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editorial

The maiden issue of our journal was published in the month of January 2013, from there we started the journey and now we are at the juncture of the release of fifth issue. Publications are lifelines of educational institutions and it is important that the designated issues are brought out regularly without discontinuity. No higher educational institution can survive without quality research. And it is necessary for all teaching faculty to be actively involved in such research activities and get them documented by publications. The journals will help us to open a corridor for our upward movement. I thank everybody, who showed commitment and responsibility towards the release of this issue. I wish all success.

Dr. Romel Joseph
Chief Editor

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COMBINATION SYNDROME: A REVIEW

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ABSTRACT

Oral destructive changes that occur in a sequential manner are often seen in patients with a maxillary denture opposing a mandibular removable partial denture. This was identified and coined by Ellsworth Kelly in 1972 as 'Combination syndrome'. This article presents the clinical features associated with it and the treatment options available for such a patient.

Key words : Syndrome, distal extension, epulis fissuratum.

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INTRODUCTION

Combination syndrome was identified by Kelly in 1972 in patients wearing a maxillary complete denture opposing a mandibular distal extension prosthesis. The glossary of Prosthodontic terms defines combination syndrome as 'the characteristic features that occur when an edentulous maxilla is opposed by natural mandibular teeth including loss of bone from the anterior portion of the maxillary ridge, overgrowth of tuberosities, papilary hyperplasia of the hard palate's mucosa, extrusion of lower anterior teeth and loss of alveolar bone and ridge height beneath the mandibular removable dental prosthesis bases. It is also called anterior hyperfunction syndrome'[2]. This complication is not seen in cases of complete dentures opposing natural mandibular posterior teeth.

History

Ellsworth Kelly in 1972 was the first person to use the term 'Combination Syndrome'. He studied a small group of patients wearing a complete maxillary denture opposed by remaining mandibular anterior teeth and a distal extension removable partial denture (RPD). Of the 6 patients followed up for 3 years, all showed a reduction of the anterior bone in the maxilla along with enlarged tuberosities[3]. For 5 patients there was an increased bone level of the tuberosities. He described 5 signs or symptoms that commonly occurred in this situation. They include anterior maxillary ridge resorption, papillary hyperplasia in the hard palate, maxillary tuberosity hypertrophy, extrusion of the mandibular anterior teeth, and bone loss under the partial denture base. His theory stated that this sequence was triggered due to a negative pressure within the maxillary denture, which causes the anterior ridge to be driven upward by the anterior occlusion, followed by an early loss of bone from the anterior part of the maxilla and formation of epulis fissuratum in the maxillary sulcus. This is followed by maxillary tuberosity hypertrophy, supra eruption of the remaining natural lower anterior teeth and posterior mandibular resorption.[4]

Saunders et al in 1979 added to the description of the combination syndrome by including destructive changes such as loss of occlusal vertical dimension, occlusal plane discrepancy, anterior spatial repositioning of the mandible, poor adaptation of the prostheses, epulis fissuratum and periodontal changes. Saunders et al suggested that the sequence of events is initiated by the loss of mandibular posterior support, resulting in a gradual decrease of occlusal load posteriorly; an increased occlusal load anteriorly and eventually increased pressure resulting in resorption of the maxillary anterior residual ridge.[4]

Pathogenesis

Combination syndrome progresses in a sequential manner. The group of complications which represent as a syndrome are interlinked to one another. The progress of the disease can occur in any one of the following sequences.

Sequence 1

The patient will tend to concentrate the occlusal load on the remaining natural teeth (mandibular anteriors) for proprioception. Hence, there is more force acting on the anterior portion of the maxillary denture.

This leads to increased resorption of the anterior part of the maxilla which gets replaced by flabby tissue. The occlusal plane gets tilted anteriorly upwards and posteriorly downwards due to lack of anterior support. The labial flange will displace and irritate the labial vestibule leading to the formation of epulis fissuratum. Posteriorly there will be fibrous overgrowth of tissues in the maxillary tuberosity.

The shift of the occlusal plane posteriorly downwards produces resorption in the mandibular distal extension denture bearing area due to the tilt of the occlusal plane, the mandible shifts anteriorly during occlusion. The vertical dimension at occlusion is decreased. The retention and stability of the denture is also decreased. The tilt in the occlusal plane disoccludes the lower anteriors causing them to supraerupt. This reduces the periodontal support of the anterior teeth. The supraerupted anteriors increase the amount of force acting on the anterior part of the complete denture and the vicious cycle continues.[1]

Sequence 2 (Craddock)

1. There is a gradual resorption of the distal residual ridge .
2. This leads to tilting of the occlusal plane posteriorly downwards and anteriorly upwards .
3. Rest of the vicious cycle continues as in sequence 1 .

Combination syndrome should be identified at an early stage and prevented. Planning over dentures and designing implant-supported dentures are some methods to prevent combination syndrome.[1]

Prevalance

Shen & Gongloff in 1989, reviewed records of 150 maxillary edentulous patients who had maxillary complete dentures and mandibular anterior natural teeth. One in four demonstrated changes consistent with the diagnosis of Combination syndrome.[1]

TREATMENT OPTIONS IN COMBINATION SYNDROME

Saunders et al in 1979 stated that, the basic treatment objectives in treating these patients is to develop an occlusal scheme that discourages excessive occlusal pressure in maxillary anterior regions in both centric and eccentric positions[1].

Mandibular R.P.D should provide positive occlusal support from the remaining anterior teeth and have maximum coverage of basal seat beneath distal extension bases.

The design should be rigid and should provide maximum stability while minimizing excessive stress on remaining teeth. The occlusal scheme should be at a proper vertical and centric relation position. Anterior teeth should be used for cosmetic and phonetic purpose only. Posterior teeth should be in balanced occlusion.[1]

Treatment options in the maxillary arch[5]:

Treatment Option 1: Planned Extractions Followed by Immediate Denture:

This technique enables the decrease in the resorption rate of the maxillary anterior residual ridge because ridges are subjected to early function coupled with improved aesthetics of the patient. It prevents formation of flabby tissues which could also arise as a result of unplanned or uncontrolled dental extractions.

Treatment Option 2: Overdenture Prosthesis with a Metallic Denture Base:

Maxillary overdenture placed on retained anterior maxillary roots will absorb occlusal forces exerted by anterior mandibular teeth thereby reducing the resorption of the maxillary ridge. Reinforcing the denture base with a cast metal framework has been shown to reduce fracture rates.

Treatment Option 3: Special impression techniques for flabby tissues:

Mucostatic impression techniques are used here. The material used for impression are impression plaster, zinc oxide eugenol, greenstick compound and Elastomeric material.

Table 1:Clinical presentation of the syndromic characteristics[6]

Syndrome Characteristics	Clinical Evaluation
Bone resorption in the maxillary anterior region	Observation of flaccid tissue in the anterior region of the residual ridge susceptible to displacement
Tuberosity overgrowth	Vertical and/or horizontal growth of fibrous or bone tissue in the right and/or left tuberosity region
Palatal papillary hyperplasia	Observation of erythematous mucosa with a papillary surface in the hard palate
Extrusion of the remaining natural mandibular teeth	Observation of dental wear at the enamel or dentin level
Mandibular posterior bone resorption	Observation of accentuated bone resorption in the posterior edentulous region

Treatment Option 4: Surgical Intervention

Vestibuloplasty and excision of flabby tissue followed by metallic denture base prosthesis.

Treatment Option 5: Implants

Implant treatment options like implant supported fixed ceramo-metal prosthesis, Implant supported over denture can be placed.

Treatment planning for the Distal extension partially edentulous Mandibular Arch

Treatment Option 1: Overdenture

Mandibular overdenture produced better prognosis in patients who already had combination syndrome and whose mandibular teeth were structurally or periodontally compromised.

Treatment Option 2:

A removable cast partial denture.

Treatment option 3: Mandibular implant supported overdenture

It offers significant improvement in retention, stability, function and comfort for the patient and a more stable and durable occlusion.

Treatment Option 4: Implant Supported Fixed Prosthesis.

In 2001 Wennerberg et al reported excellent long term results with mandibular implant supported fixed prosthesis, opposing maxillary complete dentures.

All these treatment forms were directed towards the preservation of health of natural dentition and its masticatory function.

CONCLUSIONS

Patients with a maxillary complete denture and a distal extension removable partial denture are subjected to irreversible degenerative changes. Combination syndrome has a prevalence rate of approximately 24% for denture patients[7].It is important to make the patient aware of the changes and advocate the best possible treatment option that provides the preservation of the remaining natural tissues.

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REVIEW ARTICLE

HERBAL ROOT CANAL IRRIGANTS: A REVIEW

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ABSTRACT

One of the major objectives of a root canal treatment is to disinfect the root canal system. Irrigation is carried out to reduce the number of bacteria in the root canals. For this purpose, a wide variety of synthetic drugs are available today but due to the ineffectiveness, safety concerns and side effects of these synthetic drugs, the herbal alternatives for endodontic irrigants might be advantageous .Over the past decade, interest in drugs derived from medicinal plants has markedly increased. In dentistry phytomedicine has been used as anti-inflammatory, antibiotic, analgesic, sedative and also as endodontic irrigant.This update focuses on various herbal drugs and products as well as their therapeutic application, side effects and possible drug interactions when used as phytomedicine in endodontics.

Key Words : Root canal irrigants, Phytomedicine, Bio films, Smear layer.

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INTRODUCTION

Primary etiologic factors in the development of pulp and periapical lesions have long been recognized as the bacteria.[1,2,3] The main aim of an endodontic treatment is to remove the diseased tissue, eliminate bacteria from the root canal system and prevent its recontamination.[4] Irrigation is carried out to reduce the number of bacteria in the root canal system and to control the periapical disease[5]. Herbal products have been used since ancient times in folk medicine, involving both eastern and western medicinal traditions. Many plants with biological and anti micrbiological properties have been studied since there has been a relevant increase in the incidence of antibiotic overuse and misuse. In dentistry Phytomedicines has been used as anti-inflammatory, antibiotic, analgesic and sedative agents. Herbal or natural products have also become more popular today due to their high antimicrobial activity, biocompatibility, anti-inflammatory and anti-oxidant properties[6]. A wide variety herbal products have been used in the past in medicine. Thus the aim of this review is to enlist and describe the various herbal alternatives available today for use as effective endodontic irrigants.

IDEAL REQUIREMENTS OF ROOT CANAL IRRIGANTS[7]

1. Broad antimicrobial spectrum.
2. High efficacy against anaerobic and facultative microorganisms organized in biofilms.
3. Ability to dissolve necrotic pulp tissue remnants.
4. Ability to inactivate endotoxin.
5. Ability to prevent the formation of a smear layer duringinstrumentation or to dissolve the latter once it has formed.

Herbal Endodontic Irrigants

Curcuma longa (Turmeric):

Curcumin, a member of a ginger family possesses anti inflammatory[8], anti oxidant[9], anti microbial[10] and anti cancer activity[11]. In an in vitro study conducted by Prasanna Neelakantan, it has been shown that curcumin has significant anti bacterial activity against E.faecalis and can be used as an alternative to sodium hypochlorite for root canal irrigation. Thus this herb can be used especially in endodontics for root canal failure cases. [12]

Triphala

Triphala consists of dried and powdered fruits of three medicinal plants Terminalia bellerica, Terminalia chebula, and Emblica officinalis[13]. Triphala achieved 100% killing of E faecalis at 6 min. This may be attributed to its formulation, which contains three different medicinal plants in equal proportions; in such formulations, different compounds may help enhance the potency of the active compounds, producing an additive or synergistic effect[14] .Triphala contains fruits that are rich in citric acid, which may aid in removal of the smear layer.

Morinda citrifolia:

Morinda citrifolia (MCJ) has a broad range of therapeutic effects, including antibacterial, antiviral, antifungal, antitumor, antihelmintic, analgesic, hypotensive, antiinflammatory, and immune-enhancing effects.[15,16.17,18] MCJ contains the antibacterial compounds L-asperuloside and alizarin[18]. Murray et al.[18] proved that, as an intracanal irrigant to remove the smearlayer, the efficacy of 6% MJC was similar to that of 6% NaOCl in conjunction with EDTA.

The use of MCJ as an irrigant might be advantageous because it is a biocompatible antioxidant[18]and not likely to cause severe injuries to patients as might occur through NaOCl accidents.

