

Dental Implant-Advanced Surgical Implantology

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In many clinical situations where we do not have the ideal ridge or jaw bone height to place an appropriate implant, we have to create that ideal ridge/bone situation by different means. In some situation like posterior maxilla, or posterior mandible where due to resorption, height of the bone is inadequate to insert an implant, advance implant surgeries are to be carried out, which can be:

1. Ridge augmentation (bone graft and GTR)
2. Sinus floor elevation (sinus lift)
3. Alveolar distraction
4. Lateralization of the inferior alveolar nerve.

Ridge Augmentation: To increase the height of ridge bone grafts can be of use with or without GTR. In guided tissue regeneration a membrane is used as a mechanical hindrance to the unwanted cells (fibroblasts etc.) into the bony defect, so that the wanted cells (osteocytes etc.) accumulate in the bony defect and new bone is formed beneath this membrane in the defect. Indications of GTR in variety of defects with implants are dehiscence of ridge, fenestration, residual intra osseous defects and fresh or incompletely repaired extraction sockets. These GTR membranes are either removed after 6 - 7 months (re opening of the site) or they are also available as resorbable ones. In implant cases where there is a bony defect or the implant is not covered by the bone all around its surfaces bone grafting is done and the bone graft is covered by GTR membrane so that enough bone is formed for implant stability (Figure 1).

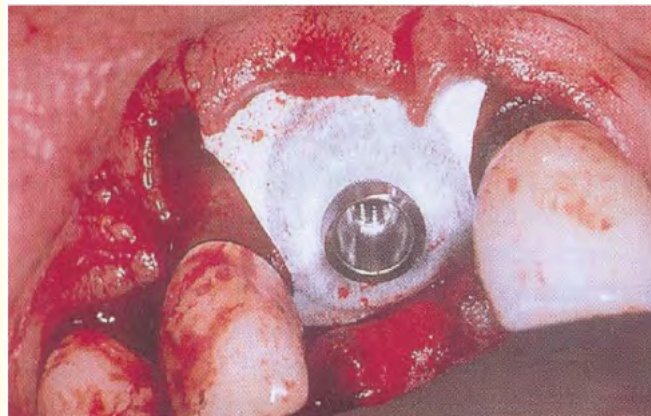


Figure 1: GTR Membrane.

Bone graft: Bone grafts are used to augment the ridge. Bone grafts can be autogenous or heterogenous, can be used as a block graft or bone chips. Sites for autogenous bone harvesting are mandibular symphysis, iliac crest, calvarium, ribs etc. Heterogenous grafts are available in blocks or granules in different shapes and sizes i.e. Bio-oss, Hydroxyapatite granules etc. According to the defect bone grafts are chosen (Figure 2a-c).

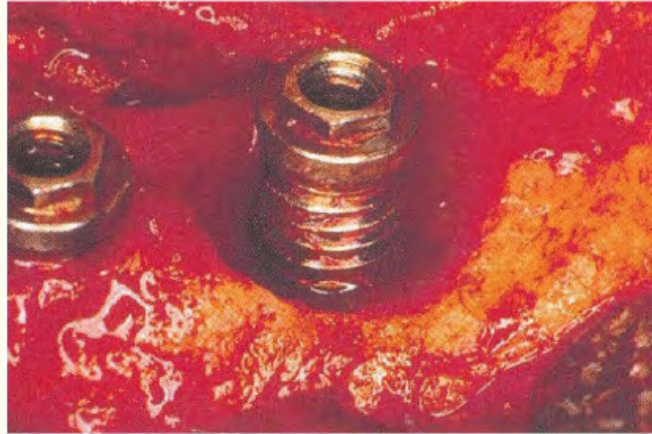


Figure 2a: Defect.

