

Role of Implants in Management of RRR

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Abstract: RRR is a chronic, progressive, irreversible and disabling disease of multifactorial origin. The use of osseointegrated implants has solved many problems of RRR. Implants restores the patient to normal contour function, comfort, esthetics, speech & health, regardless of the residual ridge atrophy, disease or injury of stomatognathic system. The aim of this paper is to have the better understanding of role of implants in management of RRR. With such understanding leading to better treatment and ultimately to the prevention and control of the disease.

INTRODUCTION

My Gums have shrunk', this is a most frequent expression given by the patient who has lost all the teeth. After the extractions have been done, the sockets are filled up with blood which then undergoes series of repair which include acute inflammation, rapid restoration of epithelial integration and connective tissue remodeling. In about 6 months of time the socket is completely formed with new bone. Rapid remodeling of the bone subsides by this time but there is a continued bone resorption resulting in considerable morphologic changes of the bone and overlying soft tissue over the years. This is actually a reduction in the size of the bony ridge under the mucoperiosteum and this phenomena is termed as Residual Ridge Resorption (RRR)¹.

The G.P.T. (2005) defines RRR as "A term used for the diminishing quantity and quality of residual ridge after teeth are removed".

The uses of osseointegrated implants have solved many problems of RRR. The use of implants restores the patient to normal contour function, comfort, esthetics, speech & health, regardless of the residual ridge atrophy, disease or injury of stomatognathic system (Misch). The support for the dentures is derived entirely from the implant; or both implant & residual ridge (implant overdenture)².

Patients with advanced mandibular residual ridge resorption will only accommodate shorter implant lengths, and consequently more than two implants must be placed. In such situations, three or preferably four implants should be prescribed to achieve sufficient intraosseous support³.

An overdenture stabilized and retained by implants may be the most rewarding and cost-effective indication for oral implants (Fig. 82). This relatively simple treatment meets the objectives associated with dramatic improvement in denture wearing, negligible surgical trauma, and low morbidity. Hopefully, it will replace much major vestibuloplasty and ridge augmentation surgery on the atrophic mandible. Even in situations of advanced residual ridge reduction, implants for support of an overdenture are possible. With the progression of mandibular alveolar ridge atrophy, the residual bone tends to be denser in structure, and thus favors the bone/implant contact area. This is contrary to the maxilla, where ridge atrophy is coupled with osteoporosis of the residual bone⁴.

The annual bone resorption in complete denture wearers will be more compared to patients with implant-supported overdentures. A limited but continuing bone resorption was observed for the patients with implant-supported overdentures, and a slightly higher annual bone resorption occurred in the implant-supported fixed prosthesis group. Regular controls with relinings of the maxillary dentures are advocated to preserve a correct vertical dimension and occlusal relationship (R. Jacobs; D. van Steenberghe M et al).

The majority of the bone loss (about 1 to 2 mm) adjacent to endosseous implants supporting complete fixed prostheses occurs during healing and remodeling periods. Minimal, if any, annual bone loss (0 to 0.08 mm) occurs in subsequent years. Studies to date are inconclusive with respect to differences between maxillary and mandibular bone loss.

Mean annual bone loss surrounding implants that support overdentures is more or less the same as that found in implant-supported fixed complete prostheses, possibly with more bone loss occurring in the maxilla compared with the mandible. This difference has been attributed to poorer bone quality in the maxilla and increased mucosal irritation surrounding the shorter abutments required for these prostheses. The presence of an implant overdenture may affect bone loss at sites remote from the implants. Jacobs et al. reported an 11% reduction in bone height distal to implants supporting overdentures compared with a 4% reduction adjacent to implants associated with fixed prostheses after 10 years. This disparity may be due to differences in anterior and posterior support. Anteriorly, the implants take the occlusal load, but posteriorly, it is taken by the residual ridge. Patients with maxillary dentures undergo a 4% vertical bone loss in the anterior maxilla opposing mandibular implant-supported overdentures or fixed prostheses compared with 13% for those opposing conventional mandibular dentures.

This finding was attributed to increased instability of the conventional mandibular dentures, which caused unfavorable stress distribution to the opposing arch. Mean annual bone loss (0.05 to 0.10 mm) for implants supporting FPDs is similar to other implant treatments. Higher mean annual bone loss is in implant-supported single tooth prostheses in partially edentulous mouths. Greater bone remodeling may occur adjacent to implants in partially edentulous mouths because these implants are more likely to be surrounded by alveolar rather than basal bone. Most patients with advanced atrophy of the mandible and corresponding troubles with denture retention and stability will benefit tremendously from implants to support an overdenture⁵.