Propolis:

Propolis, a natural antibiotic is a resinous substance that honey bees collect from trees of poplars and conifers. It possesses anti bacterial activities against streptococcus sobrinus and streptococcus mutans[19]. It also possesses good anti oxidant[20] and anti inflammatory activities [21]. It has been used as a pulp capping agent[22], cariostatic agent [23], as a mouth rinse [24] and in the treatment of periodontitis [25]. Ethanolic extract of propolis can promote bone regeneration and induce formation of hard tissue bridge in pulpotomies or pulp capping. In a study conducted

by Al-Qathami and Al-Madi,the anti microbial efficacy of propolis, sodium hypochlorite and saline as endodontic irrigants was compared and it was found that propolis showed anti microbial activity equal to that of sodium hypochlorite. [26]

Azadirachta indica (Neem):

Neem's anti viral [27], anti fungal [28], anti bacterial [29] and anti carcinogenic activity [30] makes it a potential agent for root canal irrigation. Neem leaf extract is also used to treat dental plaque and gingivitis. Being a bio-compatible anti oxidant, use of neem is advantageous as it is not likely to cause the severe harms to patients that might occur through sodium hypochlorite accidents. Naiyak Arathi et al observed that ethanolic extract of neem had significant anti microbial activity against E.faecalis.[31] In another study by Hannah Rosaline et al, the effects of herbal extracts such as Morinda Citrifolia, Aadirachta indica and green tea were studied. The most to least effective irrigants were: Azadirchta indica, sodium hypochlorite, green tea, Morinda citrifolia and saline. Thus, it is an effective herbal alternative to the more commonly used irrigant sodium hypochlorite. [32]

Aloe Vera (Aloe barbadensis miller):

Aloe vera possesses good anti bacterial and anti fungal activity. In a study conducted by Suresh Chandra, anti microbial effect of water, alcohol, chloroform extracts of aloe vera gel were investigated and it was found that chloroform extract of aloe vera had significant anti microbial effect against E.faecalis[33]. It also has been found to be effective against the resistant micro organisms commonly found in the pulp.

Green Tea

Green tea polyphenols, the traditional drink of Japan and China is prepared from the young shoots of the tea plant Camellia sinensis[34]. Green tea polyphenols showed statistically significant antibacterial activity against E faecalis biofilm formed on tooth substrate. It takes 6 min to achieve 100% killing of E faecalis[14].The antimicrobial activity is due to inhibition of bacterial enzyme gyrase by binding to ATP B sub unit[35]. Green tea exhibits antibacterial activity on E-faecalis plaknotic cells. It is also found to be a good chelating agent.

German chamomile and Tea tree oil:

German chamomile has anti inflammatory, analgesic and anti microbial properties. Tea tree oil also has many properties such as being an antiseptic, anti fungal agent, anti bacterial and a mild solvent. The active component in tea tree oil is terpinen-4-ol which is responsible for the above properties. [36] In a SEM study conducted to overcome the undesirable effects of sodium hypochlorite, it was observed that chamomile when used as an irrigant was more effective in removing smear layer when compared to sodium hypochlorite used alone but less effective than sodium hypochlorite combined with EDTA[37]. In another study by Uday Kamath et al, anti bacterial efficacy of tea tree oil was compared with 3% sodium hypochlorite and 2% Chlorhexidine against E.faecalis. It was found that maximum anti microbial activity was shown by Chlorhexidine followed by tea tree oil and then sodium hypochlorite. [38]

Allium Sativum (Garlic):

Its main active component is allicin which destroys the cell wall and cell membrane of root canal bacteria and thus can be used as an irrigant alternative to sodium hypochlorite. [39]

Jeeryin Solution:

This is a Chinese herbal compound with anti bacterial, anti inflammatory and detoxifying effects. When used at 30% concentration for irrigation of root canal, it had a similar effect to that of sodium hypochlorite.[39]

Salvadora Persica Solution (Miswak-siwak):

In a study conducted by Nawal A.K.Al-Sabawi et al, alcoholic extract of Salvadora Persica was compared with 5.25% sodium hypochlorite,0.2% Chlorhexidine and normal saline. It was shown that Salvadora Persica extract had a significant anti microbial effect against both aerobic and anaerobic bacteria with its efficacy being maximum at 15%. [40]

Aroeira-da-praia and Quixabeira:

In an invitro study conducted by Edja Maria Melo de Brito Costa et al, anti microbial activity and root canal cleaning potential of Aroeira-da-praia and Quixabeira against E.faecalis was evaluated. It was concluded that Aroeira-da-praia showed anti microbial activity at all concentrations tested whereas Quixabeira was effective only at 100% and 50% concentrations.[41]

Spilanthes Calva DC:

Spilanthes Calva DC is an important herb for oral health care. It is non toxic to human beings and has anti bacterial and anti fungal activities. Moulshree Dube et al compared the anti bacterial efficacy of methanolic extract of Spilathes Calva DC roots with 2% Chlorhexidine 3% sodium hypochlorite and doxicycline at different concentrations against E.faecalis. From the study, it was concluded that Spilanthes Calva DC root extract had comparable anti bacterial activity to sodium hypochlorite. Thus it may have potential as a root canal irrigant. [42]

Conclusion

Literature has addressed many plants with potential source for new therapies in endodontics. The studies listed have shown important medicinal activities of plants, with great demand to inhibit or suppress bacteria and their biofilm. The major advantages of herbal irrigants are safety, easy availability, increased shelf life, cost effectiveness and lack of microbial resistance so far. The in vitro studies conducted so far have shown that herbs can have a promising role as root canal irrigants. However, further clinical trials and investigations are also required for the herbal irrigants to be considered as effective alternatives to the synthetic root canal irrigants.

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REVIEW ARTICLE

CANDIDA A PROBABLE ETIOLOGY IN EARLY CHILDHOOD CARIES- A LITERATURE REVIEW

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ABSTRACT

Early Childhood Caries, a rampant type of dental caries in children below 6 years of age; is a chronic childhood disease with a severe sequalae affecting the child and family. It is a multifactorial disease, with *S.mutans and Lactobacilli* being implicated as the main microorganisms in its etiopathogenesis. Recent literature suggests a probable role of *Candida*, fungal species, a normal commensal of the oral cavity, in its etiopathogenesis. Under particular predisposing physiological or pathological conditions, *Candida* is capable of provoking pathologies via endogenous infectious mechanism. In early childhood period, due to immature immune system and not fully established micro flora in the oral cavity, children are more susceptible to opportunistic microbial colonization. The present literature review provides compilations of previous studies implicating *Candida's* probable role in caries and an attempt is made to provide and update the current understanding of *Candida's* potential role in initiation of early childhood caries in order to help health providers to diversify their treatment modalities from antibacterial to anti-fungal.

Keywords: ECC, Caries, *Candida*, *C.Albicans*, Pre-school.

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INTRODUCTION

Early Childhood Caries (ECC) also known as early childhood tooth decay is a destructive form of dental caries that afflicts the young children. The older terminologies like "nursing caries" and "baby bottle tooth decay" have been replaced with broader term ECC. It is one of the most common chronic childhood diseases in this age group; and though not life-threatening, it affects normal health and well-being of the child. The prevalence of dental caries has reduced worldwide, yet that of ECC remains high and so it is currently a WHO concern. [1,2]

The difference between ECC and the dental caries is that, here the progression of caries is very rapid and widespread; and because of this rapid progression, its prevention and management is a challenge.

American Academy of Pediatric Dentistry (AAPD) defines early childhood caries (ECC) as the presence of one or more decayed (non cavitated or cavitated), missing (due to caries), or filled tooth surface in any primary tooth in a child 71 months of age or younger. Presence of any smooth surface caries in children younger than three years of age; one or more cavitated, missing due to caries or filled smooth surfaces of the primary maxillary anterior teeth in children from ages three to five; or a decayed, missing or filled score of >=4 (age 3), >=5 (age 4), >=6 (age 5) surfaces are termed as Severe-Early Childhood Caries (S-ECC) [3].

Early Childhood Caries is an infectious disease of bacterial origin[4]. The disease is the result of frequent sugar intake leading to changes in the oral microbial ecology to a cariogenic miroflora, leading to an imbalance between the demineralization and remineralisation process, favouring demineralisation of the teeth. Thus, acidity is a pre-requisite for caries formation, and acidogenic microflora plays an important role.

Oral bacteria like, *Streptococcus mutans* and *Lactobacillus spp.* are the main microorganism implicated for the initiation and progression of caries respectively.

But presently researchers are implicating the propable role of *Candida*, a fungi in caries etiopathogenesis. This article is a brief literature review on *Candidas* role in early childhood caries.

Candida species are fungi which are common inhabitants of the normal oral microbiota found in infants. *Candida* is an opportunistic pathogen and in immunocompromised individuals it has the ability to cause a variety of infections. For instance till date, oral thrush in infants and chronic atrophic candidiasis (denture induced stomatitis) in adult are the known most common clinical manifestations of oral candidiasis.[5,6,7] Among *Candida* species, the most prevalent in the oral cavity is *Candida albicans*.[3,1,2]

As a first colonizer

Among *Candida* species, the most prevalent in the oral cavity is *Candida albicans*. Reports suggest its presence in saliva, dental plaque and also infected dentin of children with early childhood caries. Craig reported that *Candida albicans* in the biofilm of ECC is twice more prevalent than caries free children[7,8,9,10]. Reports of candidal carriage range as high as 50%. [7]

The prevalence of the *Candida* in the oral cavity varies with age: 4% in 4-5 days old babies, 24% in premature newborns, and 30% in children aged 3-12 years. [6] Higher frequencies of *Candida* were also found in children using pacifiers. Its presence in the oral cavity may be related to many factors such as birth infection, nurse fingers, hospital maternity ward [11,12,13], baby's feeding bottles, infected pacifiers, maternal skin, air, water and carious teeth.[7]

Candidal carriage in children

Candida counts were significantly associated with caries prevalence with increase in their DMFS score.[14] The carriage was approximately 3 times greater in females than in males. The yeast isolates were 71% *Candida albicans*; 19.7% *Saccharomyces spp*. and 8.6% *Candida* tropicalis.[15] Studies explains that poor oral hygiene, in children consuming unrestricted diets, may influence the salivary levels of yeasts irrespective of the frequency or amount of sugar consumed.[16,17,18,19] Children with oral *C. albicans* frequently maintained carriage over time, even with regular dental care.[20,21] Carious teeth

may constitute an ecological niche for *C.albicans* and, potentially responsible for recurrent oral and non-oral candidiasis.[22] Oral environment stabilization procedures were found to be efficient in reducing *Candida spp.* counts, especially when the zinc oxide-eugenol cement was employed.[23]

Candida albicans was observed in the oral cavity of healthy school and preschool children compared to adolescents.[24,25] The frequency of *C. albicans* in ECC was higher when compared to caries and caries-free groups.[26] *Candida albicans* was more frequently isolated in all studies, and it was the only species present in caries-free children.[27,28]

Post chlorhexidine treatment, decreased for mutans *streptococci* and *lactobacilli*, but large numbers of *Candida spp.* still remained in the saliva of several children. *Candida spp*. reduced only after post antifungal therapy. And few researchers suggested the use of antifungal drug nystatin (oral rinses) to control caries.[29]

Candida - free individuals significantly inhibited the blastoconidial growth more than *Candida*-carriers suggesting that saliva may play a role in modulating oral candidal populations in health.[30,31,32]

Recent studies concluded that prevalence of *Candida albicans* in dental plaque and carious lesions of children with ECC were relatively high and prevalence was higher in cervical group of caries.[33,34] Further studies revealed that *Candida albicans* genotype A was dominant among SECC Children.[35]

Greater acid potential

C. Albicans is acidogenic and has the ability to ferment many carbohydrates (hetero -fermentative). It is also acid-tolerant, and increased presence is seen in the oral cavity due to great number of retentive sites.[36]

Under favourable physiological or pathological conditions, it is capable of provoking pathologies. It is endowed with dimorphism i.e; it is able to exist both in yeast and pseudohyphal/hyphal form, and this property is referred to as a major virulence determinant.[37] Yeast form are normal commensal of the oral cavity. Pseudohyphal (budding shape) has been associated with a fungal (saprophytic) condition while the presence of hyphal forms has been associated with active symptomatic infections. *Candida albicans* displays many pathogenic forms, because of which it is capable of adhering to various surfaces, interfering with the immunological system of host organisms and producing several catabolytes.[38]

Some studies have shown that in an environment with a pH below 5.5, which is relevant for early childhood caries formation, acidification by *Mutans streptococcus* decreases considerably and ceases around pH 4.2 (deSoet et al.1991), whereas *C.albicans* can still secrete acid at pH 4.0 (Kl inke et al., 2009)[39,40]. Furthermore, the study by Nikawa et al. has revealed that *C.albicans* was capable of dissolving the hydroxyapatite at an approximately 20-fold rate higher than *Mutans streptococcus*, despite a lower number of yeast cells in the culture (Nikawa et al., 2003) studies above may indicate that *C. albicans* is capable of producing acids and demineralizing dental tissue in vivo.

