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Editorial

Ethical challenges of Bio-medical research is an important subject debated about today. Ethics is defined as moral code of conduct - defining the right and wrong behaviour in civilized society and comes from within. Research is an essential part of any scientific field. The three basic principles namely - respect for person, beneficence of the treatment so as to take care to do no harm and justice, which refers to treat each person in accordance to what is morally right and proper are the essential aspects while conducting research. Major breakthroughs in science such as assisted reproductive technology, stem cell research and above all human cloning have opened up unimagined vistas in the practical application of bio-medical technologies for the benefit of mankind. Ethical principles for research involving human subjects has been widely discussed on international platforms. Infact ethics committee is essential to be constituted in every institution and many of the international journals are not accepting an article for publication if ethics committee consent has not been taken in studies involving human subjects. ICMR guidelines for standard operating procedures has been laid out.

As the scope of international collaborative bio-medical research has increased during the past decade, long standing questions of ethics of designing, conducting and following of international clinical trials have re-emerged. Some of these issues have begun to take centre stage because of the concern as research were conducted by scientists from more prosperous countries in poorer nations.

Not only the bone morphogenic proteins responsible for the growth of the tooth has been identified but, periodontal regeneration based on molecular and cell biology has generated a lot of interest among researchers. For successful optimal outcomes, animal and human studies are essential. Tissue engineering is the emerging field of science aimed at developing techniques for the fabrication of new tissues to replace damaged tissues. Inability to adequately seal the healing site from the oral environment and prevent infection may pose as the major impediment for achieving optimal outcomes. Results may be evident sooner than expected. But the research should be conducted within the frame of the moral code of conduct - following the ethical principles.

Dr. (Mrs.) S. J. Nagda

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History of Prosthodontics

MRS. S. J. NAGDA, M.D.S.*

With the advent of adhesive dentistry competition in developing techniques and adhesive materials with increased bonding strength have emerged between dental scientists and manufacturers. Synthetic resins evolved as restorative materials because they are insoluble, aesthetic, insensitive to dehydration, inexpensive and relatively easy to manipulate. However soon after their introduction during the late 1940's and early 1950's, they were found to be only partially successful in meeting the requirements of a durable aesthetic material certain characteristics, such as toothlike appearance and insolubility in oral fluids, are desirable. Where then high polymerization shrinkage and high coefficient of thermal expansion led to clinical deficiencies and premature failures.

To resolve the deficiencies caused by high polymerization shrinkage and high coefficient of thermal expansion, inert filler particles were added to reduce the volume of the resinous component. Acrylic, vinyl acrylic and light cured composite materials are available for the preparation of facings for crowns and fixed bridges. They vary considerably in inorganic filler content ranging from less than 1% to 25%.

The acrylic materials are powder-liquid, types which are usually the same as heat cured denture base plastics except that the pigments are adjusted to obtain shades similar to that of hard tooth tissue. The vinyl acrylic available in a powder liquid system and vinyl polymer is supplied in a gel form.

A modified acrylic material for crown and bridge facings that permits heat curing without flasking has been developed. The material is supplied as powder and a liquid the powder is a poly (methyl methacrylate) and the liquid is an ester with low volatile potential such as tetraethylene glycol dimethacrylate.

The powder and liquid are mixed, and the gel is placed in a preheated oven for 2 min. at 135°C. The facing on the crown or pontic is built up and the restoration is placed in a preheated oven at 135°C for 8 min. to complete the polymerization.

The initial resin veneering materials were heat polymerized poly methyl methacrylate which subsequently were improved by addition of fillers and cross linking agents. Microfilled materials, which use bis-GMA, urethane dimethacrylate or 4, 8-di (methacryloxy methylene) - Tricyclo-decane as resin matrices, have created renewed interest in resin veneered metal restorations. These resins are polymerized using light of wavelength in the range of 320-520 nm, or by a combination of heat and pressure. Generally, the new microfilled resins have physical properties superior to those of original unfilled resin.

Originally the resins were mechanically bonded to metal substrates using wire loops or retention beads. Recent improvements in the bonding mechanisms have included micromechanical retention created by acid-etching the bone metal alloy and use of chemical bonding systems such as 4-META, phosphorylated surface followed by the application of a silane coupling agent (silicoating).

Prosthetic resin veneering materials have several advantages and disadvantages compared with ceramics - The advantages include ease of fabrication, predictable intra oral repairability, and less wear of apposing teeth or restorations. The disadvantages include low proportional limit and pronounced plastic deformation that contribute to distortion on occlusal surfaces leakage of oral fluids and staining below the veneers, particularly those attached mechanically, are caused by the dimensional change during thermal cycling and water sorption. Surface staining and intrinsic discoloration of these resins have been observed.