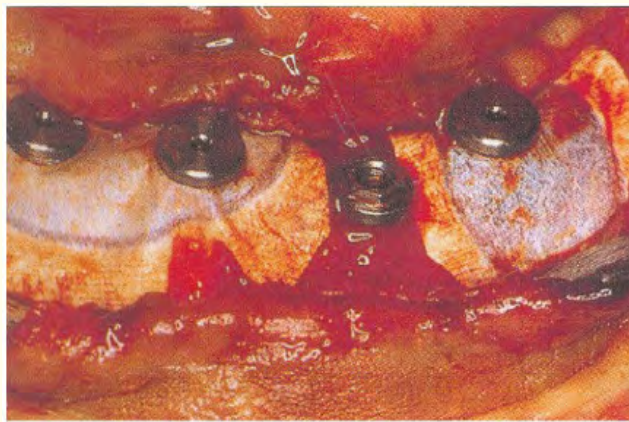


Figure 2b: GTR.



Figure 2c: Bone graft.

Sinus Floor Elevation: It is an internal augmentation of the maxillary sinus, intended to increase the vertical body dimension in the lateral maxilla in order to make the use of dental implants possible in the severely resorbed ridge in posterior maxilla.

This procedure was introduced by Tatum in 1976, and modified by Tatum 1986, Chavanaz 1998 and many other workers. In a classical sinus lift operation lateral wall of the maxillary sinus wall in a horizontal position is lifted to the new sinus bottom and the space created underneath the new sinus bottom is filled with bone grafts. This procedure is called direct sinus lift. Sinus lift can be achieved by lifting the sinus floor by specially designed osteotomes to lift the sinus floor through the extraction socket and this method is called as indirect sinus lift procedure. Implants are inserted simultaneously or in a second stage surgery after 6 - 8 months of sinus lift and bone grafting.

Operation

1. **Flap design:** Usually the incision is made on the top of the alveolar ridge, or slightly on the palatal side, through the keratinized attached mucosa and releasing incision is given in canine region.
2. **Making of bony window:** A round bur is used to make a window in the antero-lateral wall of maxillary sinus. Two horizontal and two vertical cuts are made, bony window is separated on all the three cuts (2 vertical and lower horizontal cut) and hinged on the superior horizontal cut, which is fractured and rotated inward as a trap door and the space created beneath this newly formed sinus wall is grafted by bone grafts (Figure 3a and 3b).

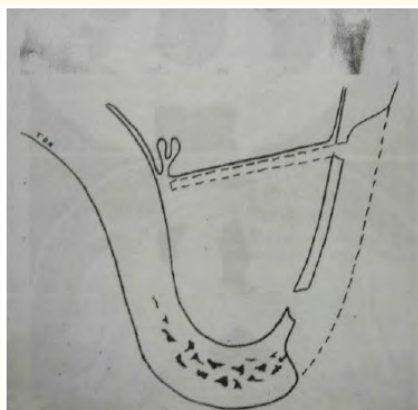


Figure 3a



Figure 3b

Direct sinus lift procedure

1. **Implant insertion:** It can be done in same time or as a second surgical procedure after 6 – 8 months, applying standard principles of implant surgery.
2. **Closure:** Air tight closure of mucoperiosteal flap is the key. The anatomical variations in the sinus i.e. mucosal irregularities, sinus septa, sinus diseases/pathologies, thickness of the anterolateral wall needs to be addressed in sinus lift procedure. As mucosal tear/perforation at the internal septa of maxillary sinus, or during elevation or detachment of sinus mucosa can affect the outcome of this procedure tremendously, because graft success depends on the vascularity of the mucosa and the mucoperiosteum.

Alveolar Distraction: By gradual stretching of an osteotomized bone, new bone formation takes place at the site of osteotomy. This technique is being applied to lengthen long bones of body (Illizarov technique), since long and also being applied to correct facial deformities in maxillofacial surgery and on the same principles this technique is used to increase the alveolar bone height by distracting the neo-bone formation at the osteotomy site using different distraction devices. It is a new and promising method of ridge augmentation, where we don't need any kind of bone graft (Figure 4a and 4b).



Figure 4a



Figure 4b

Alveolar distraction

When we achieve desired ridge height, distraction devices are removed and dental implants are inserted afterwards.