It is supposed that there are at least two processes that can be predicted in vivo which involve in the acid production of a surrounding environment by *Candida albicans*

1) It produces several organic acids including pyruvic acid and acetate (Samaranayakeet al., 1986; Collingset al., 1991)[41,42]

2) Abundant H +ATPase on the plasma membrane of yeasts pumping out proteins from the cell is induced by glucose and makes a contribution to the acidification (Bowman et al., 1986; Manavathuet al., 1999).[43] Since acidification causing demineralization of dental tissues plays the most important role in the progression of early childhood caries.[44,45] These, the acid production of microbes has been considered as one of the typical characters of caries pathogen.[46,47] According to the viewpoint of Marsh involved in dental caries[48], there are undoubtedly other acidogenic microorganisms. Considering the potential of *Candida albicans* to adherence to saliva proteins and *S.mutans*, its acid producing capability, its

ability to penetrate into dentinal canals and its enzymatic activity to degrade collagen; indicates that it may be having greater cariogenic ability and may be having a possible role in the progression of early childhood caries.

Samaranayake LP et al in 1986, conducted a invitro study to determine the growth and acid production of *Candida* species in human saliva supplemented with glucose/ glucose-free. The results of the study showed that the growth of *Candida* in saliva was accompanied by rapid decline in pH from 7.2 to 3.2 over 48 hours. And major acidic components initiating and sustaining this pH drop were pyruvates and acetates. The study concluded that acidic metabolites may play an important role in pathogenesis of oral *Candida* infections.[49]

J. Verrant et al in 1991 conducted an invitro study to determine the effect of different pH on *Candida* strains ability to adhere and form hyphae. Hefound that *Candida* were capable of adhering to buccal epithelial cells at all the pH values studied; (7.3,6.0,2.6). and the adhering strains at pH 2.6 showed hyphal forms.[50]

Pathogenicity

Studies have shown that *C.albicans* adheres to saliva-coated surfaces with assistance of salivary proteins, acrylic[51,52], dental hard tissues.[53,54,55,56] It can readily adhere to mucosal epithelial cells[57,58] and collagen[59] with the Proline-rich proteins and provide receptors for adhesion of *C.albicans* to enamel pellicles, and also help in its adhesion to *streptococcal* surfaces[60]. Thus, salivary proteins may act as a bridge (ligand) for the interactions between *C. albicans* and oral bacteria, which may aid *C. albicans* to participate in the early childhood caries development. The secreted aspartyl proteinases (Saps) are among the most important virulence factors of *C. albicans*, and are related to the adhesion of *C. albicans* to tooth surfaces and the degradation of extracellular matrix and proteins. Wengiung L et al in 2014, hypothesized that Saps are higher in S-ECC groups and Saps 1 may play a role in development of S-ECC.

Sen B.H et al in 1997 conducted an invitro study to determine the colonization of *Candida albicans* on cleaned human dental hard tissues using scanning electron microscope. The results of the study showed that hyphae penetrated into cracks, followed the ridges of the cavities and migrated into dentinal tubules. The study concluded that dental hard tissues may be invaded by *C.albicans* and are potential reservoir for disseminating candida infections.[61,62]

Nikawa H et al in 2003 conducted a study to determine the in vitro cariogenic potential of *Candida albicans*. The adherence and dissociation of *Candida albicans, Candida tropicalis, Streptococcus mutans and Streptococcus sanguinis* to six substrates including hydroxyapatite which exhibit hydrophobicity, was examined using bioluminescent adenosine triphosphate assay and spectrophotometrical method. The results shows that *Candida albicans* adherence to hydroxyapatite was extraordinary high through electrostatic interaction, but in small number. They concluded that *Candida albicans* possesses the ability to dissolve HAP to a greater extent (approximately 20-fold) when compared with *S.mutans*.[63,64]

***Candida* in association with Bacteria.**

Thein Zm et al; showed that co-culture with highest concentration of each of foregoing bacteria resulted in a consistent reduction in the yeast counts in candida biofilm, except for *Lactobacillus, S.mutans* and *S.intermedius* co-cultures indicating quantitative and qualitative nature of the bacteria modulating *C.albicans* biofilm formation in mixed species environment like our oral cavity.[65] Invitro studies using artificial biofilm homogenously inoculated with *Streptococcus mutans* and *Candida*; simultaneously confirmed the adherence capacity of *Streptococcus mutans* to *Candida* when in association.[66]

Lucja M.Jarosz et al; revealed that CSP (Competence-Stimulating peptide), an *Streptococcus mutans* quorum sensing molecule secreted during the early stages of growth, inhibits the *Candida albicans* morphological switch.[67] Further; S.Gregoire et al; revealed that glucan coated yeast

cells significantly increased the accumulation of *Streptococcus mutans* on Hydroxapatite surfaces. And this Glucan-mediated fungal- bacterial interaction represents novel cross-kingdom interaction that is involved in development of virulent biofilms associated with ECC.[68] The ability of *S.mutans* and *C.albicans* together to form biofilms is enhanced in vivo due to presence of *C. albicans* augments exopolysaccharides (EPS) production, such that co-species biofilms accrue more biomass and harbor more viable *S. mutans* cells than single-species biofilms. Glucosyltransferase-derived EPS was proved to be a key mediator of co-species biofilm development, and that co-existence with *C. albicans* induces the expression of virulence genes in *S.mutans*. Altogether, these studies demonstrate a novel mutualistic bacterial-fungal relationship that occurs at a clinically relevant site to amplify the severity of this ubiquitous infectious disease.[69]

Conclusion

This literature review reinforce those of the previous scientific literature, implying that *Candida spp* are not merely passively associated with the caries process. It remains unclear whether *Candida species* are causative agents in early childhood caries initiation or progression, or whether *Candida* colonization are merely a consequence of severe early childhood caries activity. Further studies are required to elucidate the real role of this microorganism in the etiology of ECC, which may aid in management and prevention of this chronic childhood disease.

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REVIEW ARTICLE

ZIRCONIA IN DENTISTRY - AN OVER VIEW

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ABSTRACT

The interest of dental research in metal-free restorations has been rising in the last 20 years following the introduction of innovative all-ceramic materials in the daily practice. In particular, high-strength ceramics and related CAD/CAM techniques have widely increased the clinical indications of metal-free restorations, showing more favorable mechanical characteristics compared to the early ceramic materials. Zirconia has been recently introduced in prosthetic dentistry for the fabrication of crowns and fixed partial dentures, in combination with CAD/CAM techniques. The aim of the present paper was to provide a brief review on some aspects of zirconia dental restorations.

Keywords: Zirconia, Biocompatibility, Fixed partial dentures, Implant abutment.

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INTRODUCTION

Zirconium (Zr) is a metal with the atomic number 40.It was first discovered in 1789 by the chemist MartinKlaproth[1]. Zirconia (ZrO_2) is a white crystalline oxide of zirconium. Zirconia is a polycrystalline ceramic without a glassy phase and exists in several forms. The name 'zirconium' comes from the Arabic word 'Zargon' which means 'golden in colour'[2]. The material has a density of 6.49 g/cm³, a melting point of 1852 and a boiling point of 3580.

It has a hexagonal crystal structure and is grayish in color. Zr does not occur in nature in a pure state. It can be found in conjunction with silicate oxide with the mineral name Zircon ($ZrO_2 \times SiO_2$) or as a free oxide (ZrO_2) with the mineral name Baddeleyite[3]. These minerals cannot be used as primary materials in dentistry because of impurities of various metal elements that affect color and because of natural radionuclides like urania and thoria, which make them radioactive[4]. Complex and timeconsuming processes that result in an effective separation of these elements are necessary in order to produce pure zirconia powders. After purification the material produced can be used as a ceramic biomaterial. Recently zirconia has emerged as a versatile and promising material among dental ceramics, due to its excellent mechanical properties owing to the transformation toughening mechanism.

PHASES OF ZIRCONIA

Zirconia is polymorphic in nature, and displays different crystal structure at different temperatures with no change in chemistry. It exists in three crystalline forms: monoclinic (m), tetragonal (t) and cubic (c). Pure zirconia has a monoclinic structure at room temperature, which is stable up to 1170ºC. From 1170ºC to 2370ºC, tetragonal zirconia is formed, while cubic zirconia is formed at temperatures above 2370ºC up to the melting point (2680ºC). Upon cooling spontaneous reversal of transformation occurs. Passerini and Ruff et al, discovered that the tetragonal, or even the cubic form could be retained metastably at room temperatures by alloying zirconia with other cubic oxides termed as "stabilizers[5]".

STABILIZED ZIRCONIA

Stabilized zirconia is a mixture of zirconia polymorphs obtained at room temperature, by the addition of stabilizer. With the addition of stabilizing oxides in concentrations less than those required for complete stabilization, zirconia can also be partially stabilized in a multiphase form, known as partially stabilized zirconia (PSZ). It consists of cubic zirconia, as the major phase, and monoclinic and tetragonal zirconia precipitates, as the minor phase. Several different oxides are added to zirconia to stabilize the tetragonal and/or cubic phases. Magnesia (MgO), Yttria (Y_2O_3), Calcia (CaO), and Ceria (CeO), amongst others, allow the generation of Partially Stabilized Zirconia (PSZ)[6,7]. Partially stabilised zirconia displays high resistance to temperature changes which makes it suitable for use in an environment subject to high temperatures. When the whole material is constituted by transformable t-zirconia grains it is called Tetragonal zirconia polycrystals (TZP).

TYPES OF ZIRCONIA CERAMICS: AVAILABLE FOR DENTAL APPLICATIONS

Although many types of zirconia-containing ceramic systems are currently available, to date only three types are used for dental application. These are:

- Yttrium tetragonal zirconia polycrystals (3Y-TZP)
- Magnesium partially stabilized zirconia (Mg-PSZ)
- Zirconia-toughened alumina (ZTA).

Yttria partially stabilized tetragonal zirconia polycrystal (3Y-TZP) is the most popular and frequently used form of zirconia commercially available for dental applications. It consists of an array of transformable t-Zr grains stabilized by the addition of 3mol% yttrium-oxide (Y_2O_3). It exhibits low porosity and high density.

Partially stabilized zirconia (Mg-PSZ): The stabilizer added is MgO in concentrations lower than that required for full c-ZrO_2 stabilization. Due to the difficulty of obtaining Mg-PSZ precursors free of SiO_2, magnesium silicates can form that lower the

Mg content in the grains and promote the t-m transformation. This can result in lower mechanical properties. This material has not been successful due to the presence of porosity, associated with a large grain size (30-60μm) that can induce wear, low stability, and overall poor mechanical properties, especially when compared to 3Y-TZP.

Glass-infiltrated zirconia-toughened alumina (ZTA): Zirconia particles are combined with a matrix of alumina forming a structure known as zirconia-toughened alumina (ZTA). The zirconia-toughened materials utilize the stress-induced transformation capability of the dispersed zirconia.[5]

BIOLOGICAL CHARACTERISTICS

Biocompatibily

In vitro and in vivo studies have confirmed a high biocompatibility of zirconia, especially when it is completely purified of its radioactive contents. Generally, ceramics are inert materials, which have no adverse local or general tissue reactions. As the ceramic prostheses are made with highly polished surface, they can contact the gum tissue and assist in the maintenance of gingival architecture. Depending on the smoothness, the ceramics prevent the buildup of plaque, creating a favorable surface for the gingival tissues. Zirconia based ceramics are chemically inert materials, allowing good cell adhesion, and while no adverse systemic reactions have been associated with it. However, particles from the degradation of zirconia at low temperature (LTD) or from the manufacturing process can be released, promoting an immune localized inflammatory reaction[8].

Degree of toxicity

In vitro tests have shown that zirconia has a lower toxicity than titanium oxide and similar to alumina. Cytotoxicity, carcinogenicity, mutagenic or chromosomal alterations in fibroblasts or blood cells has not been observed[9].