Prosthetic resins have also been used as a conservative alternative to conventional prosthodontic restorations, such as for masking tooth discoloration or malformation. The resins are used as preformed laminate veneers where resin shells are adjusted by grinding and the contoured facing is bonded to tooth structure using the acid etching technique with either autopolymerizing or visible light activated or dual cure luting resins.

* Professor and Head, Dept. of Prosthodontics, Nair Hospital Dental College, Mumbai.

Full Mouth Rehabilitation Of Partial Anodontia - A Case Report

MENON PRASAD RAJAGOPAL*, M. GOPINATHAN, M.D.S.**

ABSTRACT

Partial anodontia is a rather common condition and at the same time a rather debilitating one. The condition affects the aesthetics and functional capability of the patient. At the same time it has a devastating effect on the psychology of the patient.

The prosthodontic management of this condition has to address all these aspects to achieve a complete treatment.

This article details a case of true partial anodontia which was successfully rehabilitated in our department using a combination of fixed and removable prosthesis.

INTRODUCTION

Congenital absence of teeth may be of two types - total and partial.

Total anodontia is a condition in which all the teeth are missing and usually involves both the deciduous and permanent dentition. True total anodontia is a rare condition and it occurs commonly in conjunction with generalized systemic disturbances like hereditary anhidrotic ectodermal dysplasia.

Pseudoanodontia is a condition where there are multiple unerupted teeth.

True partial anodontia is quite common and there is a predilection for certain teeth like third molars and lateral incisors. In severe cases there are very few teeth remaining in the dental arches.

Studies have shown a correlation between congenitally missing deciduous teeth and their permanent successors suggesting a genetic factor. It has been suggested to be a point mutation in a closely linked polygenic system most often transmitted as an autosomal dominant trait within complete penetrance and variable expressivity.

CASE REPORT

A 24 year old male was referred to the department of Prosthodontics from the department of Oral Medicine and Radiology for treatment.

The case had been diagnosed as true partial anodontia after clinical, radiographic and biochemical investigations in the Oral Medicine department. No underlying systemic disorder could be diagnosed. The

* P. G. Student, Department of Prosthodontics, ** Professor and Head of Department of Prosthodontics, Government Dental College, Calicut.

patient's familial history revealed that the mother suffered from a similar condition but the other three siblings were normal.

PROSTHODONTIC TREATMENT STRATEGY

Impressions were made, diagnostic casts articulated, Orthopantomograms studied after clinical evaluation. This helped us to devise a feasible prosthodontic treatment plan for the patient.

The prosthodontic considerations which had an immediate bearing on the treatment plan were -

- Number and condition of remaining teeth.
- Finalizing the teeth to be extracted or restored.
- Estimating the interocclusal distance.



Figure 1

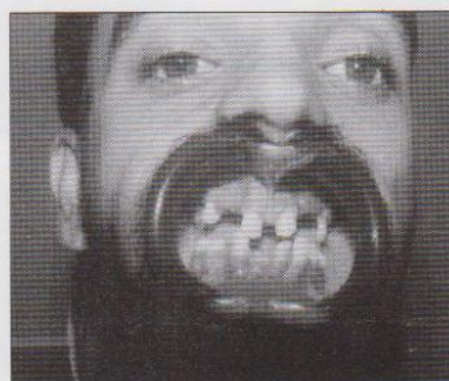


Figure 2

Fig. 1 and 2 shows the preoperative clinical condition of the patient.

- Based on the above mentioned prosthodontic considerations it was decided that the lower arch would be restored by a fixed prosthesis thus restoring the occlusal plane.
- The upper arch would be rehabilitated by a removable overdenture prosthesis after

strategically restoring and maintaining three teeth.

REHABILITATION OF LOWER ARCH

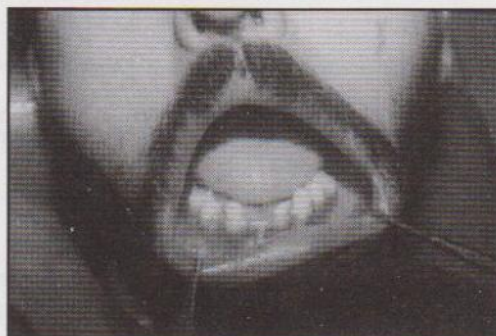


Figure 3

- The lower first molars 36 & 46 were prepared for full crown restorations to provide an orientation for aligning the occlusal plane and the restorations were cemented in place.
- The remaining teeth i.e. 32, 33 and 43 were also prepared to receive a fixed partial denture. 44 was replaced as a cantilever from 43 as the fixed prosthesis would be opposing a removable denture.
- All the retainers and pontics were metal crowns with acrylic facings due to both financial constraints and to prevent excessive wear of opposing removable acrylic prosthesis.