Factors to consider in selecting an occlusal concept for patients with implants in the edentulous mandible⁶:

In a maxillary Kennedy class I or II situation, either group function or balanced occlusion is advocated depending on the characteristics of the opposing dentition. When a complete dentition is present in the maxilla or in the case of a Kennedy class III or IV situation, mutually protected occlusion or group function is recommended depending on the length, position, and number of implants. It is stressed that detailed preimplant placement diagnosis and treatment planning are essential to obtain a high standard of treatment with overdentures supported and retained by implants. It is extremely important that the type of overdenture and the occlusal concept are considered before treatment is begun.

Factors to consider in selecting an occlusal concept for patients with implants in the edentulous maxilla

Most practitioners have recommended a balanced occlusion for these patients and believe that in the absence of this occlusal concept, the patient can have some of the symptoms of the combination syndrome. Lingualized occlusion can be given, in which the lingual cusps of the maxillary posterior teeth contact the fossae of the mandibular teeth, and a balanced occlusion is created between elements of the opposing teeth with freedom of movement (long centric) and clearance of the anterior teeth.

In patients in whom a restricted freedom of occlusion is desirable, for example, in a patient with a craniomandibular disorder, sequential canine guidance is suggested. This concept is based on a combination of balanced occlusion and mutually protected occlusion. For the first 2 mm of eccentric movements, the articulation is balanced, but when this range of movement goes beyond this 2 mm range, the balanced articulation is replaced with a group function and finally a mutually protected occlusion. This concept is suggested when the maxilla is large and excellent retention of the maxillary denture is achievable.

Factors to consider in selecting an occlusal concept for patients with implants in the fully dentate maxilla

The mutually protected occlusion or an occlusion based on group function would be the appropriate occlusal concept

Every attempt should be made to ensure that the occlusal forces introduced by the opposing natural dentition are spread over the largest possible implant-bone interphase. This implies that a minimum of four implants is the standard for these patient situations.

Factors to consider in selecting an occlusal concept for patients with implants in the partially edentulous maxilla

When the maxilla is partially edentulous, the situation is quite different. The four Kennedy classification groups of partial edentulism that should be considered are (1) Kennedy class I (bilateral free-end), (2) Kennedy class II (unilateral free-end), (3) Kennedy class III (teeth-bound open spaces), and (4) Kennedy IV (a teeth-bound open space crossing the midline).

The Kennedy class I situation, with natural teeth in the anterior region of the maxilla (canine to canine) and edentulous bilateral posterior segments restored with a removable partial denture is, from the occlusal point of view, to be compared with an edentulous jaw. Balanced occlusion is the preferred concept when articulated with the opposing arch with implants. If the edentulous sections of the maxillary jaw are restored with a cantilever fixed partial prosthesis or a prosthesis supported by implants, or if more natural teeth are present (premolar to premolar), the situation is similar to an arch with a complete dentition opposed to the edentulous mandible.⁷

For the Kennedy class III or IV situations, when the dental restoration is rehabilitated with a fixed prosthesis or with a clasp retained tooth-supported removable partial denture.

The relationship between maxilla and mandible is of the utmost importance when choosing an appropriate concept of occlusion for therapy that involves dental implants. The condition of the opposing jaw influences the concept chosen. The importance of equalizing the forces in both jaws is extremely important. When the opposite jaw is edentulous, the implant-supported fixed prosthesis may not be the first choice of treatment, although many advocate this prosthesis. A mandibular overdenture supported by two implants with a resilient attachment may be more desirable. However, if the opposing arch is a complete natural dentition, the overdenture should be avoided.

When the maxilla is edentulous, it is important not to have any contacts between the anterior teeth of maxilla and mandible in centric occlusion to avoid overloading the anterior region of the maxilla. Only during eccentric movements are minimal contacts between the anterior teeth allowed.^{8,9}

A regular checkup every 6 months is essential for the patients with implants. Wear, mucosal resilience, and residual ridge reduction in the course of time change the occlusion in all overdenture situations, leading to premature anterior contacts and thus loss of the planned occlusal relationships.

Conclusion

The etiology of residual ridge resorption is a subtle combination of local and systemic factors, but the exact processes involved are poorly understood. And because these underlying causes are poorly understood, there is no reliable clinical measurement, which might predict the future rate of alveolar ridge resorption in a particular edentulous patient. The best possible method for management of RRR is to preserve as many teeth or roots, as possible, followed by over-dentures which may act as effective means of preserving adjacent alveolar bone.

The use of endosseous implants to support fixed or removable prostheses has been shown to preserve adjacent remaining alveolar bone. But as with natural teeth, implants are not immune to bone loss. The benefits of implant supported prosthesis for edentulous patients are immense. Functional & esthetic requirements are better achieved & maintained, with the risk of time dependent & variable RRR compellingly reduced. Use of implants provides a definite advantage of long-term prevention in reduction of residual ridges¹⁰.

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