Radioactivity

Zirconia is often accompanied by radioactive elements of long half-life, such as thorium (Th) and uranium (U). The separation of these elements is difficult and costly. Two types of radiation are correlated with zirconia: alpha and gamma. Significant amounts of alpha radiation have been observed in zirconia based ceramics used in the manufacture of surgical implants, because, due to their high ionization, the alpha particles destroy cells of hard and soft tissues. As for gamma radiation, the literature suggests that the radiation level is not worrisome in zirconia[9].

MECHANICAL PROPERTIES

Its mechanical properties are very similar to those of metals and its colour similar to tooth colour. Hence it has been called as 'Ceramic Steel' by Garvie[3]. Fracture toughness of Zirconia is between 6 and 10 MPa, which is almost twice as high as that of aluminium oxide ceramics. This is due to transformational toughening, which gives zirconia its unique mechanical properties. Its resistance to traction can be as high as 900-1200 MPa and its compression resistance is about 2000 MPa[10,11]. Cyclical load stresses are also tolerated well by this material. Surface treatments can also modify the physical properties of zirconia. Fracture loads ranging between 706N, 2000N and 4100N were reported; all of the studies demonstrated that in dental restorations zirconia yields higher fracture loads than alumina or lithium disilicate[12,13].

Ageing

Aging occurs through a slow surface transformation to the monoclinic stable phase. This transformation begins in individual particles on the surface through a mechanism of stress corrosion. The initial transformation of specific particles can be related to a state of imbalance: greater particle size, lower yttria content, specific guidance from the surface, the presence of residual stress, or even the presence of a cubic phase. The transformation occurs through nucleation and growth processes[14]. This phenomenon leads to a cascade of events occurring in neighboring particles, leading to an increase in volume that stresses the particles and results in subcritical crack growth (SCG), offering a way for water to penetrate inside the material.

MANUFACTURING PROCEDURES

CAD/CAM technology is commonly used for fabrication of zirconia dental frameworks. The die of the supporting abutments or directly the wax patterns of

the crown/FPD are scanned. Both contact scanners and non-contact scanners are available. After scanning, a virtual, framework is designed by sophisticated computer softwares (CAD). Then, through a CAM milling procedure, a framework with, accurately controlled dimension is machined out of the blank. For milling two different techniques can be used. "soft machining" of presintered blanks which employs milling of pre-sintered blanks that are then fully sintered at a final stage or "hard machining" which employs milling of fully sintered blanks[14].

For systems employing pre-sintered blocks, they seem less machine influenced, because the blocks are more porous. The subsequent sintering of presintered machined infrastructure increases the hardness and fracture toughness. However, repeated heat treatments, to those parts which are subjected to application of feldspathic or glass porcelain, seem to have a negative effect on fracture resistance of the material[15].

On the other hand, the fully sintered blocks present high hardness, requiring robust devices that will generate more power and thus greater compressive tension on the outer surface of the block, enabling the transformation of the tetragonal to monoclinic phase ($t \rightarrow m$).

APPLICATION

The spectrum of clinical application of zirconia includes the fabrication of veneers, full and partial coverage crowns, fixed partial dentures, posts and/or cores, primary double crowns, implants, implant abutments and various other dental auxillary components like cutting burs, surgical drills, extracoronal attachments and orthodontic brackets.

Zirconia implant.

The principal disadvantage of titanium is its dark grayish color, which often is visible through the peri-implant mucosa, therefore impairing esthetic outcomes in the presence of a thin mucosal biotype. Unfavorable soft tissue conditions or recision of the gingival may lead to compromised esthetics. Furthermore, reports suggest that metals are able to induce a nonspecific immunomodulation and autoimmunity. Galvanic side effects after contact with saliva and fluoride are also described. Although allergic reactions to titanium are very rare, cellular sensitization has been demonstrated. Because of these disadvantages, novel implant technologies that produce ceramic implants are being developed. However, ceramics are known to be sensitive to shear and tensile loading, and surface flaws may lead to early failure. These realities imply a high risk for fracture. In recent years, high strength zirconia ceramics have become attractive as new materials for dental implants. The inflammatory response and bone resorption induced by ceramic particles are less than those induced by titanium particles, suggesting the biocompatibility of ceramics[16]. The clinical use of zirconia dental implants is limited because fabrication of surface modifications is difficult, and smooth implant surfaces are not beneficial for osseointegration because of poor interaction with tissues. Although zirconia may be used as an implant material by itself, zirconia particles are also used as a coating material of titanium dental implants. A sandblasting process with round zirconia particles may be an alternative surface treatment to enhance the osseointegration of titanium implants[17,18,19].

Zirconia posts - The main advantage of zirconia posts lies in its translucency and tooth-colored shade, thereby rendering the material usable with all-ceramic crowns in the anterior region. Zirconia posts are also indicated for teeth with severe coronal destruction, as they offer better strength than composite materials. Care should be rendered to preserve tooth structure during root canal preparation. Maintenance of both appropriate ferrule effect (minimum 2mm in height) and the periphery of the root canal dentin (minimum 1 mm in width) are essential for achieving clinical longevity. The main disadvantage of zirconia posts is that its higher rigidity results in more of root fractures than fracture of posts which is undesirable. Besides, it is almost impossible to retreat teeth restored with zirconia posts as it is very difficult to remove it from the root canal[20].

Bilayer veneers - the inherent opacity of the zirconia core allows clinical application of high-strength veneer restoration with better masking ability for the colour management of discoloured teeth. The modified core may be fabricated with 0.2 mm to 0.4 mm

thickness[21].

Zirconia crowns - Tooth preparation for zirconia crowns is comparable to those for metal-ceramic restorations. The abutment should be adequately prepared to allow enough space for both the substructure and the veneering material and the favourable distribution of the functional stresses. Tooth preparation can be realized with various finishing lines, although chamfer and rounded shoulder are recommended[22,23.]

Fixed partial dentures - Exceptional mechanical properties of zirconia like high flexural strength and fracture resistance allows realization of fabrication of all-ceramic FPDs in both anterior and posterior sites.For a good long-term prognosis for zirconia FPDs, the connectors should be properly designed and fabricated. Connecting surface area of the FPD must be at least 6.25 mm^2. For this reason, ceramic FPDs should only be used when the distance between the interproximal papilla and the marginal ridge is close to 4 mm[24]. Height of abutment is fundamental to obtain ZrO_2 frameworks with correct shape and dimension in order to ensure mechanical resistance of restoration.

Contraindications ■ As cantilever pontic ■ In class II div II malocclusions patients, due to deep bite there will be insufficient space for labo-lingual connector width. ■ Mesial tilting of abutment tooth with supra erupted teeth, which cannot be corrected with minimal enameloplasty. ■ Very short clinical crown that does not permit height of connector (occlusal-gingival).

SURVIVAL RATES AND COMPLICATIONS OF ZIRCONIA BASED RESTORATIONS

Many studies have been performed on survival rates of zirconia restorations. The bulk of data available for zirconia posterior FPDs indicate the best clinical results (93.3%) with all-ceramic systems. Complications of zirconia FPDs have been reported as cracking or chipping of veneering ceramic, whereas other all-ceramic restorations have exhibited some framework fractures. A study retrospectively reported that the success rate of 26 CAD/CAM cross arch zirconia implant bridges was 98.6% at the unit level after 5 years of service. Successful soft tissue parameters were found around all the implants. After 4 years of service, the reported failure rates were 4-6%[25]. Routine mechanical complications of such restorations have been reported as framework fractures, chipping of veneering ceramic and loss of retention or deboning. Bulk fracture is a rare occurrence and usually such fractures occur in long-span FPDs[26]. Range of the incidence of chipping reported in zirconia-based restorations was different. In non-load-bearing areas, these unsuitable factors can result in failures such as chipping[27,28]. However, areas under loading such as connectors are susceptible to chipping with a higher incidence rate. It is clear that ceramic veneer cracking is a multifactorial phenomenon and that only some of its possible causes have been distinctly highlighted: differences in CTEs between framework and ceramic, firing shrinkage of porcelain, areas of porosities, flaws on veneering, poor wetting by veneering material on core, improper framework support, overloading and fatigue[29]. Because of differences in the material composition of ceramic systems (composed of metal, alumina or zirconia, glass-ceramics and feldspathic ceramics), different treatments are required for the exposed material surfaces after chipping[30].

BONDING TO ZIRCONIA

One problem of zirconia application is its adhesion to different substrates. Routine methods for bonding of restorations to hard tooth structures and restorative materials do not provide desired bond strength for ZrO_2 components. Surface treatment of zirconia produces an activated surface in different applications.

Conventional surface treatment techniques are (1) acid etching (typically HF), (2) abrasion with diamond (or other) rotary instruments, (3) air abrasion with alumina (or other) particles, (4), application of different laser types and (5) a combination of these techniques that actually roughen surfaces[31,33]. Since zirconia is resistant to aggressive chemical treatment, very aggressive mechanical abrasion methods must be used to provide sufficient surface roughness. Zandparsa et al[34] compared the effect of airborne particle abrasion, acid etching (Piranha solu-

tion), and application of an alloy primer on shear bond strength of zirconia to enamel and concluded that airborne particle abrasion in combination with the application of a zirconia primer provides a durable bond strength. Surface grinding is a commonly used alternative for roughening the surface of ZrO_2 to improve mechanical bonding. There are several methods used for surface roughening: roughening with abrasive paper or wheels (SiC or Al_2O_3), particle air-abrasion using Al_2O_3 or other abrasive particles ranging in size from 50 to 250 µm and grinding with a diamond bur. A novel surface roughening technique that has been explored for ZrO_2 is selective infiltration etching (SIE). SIE uses a heat-induced maturation process to prestress surface grain boundaries in ZrO_2 to allow infiltration of boundaries with molten glass. The glass is then etched out using HF, creating a network of inter-granular porosity that allows nanomechanical interlocking of resin cement. The advantage of SIE is that it only involves grains that are exposed to molten glass, allowing control of the area to be etched. The use of SIE improved nano-mechanical retention of zirconia by increasing the surface area available for bonding). Recently, it was reported that the experimental hot etching solution could be considered an alternative treatment modality to sandblasting for zirconia cores to avoid phase transition at the surface from tetragonal to monoclinic that may be detrimental for the longevity of the zirconia-veneering ceramic restoration[35]. Recently, use of lasers is a method for roughening of surface of zirconia restorations. Results of laser-based studies are controversial. Akyl et al reported that roughening of the surface of Y-TZP ceramic by Er:YAG laser increased the shear bond strengths of ceramic to dentin and reduced microleakage scores[36]. Resin cement is a standard material for luting a ceramic prosthetic to tooth structures. Resin-based composite cements have compositions and characteristics similar to conventional restorative composite resins and consist of inorganic fillers embedded in an organic matrix (e.g. Bis-GMA, TEGDMA, UDMA). The use of phosphate monomer luting cements on freshly air-abraded zirconia is the simplest and most effective way for zirconia cementation procedure. These resin cements have shown good mechanical retention. MDP-containing resin cement continues to be a popular choice for luting ZrO_2 prosthetics in clinical applications due to its low failure rate and loss of retention.

CONCLUSION

Although clinical long-term evaluations are a critical requirement to conclude that zirconia has good reliability for dental use, biological, mechanical, and clinical studies published to date seem to indicate that ZrO_2 restorations are both well tolerated and sufficiently resistant. Ceramic bonding, luting procedures, ageing and wear of zirconia abutment should be evaluated in order to guide adequate use of zirconia as prosthetic restorative material. Patient selection, coupled with adequate clinical and technical protocols, are imperative in order to obtain good performance of these restorations. As many new trends and applications for zirconia are being discovered, the future of this biomaterial appears to be very promising.

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REVIEW ARTICLE

MAGNIFICATION IN ENDODONTICS
Dental Loupes Vs Microscope

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ABSTRACT

Better ideas, observation and understanding are possible when one routinely uses magnification during all operations. Dental loupes and microscopes are such devices that are borrowed from allied surgical fields, utilized in the field of endodontics and improved by research. The aim of this review is to discuss the role of magnifying aids like dental loupes and microscopes with its added advantages in endodontics.

Key Words: Magnification, Dental Loupes, Microscope, Microsurgery, Illumination.

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INTRODUCTION

Excellence in endodontics proceeds with newer innovative devices, borrowing operative devices from allied surgical fields and with thorough understanding of the basic biological science.

