal capsule (no history).
2. Iatrogenic: surgical procedure may sometimes be responsible (h/o surgery).

As part of management, started with steroid therapy [100mg Wysolone] for regeneration of nerve Along with TENS therapy carried out biweekly for 4 weeks (figure 7).

Following review after 3 weeks, patient report with



mild sensation of the left side with the application of TENS.

DISCUSSION

Facial nerve paralysis or Bell's palsy is defined as a neural disorder of the peripheral seventh cranial nerve or the facial nerve. Most often it is idiopathic but various other etiologies have been reported such as traumatic, compressive, infective, inflammatory or metabolic abnormalities involving the facial nerve. Previously stated incidence of Bell's palsy is 20 to 30 cases per 100,000 people per year⁸. Idiopathic (Bell's) palsy occurs with a frequency of 15-40/100,000 people⁹. The condition is acute in onset and presents with edema of the nerves and is associated with numbness or pain in the ears, face or neck in approximately 50 % of cases. Majority of patients presenting with this condition respond extremely well to steroids and physiotherapy within a 6-month period¹⁰. Various studies have been conducted investigating the role of steroids in addressing facial palsy, typically with regimens such as prednisone 1mg/kg/d up to 70-80mg. This is commonly tapered after 5-7 days, although treatment may be extended if no improvement is appreciated. Many investigations have cited benefit to steroids¹¹.

Most of the studies where electrosurgery was used to treat denervated muscles were performed on animals or in muscles bigger than facial muscles. There is always a lack of precision regarding the current type, duration and frequency of the stimuli that may favour better outcome^{12,13}. Electrical stimulation was applied in the present case to check for the nerve stimulation if present as reported and is not a complete treatment. As stated TENS therapy used along with other modes of treatment can be beneficial. As in the present case was referred to plastic surgeon who advised the used of TENS after the surgery for better results. It is probable that electrical stimulation of nerves, if applied with other modes, that is, electromyography and electroneurography studies may give better results with the aim of restoring or getting the facial expressions back.

CONCLUSION

We highlighted a case of facial nerve paralysis affecting a 21 year old male with visible clinical features. The present case has nil etiology and is considered as idiopathic. Here we attempted TENS therapy as a mode of management along with steroid therapy, and patient experienced a mild variation on the affected side on a biweekly dose of therapy. Although TENS therapy cannot cure the disease to a full extent, it can be used as an adjuvant in the management of neural pathologies giving better results.

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CLINICAL INNOVATION INNOVATIVE TECHNIQUE TO ENGAGE ELASTICS ON ARCHWIRES FOR ANTERIOR INTRUSION WITH TADS

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ABSTRACT

The aim of the manuscript is to introduce a new simplified method to substitute crimpable hooks on archwires to engage vertical elastics for intrusion of anterior teeth using Temporary Anchorage Devices (TAD).

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INTRODUCTION

In orthodontics, intrusion of anterior segment is commonly done to correct gummy smile and deepbite due to vertical maxillary excess.¹ With the introduction of Temporary Anchorage Devices (TAD) like miniscrew implants into orthodontics, intrusion of anterior teeth has become a simpler and a more effective method compared to intrusion arches.² TADs provide skeletal anchorage and true intrusion of anterior teeth take place with minimal counter forces acting on the posterior segment.^{3,4} However, engaging vertical elastics on straight archwires for anterior intrusion is limited to a few techniques, of which, crimpable hooks being the popular one.⁵

Some of the disadvantages experienced by clinicians while using crimpable hooks are

- Low stability
- Sliding of the hooks within the archwire
- Distortion of the archwire
- Breakage while engaging elastics
- Tissue injury to the labial mucosa

PROCEDURE

This simplified technique is a modification of canine loops used in Begg's appliance.⁶ In this method, a loop is made on the rectangular archwire, such that the loop lies on the occlusal aspect between the canine and lateral incisor.

Positioning the loop on the occlusal aspect of the archwire helps in engaging the vertical elastics with ease and with minimal tissue irritation to labial mucosa.

Engaging the vertical elastics directly to archwire minimizes the undesired labial tipping of the anteriors and a true intrusion of the anteriors takes place.

This method can also be used for the intrusion of the mandibular anteriors. But, the loops have to be of minimal size in order to prevent any occlusal interferences.



Figure 1: Intraoral photograph showing vertical elastics engaged from TADs to archwire



Figure 2: Intraoral Photograph showing the loops incorporated into the archwire to engage the vertical elastics.

CONCLUSION

This simplified technique was proposed to substitute the use of crimpable hooks on archwires to engage elastics for the intrusion of anterior teeth using TADs. With this technique the undesired effects of crimpable hooks can be avoided which makes it comfortable for both the clinician and the patient.

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