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REVIEW ARTICLE

Pediatric Prosthodontics: A Systematic Review

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ABSTRACT

Prolonged retention of tooth enhances the possibility that dentist may treat the patients with severe tooth wear without any invasive procedure. The quality of treatment and rehabilitation for the head and neck cancer patient, especially the pediatric patient, has progressed markedly over the years due to the cooperation of specialists involved in the total care of the patient. The success of treatment is dependent on patient–parent cooperation and initial molding can be achieved by operant conditioning. The desire to look like others who have teeth can be a motivator for the young child. Hence; in the present review, we have summarized some of the important aspects of pediatric prosthodontics.

KEY WORDS: Crown, Pediatric, Prosthodontics

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INTRODUCTION

Prosthodontics is the dental specialty pertaining to the diagnosis, treatment planning, rehabilitation, and maintenance of the oral function, comfort, appearance, and health of patients with clinical conditions associated with missing or deficient teeth and/or maxillofacial tissues by using biocompatible substitutes. Teeth can be lost or require replacement as a result of factors like caries, trauma, infection, congenital anomalies (cleft lip and palate deformities, amelogenesis imperfect, dentinogenesis imperfecta), inborn defects (ectodermal dysplasia), systemic disorders (osteoporosis), premature tooth loss, radiation damage and neoplasia. The congenital absence of teeth is one of the most frequent reasons for the need of complete and partial dentures for young children.¹⁻³

Treatment of patients with oligodontia can challenge the clinician not only because patients present a great number of congenitally missing teeth, or even anodontia, but also because of the age they are usually referred for rehabilitation. The success of treatment is dependent on patient–parent cooperation and initial molding can be achieved by operant conditioning. The desire to look like others who have teeth can be a motivator for the young child.⁴

Prosthodontics in children is more challenging because of the anatomy, erupting teeth, growth pattern, patient cooperation and understanding. Pediatric patient may be required to follow up more often than adult patients needing procedure like recliners or refits of removable prosthesis because of growth pattern. It is a multi- step, long-term procedure, requiring close cooperation of restorative dentist, orthodontist and speech therapist.

Due to the specific skeletal differences in young patients all prosthodontic procedures undergo modification. It can be said that such prostheses are between dentures and orthodontics because they act as a functional appliance. They also meet the so called function – space maintainers, they improve the chewing function, and they improve the aesthetic appearance.⁴

IMPORTANT CONSIDERATIONS DURING PROSTHETIC TREATMENT PLANNING IN CHILD PATIENTS

Nanda (1976) suggested that the following questions be asked before a prosthodontics appliance is fabricated for a child

1. Will the child adapt to change in oral environment caused by the insertion of the appliance.

2. Will the appliance be capable of preventing tooth migration, extrusion, and adverse oral habits
3. What is the anticipated eruption time of the succedaneous teeth?
4. If needed what type of appliance is indicated?
5. Is there any evidence of psychological trauma because of early loss of anterior primary teeth?
6. Will the absence of anterior teeth have any detrimental effect on speech development?
7. What influence will the absence or insertion of appliance have on the growth and development of the child?^{5,6}

Proper diagnosis and treatment planning are important before starting any dental procedures on pediatric patients. It varies from the adult patient by many factors like:

1. Growth; in young children the presence of teeth is vital for the development of the perioral structures and proper psychology.
2. Mastication: the denture should be facilitate effective mastication and not effect the dietary habits and nutrition of the child.
3. Interarch distance : in case of certain systemic disorders decreased interarch distance in the posterior region may not enable placement of teeth in that particular area. Thus only the denture base can be extended till there.
4. Space management: the denture can be given to the pediatric patient for space management to facilitate proper eruption of permanent teeth. The clasps of the appliances should not interfere with the eruption of permanent teeth.
5. Neuromuscular skills. The neuromuscular skills in the child are not as developed as that of an adult. The better the neuromuscular coordination the better is the adaptation to the new denture.
6. Patient education: the patient must understand the need for the prosthetic replacement, its maintenance and the importance of good oral hygiene.
7. Parent attitude: while treating the child patient the parent may have to be taken into more consideration than the patient himself. The parents play an important role in explaining the treatment plan to the child patient.⁷

ANATOMICAL AND PSYCHOLOGICAL CONSIDERATIONS IN A CHILD PATIENT

ORAL MUCOSA AND SKIN

- Unlike adults, the denture bearing mucosa in children is thicker and well circulated. They are therefore less prone to trauma.

- Giving proper dentures can compensate skin folds around the mouth in child patients.

RESIDUAL BONE CHANGES

- Maxillary and mandibular bones are more porous in children and have abundant blood supply. This results in faster healing of the extraction sockets following which the prosthesis is constructed.
- Growth of dental arches requires a frequent change of denture

TONGUE AND TASTE CHANGES

- Loss of tooth results in placement of tongue between the edentulous ridges.
- Unlike adults inflammation of tongue or taste buds or taste alteration is uncommon in children.