It is a well known fact that better surgeries are possible with HIM-Haemostasis, Illumination and Magnification. While haemostasis is in the domain of surgical skill, the other two factors are with field of endodontics and improved by research.

Co-axial Illumination and stereoscopic grades magnification with accessories for assisting and teaching has definitely given a new leap of intent in the field of dentistry and endodontics in particular.

HISTORY[1]

1975 Baumans article stressing the benefits of the use of an operating microscope to dentist and its possible uses in endodontics was published.

1981 A premilinary report by Apotheker was published which highlighted the various applications of a special dental microscope (Dentiscope) including endodontics and teaching.

1983 Humes and Greaves reported various uses of the operating microscope in general dentistry.

1984 Reuben and Apotheker tested the dental microscope (Dentiscope) in an apical surgery and recommended its further application in endodontics.

1986 Pecora and Adreana also used microscope during the performance of 50 apecoectomies and reported reduced incidence of post operative symptoms.

1989 Selden and Bethlehem reported the successful non-surgical treatment of calcified canal using microscopes.

1992 Carr advocated the use of microscopes for different routine endodontic procedures.

1995 Weller et al. stressed the use of surgical operating microscopes in recognizing and treatment of the canal isthmus during apical surgeries to increase the success rate.

MICROSCOPE Vs LOUPES

Advantages of Microscope over Loupes

1. Microscopes gives a detailed stereoscopic view of a small operating field which the loupes cannot.
2. Magnification from 3**x** - 40**x** can be obtained with microscopes[2].
3. It gives higher magnification, elimination and superior optical properties.
4. Images are stable unlike that with higher magnification loupes or spectacles.
5. Clinician can easily change the working magnification.
6. There is no weight on the nose and head.
7. Using beam splitters, the assistant surgeon can also view the magnified surgical field directly.
8. Still photography, video documentation and live screening of the surgical procedure is possible unlike loupes.
9. They use Galilean optical principle i.e, binocular eye piece jointed by 2 prisms with parallel optical accesses - permits stereoscopic viewing of the surgical field without eye convergence[3].
10. Less eye strain and fatigue to the operator.
11. Illumination near optical axis is called ca-axial lighting. Microscope equipped with co-axial lighting provides a homogenous illuminated field that is concentric with field of view. Thus the light is focused between the eye piece in such a fashion that clinician can look in to the surgical site without seeing any shadow[4].
12. They are also incorporated fully coated optics with achromatic lens provided[3].
13. They allow lens invasive surgical procedures and minimal retraction leading to less post-operative pain[5].

Limitations of Microscope

- Bulky, occupies lot of space in the operatory and very difficult to carry[2].
- Training regarding its parts and usage is a must

before surgery is attended on the patient and learning curve is considerably more[6].

- Surgeon's position is restricted[4].
- With higher magnification, field of view and depth of focus is reduced[7,5].
- Time is required before one gets adjusted in using the microscope[8].
- Very expensive[3].
- Requires proper and regular maintenance[8].

But the above sited disadvantages can be overcome by proper learning and quality instruments with more workshops, these disadvantages become null and void.

Advantages of Loupes over Microscopes

1. Small in size, does not occupy such space and easy to use and store

2. No formal training is required

3. Surgeon's position is not restricted.

4. Occasionally more practical than a microscope, particularly in preliminary procedures, when very high magnification and illumination is not required.

5. Very minimal maintenance is required.

6. Not expensive as a microscope.

7. Prism telescopic loupes produces better magnification by wider depth of field, longer working distances and larger field of view. These loupes gives magnification from 2.5**x** to 8**x**. They can incorporate coaxial, fibre optic, lighting in the lens element to improve illumination.[3]

Disadvantages of Loupes

1. Stereoscopic view is not possible in loupes, hence no depth perceptions.
2. With loupes, magnification only up to 5**x** is practical. For higher magnification microscopes are better[1].
3. Image is not stable due to head movement.
4. Illumination is not as high as in microscope.
5. Only limited magnification change is possible.
6. Loupes with higher magnification are uncomfortable on nose or head due to their large size and increased weight[1].
7. Clinician's eyes must coverage the view to the operating field. This result in eye strain, fatigue and even vision changes in prolonged use of poorly fitted loupes.
8. Accessories like auxiliary observation tubes, 35mm camera, T V camera or movie camera cannot be attached to capture the magnified field[10].

DISCUSSION

Pathways to pulp other than apical and accessory foramen lead to pathological changes in the healthy pulp and periodontium with a cascade of events. Identifying the portal of entry to and exit from pulp space and hermetic seal after debridement forms the basic in endodontics. Clinical clues, radiographic co-relations, visual, tactile, tracing, staining, therapeutic, microbiological and normal vision inspection are generally available for routine endodontics in the past. With magnified visual perception, newer understandings are emerging in endodontics leading to excellence in treatment.[1]

A better illumination and higher magnification is needed for endodontic excellence. The answer to this need for magnification initially was solved with the introduction of magnifying loupes. Although the magnification associated with loupes is helpful, it is indeed limited when compared to the typical microscope which offers magnification in the order of 3**x** - 30**x**.

Endodontics has changed fundamentally in the last few years following the introduction of the surgical operating microscope. Cases that once seemed impossible became easy and exciting to operate like

a) Location of MB' canal of maxillary molar, missed or extra canal and orifices of the root canal in calcified pulp chamber.[5,12]

b) Retrieval of separated instrument of silver points from middle and apical third.[5]

c) Apicoectomies, from osteotomy to apex resection to retro filling and suturing through surgical approach.[5, 13] With the use of surgical operating microscopes, cases can now be performed with a higher degree of clinical confidence, predictability and success.[5]

CONCLUSION

By nature of the specialty an endodontist would also agree that diagnosis in the most different aspect of endodontics. Any equipment or methodology that assist in diagnosis and treatment procedure is appreciated and magnifying aids especially microscopes certainly meets these criteria. The bottom line of success depends upon our commitment to achieve perfection and excellence. If we make an honest, sincere effort, we will find ourselves rejuvenated and endodontics more enjoyable.

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CASE REPORT

CONSERVATIVE MANAGEMENT OF A PERIODONTALLY COMPROMISED TOOTH - A CASE REPORT ON BICUSPIDIZATION WITH TWO YEAR FOLLOW UP.

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ABSTRACT

The mandibular molars are first teeth to erupt in oral cavity and therefore are having high caries susceptibility index, which actually necessitates cautious implementations of oral hygiene measures. Any deprivation in the maintenance may lead to serious problem like furcation involvement. Bisection/bicuspidization is the separation of mesial and distal roots of mandibular molars along with its crown portion, where both segments are then retained individually. A multidisciplinary treatment procedure for such clinical situations that includes restorative dentistry, endodontics, periodontics, and prosthodontics is necessary to preserve the teeth in whole or in part. These teeth can act as independent single units of mastication or as abutments in simple fixed bridges. This clinical report has sought to systematically review the multidisciplinary treatment procedure for periodontally compromised mandibular molar by bicuspidization and total rehabilitation using the double crowns technique.

Keywords: Bicuspidization, furcation defect, molars.

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INTRODUCTION

The treatment, management and long-term retention of mandibular molar teeth exhibiting furcation invasions have always been a challenge to the discerning general dentist or dental specialist. Continued periodontal breakdown may lead to total loss of tooth unless these defects can be repaired or eliminated and health of the tissues restored. [1]

Term furcation involvement refers to the invasion of the bifurcation and trifurcation of the multirooted teeth by the periodontal disease.[2]Though, furcation involvement is the most common phenomenon in mandibular molars it requires immediate attention with respective management.[3] Advances in dentistry, as well as the increased desire of patients to maintain their dentition, have led to treatment of teeth that once would have been removed.[4]

Bicuspidization is a valuable treatment option to save multirooted teeth having a hopeless prognosis.[3] Bisection/bicuspidization technique is the separation of mesial and distal roots of mandibular molars along with its crown portion, where both segments are then retained individually. It is usually performed in Grade II or III furcation defects of mandibular molars, to remove the irritants under the fornix and to obtain two single-rooted teeth for crowning as premolar.[5]

The prognosis of the tooth with hemisection / bicuspidization depends on the supporting bone, the restorative treatment plan, and the oral hygiene of the patient. Thus tooth separation / bicuspidization procedures are used to preserve as much tooth structure as possible rather than sacrificing the whole tooth.[6]

In order to carry out this present day mandate, periodontally diseased teeth with severe bone loss at furcation area may well be retained by separation of their roots. This article describes a simple procedure for bicuspidization in mandibular molar and its subsequent restoration.

CASE REPORT

A 55 year old male patient came to the department of periodontics with the chief complaint of pain in left lower back tooth region since 3 months. On examination 36 revealed a Grade III furcation involvement. On probing the area, there was 7mm deep periodontal pocket in the buccal aspect around the furcation area (Fig.1). Class II caries with no periapical pathology was detected in the distal aspect. On radiographic examination, intra oral periapical radiographs (IOPA) confirmed Class III furcation involvement (Glickman's classification) with evident bone loss in the furcation area (fig. 2). The mesial and distal roots have sufficient bone support.

Based on above findings oral prophylaxis was performed followed by administration of systemic antibiotics for five days.

A routine blood heamogram was advised, and after ascertaining it was within normal limits, treatment plan was formulated. Root canal treatment, subsequent bicuspidization and restoration of tooth with PFM crown was planned (fig. 3).

Accordingly access cavity was prepared and the working canal length was determined and the canals were biomechanically prepared using step back technique. Lateral condensation technique was followed in the mesial and the distal canal for obturation. Damaged tooth structure was reconstructed with silver amalgam core. The occlusal table was minimized to redirect the force along the long axis of each root.

Under local anesthesia, full thickness flap was raised with conventional flap procedure from distal aspect of 35 to mesial aspect of 37 on both buccal and lingual sides. A vertical cut method was used to separate the crown of 36. A long shank straight fissure diamond bur was used to make vertical cut towards the bifurcation area. Single molar is now separated into two crowns (fig. 4, 5). The furcation area was trimmed to ensure that no residual debris were present that could cause further periodontal irritation.

Curettage of the furcation area was done, which became accessible on separation. Sutures were placed between mesial, distal and mid-portion of the separated tooth. Periodontal dressing was placed. Systemic antibiotics and analgesics were prescribed and post operative instructions were given.

Patient was recalled after ten days for suture removal followed by crown preparation on two separated halves of 36. Impression was recorded and temporization done. After one week, two separate PFM crowns were cemented on mesial and distal half of the tooth (fig. 6).

Case was followed up postoperatively every six months till date.

DISCUSSION

Periodontitis is considered as subgingival inflammation caused by bacterial infection. It affects the periodontal supporting tissues including periodontal ligament, cementum, and alveolar bone. Periodontitis affects the junction of multi-rooted tooth, initially with tissue destructions then gradually with further bone loss and eventually end up with furcation involvement.[7]

The mandibular molars are first teeth to erupt in oral cavity and therefore are having high caries susceptibility index, which actually necessitates cautious implementations of oral hygiene measures. Any deprivation in the maintenance may lead to serious problem like furcation involvement.[7]

Diagnosis and treatment of furcation involvement is a challenge. Management of molars with furcation involvement represents one of the major problems in clinical periodontology. Both prognosis and choice of therapy depend on the degree of furcation involvement.[8] Root surfaces facing the furcation area of mandibular molars are concave, resulting in a wider mesiodistal osseous chamber than either the buccal or lingual furcation opening.[2]

Farshchian and Kaiser were the first to depict the successful implementation of bicuspidization or molar bisection procedures in the management of severe furcation involvements.[7] They stated that the success of bicuspidization depends on three factors:[1,4,7,9]

(i) stability of, and adequate bone support for, the individual tooth sections;

(ii) absence of severe root fluting of the distal aspect of the mesial root or mesial aspect of the distal root;

(iii) adequate separation of the mesial and distal roots, to enable the creation of an acceptable embrasure for effective oral hygiene [1,4,7,9]

Indications of bicuspidization [3,9,10]

- Severe bone loss affecting one or more roots untreatable with regenerative procedures.
- Class II or III furcation invasions or involvements.
- Severe recession or dehiscence of a root.
- Root caries of the furcation area.
- Severe root proximity inadequate for a proper embrasure space.
- Root trunk fracture or decay with invasion of the biological width.

