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Prosthetic Treatment Options for Implant Supported Prosthesis

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Abstract
Implant prosthetic therapy has changed the way of understanding of modern dentistry. Dental implantology is a term used today to describe anchoring of alloplastic material into the jaws to provide support and retention for prosthetic replacement of teeth that has been lost. Successful implant therapy, proper treatment plan considering both surgical and prosthetic part is the key of success. This present article has discussed different prosthetic options for implant supported prosthesis. A step-by-step detailed prosthetic options with their indications has been discussed to help all dental implant practitioners in making a successful treatment for different cases and patients.

Key words*: Prosthetic, implant supported prosthesis, treatment options*

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I. Introduction

The goal of modern dentistry is to restore the normal, function, comfort esthetics, speech, and health regardless of the atrophy, disease, or injury of the stomatognathic system.[1] However, the more the number of teeth missing in a patient, it becomes more difficult to achieve this goal with traditional dentistry. Dental implantology is a term used today to describe anchoring of alloplastic material into the jaws to provide support and retention for prosthetic replacement of teeth that has been lost.[2] To date, overall positive experiences and generation of new knowledge have targeted the immediate future as a time to establish endosteal dental implants as a routinely applied treatment modality in dentistry.

The patient's function when wearing a conventional complete denture prosthesis may be reduced to 60% of that formerly experienced with natural dentition.[3]

The increased need and use of implant-related treatments result from the combined effect of a number of factors including psychological aspects of tooth loss, aging population, tooth loss related to age, anatomic consequences of edentulism, poor performance of removable prosthesis, and predictable long-term results of implant-supported prostheses.[3]

Focusing on the tooth or teeth to be replaced, today's implant practitioner considers a broad and complex set of interwoven factors before formulating a treatment plan. The treatment planning phase is divided into three stages.[4]

PRELIMINARY CONSULTATION

A preliminary treatment plan based on chief complaint of the patient, history of present illness, medical history, and clinical and radiographic examination, to be made. Diagnostic impressions should be made to obtain accurate study models. Bone mapping procedures may be carried out to assess the available bone volume. The patient's facial appearance should be documented with preoperative extraoral and intraoral photographs. The initial consultation should also serve to educate and orientate the patient. Visual aids (such as educational models, photographs, and videos) and printed literature are useful in this regard.

JOINT CONSIDERATIONS

The next phase in the treatment planning process involves the entire implant team including the surgeon (if separate), prosthodontist, and other specialists. The hygienist or laboratory technician may also be included. The planning conferences provide opportunities for the team to review the patient's chief complaints, expectations, history, and current medical and dental status.

FINAL CONSIDERATIONS

Various treatment options can be presented to the patient for approval. The patient should be informed to the anticipated number of implants and whether any ancillary procedures are required. If a grafting procedure is indicated, the patient must also be aware of the various materials available for the graft.

The benefit–risk ratio of all these procedures should be presented. The postoperative course should be carefully described to patients. Written consents should be secured for both the surgical and restorative procedures. A full disclosure of potential complications is essential. The best course for the implant practitioner is to present the patient with global and domestic statistics for implant success rates as documented in the literature.[5]

ORAL AND SYSTEMIC CRITERIA

The bone and soft tissue response following endosseous dental implant placement is controlled by wound healing factors, biomechanics, and mineral metabolism. Due to the complexity of the tissue response, osseointegration and maintenance of endosseous dental implants may be influenced by many factors including age, diet, drugs, systemic disease, and oral disease.[6] In general, endosseous dental implant may be considered for any patient in reasonable health who desires the replacement of missing teeth and has enough bone in the area or can undergo a bone augmentation procedure.[6] Various factors and their influence on dental implant therapy are physical status and age of patient, hypohidrotic ectodermal dysplasia, smoking, osteoporosis, diabetes mellitus, scleroderma, multiple myeloma, Parkinson's disease, etc.[7]

RADIOGRAPHIC CRITERIA

Diagnostic imaging and techniques help develop and implement a cohesive and comprehensive implant treatment plan.[8] The purpose of implant imaging is to provide accurate and reliable diagnostic information on the patient's anatomy at the proposed implant sites.[9]

COMPUTED TOMOGRAPHY

Although computed tomography (CT) procedures can identify the available bone height and width accurately at a proposed implant site, the exact position and orientation of the implant (which many times determine the actual length and diameter of the implant) often are dictated by the prosthesis.[3] A diagnostic template is most beneficial with this imaging technique.[3,10]

COMPLEX TOMOGRAPHY

Diagnostic templates of CT examination are generally more precise than tomography examination.[3] The simple method to produce tomography template is by placing 3 mm ball bearing at proposed implant positions in vacuform of diagnostic cast. Ball bearing can serve as a measure of magnification of the image.

