Replacement of missing teeth in young adult patients: Diagnosis, treatment options, and outcome of care - A review

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Abstract

Patients often present with congenital and acquired tooth loss, traumatic injuries, and it is incumbent on the prosthodontics team to diagnose educate and provide care plans that address the range of issues concerning the young adult needing tooth replacement therapy. The challenge in treating patients with missing teeth in young adult patients and concomitant malocclusion, particularly in the long-term is how to achieve the best esthetic and functional results. The diagnostic phase is critical and involves an interdisciplinary team. Auto-transplantation of teeth and orthodontic space closure represent viable biological approaches for replacement of incisors because of the permanence of the result, particularly in growing individuals. Even if solid comparative research data for the different replacement methods so far are not available, a compilation of all treatment modalities can produce treatment results that are almost indistinguishable from an intact dentition. This will lead to progressive care plans that engage removable, fixed, and implant prosthodontics with an eye to a multidisciplinary approach. This paper will review the critical points of assessment, key points to consider, and then provide clinical examples of care plans for the transitional adult in our practice. The goal should be that patients who have received treatment for missing teeth will have treatment results that are indistinguishable from normal appearance. A prerequisite is that the therapy is based on a complete diagnosis, that the indications for the selected approach are present, and that attention to detail throughout treatment is exercised by all involved in the treatment.

Keywords

Auto-transplantation, canine substitution, decoronation, implant therapy

Introduction

Replacement of missing teeth in young adults is one of the most challenging problems in dentistry largely because of the absence of definitive guidelines and variety of treatment options available. Tooth loss is considered to be a serious event in the life of a person, psychologically a very traumatizing and upsetting experience, requiring significant psychological readjustment.¹² There is a direct relationship between the number of teeth present and total satisfaction with oral status.¹³⁴ However, the challenge mainly is to satisfy the patient’s demand and replace the missing teeth for improving the esthetics, function, and quality of life without harming the remaining teeth or gingival tissues.¹⁵ Rehabilitation of the subjects in this particular age group assumes significance as the conventional treatment modalities for the replacement of missing teeth have to be applied with caution and judgment arrived at with multidisciplinary approach. The problem of restoring function and esthetics varies notably according to the age of the patient, the location of the missing teeth and the extent of the edentulous span. Achieving an optimal treatment result, it frequently is necessary to seek the amalgated efforts of a multidisciplinary team of experts, representing pediatric dentistry, prosthodontics, orthodontics, endodontics, and dental technology. Recreating the beauty and function of the natural dentition requires the skill and competence of such skilled team. There are numerous factors which can affect the treatment plan, and while fabricating dental prosthesis these factors such as condition of adjacent teeth, number of teeth to be
replaced, social and medical factors, patient motivation should be considered.[5]

**Reasons for Tooth Loss in Young Adults**

Tooth loss in the patients is primarily due to congenital and acquired defects. Trauma contributes for a large number of patients in the specified age group seeking treatment for the loss of anterior teeth maxilla in particular. Trauma again requires assessment of the injury to the supporting and associated structures, prerequisites of reimplantation as the treatment begins soon after the incident. In young adults, intrusion of the teeth is sometimes misdiagnosed as injury due to the eruption status of the mixed dentition. This leads to progressive and comprehensive care plans involving fixed, removable, and implant prosthodontics.

Tooth loss due to congenital causes will have to be evaluated for the available bone and the condition of the abutment teeth and also the systemic condition of the patient. The inheritance pattern of the disorder should be studied to prevent the transfer of the condition to the offspring, and these subjects should be made to undergo genetic counseling. Indeed, early diagnosis is essential to the development of treatment strategies needed to manage the process of continued growth and development. Varying esthetic and functional needs of the patient, limits treatment until growth is complete and definitive restorations can be fabricated. The absence of lamina dura and periodontal ligament (PDL) widening is a result of many systemic diseases leading to tooth loss. Genetic causes of tooth loss due to deficiency of interleukins have gained significant importance now due to reports in recent publications. The etiology of dental agenesis and the mechanism has yet to be fully explained. There is undoubtedly a genetic component with an autosomal dominant pattern of inheritance, variable expression, and incomplete penetrance.[7] Certain syndromes, such as ectodermal dysplasia, are integrated with the developmental absence of large numbers of teeth[8] and even anodontia.[9] Environmental factors may also be implicated such as trauma, infection, irradiation, and endocrine disorders.[10] A medical practitioner should address such medical disorders prior to dental treatment.