Contraindications of bicuspidization [3,9,10]

- Poor oral hygiene status
- Systemic factors
- Unfavorable tissue architecture
- Retained roots endodontically untreatable
- Excessive deepening of pulp chamber floor
- Severe root resorption
- Presence of a cemented post in the remaining root

Advantage of the amputation, hemisection or bisection is the retention of some or the entire tooth. However, the disadvantage is that the remaining root or roots must undergo endodontic therapy and the crown must undergo restorative management.[1,3]

Bicuspidization procedures with double crowns may be considered as a suitable alternative to extraction in multi-rooted teeth with hopeless prognosis.[7] The clinical outcome and long-term performance of bicuspidization and double crowns are predictable with high success rates. Bicuspidization with definitive prosthetic rehabilitation have received acceptance as a traditional and reliable dental treatment.[3,7]

CONCLUSION

The management of furcation involvement presents one of the greatest challenges in periodontal therapy. The decision for a specific treatment for a periodontitis- affected furcation certainly depends

Fig.1 Pre-operative view showing Grade III furcation in relation to 36

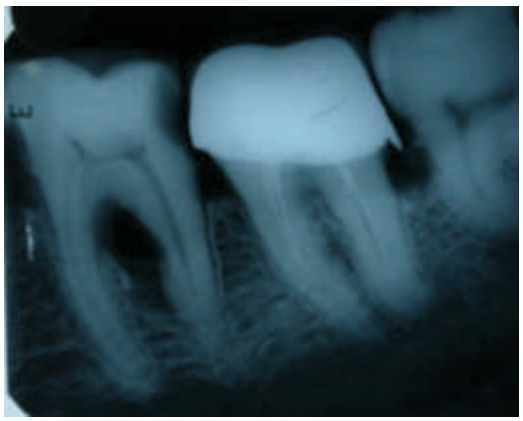

Fig.2 Preoperative radiograph

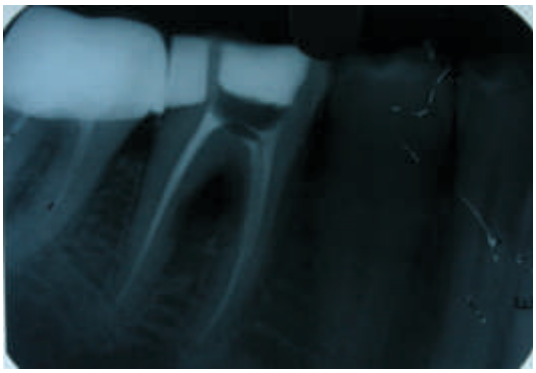

Fig.3 Preoperative radiograph showing well obturated root canal in relation to 36

Fig.4 Bicuspidization -A vertical cut made toward the bifurcation area for hemisection

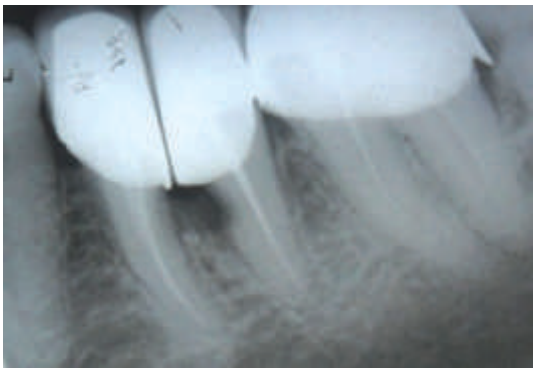

Fig.5 Post operative radiograph

Fig.6 Crown placed

on several factors. Tooth type and degree of furcation involvement may be regarded by the majority of therapists as the most important factors influencing the decision for one or other treatment mode.

The prognosis of the tooth with bicuspidization depends on the supporting bone, the restorative treatment plan, and the oral hygiene of the patient. With improvement in the dental procedures and materials in both periodontics and endodontics leading to more sophisticated therapy, teeth at marginal prognosis has provided the opportunity for patients to maintain a functional dentition for life time.

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CASE REPORT

A FLUCTUANT SWELLING IN THE FLOOR OF MOUTH

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ABSTRACT

Swellings arising from the floor of the mouth can be a diagnostic challenge. We have to distinguish it from infections or tumors of salivary gland, mucous extravasation phenomena, benign or malignant tumours of connective tissue and also from abnormalities arising during embryonic development. This article reports a case of swelling within the floor of mouth emphasizing the clinical steps that helped to achieve an accurate diagnosis of ranula, the differential diagnosis, the investigations and various treatment modalities for the same.

KEY WORDS: fluctuant swelling, floor of mouth, Ranula

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INTRODUCTION

Clinicians often come across swellings of the floor of mouth which may be developmental, inflammatory, benign or malignant lesions. A detailed history combined with meticulous clinical evaluation will facilitate the diagnosis. A number of investigations are available to aid the diagnosis and has to be chosen according to the need. This article is intended to exhibit and discuss a case of obstructive swelling of the floor of mouth.

CASE REPORT

An 18-year old girl reported with a complaint of a swelling on the floor of her mouth since 6 months. It was reportedly smaller in size and gradually progressed causing her discomfort during speech and mastication. The swelling had ruptured twice but was not associated with bleeding or pus discharge. The swelling reappears few days after its rupture and increases in size. No change in size is noticed during meal times. There were no significant findings on general physical examination. Intra orally, a well-defined, lobulated, ovoid swelling was observed between the ventral aspect of tongue and floor of mouth on the right side (fig.1). It was bluish in color with smooth, shiny outline measuring around 3X4 cms. The swelling was soft and fluctuant, non-pulsatile and non-tender on palpation. A provisional diagnosis of ranula was made based on the history and clinical presentation. Differential diagnosis of sialolith, dermoid cyst and connective tissue tumors such as lipoma or fibroma was also considered but ruled out because of the history of occasional rupture of swelling and fluctuant consistency. A fine needle aspiration was carried out and the contents obtained were clear fluid. Such simple bedside or chair-side investigations can be used to rule out vascular lesions. Surgical excision of the swelling and the sublingual gland was done under local anaesthesia (fig.2, 3) and the patient was discharged with post-operative instructions and medications. One week later the patient was recalled for review and the surgical site had healed uneventfully. Her phonation and tongue movements were significantly improved.

DISCUSSION

Ranula is a specific form of mucocele which occurs in the floor of the mouth in association with the ducts of the submandibular or sublingual salivary gland. The term Ranula was derived from the latin word Rana which means 'Belly of frog' as it resembles the underbelly of a frog. Verma G defines ranula as a psuedocyst that lacks an epithelial lining and arises due to accumulation of saliva in the connective tissue resulting from rupture of the excretory ducts [1]. However some studies report that 1 to 10% of ranula are true retention cyst.[2] On clinical presentation, they are small to medium sized swelling on the floor of the mouth lateral to the lingual frenum. In our case a medium sized swelling was appreciated on the right side to the frenum. On palpation, they are soft and fluctuant with mild tenderness. However, the patient can experience displacement of tongue and interference with oral function as was reported in our case. Ranulas have classically been divided into simple and diving/plunging type. Simple ranulas classically remain confined to the sublingual space, whereas plunging ranulas extend beyond it [3]. It is accepted that they arise as a result of extravasation of saliva from the sublingual gland through a hiatus in the mylohyoid muscle. The prevalence of ranula is about 0.2 cases per 1000 persons and accounts for 6% of all oral sialocysts[2].

Swelling of the floor of the mouth is of clinical importance as some benign and malignant lesions may have similar clinical presentation. Submandibular lithiasis is one of the most frequent causes of intraoral swelling. This will be associated with increase in swelling during meal times. Occlusal radiography, ultrasound of the submandibular region or computed tomography will be quite helpful in confirming and locating the sialolith. Dermoid cysts could be the next consideration occurring in the second or third decade of life. They are more commonly central though lateral varieties are also accounted for. Their consistency will be dough like and ultrasonic scan will show infrasonic formation with distinct boundaries. Other developmental lesions which very rarely occur are the branchial cleft cyst, heterotopic gastrointestinal

cysts, thyroglossal duct cysts and ectopic thyroid tissue. Other congenital masses include vascular malformations which will appear erythematous and lymphangiomas which more probably appears as multiple projections. Inflammatory swellings of the floor of the mouth include Ludwig's angina, cellulitis, and submandibular and sublingual space infections all of which are diffuse in nature. Benign mesenchymal tumors such as fibroma, neurofibrom (firm in consistency), lipoma (soft in consistency) can also occur but will be a well defined, smooth ,slow growing swelling. Malignant neoplasams of the salivary gland such as adenoid cystic carcinoma and mucoepidermoid carcinoma and rarely lymphoma can also occur as swelling in the floor of the mouth masking the true aggressive nature of these lesion . Needless to say, even though multiple investigative modalities are available ranging from simple fine needle aspiration as done in this case to magnetic resonance imaging and scintigraphy (to rule out thyroid tissue) confirmation diagnosis via histopathological examination remains the gold standard [4,5]. Various treatment modalities advocated are incision and drainage, marsupialization, excision of ranula only and excision of ranula along with sublingual salivary gland[1]. The latter was done in this case because of damage to the sublingual duct. Beside surgical management, CO2 laser and Cr: YSG laser has been used to vaporize ranulas. The minimal lateral tissue damage seen with laser minimizes the risk. Intra cystic injection of sclerotherapy agents like OK-432 (a lypholized mixture of low virulence group streptococcus pyogenes with penicillin G potassium), Bleomycin and Botulinum Toxin Type A has been reported to be effective in the management of intraoral ranula's[6].

Figure 1:
Bluish, dome shaped swelling on the floor of mouth.

Figure 2:
Surgical excision of the lesion with the sublingual glands

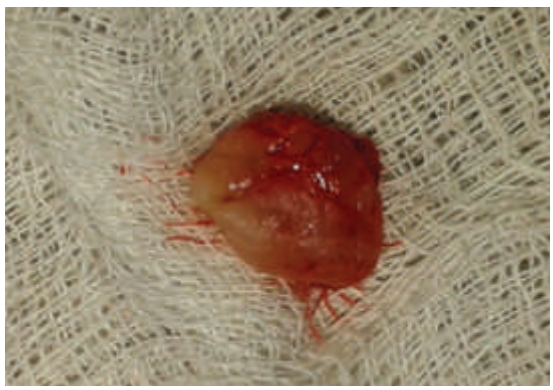

Figure 3:
The excised specimen

CONCLUSION

Ranula is an uncommon lesion arising from the sublingual gland presenting as a soft fluctuant swelling on lateral aspect of floor of mouth. It can be readily recognized by clinical evaluation. This article helps to familiarize ranula, thereby improving the diagnostic skills. Oral ranulas are better managed by surgical removal along with offending sublingual gland.

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CASE REPORT

IMMEDIATE DENTURES: A CLINICAL REVIEW AND CASE REPORT

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ABSTRACT

Conventionally patients are advised to wait for a minimum period of 3 months, for fabrication of complete denture following extraction. But many patients may find this edentulous period most embarrassing. Immediate dentures may be advocated in such situations, helping the patient for a smoother transition to conventional complete denture. This article reviews the advantages and disadvantages of immediate dentures along with a case report.

Key words: Immediate dentures, post extraction site protection

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INTRODUCTION:

An immediate denture refers to a dental prosthesis constructed to replace the lost dentition and associated structures of the maxillae and mandible and inserted immediately following removal of the remaining teeth. Immediate dentures may be contraindicated in cardiac, endocrine diseases, slow wound healing capacity, acute periapical or periodontal diseases, extensive bone loss, psychologically disturbed patients.[1,2]

There are 2 types of immediate denture

1. Conventional (Classic) immediate denture: Following completion of healing, the immediate denture is relined to serve as a long term prosthesis. The conventional immediate denture is selected only if anterior teeth is remaining, or if patient is willing to undergo extraction of posterior teeth prior to anterior teeth.
2. Interim (Transitional) immediate denture: After healing is completed, a new conventional complete denture is fabricated in place of the immediate denture. This type of immediate denture is usually selected when anterior and posterior are remaining till the day of extraction and placement of immediate denture.

A jiffy denture may also be used when the immediate denture has to be fabricated very quickly in one day or one session. In jiffy denture the tooth may be made from autopolymerizing acrylic resin, or portions of the previous removable or fixed prosthesis.