SALIVARY FLOW CHANGES

- Children have a good salivary flow and thus have fewer problems during denture wear.

PSYCHOLOGY OF PATIENTS

- Child may develop inferiority complex if teased by friends and ridiculed by parent during this period.⁷

OVERLAY DENTURES IN CHILDREN

An overlay denture is a complete or partial removable denture fabricated over retained teeth or roots that are not prepared with a coping to interface with the denture.⁷ This is in contrast to an overdenture in which the remaining teeth require endodontic treatment and cast gold copings.⁸ Retained roots help to provide support, stability, tactile and proprioceptive sensation to reduce ridge resorption.⁹

INDICATIONS FOR OVERLAY DENTURES

- Congenital disorders (e.g., Cleft palate), oligodontia, ectodermal dysplasia, and cleidocranial dysplasia.
- For disorders associated with malformed or missing teeth.
- Patients with severely eroded or abraded teeth (dentinogenesis imperfect, amelogenesis imperfect).
- Patients with very few teeth, teeth with a small clinical crown or short roots.
- Small dental arches with a little lip support.
- Large spaces between teeth which are difficult to correct orthodontically.¹⁰⁻¹²

CONTRAINDICATIONS FOR OVERLAY DENTURE

- When other prosthesis can achieve superior results
- Patients with poor oral hygiene.
- Psychological factors¹³

INDICATIONS FOR USE OF DENTAL CROWNS ON DECIDUOUS TEETH ARE:

- Developmental defects.
- Fractured teeth.
- Teeth after pulpal therapy.

- Restoring multisurface caries, especially in patients with high caries risk.
- Teeth with extensive wear.
- Teeth that need to function as an abutment for space maintainer.¹⁴

CONTRAINDICATIONS FOR USE OF DENTAL CROWNS ON DECIDUOUS TEETH ARE:

- In younger patients great care should be taken during preparation of the tooth
- Deciduous having a large pulp
- Teeth under the partial eruption stage
- Mobile or periodontally involved teeth
- Grossly carious teeth with a minimal tooth structure.

Materials and designs used for such crowns varied greatly over the years, and recent improvements in design of dental materials have provided a variety of different dental crowns. Most important factors considered by dentists when choosing adequate crowns are durability, esthetics, retentiveness, adaptability, placement time, allergenicity and cost.¹⁵

ADVANCEMENTS IN PEDIATRIC PROSTHODONTICS

a) IMPLANTS IN CHILDREN

Dental implant is defined as a prosthetic device made up of alloplastic material(s) implanted into the oral tissue under the mucosal or periosteal layer, and on or within the bone to provide retention and support for a fixed or removable prosthesis.¹⁴

Implant popularity as a treatment modality in adults is tremendous. In case of adults the amount of research being carried out is extensive, however, the treatment planning and execution of implant placement in children and adolescents is still in its infancy.

In partially edentulous cases, long-term success of dental implants has been responsible for other clinicians to broaden the use of implants to adolescents in whom teeth are missing due to trauma or agenesis. Anodontia either primary or acquired occasionally creates the opportunity for the use of dental implants.¹⁵

According to World Health Organization –young people between the age of 10 years and 19 years are termed adolescents.¹⁷ However, in adolescents the use of implants differs significantly from adults. Because a variety of changes occur in the dentition and jaws of the adolescent, special importance has to be given to the growth of the child.

b) ZIRCONIA CROWNS

Zirconia crowns are relatively new in dentistry, firstly introduced in 2001.¹⁹ In 2006 Dr Johnson and Dr Jeffrey Fischer founded Ezpedo, Inc in USA and developed world's first pediatric zirconia crown. In 2007, they developed the first prototype and in 2008 the first preformed zirconia was fitted in the child's mouth. In 2012, Nusmile from USA introduced full coverage zirconia crowns system with featuring exclusive try in crowns.¹⁸

Different company zirconia crowns²⁰

1. NuSmileZre
2. Kinder Crown Zr
3. EZ Pedo Crown
4. Cheng crown
5. Kids E Crown
6. Signature Crown

c) FUNCTIONAL LINGUAL ARCH WITH HINGE-TYPE LOCKABLE DENTULOUS COMPONENT

The lingual arch is a bilateral fixed space maintainer, consisting of a single heavy-gauge stainless steel wire adapted anteriorly to the lingual aspect of mandibular arch and posteriorly to bands on the first permanent molars. A new functional lingual arch design that incorporates a hinge-type openable dentulous component with a locking mechanism, with various advantages over the conventional lingual arch design.²⁰⁻²²

CONCLUSION

There are a large number of children suffering from absence or loss of teeth due to congenital hypodontia or trauma. Pediatric dental, orthodontic, prosthodontic, and oral and maxillofacial surgery specialties become integrated in treating the pediatric patient. The greater the physiologic harmony that can be created within the teeth, alveolar bone and growth, greater are the chances of successful dental prosthetic treatment in children

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