Figure 4

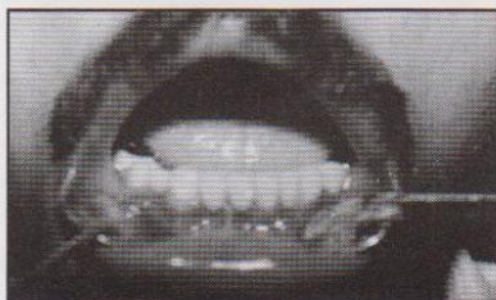


Figure 5

REHABILITATION OF UPPER ARCH

As mentioned earlier overdenture prosthesis was planned and treatment was begun after the lower arch was completed.

- Teeth remaining in the arch were 21, 26, 11 & 12.
- 26 was indicated for extraction as it was not restorable by endodontics.
- The remaining three teeth were endodontically treated following which they were prepared to receive post and coping restorations.

After cementing the post and the coping impression procedures for overdenture fabrication were instituted. Orientation jaw relations were recorded, final impressions made and intermaxillary relations transferred. The remaining steps were similar to those followed in conventional complete denture prosthodontics.



Figure 6



Figure 7



Figure 8

The above figures illustrate the treatment sequence in the upper arch (fig. 6-8).

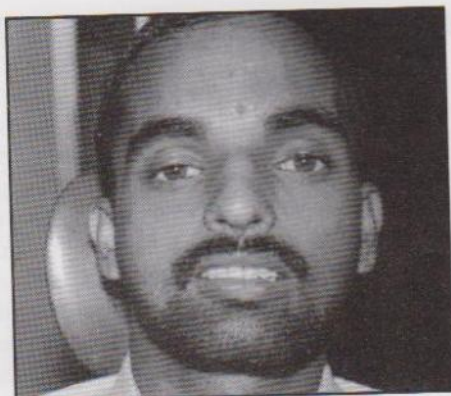


Figure 9



Figure 10

DISCUSSION

The use of removable overdenture prosthesis in the upper arch and a fixed prosthesis in the lower arch ensured the ideal solution to the patient's problem in terms of aesthetics, biomechanics and function.

The fabrication of fixed and removable prosthesis enabled the full mouth rehabilitation of the patient. He was put on a periodic recall and check up after demonstration of optimal oral hygiene maintenance procedures.

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Abstract

RESTORATIVE MATERIAL OPTIONS FOR CAD/CAM RESTORATIONS

Advances in adhesive dentistry and technological developments using dental computer aided design (CAD) / Computer Aided Manufacturing (CAM) systems have provided alternative esthetic restorations to conventional laboratory processed restorations. Restorative materials for CAD/CAM generated restorations must be able to withstand the rigors of the milling process, while providing clinical longevity once cemented. The esthetic restorative materials currently available for use with the cerec system provide dentists with ceramic and polymer options for inlays, onlays, veneers and crowns.

Cerec System : Developed in the early 1980's specifically to deliver ceramic restorations chairside during a single appointment, the cerec is a unique application of CAD/CAM technology. The initial cerec 1 unit and cerec operating system have evolved into a family of hardware, which includes the cerec 3, cerec 2, cerec Link and cerec Inlab. Each system uses software programs with the capability of Laboratory or operator use. The current cerec 3 unit allows for fabrication of a full range of restorations, including inlays, onlays, crowns and veneers.

However the variety of materials currently available make it important to distinguish the type of restorations fabricated with the cerec system.

- Dennis J. Fabbinder; *Compendium*, Oct 2002
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Removable Partial Denture To Complete Denture : Not Always A Smooth Transition - A Case Report

SUPRIYA RAJENDRA NERL, M.D.S.*, RAGHUNATH APPASAHEB PATIL, M.D.S.***, GANGADHAR ANGADI, M.D.S.***

ABSTRACT

Mild chronic irritation produced by the denture sometimes will not be felt by the patient, but it can be detected by the dentist. This article reports a similar case of a patient who had been wearing a maxillary anterior removable partial denture continuously for the last twenty years. Patient was unaware of the U shaped uniform palatal mucosal depression along the outline form of removable partial denture, as it was asymptomatic. Patient was informed about the ill effects of the existing removable partial denture and told to discontinue. Reasonable period of tissue rest and elimination of causative factor helped the tissue to recover.

Thus before the patient is dismissed, a reminder should always be given of the necessity of continuing adequate home care and of frequent maintenance checks by the dentist.