Advantages of immediate dentures[3,4]

Following extraction, immediate dentures can serve as a splint, as an aid to control bleeding, and for protection of the extraction site from trauma due to food, tongue or opposing tooth. From the clinical appearance of alveolar ridges after placement of immediate dentures, it may be noted that bone resorption is slower, and tissue softness is also preserved when stimulation is supplied by a denture base.

Immediate dentures can help the patient avoid social embarrassment due to edentulousness, as well as regain adequate function in speech, deglutition and mastication .

The remaining natural teeth may also be used as a guide in establishing vertical dimension of occlusion, selection and positioning of artificial teeth

Limitations of immediate denture[5,6]

Immediate denture fabrication may be more challenging for the dentist to attain good esthetics and patient acceptance as there may be no opportunity for anterior try in. The procedures may be more time consuming, and require more appointments particularly during the adjustment phase. Adequate fit may not be obtained relative to a conventional complete denture. These limitations should be explained to the patient prior to the construction of immediate dentures.

Selection of patients[7,8]

Philosophical type patients may be the best candidates for immediate dentures. They are self motivated and accept dentures for maintenance of health and appearance. They are able to adjust rapidly, and are willing to listen and carry out instructions in an intelligent manner. This mental attitude may contribute to a favourable prognosis for the immediate denture. Also absence of medically compromising conditions may contribute to a good prognosis.

CASE REPORT

A 52yr old female patient presented with a completely edentulous mandible arch and a Class I Kennedy maxillary edentation, with remaining incisors and a left first molar, which were periodontally compromised (fig. 1). She wanted immediate rehabilitation and was particular that she could not remain edentulous for an extended period of time.

She was presented the treatment option of immediate dentures and was explained about its limitations. She was cooperative and willing for an immediate denture. Radiographic and clinical examinations were done, and she was appointed for an immediate denture. Maxillary and mandibular impressions were made with irreversible hydrocolloid impression material and stone casts were prepared. Secondary impressions were made with vinyl

polysiloxane impression material with custom acrylic trays. Maxillomandibular jaw relation records were made to articulate the casts (fig. 2).

Jaw relation record.

The proper shade and size of teeth were selected, using the patient existing teeth as a guide. The arrangement of the posterior artificial teeth was completed and evaluated in the patient's mouth to confirm maxillo-mandibular relation records. The wax-up in the posterior region was performed using the conventional method. In the anterior region, the wax -up was modified by creating a window (fig. 3).

Teeth arrangement[9,10]

Patient was called for posterior teeth try in prior to extraction of the remaining teeth.

Arrangement of anterior teeth.[11,12]

Jerbi's modification of Kelley's rule of thirds was followed for modification of casts (fig. 4)

1) First step is to cut away those parts of the crowns of the teeth that are visible i.e. at free marginal gingiva. It must be remembered that a portion of crown still lies beneath gingiva.

2) Step two is to trim the cast so that the sites of previously removed crowns are recessed approximately 1mm. With this step, the trimming equals the removal of entire crown of each tooth.

3) Third step is a flat cut across the facial surface of the ridge. Starting the cut at labial depth of recess made in the cast during step two, stone is removed in a continually diminishing amount from this point to the junction of the gingival and middle third areas of facial surface of ridge. The removal of this amount represents the collapse of labial gingival tissues towards the alveolus.

4) Step four is another flat cut across facial portion of the ridge. This cut begins at crest of ridge and extends to the mid width point of cut made in step three. This begins the contouring of labial surface of the ridge.

5) The fifth step is to trim that part of the cast which is lingual to the teeth. Most casts present a reproduction of continuous roll of gingival tissue that normally lies against the lingual aspects of teeth and it is a landmark for trimming the cast in this area. This roll is completely trimmed away, but care is taken to preserve a part of the cast to represent the incisive papilla in its collapsed position.

6) The last step is to shape and smooth the surfaces of the cast that have been trimmed in the previous steps. The vestibular third of ridge is not trimmed.

Following cast modification, artificial teeth were arranged. Investment and sacralisation was done following wax up. The resulting dentures were polished, and patient was called for denture insertion immediately after extraction (fig. 5).

Patient was given instructions not to remove the denture for 24 hrs, and was recalled the next day to make necessary adjustments. The patient was then kept on further regular recall.

DISCUSSION

The primary advantage of an immediate denture is the maintenance of a patient's appearance because there is no edentulous period. Circumoral support, muscle tone, vertical dimension of occlusion, jaw relationship, and face height can be maintained. Less postoperative pain is likely to be encountered because the extraction sites are protected. The tongue will not spread out as a result of tooth loss. Patients who are in poor general health or who are poor surgical risks or patients who are identified as uncooperative because they cannot understand and appreciate the scope, demands, and limitations to the course of immediate denture treatment may not be suitable candidates for immediate dentures. The main disadvantage lies in the inability to accomplish a denture tooth try-in in advance to extractions which precludes knowing what the denture will actually look like on the day of insertion. Relining may be necessary later on. Also, because this is a more difficult and demanding procedure, more chair side time, additional appointments, and therefore increased costs are unavoidable.

Fig 1. Pre extraction photograph of the patient

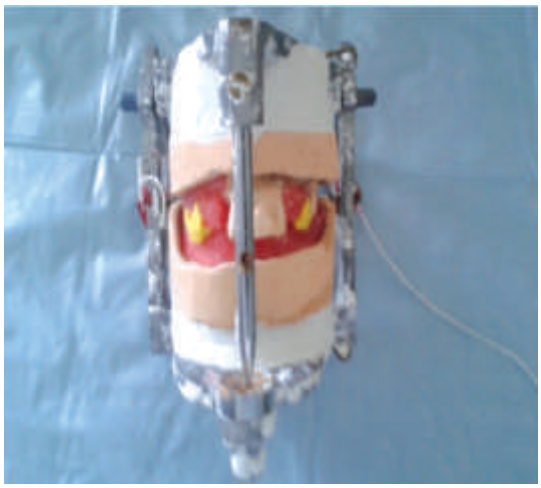

Fig. 2 Jaw relation in the articulator

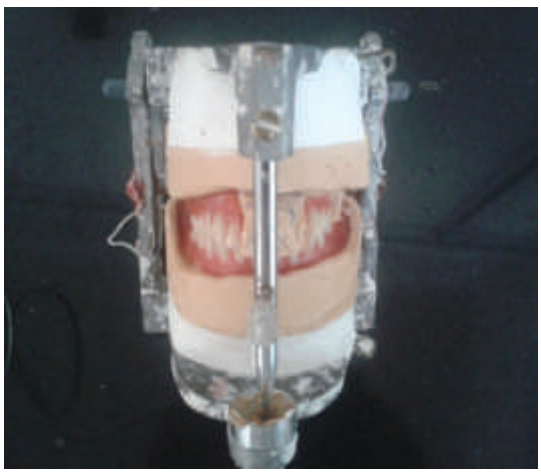

Fig. 3 Trial in the articulator

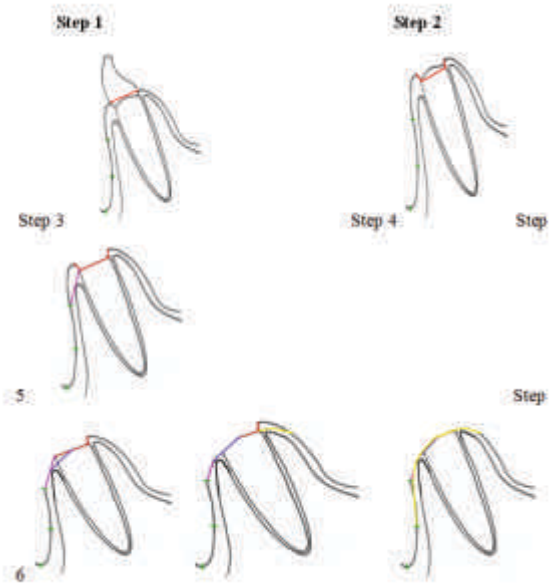

Fig. 4 Modification of cast
(Jerbi's modification of Kelley's rule of third.

Fig. 5 Photograph of the patient after insertion.

CONCLUSION

Immediate dentures allow patients to continue their social and business activities without being in edentulous state. However the patient should be carefully selected for immediate dentures, and explained about its limitations before starting the treatment procedure. A properly fabricated immediate denture can help the patient in a smoother transition to a complete denture.

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CASE REPORT

PROSTHETIC REHABILITATION OF A HEMI MANDIBULECTOMY PATIENT WITH TWIN OCCLUSION

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ABSTRACT

Oral rehabilitation of patients whose mandible and/or adjacent structures are treated with surgery and radiotherapy presents the maxillofacial prosthodontist with a variety of challenges. Resection of mandible may cause topographic defects, physiological and esthetic defects. Mandibular movements are affected with loss of muscle attachments. The most significant difficulty encountered will be deviation of mandible towards the surgical site. Numerous prosthetic methods are employed to minimize deviation and improve efficiency which includes implant supported prosthesis, mandibular guide flange prosthesis, and palatal based guidance restoration. This article describes rehabilitation of patient who underwent hemi mandibular resection with twin occlusion in the maxillary complete denture opposing unresected site of mandible.

Key words: Twin occlusion, hemimandibulectomy

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INTRODUCTION

Functional rehabilitation of patient who has a partially resected mandible is one of the most challenging procedures confronting the maxillofacial prosthodontist. Loss of continuity of mandible destroys the balance of the mandibular movement and function, leading to altered mandibular movement and deviation of residual fragment towards the surgical side. [1,2] There are multifactorial causes for the deviation including the extent of osseous and soft tissue involvement, the loss of sensory and motor innervations, the type of wound closure and certain additional forms of treatment that the patient might have received. The greater the loss of tissues, greater will be the deviation of the mandible to the resected side, thus compromising the prognosis of the prosthetic rehabilitation to a greater extent. [1,2] Apart from deviation other dysfunctions observed are difficulties in mastication, speech, swallowing. Following surgical resection the remaining mandibular segment often is retruded and deviated towards the surgical side at the vertical dimension of rest. During opening deviation increases leading to angular path of opening and closing. Generally in these patients while mastication, entire envelope of motion occurs towards the surgical site which are very less precise.

Canter & Curtis provided a hemimandibulectomy classification for edentulous patients that can be applied in partially edentulous arches[1,2] (fig. 1). Class I: Mandibular resection involving alveolar defect with preservation of mandibular continuity.

Class II: Resection defects involve loss of mandibular continuity distal to the canine area.

Class III: Resection defect involves loss up to the mandibular midline region.

Class IV: Resection defect involves the lateral aspect of the mandible, but are augmented to maintain pseudo articulation of bone and soft tissues in the region of the ascending ramus.

Class V: Resection defect involves the symphysis and parasymphysis region only, augmented to preserve bilateral temporomandibular articulations.

Class VI: Similar to class V, except that the mandibular continuity is not restored.

Treatment options in such conditions include surgical reconstruction using alloplastic implants, autogenous bone grafts; allogenic bone graft and prosthetic rehabilitation include mandibular guide flange prosthesis, palatal ramp prosthesis. In patients where reconstruction is not done after resection of the mandible, scar tissue formation occurs over a period of time that stiffens tissues and worsens prosthetic rehabilitation [3,4]. As patient was completely edentulous, treatment options were very limited.

Factors compromising patient's ability to function with complete dentures are 1.Only half to one third of mandible left compromises stability, retention, support. 2. Angular path of closure induces lateral forces on the dentures that tend to dislodge them. 3. Deviation of mandible creates abnormal jaw relationships. 4. Impairment of motor and sensory control impairs the patient ability to control prosthesis during function. So, this article highlights prosthetic rehabilitation of a hemimandibulectomy patient with twin occlusion.

CASE REPORT

A 68 years old male patient reported to department of prosthodontics with a chief complaint of difficulty in mastication since 3 months. His medical history revealed he is known diabetic and is on medication since 13 years. He underwent mandibular resection and was reconstructed with plating 10 years back in left quadrant region as he was diagnosed with fibrous histiocytoma. But he exhibited a rejection reaction to replating done in mandible so it was surgically removed. His dental history revealed that he underwent extraction of all teeth due to dental caries 3 months back. Extra oral examination revealed that patient has asymmetrical face and convex profile (fig. 2). There was a significant deviation of mandible towards the operated site. Intra oral examination revealed that patient is completely edentulous. On palpation & evaluation of ortho-pantomogram (fig. 3) it was found that mandibular ridge is present till midline. This case represented typical class 3 Cantor and Curtis classification.

