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Review Article

TOOTH IMPLANT CONNECTION: BOON OR BANE- A REVIEW

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ABSTRACT

The concept of connecting tooth to implants has remained a highly controversial topic in implant dentistry for long. This is due to the uncertainty about the long term stability and health of the implants and teeth when supporting a fixed bridge. Some authors believe that it is beneficial to use such a connection while others believe that such a connection poses a great biomechanical challenge due to difference in the mobility patterns of a tooth and implant. This review aims to discuss the rationale of connecting tooth and implants along with the potential risks and complications associated. Also, the review summarizes the guidelines a clinician must follow if planning such a treatment modality for the patient.

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INTRODUCTION

Implant therapy has become a highly predictable method of replacing missing teeth during the past decades for both partially and completely edentulous patients. In partially edentulous cases, option to rehabilitate apart from the conventional treatment options can be tooth- implant supported prosthesis (TISP) or implant- only supported prosthesis. Selection between the two depends on the conditions. But connecting the implant to the tooth has been a controversial issue because of the inherent differences between these two components particularly in their support mechanism and survival rate.

Implants were first connected to tooth in early 1980's when there was no implant with anti rotational feature. Thus, it was a necessity to connect implant to either natural tooth or another implant to prevent rotation of the restoration and to avoid the complications related to it such as screw loosening and fracture¹. It was in 1988 when Dr John Beumer introduced the first screw retained abutment with anti- rotational feature:

The UCLA abutment, after the invention of which the implant only supported prosthesis became feasible for the first time¹.

It has been thought that the difference in the support mechanism and mobility patterns between the implants and the tooth results in different behaviours when masticatory force is applied on them. The tooth having periodontal ligament as the support mechanism shows physiological mobility leading to displacement of the crown ranging between 50-200 micron². On the other hand, implants are rigidly connected to the surrounding bone and demonstrate maximum displacement of 10 micron². This difference may cause biomechanical problems either within the restoration itself or in the bone supporting the implant and the tooth.

The purpose of this article is to discuss the benefits of connecting teeth to implants along with the potential problems associated.

Rationale of Connecting Tooth to Implant

It has been suggested connecting implants to tooth results in more support for the prosthesis. This is of particular importance

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in patients with bruxism. The proprioception of the tooth helps in reducing the applied masticatory stress to the implants. This also enhances stability as the prosthesis is able to resist the rotational forces better.¹

TISP is also beneficial from aesthetic point of view. It is always challenging to provide good aesthetics when implant only supported prosthesis is given. But when they are connected to tooth, preservation of adjacent papillae and thus maintenance of aesthetics becomes easier.

Absence of other options such as in patients with systemic limitations where bone augmentation cannot be implemented and when local limitation exists such as close approximation of the implant site with maxillary sinus or mental foramen where insertion of additional implants is not possible or when the patient has economic problem, TISP becomes the only option.

Advantages of TISP

Aesthetic: TISP preserves the papilla adjacent to the tooth which enhances aesthetics and function of phonetics.¹

Cost Effective: By reducing the number of implants, it reduced the overall cost of teeth replacement.³

Widens Treatment Possibilities: It can be the treatment of choice in patients with anatomic limitation (proximity to vital structures), systemic illness and in patients with lack of bone for implant placement and in patients who do not wish to undergo bone augmentation procedure.

More Favourable Bone Reaction: As the proprioception of the tooth reduces the transfer of excessive loads to the bone, there is more favourable bone reaction. Also, it has been seen that the potential problems of loosening and fracture of fixation screws and abutments that occur in free standing implants are less in TISP.⁴

Complication of TISP

The complications arising from TISP can be divided into technical and biological complications. According to a study, significant technological complications were found more in patients with bruxism. Biological complications occurred in 9.6% of the implants whereas in dental abutments, the percentage was 1.8%.⁵