PANORAMIC RADIOGRAPHY

A diagnostic template can be used with panoramic radiographs to assess the amount of magnification. Five millimeters ball bearings or wires are incorporated around the curvature of the arch while fabricating the template. The amount of magnification can subsequently be determined in the radiograph which helps in offsetting the inherent inaccuracy in this technique.[9]

PROSTHETIC CRITERIA IN IMPLANT DENTISTRY

Implant dentistry is unique because additional foundation units may be created for a desired prosthodontic result. Thus, a range of treatment options are available to most partially and completely edentulous patients. In the past, greater emphasis has been placed on the bone available for implant insertion which determines the position and number of implants and consequently, the final prosthesis design.[11] However, the implant treatment plan of choice is both patient and problem centered and requires a shift in this traditional approach. The benefits of implant dentistry can be realized only when the full range of available options for the final prosthesis is first evaluated by the practitioner and then presented to the patient. Thus, it is important to first visualize the intended final prosthesis based on which the existing bone is evaluated to determine the type and number of implants necessary to support the intended prosthesis.[12]

BONE VOLUME INFLUENCE ON PROSTHETIC IMPLANT THERAPY

Different bone volume requires treatment plan approached dental implant placement. Misch and Judy (1985) given a classification system for the available bone with treatment options for all categories.[13,14]

Table 1: Prosthodontic options[3]

Type	Definition
FP-1	FP which replaces only the crown and appears like a natural tooth
FP-2	FP which replaces the crown and a portion of the root Crown contour appears normal in the occlusal half but is elongated or hypercontoured in the gingival half
FP-3	FP which replaces missing crowns and gingival color and portion of the edentulous site
RP-4	RP which is mainly an overdenture completely supported by implants
RP-5	RP which is an overdenture supported by both soft tissue and implant

FP=Fixed prosthesis, RP=Removable prosthesis

BONE DENSITY INFLUENCE ON PROSTHETIC IMPLANT THERAPY

Besides its external architecture, bone also has an internal architecture represented by its density. The strength of the bone supporting the endosteal implant is directly related to its density.[3] Therefore, bone density exerts a significant influence on the clinical success of implant therapy.[15,16] A range of implant survival has been found relative to location. The anterior mandible has greater bone density than the anterior maxilla.[17] The posterior mandible has poorer bone density than the anterior mandible.

As the bone density decreases, the biomechanical loads on the implants must be reduced.[3,18] This can be accomplished in several ways by considering the following prosthetic design.[19-21]

1. Restorative materials may be considered
2. Angle of load on the implant body should be more axial and offset loads minimized
3. Splinting the crowns of adjacent implants with relatively stiff 2.
4. Narrower occlusal tables should be designed
5. Cantilever length may be shortened or eliminated in case of full-arch restorations for edentulous patients
6. RP-4 rather than FP prosthesis may be considered in edentulous patients to reduce nocturnal parafunctional forces
7. RP-5 prosthesis may be considered to permit the soft tissue to share the occlusal force
8. Night guards and acrylic occlusal surfaces distribute and dissipate the parafunctional forces on an implant system
9. By considering progressive bone loading.

FORCE FACTORS INFLUENCE ON PROSTHETIC IMPLANT THERAPY

These factors such as parafunction (bruxism, clenching, and tongue thrust), direction of load forces, and nature of opposing arch influence the stress environment of the implant and prosthesis.[22]

An occlusal analysis should be carried out to identify any premature contacts during mandibular excursions.

An elimination of eccentric contacts may allow recovery of the periodontal ligament health and muscle activity within 1–4 weeks.[23]

A night guard should then be given with even occlusal contacts around the arch in centric occlusion and posterior disocclusion with anterior guidance in all excursive movements. The patient is advised to wear the device for a period of 4 weeks at night.

