Expanding the Scope of Implantology with Ridge Expansion

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Introduction

With the implant replacing conventional fixed partial denture as the preferred treatment modality, it is imperative that the clinician not only familiarises himself but also excel in this treatment modality. Implants simulate natural tooth by obtaining support directly from the alveolar bone. The implant success and survival is critically dependent on the quality and the quantity of the residual bone. It is a well established fact that post-extraction the alveolar tends to resorb with the maximum resorption taking place in the first year.

The residual ridge is defined as the portion of the residual bone and the soft tissue covering it. It serves as the foundation or support area for dentures. Residual Ridge Resorption (RRR) is a term used for the diminishing quality and quantity of the residual ridge after the loss of teeth. It is a continuous process leading to change in shape and reduction in size of the residual ridge although at different rates in different individuals and in the same individual at different times. The term localized alveolar ridge defect refers to a volumetric deficit of the limited extent of bone and soft tissue within the alveolar process. Clinical examination and radiographic evaluation are effective diagnostic tools and the advent of Cone Beam Computed Tomographic analysis the exact anatomy of the residual ridge can be established.

Guided bone regeneration (GBR) is a surgical procedure involving the placement of a cell-occlusive physical barrier between the connective tissue and the alveolar bone defect. The reconstruction of large skeletal deficiencies presents a challenging problem. A main hindrance for successful bone healing and creation of new bone is the rapid formation of soft connective tissue. In-growth of soft tissue may disturb or totally prevent osteogenesis in a defect or a wound area. In-vitro experiments by Ogiso et al in 1991 demonstrated that fibroblasts produce one or more soluble factors that are inhibitory to bone cell differentiation and osteogenesis. The conditions to be met for new bone formation to be predictably accomplished by guided bone regeneration are a source of osteogenic cells, adequate source of vascularity, wound site stability during healing, creation and maintenance of appropriate space between the membrane and the parent bone surface and, exclusion of soft connective tissue cells from the space created by barrier membrane. Ridge expansion techniques are ridge augmentation procedures with a better predictability and the commonly employed are the Ridge Splitting Technique and Distraction Osteogenesis.

Ridge Splitting Technique

Ridge expansion technique is indicated only for horizontal augmentation, where there is adequate height of the residual maxilla. 8-10 mm of bone between the sinus and the crest of the ridge but inadequate buccolingual width is present. The two techniques available as a treatment option are ridge split and/or lateral augmentation.

Ridge splitting technique is an excellent technique for immediate implant placement in narrow (2-3mm) but well formed ridges, where the implants can be placed in the split. Osseous grafts are then filled around the implant to eliminate any spaces. Chisel and mallet, osteotomes and piezoelectric devices can all be used to create the split. Peizoelectric devices are the latest equipment which use ultrasonic waves for splitting of bone, and the property of cavitation simultaneously helps in removing the debris. Thus, increasing the efficiency and reducing the complexity of the process.

Distraction Osteogenesis

Distraction osteogenesis is a biologic process that stimulates the formation of new bone and soft tissue following the gradual separation of the two bone segments. The concept of bone lengthening was first described by Codivilla, who reported the lengthening of femur. The technique of lengthening a callus was popularized by Ilizarov et al in 1980. Subsequently distraction osteogenesis was applied to the cranio facial region by Chin m et al in 1996 and for ridge augmentation by Block MS in 1996.

The various advantages of this technique are the lack of additional surgical site for donor hard-tissue, hard-tissue increase is concurrently associated with soft tissue and there is theoretically no limit to lengthening. The long duration of the treatment is a major disadvantage of this procedure, along with the need for the suitable distracter and the increased chances of infection.

Chiapasco in 2001 and jensen in 2002 examined the bone height stability following prosthetic reconstruction for dental implants inserted into areas of distraction osteogenesis and reported an implant success rate of 88 to 100%.

Conclusion

Many techniques exist for effective ridge augmentation. The approach largely is dependent on the extent of the defect and specific procedures to be performed for implant reconstruction. It is more appropriate to use an evidence based approach when a treatment plan is being developed for bone augmentation cases.