Technical complications

Intrusion of tooth: According to a survey, the rate of intrusion is between 3% to 5.2%. It is more common in patients with parafunctional habits. Various theories have been proposed to explain intrusion phenomenon. The effect of Ratchet theory according to which the frictional resistance of the parts of attachment i.e, patrix and matrix result in intrusion as the tooth is not able to return to its original position after apical loading force. Debris impingement theory states that impaction of food particles at the bottom of the matrix prevent the tooth from returning back to its original position. Differential energy dissipation theory states that high mechanical stress on the natural tooth in comparison to implants activate the osteoclast surrounding the root and result in intrusion. Another theory is based on impaired rebound memory which is due to the loss of elastic memory of the periodontal ligament and remodelling of the tooth to a less traumatic position which is apical to the original position.

Other technical problems arising from TISP include fracture of the implant or the abutment tooth, abutment screw loosening, cement bond breakdown and prosthesis fracture.

Biological complications

Bone loss around the implant is the most common biological complication arising from TISP. It is believed that overloading of the tooth is the main causative factor of bone loss. The amount and rate of bone loss depends on the duration and intensity of the load applied.

Other complications include peri-implantitis, endodontic problems, loss of implant or the abutment tooth, caries and root fracture.^{1,3,4}

Influence of the Type of Connection Used In TISP

There are three types of connection that can be used to support TISP.

Rigid connection: In this, the tooth is rigidly connected to the implant with a fixed dental prosthesis. Authors favouring this type of connection believe in the presence of sufficient flexibility in the implant complex to compensate for the differential mobility patterns. On the other hand, there are authors who believe that such a connection is not rationale. It has adverse effects on the implant in the long run producing greater marginal bone loss.

Non rigid connection: In this, the tooth is non- rigidly connected to the implant by means of inter-mobile elements which provide flexibility to compensate for the mobility of the tooth or attachments and telescopic restorations which act as stress breaking element.

Resilient connection: In this, a flexible component is used that simulates the periodontal ligament and act as stress absorbing element.^{1,6,7}

DISCUSSION

Various fixed treatment modalities are available for the patient reporting with multiple missing teeth such as conventional tooth supported bridge, tooth supported bridge with cantilevers, implant supported bridge and combined tooth implant supported bridge⁶. Selection criteria is based on the number and condition of the remaining teeth, space available, adequacy of bone support, patient's desire and economic factors. If planning for implant treatment, implant only supported fixed prosthesis remains the treatment of choice but certain situations necessitate the use of tooth implant supported prosthesis⁷. To ensure long term clinical success rate, various clinical guidelines have been proposed that a clinician must follow if planning such a treatment modality for the patient. This includes^{8,9,10}

1. Implants should be splinted to natural teeth only when the teeth need support as fully integrated implants stabilize periodontally weak teeth.
2. When planning TISP, care should be taken not to end the fixed prosthesis on the weakest splinted abutment as the weak tooth will further burden healthier abutment.
3. Definitive cement must be used for cementation and not screw for retention irrespective of the connection used.

4. If a natural pier abutment exists between two implants, stress breaker should not be used
5. Telescopic attachments should be avoided whenever possible
6. Design of the prosthesis should be such that it allows minimal movement in the buccolingual direction.
7. Long span bridge should be avoided. One pontic between two abutments should be preferred. Additional pontic should be used with additional tooth or implant support.
8. Minimal taper should be given on the axial walls of the abutment tooth to provide retention. If the clinical crown is not long, boxes and retention grooves should be given to enhance resistance form.
9. TISP should be avoided in patients with parafunctional habits. If given, number of implants should be increased.
10. If the tooth to be used as abutment has extensive loss of the coronal tooth structure or root canal anatomy inadequate to retain a post and core, TISP should not be used. Also, in patients with uncontrolled caries rate, TISP should be avoided.

CONCLUSION

From the above review, it can be concluded that tooth implant supported prosthesis can be a reliable treatment option in specific conditions. Apart from the various advantages it offers, this treatment modality has various demerits and risks too. Thus, careful patient selection along with risk benefit analysis is a prerequisite to enhance the success rate.

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