INTRODUCTION

A considerable number of people loose their teeth sometimes during the course of their life either due to trauma, caries or periodontal disease. Replacement of missing teeth either by a fixed partial denture or a removable partial denture is a very well accepted treatment modality which is successful, provided the patient maintains it.^{2/5} Many seek treatment immediately for esthetics, if the anterior teeth are missing. However, once the esthetic demands are fulfilled, it has been seen that patients are not interested in the care or maintenance of their other remaining teeth. We present a similar case of a patient who wore an anterior removable partial denture till he reached a state of complete edentulousness and later demanded addition of other teeth to the existing removable partial denture.

CASE REPORT

A 65 year old male patient presented to Department of Prosthetics, K.L.E.S' Institute of Dental Sciences, Belgaum with the chief complaint of loss of maxillary posterior teeth. He was wearing an anterior removable partial denture for the last twenty years. He wanted

addition of artificial teeth to the existing removable partial denture. Denture's hygiene was not maintained. Only central incisors and left lateral incisor were retained. Sequence of loss of teeth was noted. History of accident for the loss of maxillary anterior teeth was noted. Patient was wearing mandibular complete denture since last six years. Recently patient underwent extraction of maxillary posterior teeth due to periodontal disease.

The clinical examination revealed that patient had a U shaped uniform palatal mucosal depression without a break in the continuity of the epithelium at the outline of removable partial denture. The palatal epithelium had dull red, satin like appearance. Radiographic examination did not reveal any bony pathology. Patient was unaware of this damage as it was asymptomatic. Patient was informed about the ill effects of the existing removable partial denture, and hence told to discontinue the removable partial denture. Health of the mucosa was promoted by hygiene and therapeutic measures like oral physiotherapy and salt water gargling.

A month later, there was noticeable improvement in the palatal mucosa. After the complete recovery of the palatal mucosal defect, new maxillary and mandibular complete dentures were fabricated. Instructions regarding adequate home care of the denture was given. Patient was also educated about importance of tissue rest and frequent check-up visits to the dentist.

DISCUSSION

Chronic irritation produced by the denture, at times is not noticed by the patient, but it can be detected by the dentist. This case is an example of the same. Sufficient evidence exists today to state that well fitting dentures are not injurious to oral mucosa.^{2,1} In this case mastication without posterior maxillary teeth caused additional load upon partial denture bearing tissues. The load imposed upon the basal seat tissues must be controlled.⁴ The failure of support from the basal seat to resist the load caused intolerance to partial denture. Thus regular check-up visits to the dentist is a must, to incorporate the changes in denture as it occurs in tissues, so as to achieve balance between the load which dentures impose and the support which the tissues can comfortably provide in order to preserve the health of remaining tissues.³

Key Word : denture sore mouth, denture maintenance

Reader, **Associate Professor, *Professor, Department of Prosthodontics, K.L.E.S' Institute Of Dental Sciences, Belgaum - 590 010, Karnataka.*

Continuous wear of maxillary anterior removable partial denture against mandibular complete denture till loss of maxillary posterior teeth and thereafter the resorption of maxillary posterior residual ridge, directed masticatory forces at the slope of the ridge through palatal border of maxillary partial denture, which caused stress concentration and constant mild pressure, manifested clinically by palatal mucosal depression. In addition roughened surface of the acrylic resin rubbed against the mucosa as the partial denture moved in function could be the etiology for palatal mucosal changes. Withdrawal of the maxillary anterior removable partial denture and oral physiotherapy helped the tissues to recover.

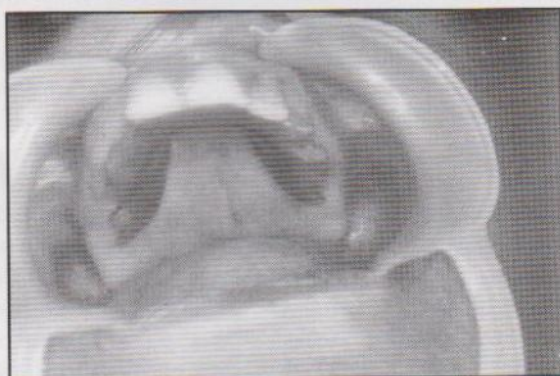


Fig. 1 : Maxillary removable partial denture in mouth.



Fig. 2 : Poor hygiene of tissue surface of partial denture.

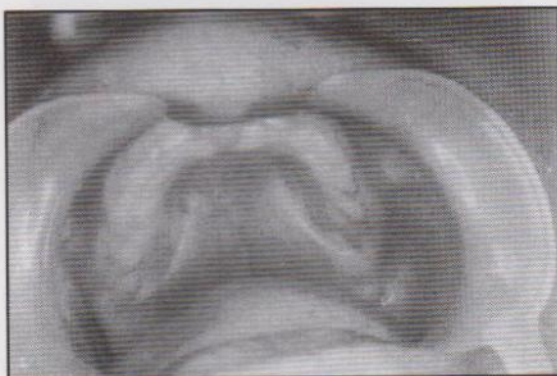


Fig. 3 : U shaped palatal mucosal depression.