Alteration of the anterior occlusal scheme is not as critical due to the absence of detrimental horizontal forces. A soft night guard with a hard acrylic outer shell and inner soft resilient liner, with slight relief over the implants, is often beneficial in reducing the impact of the forces during parafunction.

METAL-CERAMIC RESTORATIONS OVER IMPLANTS

The main problem encountered with this restoration is related to the added bulk of metal used in the substructure to keep porcelain to its ideal 2 mm thickness. This amount of metal acts as a heat sink during casting procedures which results in porosities and increases the risks of fracture after loading.[24]

HYBRID PROSTHESIS

An alternative option in such situations is the hybrid prosthesis. Because acrylic acts as an intermediary between the porcelain teeth and metal substructure, the impact force during dynamic occlusal loading also may

be reduced. Hence, hybrid prostheses are indicated for implant restoration in large crown height spaces as a general rule.[3,24]

Arch relationships often are affected in edentulous ridges due to the facio-lingual direction of resorption. As a result, implants often need to be placed more lingual in comparison to the original incisal tooth position. The final restoration is subsequently over contoured facially to restore the incisal two-thirds for improved esthetics.

TREATMENT CONSIDERATIONS

Anterior cantilevered crowns often require additional implants splinted together and an increase in the anteroposterior (A-P) distance between the most distal and most anterior implants to compensate for the increased lateral loads and moment forces, especially during mandibular excursions.[3,25]

The edentulous arch form is described as ovoid, tapering, or square. The ovoid arch form is the most common, followed by the square, then the tapered form.

The presence of a square arch form is more common in maxillary edentulous patients due to resorption of the premaxilla region. The arch form is a critical element when anterior implants are splinted with posterior implants to minimize cantilever forces. The distance from the center of the most anterior implant to a line joining the distal aspect of the two most distal implants is called the anteroposterior distance or A-P spread.

The most ideal biomechanical arch form depends on the restorative situation:

• The tapering arch form of residual bone is favorable for anterior implants supporting posterior cantilevers due to a greater A-P spread

• The square arch form of residual bone is preferred when canine and posterior implants are used to support anterior teeth in either arch

• The recommended anterior cantilever dimension in the maxilla is less than that of the posterior cantilever in the mandible because the bone is less dense and forces are directed outside the arch during excursions.

An implant placed in the improper position can compromise the final results in terms of esthetics, biomechanics, and maintenance.

The permucosal position of the implant abutment is of particular importance for FP-1 prostheses. The ideal position is directly under the incisal edge position of the anterior natural tooth and under the central fossa of posterior natural teeth to be replaced.

The number of implants used to support a completely implant-supported restoration in the edentulous mandible usually ranges from 5 to 9 in the mandible, with at least four of these implants inserted between the mental foramens.

A greater implant number in the completely edentulous maxilla is indicated to compensate for the less dense bone and more unfavorable biomechanics and ranges from 6 to 10.[18] At least two or three of these implants should be placed in the premaxilla, depending on the arch shape and other force factors.

All implants in either arch should be splinted together when fewer implants are used. The final restoration may be segmented (canine to canine and two posterior segments) when the number of implants permits so.

II. Conclusion

Implants have become the treatment of choice in many, if not most, situations when missing teeth require replacement. Studies of the interaction between implant-supported restorations and the surrounding oral environment appear, fortuitously, to support the conclusion that the human host response to oral implants is favorable. The treatment planning for an implant restoration is unique regarding the number of variables that may influence the therapy. Of prime importance is the recognition of the fact that a definitive treatment plan should be developed sequentially to ensure the best possible service. With appropriate diagnosis and conscientious treatment planning, the use of endosseous oral implants enjoys good prognosis.