**Treatment Goal and Objectives**

Treatment goal and objectives in these patients should primarily focus on control of caries and periodontal disease and have the provision of harmonious occlusal relationship in replacement of missing teeth. The psychosocial impact is maximum in subjects who have trauma as the underlying cause of tooth loss and counseling of these patients is mandatory prior to any treatment. The nature of the injury to individual tooth and vitality tests keeping in mind the false positive and negative nature of the results and should be repeated at the interval to rule out any discrepancy. In patients where teeth are missing congenitally, the loss of alveolar bone results in thin lips, prominent nose, and chin, depressed facial appearance with reduced lower facial height.[11] Caries index of the patient helps in designing the postcare plan for the patient and also selecting a treatment plan which should take into account his high-risk condition into account. Caries susceptibility index of the patient should be taken into account before designing a treatment plan for the patient. The replacement of missing teeth, anterior (palatal aspect), and the posterior occlusal forms of the teeth being replaced have to be designed keeping in mind the anterior guidance. Anterior guidance has basically two components, i.e., canine guided or group function. Next to centric relation, the anterior guidance is the most important determination that must be made when restoring the occlusion.[12] The duplication of the existing anterior guidance should be customized for every individual patient. The treatment options available for the missing teeth in the young adults comprises of implants, only after cessation of growth, resin bonded fixed partial dentures, removable partial dentures, autotransplantation, orthodontic space closure, and reimplantation.

**Implant Therapy in Young Patients**

Insertion of implants as a general rule in the growing adults should be delayed until the growth of the alveolar process is complete. Various theories have been put forward to study and interpret the growth process, out of which superimposition of lateral tracings showing no bony growth changes during the 1-year interval is the most widely accepted theory for the conforming cessation of growth. Hand wrist skeletal radiographs and its comparison to standard atlases can also predict the growth pattern. It even is advisable to determine growth cessation through a combination of several methods.[13] Clinically, histologically, and radio logically, the implants do not follow the formation and development of the alveolar process. The pattern of growth in maxilla and mandible is in transverse sagittal and then vertical. This growth pattern is probably responsible for the implant to develop infraocclusion or labioversion in relation to the remaining natural teeth. Rather than insertion of implants in this particular age, technique to facilitate the implant placement later by development of the site should be promoted and can be achieved by two techniques:

**Guided eruption and ridge development**

Guided canine eruption and placement into the congenital missing lateral incisors followed by orthodontic movement later to open up space for implant placement is an alternative treatment option for optimum development of future implant site. The guided eruption of the canine in the space of lateral incisor develops the bone width labio-palatally due to the size of the canine. The alveolar process of these congenital missing teeth areas is deficient in bone necessitating bone augmentation and other ancillary procedures mandatory at the site of implant placement for the replacement of missing laterals.

**Decoronation**

Protruded maxillary incisors and incompetent lips predispose the young population to dental trauma, whereas traumatic
Missing teeth in young adult patients

Injuries among adults are more often seen following accidents, fights, and sports activities. The local arrest of the surrounding alveolar ossification collateral to the continuous skeletal growth and development leads to infra-positioning, one of the negative sequel of tooth ankylosis. Complicated future prosthetic rehabilitation in an unesthetic dento-gingival complex due to infra-positioning is often seen. Decoronation as a treatment option in the ankylosed tooth in the anterior region preserves bone for future implant placement and also increases the vertical bone height. Decoronation procedure is considered critical, particularly when the growth of alveolar ridge is anticipated to be at a level almost the same bone height with that of adjacent teeth. During the phase of active development, maxillary skeletal, and dental growth results in marked changes in all three dimensions. In vitro research on the study, models have revealed that osseointegrated implants lack the compensatory growth mechanism of the natural dentition and, therefore, the skeletal maturation and not the chronological age of the patient should be taken into deliberation to avoid objectionable esthetics of the implant-supported final prosthesis. The technique basically involves removal of crown leaving the root intact and inducing bleeding to activate osteoblasts and osteoclasts. To an evident external replacement resorption in ankylosed teeth, internal replacement resorption sets in. Gutta percha should be removed from the apical portion of root canal treated tooth before inducing bleeding from the interior aspect. Root is resorbed in due time leaving the site ideal for implant placement. Trans-alveolar extraction of ankylosed tooth involves trauma and excessive bone removal which complicates implant placement involving bone grafting and other procedures.

Diagnostic Wax-up of the Different Treatment Options

Diagnostic wax-up of the various treatment options help in predicting the outcome of the restorative treatment and involves the patient in the decision process to help him choose the suitable treatment. It also helps in estimating the amount of space to be closed or opened for tooth replacement in addition to space analysis on casts and models.