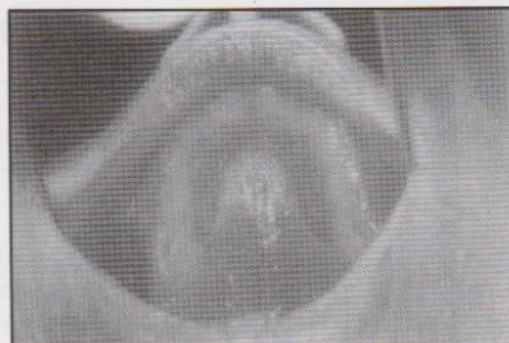


Fig. 4 : Improvement in the palatal mucosa.



Fig. 5 : Healed palatal mucosa.

CONCLUSION

Ill fitting denture, disharmonious occlusion, poor oral hygiene and continuous wearing of the prosthesis are contributing factors for tissue damage. Eliminating the causative factor and reasonable period of tissue rest helps the tissues to recover. This enabled us to transform an unhealthy, unattractive partial denture with poor function into a comfortable complete denture with proper occlusal contact capable of giving good function while greatly enhancing esthetics.

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Maintaining Diastema In A Fixed Partial Denture - A Case Report

NISHA MENEZES, B.D.S.*, VIDYA CHITRE, M.D.S.***, R. K. SINGH, M.D.S.***, MEENA ARAS, M.D.S.**

ABSTRACT

When rehabilitating a semi-edentulous arch with a fixed partial denture, a number of factors influence its success; amongst which an important factor is the amount of space available. This article describes the use of loop connectors in a patient with generalized anterior spacing and also enumerates the different treatment options available in the management of excessive pontic space.

INTRODUCTION

One of the challenges in esthetic reconstruction of the semi-edentulous arch is optimal utilization of the available space. Often either too much or too little space is available, complicating treatment.

When such spaces are to be treated, modification of the restoration, by altering the shape of the pontic and/or retainers and the shape and location of the connectors is required to develop good esthetics.

Following is an account of the rehabilitation of a case having excessive pontic space and a discussion on the different treatment options available in its management.

CASE REPORT:

A 21 year old female patient reported to the department of Prosthodontics at the Goa Dental College, seeking replacement of a missing upper right lateral incisor which was lost as a result of trauma 18 months prior. She had been given a removable partial denture but was keen on having a fixed restoration.

Intra-oral examination revealed that the patient had generalized maxillary mandibular anterior spacing. The pontic space available was more than that required for replacement of the lateral incisor. Space available between maxillary right central incisor and right canine was measured and found to be 10mm., while the left lateral incisor measured 7mm. mesio-distally.

The patient was advised to undergo orthodontic therapy but she was unwilling to do so, because of the long duration of the treatment. Thus we were faced with the need to replace the missing lateral

Key Word : Excessive pontic space, Maintaining diastema, Loop connectors.

*PG Student, **Asst. Professor, ***Professor & Head, Dean, Department of Prosthodontics, Goa Dental College & Hospital, Bambolim - Goa.

incisor with the fixed partial denture in a space that was larger than required

Restoration with a conventional FPD would result in looking wider than their contra-lateral counterparts and also the elimination of diastemas on that side. We therefore decided to restore the missing tooth with a fixed partial denture having loop connectors.

The maxillary right central incisor and right canine were prepared to receive metal ceramic full crown retainers. The margins of the preparations were kept at the level of the gingival crest. Following gingival retraction, impressions were made with elastomeric impression material and poured in die stone. The retainers and the pontic were waxed up following which the connectors were made from sprue wax, which was spherical in cross section and maintained passive contact with the palatal mucosa (see fig. 1 and fig. 2). The wax pattern was cast following routine casting procedure and was later veneered with ceramic. The result was an esthetically pleasing fixed restoration, which maintained the diastemas that were originally present in the natural dentition (see fig. 3).

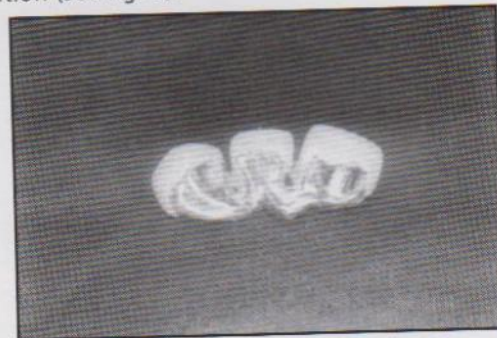


Fig. 1 : Palatal view showing loop connectors.