References

[1]. Dewan SK, Arora A, Sehgal M, Khullar A. Implant failures: A broader perspective. J Dent Implant 2015;5:53-9.
[2]. Dholam KP, Gurav SV. Dental implants in irradiated jaws: A literature review. J Cancer Res Ther 2012;8 Suppl 1:S85-93.
[3]. Misch CE. Dental Implant Prosthetics. 2nd ed. Amsterdam, Netherlands: Elsevier Health Sciences; 2014.
[4]. Mehrotra G, Iyer S, Verma M. Treatment planning the implant patient. Int J Clin Implant Dent 2009;1:12-21.
[5]. Babbush CA, Hahn JA, Krauser JT, Rosenlicht JL. Dental Implants – E-Book: The Art and Science. 2nd ed. Philadelphia- United States: Saunders; 2010.
[6]. Sugerman PB, Barber MT. Patient selection for endosseous dental implants: Oral and systemic considerations. Int J Oral Maxillofac Implants 2002;17:191-201.
[7]. Guobis Z, Pacauskiene I, Astramskaite I. General diseases influence on peri-implantitis development: A systematic review. J Oral Maxillofac Res 2016;7:e5.
[8]. Binsu S, Nair KC, Nayar S, Tella S. An innovative simplified method for assessing available bone in mandible for implant. J Indian Prosthodont Soc 2016;16:213-5.
[9]. Shannoun F, Blettner M, Schmidberger H, Zeeb H. Radiation protection in diagnostic radiology. Dtsch Ärztebl Int 2008;105:41-6.

[10]. Pal US, Chand P, Dhiman NK, Singh RK, Kumar V. Role of surgical stents in determining the position of implants. Natl J Maxillofac Surg 2010;1:20-3.
[11]. Monteiro DR, Silva EV, Pellizzer EP, Filho OM, Goiato MC. Posterior partially edentulous jaws, planning a rehabilitation with dental implants. World J Clin Cases 2015;3:65-76.
[12]. Leles CR, Freire Mdo C. A sociodental approach in prosthodontic treatment decision making. J Appl Oral Sci 2004;12:127-32.
[13]. Misch CE, Judy KW. Classification of partially edentulous arches for implant dentistry. Int J Oral Implantol 1987;4:7-13.
[14]. Juodzbalys G, Kubilius M. Clinical and radiological classification of the jawbone anatomy in endosseous dental implant treatment. J Oral Maxillofac Res 2013;4:e2.
[15]. Koszuta P, Grafka A, Koszuta A, Lopucki M, Szymanska J. Effects of selected factors on the osseointegration of dental implants. Prz Menopauzalny 2015;14:184-7.
[16]. [16] Turkyilmaz I, McGlumphy EA. Influence of bone density on implant stability parameters and implant success: A retrospective clinical study. BMC Oral Health 2008;8:32.
[17]. Kim HJ, Yu SK, Lee MH, Lee HJ, Kim HJ, Chung CH. Cortical and cancellous bone thickness on the anterior region of alveolar bone in Korean: A study of dentate human cadavers. J Adv Prosthodont 2012;4:146-52.
[18]. Winter W, Klein D, Karl M. Micromotion of dental implants: Basic mechanical considerations. J Med Eng 2013;2013:265412.
[19]. Vasconcellos LG, Nishioka RS, Vasconcellos LM, Nishioka LN. Effect of axial loads on implant-supported partial fixed prostheses by strain gauge analysis. J Appl Oral Sci 2011;19:610-5.
[20]. Davies SJ, Gray RJ, Young MP. Good occlusal practice in the provision of implant borne prostheses. Br Dent J 2002;192:79-88.
[21]. Yuan JC, Sukotjo C. Occlusion for implant-supported fixed dental prostheses in partially edentulous patients: A literature review and current concepts. J Periodontal Implant Sci 2013;43:51-7.
[22]. Misch CE. Consideration of biomechanical stress in treatment with dental implants. Dent Today 2006;25:80, 82, 84-5.
[23]. Verma M, Nanda A, Sood A. Principles of occlusion in implant dentistry. J Int Clin Dent Res Organ 2015;7 Suppl S1:27-33.
[24]. Egilmez F, Ergun G, Cekic-Nagas I, Bozkaya S. Implantsupported hybrid prosthesis: Conventional treatment method for borderline cases. Eur J Dent 2015;9:442-8.
[25]. Jain AR, Nallaswamy D, Ariga P, Philip JM. Full mouth rehabilitation of a patient with mandibular implant screw retained Fp-3 prosthesis opposing maxillary acrylic removable over-denture. Contemp Clin Dent 2013;4:231-5.

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