CLINICAL PROCEDURE

Preliminary impressions were made with irreversible hydrocolloid material (Zelgan2002, Dentsply) using stock trays (fig. 4). Casts were poured with

type III dental stone (Kalabhai Pvt Ltd, India). On maxillary cast conventional custom tray was fabricated with self-cure acrylic resin (DPI - RR, India) and border molding was performed. Final impression (fig. 5) was made with zinc oxide eugenol impression paste (DPI, Mumbai, India). Mandibular resection results in compromised stability, support and retention. This can be minimized by recording tissue in functional form there by reducing the undue tissue response. Spacer was adapted and nineteen gauge stainless steel wire was bent into loop and placed over spacer. Such two loops were placed. Self cure acrylic resin tray was on the unresected side of mandible. The loops were left open. The tray was finished and polished (fig. 6). Border moulding was on the unresected side and on the resected side impression was made with heavy body putty silicone material (Aquasil, Dentsply). Final impression was made with light body silicone impression material (Aquasil, Dentsply). Impressions were poured with type III dental stone to obtain master cast. Denture bases and wax occlusal rims were fabricated. Maxillary master cast was articulated using a face bow (Hanau USA) on a semi adjustable articulator (Hanau wide vue, USA). Maxillomandibular relation were recorded, patient's tactile sense of comfort was used to assess the vertical dimension of occlusion. Patient was advised to move his mandible as far as possible towards unresected side and gently close his mandible into position to record a functional maxillomandibular relationship (fig. 7). After articulation two sets of semi anatomic teeth were selected [7]. Two rows of teeth were arranged for the posterior region of edentulous maxilla on unaffected side, 1st as per the ridge contour and 2nd palatal to it to occlude with mandibular teeth. Arrangement was verified during try in (fig. 8) and denture was finished and polished in conventional manner (fig. 9).The dentures were evaluated intraorally and the mandible was manipulated to the static centric position area (fig. 10, 11). Any interference in normal movements was corrected. The dentures were removed, repolished and then reinserted. The patient was given post insertion instructions and was motivated to make efforts to learn to adapt to the new dentures. Simple exercises were suggested to the patient such as repeated opening and closing of mandible. This helped the patient learn to manipulate the lower denture into the proper position. Initially, retention of the dentures, especially the lower one was a problem but this improved with constant use. Within a week, the patient expressed satisfaction in mastication and phonetics.

DISCUSSION

This article highlights functional rehabilitation of hemimandibulectomy patient who has undergone resection without reconstruction. Literature advocates fabrication of guide flange or palatal ramp prosthesis for such patients to prevent deviation of mandible.[6] Since patient exhibited rejection reaction to the plating done in the mandible it was removed surgically. Since a considerable time had elapsed after surgery guidance flange prosthesis was not possible. Hence we fabricated a conventional maxillary removable partial prosthesis with two rows of teeth-twinned occlusion[5,7,8]. Two rows of teeth were arranged because the patient could not close in proper intercuspation and hence could not masticate. The palatal row of teeth intercuspated with the remaining mandibular teeth and the buccal row of teeth supported the cheeks. After insertion of the prosthesis the patient could intercuspate mandibular teeth properly due to twin maxillary occlusal table. The patient was kept on 6 months recall. After 1 week the patient reported an increase in masticatory efficiency and seemed happy with the treatment.

CONCLUSION

Surgical and prosthodontic rehabilitation of the mandibulectomy has the potential of being extremely gratifying to clinician as well as to quality of patient's life. Certain basic principles in complete denture fabrication should be modified for mandibular resection patients because of many restrictive physical factors. In edentulous patients, a broad occlusal table developed in the maxillary arch on the unaffected side will help to position the residual fragment into the correct sagittal relationship, enhance the stability of the dentures and thus, improve masticatory ability. The positive thinking about the treatment is that concentration should not be on what is lost in the eradication of disease, but rather taking full advantage of the remaining structures.

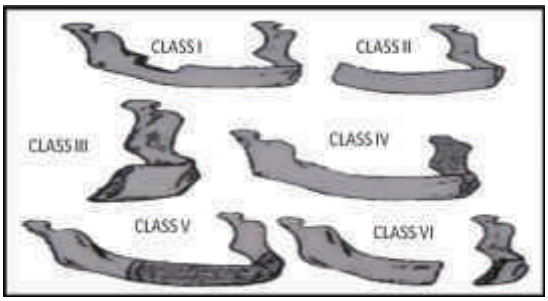


Fig. 1 Canter & Curtis hemimandibulectomy classification

Fig. 2 Extra oral frontal view

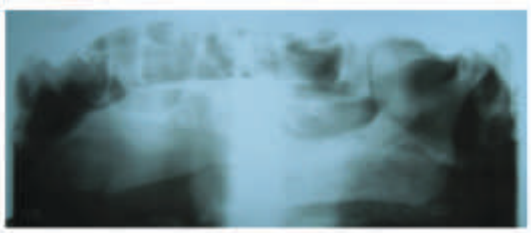


Fig. 3 Ortho-pantomogram revealing resection of mandible

Fig. 4 Preliminary impressions were made with irreversible hydrocolloid material

Fig. 5 Maxillary final impression

Fig. 6 Finished special tray

Fig. 7 Maxillomandibular relation transferred to semi adjustable articulator

Fig. 8 Twin occlusion try in verified in patients mouth

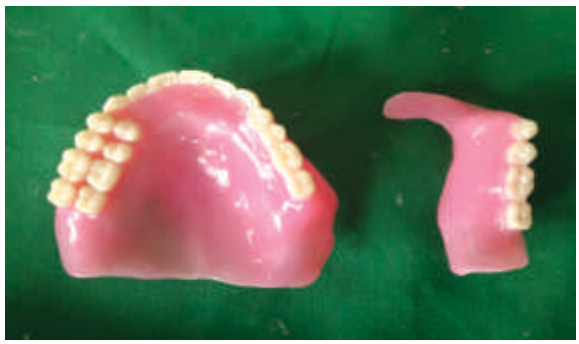
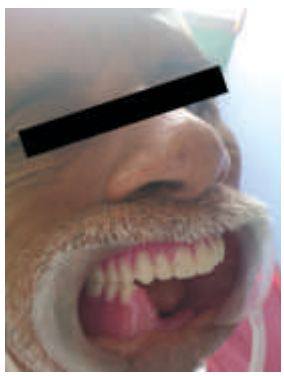


Fig. 9 Finished and Polished maxillary and mandibular dentures

Fig 10 Denture insertion done



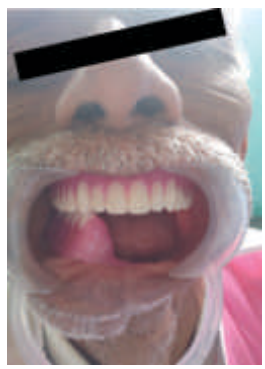


Fig 11 Twin occlusion verified in patients mouth after denture insertion

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CASE REPORT

MARYLAND BRIDGE

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ABSTRACT

Resin bonded bridges can be highly effective in replacing missing teeth, restoring oral function and aesthetics and result in high levels of patient satisfaction. They represent a minimally invasive, cost effective treatment modality. This article presents a case report on resin bonded bridge.

Key Words : Resin bonded bridge, bonding, resins cement.

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INTRODUCTION

Resin bonded or resin retained bridges (RBBs/RRBs) are minimally invasive fixed prostheses which rely on composite resin cements for retention. These restorations were first described in the 1970s and since then they have evolved significantly. The major disadvantage of conventional fixed partial denture is the destruction of tooth structure required for the abutment preparation upon which the retainers will be placed. Resin bonded fixed partial denture is an alternative to the conventional fixed partial dentures which require only minimal preparation of the abutments.

A variety of dental concerns need to be addressed when treating an anterior tooth such as shade (hue, chrome, and value), morphology, gingival contours, bone levels, and occlusion. Additionally, a choice between a fixed prosthesis, removable prosthesis, and an implant needs to be determined. Finally, patients are not only becoming more demanding with regard to esthetics, but also are often opting for more conservative and less invasive procedures[1]. This article presents a case report on resin bonded bridge.

Case report

A male patient, aged 40 years presented with missing lower central incisors(fig.1, 2). Patient gave a history of loss of teeth due to trauma one month back. Periodontal health of the abutments were found to be compromised. After considering the patient's wish and the clinical situation, the option of removable partial denture, fixed partial denture and implant were eliminated and it was decided to replace the missing teeth with a Maryland bridge. Tooth preparation for both 32 and 42 was done following the standard technique. Lingual preparation ended 1mm from the incisal edge and a chamfer finish line was prepared 1 mm supragingivally (fig. 3). An impression was made in addition silicone impression material and sent to the laboratory. The laboratory technician was instructed to keep the metal wings of the prosthesis off the incisal third to prevent darkening of the tooth because of the inhibition of light transmission. In addition, care was taken to make sure metal would not be visible interproximally or at the embrassure areas (fig. 4, 5). After isolation with a rubber dam, the Maryland bridge was cemented using resin cement (fig. 6 , 7). A follow-up was advised.

Discussion

Many treatment modalities are available for replacing a single missing tooth; removable partial denture, fixed partial denture or dental implant. Each modality is a possible treatment option and has its own advantages and disadvantages. Patient awareness of the advantages and disadvantages of different treatment modalities is very important for decision making, therefore there are many factors making teeth replacement one of the most challenging restorations in dentistry. [2]

The term 'Maryland Bridge' resulted from the development of a type of electrochemical etching at the University of Maryland. Electrolytic etching were performed by 3.5 % solution of nitric acid at 250 mA current for 5 minutes followed by placing in 18%hydrochloric acid for 10 minutes in ultrasonic cleaner. This procedure is used for non- beryllium Ni- Cr alloys or 10 % solution of sulphuric acid at 300mA current followed by the same above mentioned procedure is used with beryllium containing Ni- Cr alloy.

The three most common complications associated with resin-bonded prosthesis are debonding (21%), tooth discoloration (18%) and caries (7%).[3] Even after 10 years of service the periodontal response for resin bonded fixed partial dentures is minimal[4]. From a clinician's perspective, the main advantage of RBBs is that, in comparison to conventional bridge preparations, they are conservative of tooth structure[5].

Biological reasons for failure include caries and periodontal disease but these occur relatively rarely[6]. To prevent complications oral health education, encompassing oral hygiene instruction and advice regarding diet and the use of fluoride, should be provided at the treatment planning stage and finalised following bridge cementation. The most common technical reason for RBB failure is debonding[5]. Authors have reported that debonding does not appear to affect patient satisfaction[7, 8] and there is usually limited damage to abutment teeth.

If a bridge debonds there are two options: remake or recement. If a one off event such as trauma has resulted in decementation, recementing the restoration may well be appropriate. However, studies have shown that once a bridge has debonded it is more

likely to fail again[9] and recementing for a second time is generally ill advised as replacing the bridge has been found to have a higher success rate.[9] This is probably because in the majority of failed cases, there is an inherent problem with bridge design which may have been present at initial cementation and/or developed since. When only one retainer fails, the bridge is likely to remain in situ promoting the development of caries beneath the failed retainer[10,11]. Where there is a fixed-fixed design and only one side is loose, attempts can be made to

Figure 1&2 - Preoperative intraoral view

Figure 3 - Teeth preparation of 32&42

Figure 4 - Lingual view of Maryland bridge

Figure 5 - Maryland bridge

Figure 6 - Postoperative extraoral view

Figure 7 - Postoperative intraraoral view

remove the retainer that is still in place with the help of an ultrasonic scaler. Parafunctional forces increase the likelihood of restoration failure, especially where the occlusion has not been accounted for. Any habits should be identified during the assessment phase and the patient should be counselled to avoid habits like nail and pen biting. When bruxism is suspected the prescription of a night guard or occlusal splint should be considered.

Metal connectors may shine-through translucent incisors causing them to appear grey and in fact Djemal et al. [7] reported that the metal of the retainer was the most common reason for patient dissatisfaction with their RBB. Greying can be reduced to an extent by the use of opaque cement and careful retainer design, avoiding extending the metal to within 2 mm of the incisal edge, where the enamel becomes relatively more translucent.

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GUIDELINES FOR SUBMISSION OF MANUSCRIPTS

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Journal of Odontological Research, an official publication of Indira Gandhi Institute of Dental Sciences, Nellikuzhy P. O., Kothamangalam 686 691, Kerala, is a peer-reviewed journal published bi-annually in print format.

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