Fig. 2 : Labial view of the fixed partial denture.



Fig. 3 : Prosthesis cemented in place.

DISCUSSION:

To achieve esthetic balance, restorations must appear symmetrical on either side of the midline and should be in harmony with the rest of the dentition to avoid the false tooth look.

There are limitations to what can be accomplished esthetically. The position of the abutment teeth, the thickness of the teeth, the amount of pontic space available, as well as the ridge form, very often influence the esthetic outcome of the fixed partial denture. Modifications as regards to choice of materials used, types of retainers as well as shape and location of connectors can help enhance esthetics when working in less than ideal situations.

The problem of excessive space can be managed by one of the following:

1. Repositioning the teeth orthodontically to a more favourable alignment.
Orthodontic closure of generalized anterior spacing is brought about by retraction of the anterior teeth provided there is adequate overjet. Such a closure with proper alignment of teeth could be best brought about with the help of a fixed appliance and would take a minimum of 8 - 12 months.
2. Making each tooth slightly larger.
Delicate inter-proximal contouring¹ by placing the proximal contacts lingually, permits large facial embrasures and aids in silhouetting the facial line angles of the tooth. In some instances, the tooth surfaces adjacent to the facial embrasure may be hollow ground incisogingivally to increase the shadow effect of the embrasure. This procedure can reduce apparent

tooth size by approximately 1.5 mm i.e., by 6 mm in restoration of all maxillary incisors.

Ceramic veneer fixed partial dentures², have been described for use in these situations. A ceramic veneer fixed partial denture is designed to have a pontic suspended between porcelain veneers. When the edentulous space is too large, facial veneers can be used to widen the retainers and narrow the pontic thus achieving a more acceptable tooth size relationship.

3. Using single tooth implants.

Implant replacements have become a popular alternative to the traditional fixed partial denture for replacement of a single tooth - an alternative that completely precludes tooth preparation. Besides preserving tooth structure, they help in preserving the surrounding bone, they do not add an additional functional load on to the adjacent teeth and may be used when diastemas are to be maintained between adjacent teeth.

4. Maintaining diastema with fixed restorations using appropriate connector design.

Fixed partial denture designs that maintain diastemas are:

- a. Spring cantilever design³

Indicated when teeth adjacent to the pontic do not require restoration, but a posterior tooth on the same side of the arch requires a full coverage restoration, and also when diastemas between the anterior teeth are to be preserved. Spring cantilever bridges are restricted to the replacement of upper incisor teeth. Only one pontic can be supported by a spring cantilever bridge. This is attached to the end of a long metal arm running high into the palate and then sweeping down to a rigid connector on the palatal side of a single retainer or a pair of splinted retainers. The arm is made long and fairly thin so that it is springy, but not so thin that it will deform permanently with occlusal forces. Forces applied to the pontic are absorbed by the springiness of the arm and the displacement of the soft tissues of the palate, so that excessive leverage forces are not exerted on the abutment teeth. The abutment teeth are usually two premolar teeth splinted together or a single molar tooth.

Spring cantilever bridges are seldom made these days because of the difficulty in maintaining oral hygiene and have been replaced by minimal preparation bridges or by single tooth implants.

- b. FPD with loop connectors⁴

This type of a design may be used when diastemas between the anterior teeth are to be

maintained. The connectors are waxed from sprue wax or shaped from platinum- palladium-gold alloy and are spherical in cross-section. Just like the pontic, they maintain passive contact with the mucosa. The problem with this kind of a design is that the patient finds it difficult to clean beneath the connectors and therefore must be instructed in proper oral hygiene measures. Dental floss held in a floss threader should be used to clean beneath the connectors.

CONCLUSION:

In the case discussed above, all the other treatment options were ruled out either because of time constraints or financial limitations. A fixed partial denture with loop connectors was preferred over the spring cantilever design as the patient did not require any posterior full coverage restoration.

Once a patient decides to have a lost tooth replaced with a fixed partial denture, it must be remembered that regardless of how skillfully the bio-

mechanical requirements have been met, the patient will judge the restoration primarily on the basis of how good it looks, especially if the restoration is an anterior one.

Because of increasing esthetic demands, selection of a proper prosthesis is no longer a simple decision. A critical comparison of the many available treatment modalities is required to choose the most appropriate restoration for each case. Restoration of function, esthetics and comfort are goals that must be balanced with predictable longevity, least biological consequence and effective cost.