Canine substitution and veneering

Orthodontic approaches for prosthodontic rehabilitation must take into consideration the following into picture, i.e., over jet, overbite, crowding, spacing, occlusion and its classification, space analysis to come to a treatment plan which is definitive and not detrimental. One is esthetic and the other functional. The canine tooth is markedly different tooth as compared with a lateral incisor. Its mesio-distal width is typically greater; has bulbous facial surface and not flat; incisal edge has marked contrast to lateral incisor; and its gingival contour is typically higher than a lateral incisor. The canine has the largest root and, therefore, the likelihood of a “canine eminence” can create an unnatural gingival architecture. Gingival contour can be achieved by selective intrusion and extrusion. Unilateral agenesis cases provide a greater challenge in meeting the esthetic demands. The premolar substituting for a canine is pretty diminutive and also the root configuration of the premolars is not conducive and accept the forces during canine guidance in lateral excursions.

Auto-transplantation and orthodontic closure

Auto-transplantation is defined as the transplantation of embedded, impacted, or erupted teeth from one site into extraction sites or surgically prepared sockets in the same person. Auto-transplantation has been used to replace missing teeth and teeth of poor prognosis. Auto-transplantation of teeth and orthodontic space closure constitute feasible biological approaches for substitution of incisors because of the permanence of the result, particularly in growing individuals. The most evident advantage of replacing missing incisors with the patient’s own teeth, by transplantation, is the permanence and biotic reconcilable of the treatment result. Auto-transplantation is a viable treatment option for the replacement of single missing tooth in the growing adults. Premolars can be used as a replacement in the anterior even in congenitally missing areas by preparation of socket, and the developing third molars can be used as a replacement for the first molars. CAD/CAM generated tooth replicas help in designing the socket and prevent injury to the PDL. An important prerequisite for transplantation is a donor tooth with 2/3 to 3/4 root length formed that can be abandoned without deleterious effects on the donor site. Premolars are usually the preferred graft because dental trauma customarily happens at the time when premolar root development has still not been completed, external root form is favorable by virtue of being straight and conical, and the extraction space may be utilized to relieve crowding. Minimizing trauma to the extracted tooth is important to preserve the PDL for the success of this procedure. Rigid or flexible fixation should be done for initial stability. Flexible fixation is by silk suture 2-0 passing labio-palatally around the tooth over the occlusal surface and rigid fixations by stainless steel wire and composite if more than 2 mm of mobility is felt after transplantation. If the transplanted tooth has a closed apex root canal treatment can be performed 2 weeks later. In addition, radiographs are an important tool to evaluate PDL and lamina dura, root formation, and alveolar bone level. Potential complications to be aware of include ankylosis, periodontal disease, root resorption, and pulp canal obliteration.

Auto-transplantation versus implants

A comparison in relation to function, cost, time, treatment of complications and esthetics between implants and auto-transplantation can be drawn to determine the line of treatment in young adults. The presence of PDL fibers in an auto-transplanted tooth preserves bone in comparison to implants where resorption is an evident phenomenon due to the absence of fibers. Implant therapy is costly and has a time lag of months, whereas auto-transplantation is completed within 2-3 weeks in a maximum of the cases requiring adjunct root canal therapy.
The management of complications with transplantation is non-invasive and does not require surgical intervention and bone/soft tissue grafting. Natural tooth typically provides more esthetics; however, prosthetic reconstruction in some cases can alter esthetics. Esthetics in implants in turn varies on the case; clinician and lab have the potential to be excellent but difficult to achieve a natural look.

Removable partial denture

Removable partial dentures with their high risk of caries and periodontal problems should be advised only in circumstances strictly calling for such procedure. Removable partial dentures are prescribed mainly because of the mix of professional functional cultural and economic considerations rather on scientific evidence. Utilization of different impression techniques, selection of suitable clasps, accurate extension of dentures, and achievement of harmonious occlusion are the key factors to make an adequate acrylic partial denture.[27] Removable partial dentures are easy to fabricate, necessitates less chair time, low cost, no invasive preparations on abutment teeth, easy to insert, and to remove by the patient himself.[28] Acrylic dentures should be tissue friendly, restoring esthetics by incorporation of appropriate denture flanges and should utilize all anatomical and physiological factors available to achieve better mechanical properties such as support, retention, and stability.[29]

Outcome of care

Furthermore, long time follow-up study and comparative data collected should be evaluated to predict the outcome of care in these young adults for the restorative options available. Patient’s response to treatment appears to be influenced by adaptive capacity and personal characteristics. The choice of treatment arrived at after careful diagnosis in these young adults helps in restoring the self-esteem and improves their quality of life.

References


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