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Abstract

ASSOCIATION OF EDENTULOUSNESS WITH SYSTEMIC FACTORS IN ELDERLY PEOPLE LIVING AT HOME

Objective : To examine the association of edentulousness with systemic factor : age gender, tobacco-smoking, alcohol intake, body mass index, functioning in daily living, cortical thickness of the mandibular angle, and systemic diseases, bone fracture (an indicator of the osteoporosis), diabetes, thyroid disease, hyperparathyroidism, asthma, heart failure, hypertension.

Methods : The study population comprised 293 elderly subjects, 124 (42%) edentulous and 169 (58%) dentate. The data from clinical and radiographic examinations and structured interviews were analysed by multiple logistic regression.

Conclusions : The finding of associations of history of bone fracture, tobacco smoking and asthma with edentulousness emphasizes the association of systemic conditions with edentulousness. Advanced age was related to an edentulous maxilla. The relationship between asthma and total tooth loss in the maxilla might suggest a local oral effect of medications used by asthmatic patients.

- Qiufei Xie and Anja Ainamo

School of Stomatology, Beijing Medical University,
Beijing, People's Republic of China and Institute of Dentistry,
University of Helsinki, Helsinki, Finland.
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Materials Used For Maxillofacial Prostheses Reconstruction - A Literature Review

ALKA GUPTA, M.D.S.*, DESHRAJ JAIN, M.D.S.**

ABSTRACT

Purpose: This literature review provides information about materials being used for extraoral facial prostheses reconstruction.

Material: This information includes the material used in past, commercially available newer materials, their chemical type, their comparison in respect to the ideal requirement of maxillofacial prostheses material.

Conclusion: It can be deduced from this review that to achieve the goal for quality of biocompatibility, durability against all conceivable deterioration, ease of fabrication and cost effectivity of material used for maxillofacial prostheses further research is needed to get the perfection in this field.

INTRODUCTION

A rewarding area of Prosthodontics is the rehabilitation of patient with acquired facial defect. This article is an attempt to throw light on review of literature, regarding materials being used for maxillofacial reconstruction.

Extraoral maxillofacial prostheses can be a valuable option for patient with orofacial defects.

Lontz J F¹ stated that the most recent historical impetus to advance the state - of - the -art from primitive metal, leather, & rubber was initiated in early 1970s. Later most of the general biomedical materials like acrylic polymers, polyetherurethanes, silicone elastomers etc. were investigated, to make use of them as restorative materials for maxillofacial reconstruction.

Presently there are no ADA specifications for maxillofacial prostheses materials.

Sweeny and Associates in 1972² and Lewis and Castleberry in 1980³ reviewed the requirements of an ideal material. They assembled data from physical, mechanical, and chemical tests of various materials and correlated their values with the clinical performance. As a result of these efforts several important criteria may be listed for the ideal material, which fall under two categories. They are 1) Processing characteristics and 2) Performance characteristics. (Table I & Table II)

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**Assistant Prof. (Postgraduate Student), **Prof. Head, Department of Prosthodontics, College of Dentistry, Indore, (M.P.)*

LITERATURE REVIEW

Even before dentistry attained its status as a profession, some surgeons⁴ had recognized the limitations inherent in grafting tissue for repair of certain maxillofacial deficiencies and had argued the use of prostheses as an alternate method.

Artificial eye found in Egyptian mummies and Popp's reference to the use of artificial eye and noses by the Indians and the Chinese lead us to think that they applied their skill to prosthetic restoration also.

Ambroise Pare (1517-1590)⁴, the famous French surgeon appears to be the first medical writer on this subject. He recommended a prosthetic nose, which could be made of silver and attached to the face by strings, with the line of junction at the lip being camouflaged by an artificial moustache.

Maxillo-facial prosthetics owes much to Pierre Fauchard (1678-1761)⁴, the illustrious dental pioneer of the seventeenth century. Fauchard made us realize that the usefulness of intraoral prostheses could be extended to improve cosmetic appearance and also repair any palatal deficiency that the patient may have. Fauchard's invention which today is of practical value in maxillo-facial prosthetics, is the special spring which he devised for the retention of upper and lower dentures. Today, the successful retention of certain bulky maxillofacial prostheses is made possible by the use of springs that he introduced some three hundred years ago.

Fauchard's influence upon maxillofacial prosthetics following his monumental publication can be noticed in a study of an unusual prosthesis made in the early 1800's. This prosthesis was constructed under the direction of a military surgeon, in collaboration with a silversmith, for a French artilleryman who had lost a major portion of his face in a battle. The victim later came to be known as the "Gunner with the Silver Mask".

William Morton (1819-1868)⁴ also did some pioneer work in maxillo-facial prosthetics. Morton constructed a new nose out of porcelain for a Boston lady who had lost her own from a malignant disease. The nose was enameled to the exact color of the patient's complexion. Dr. Morton attached the nose to her spectacles.

The contributions of the Frenchman Claude Martin to the maxillofacial prosthetics are noteworthy. The book which he published in 1819 should be of

interest to all those who are engaged in this work. For example, he introduced, among many other innovations, a method of retaining a nasal prosthesis by a very ingenious device, which compensated for the movement of facial muscles. This prosthesis, like the one made by Morton, was made from ceramic material.

Towards the end of nineteenth century, Vulcanite, having already proved its value in Prosthodontics, found simultaneous use in maxillofacial prosthetics. It replaced most of the earlier materials, such as cellulose acetate, ceramic, and metals.

Upham (1901)⁴ a Boston dentist described the use of vulcanite as follows: "It is easily worked, has no odor, and is not easily broken. Celluloid is harder to work, is easily broken, and readily catches fire. Aluminum is hard to work and so is silver".

In time, however, some workers showed dissatisfaction with vulcanite and began looking for a more life like material that possessed translucency and pliability that were totally lacking in vulcanite.

In Germany 1913⁴ the gelatin-glycerin compounds attracted much attention. Here was a material that was easy to compound and simple to manipulate, and one that possessed pliability, translucency, and adaptability of intrinsic coloring to match the skin, and found ready application for facial injuries involving the soft tissues. Although the gelatin-glycerin mixture, when new, produced a far better esthetic result than had been possible with any of the rigid materials that were being used, restorations made from it lasted only a few days or a week at the most. New duplicate prostheses, therefore, had to be made.

The use of prevulcanized latex was introduced independently by Bulbulian and Clarke⁴.

Even though this material had many shortcomings by our present standards, it served its purpose well, and it continues to be used for certain types of restorations. It is particularly useful when hollow and, hence, lightweight prostheses are required for conditions presenting retention problems.

Perhaps the most significant contribution of the prevulcanized latex era was that it provided the impetus in the early 1930's to further research towards finding a material which combined the desirable qualities of latex, such as durability and strength, with properties yet to be realized.

Fonder and Winnetka as early as in 1955 presented an article titled "Dental Materials and Skills in Oral and Facial Prostheses"⁵. They used acrylic resin for fabrication of cleft palate, missing ears, noses, and parts of the face, for rehabilitation of people.

Methyl methacrylate^{5, 6}: the rigid variety, which has completely replaced the older vulcanite, has been used for a variety of maxillo-facial prostheses. Its excellent translucence, and intrinsic and extrinsic coloring possibilities and the ease of processing in most dental laboratories, has attracted a number of workers in spite of its rigidity.

COMMERCIALLY AVAILABLE NEWER MATERIALS

Newer materials representing a variety of polymer classes offering unique characteristics have recently been made commercially available are as follows^{7, 8}:

Acrylic resin copolymer (Palamed-Kulzer), Vinyl Polymers and Copolymers (Realistic-Prosthetic services, Calif. Mediplast-Standard arts, Butler) Polyurethane Elastomers (Epithane-3 Daro products Butler).

Silicone Elastomers-RTV & HTV Silicone (MDX 4-4210, Silastic 372,373 Dow Corning Mich., A-2186 Factor 2 Inc. Ariz., Cosmosil- Principality, UK.)

Work-done by Canta & Hildedsted on Acrylic copolymers in 1966-8 did not receive wide acceptance because of a number of objectionable properties, like poor edge strength, poor durability, degradation when exposed to U.V Light and complete restoration often become tacky, predisposing to dust collection and staining.

Vinyl polymers and copolymers, a flexible plastic material is basically plasticized polyvinyl chloride or a copolymer of polyvinyl chloride & polyvinyl acetate.

When resin fine granules are dispensed in a suitable plasticising agent it results into a pliable, tough, life like material quite suitable for Maxillofacial prostheses.

However it had demerits like when cured at high temperature in metal molds, due to plasticizer migration it resulted in discoloration, and hardening of the prosthesis, particularly at the margins. It had poor edge strength and often required reinforcement with nylon fibers. Degradation on exposure to U.V light. Serviceability was not more than 6 months.

Polyurethane Elastomers can be synthesized with a wide range of physical properties by varying the reactants and their amounts^{8, 9}. They contain urethane linkages. There are two reactants a polymer terminating with an Isocyanate and other one terminating with a hydroxyl group in presence of a catalyst that is stannous octate or dibutyltin dilaurate plus a thermosetting deglossing emulsion of a polyurethane elastomers with silica powder. Varying the amount of Isocyanates will change the physical properties of the final product. So polyurethane elastomer is a four compound system.