Lateralizing the inferior alveolar nerve: In mandibular posterior area where resorption of the ridge is extensive and bone graft cannot be done, we can temporarily mobilize the inferior alveolar nerve to allow insertion of an implant of adequate length at this site. The technique is as follows:

1. **Incision:** A crestal incision with anterior extension at least up to one tooth anterior to the projected implant site, and a releasing oblique incision is made at this anterior end of crestal incision (Figure 5a).
2. **Bone removal lateral to the canal:** A cortical bone piece lateral to the canal is removed by giving osteotomy cuts (Figure 5b).
3. **Mobilization of inferior alveolar nerve:** While inserting the implant this inferior alveolar nerve bundle should be gently retracted laterally with the help of vascular tapes (Figure 5c).
4. **Implant placement and closure:** After placing the implants inferior alveolar nerve is replaced passively within the bone. In some cases where inferior alveolar nerve is virtually on the crest of the ridge, fragments of bone may be placed between implant and nerve from the implant (Figure 5d).
5. **Complications:** This procedure usually causes some impairment of function ranging from transitory to permanent paresthesia to dysesthesia. So one must consider and discuss these likely complications before performing this procedure.

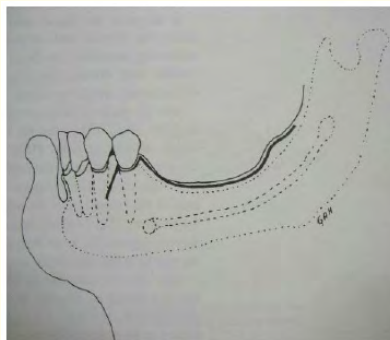


Figure 5a: Incision.

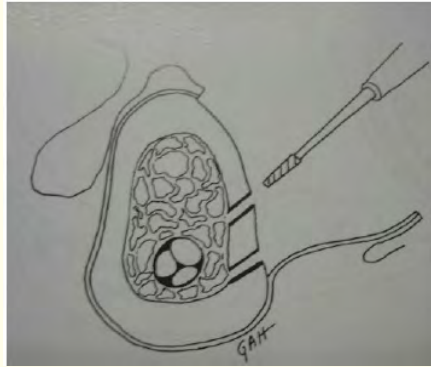


Figure 5b: Bone Removal.

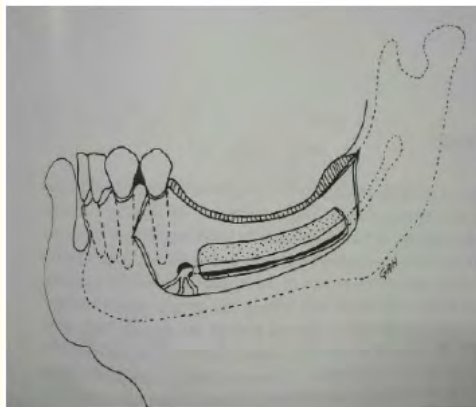


Figure 5c: Mobilization of nerve.

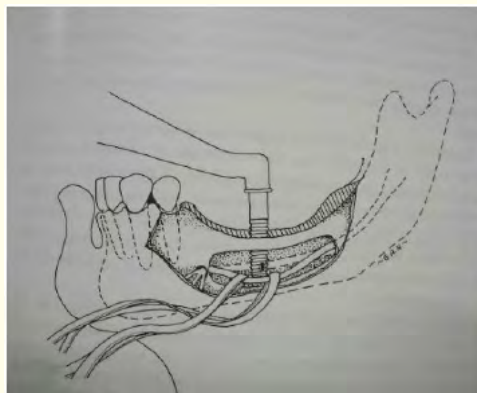


Figure 5d: Implant placement.

Conclusion

All the clinical situations are not ideal for implant placement. In practice most of the patients present with resorbed ridges where implant insertion is not possible. By above mentioned surgical interventions these ridges can be build up so that they can house an appropriate implant screw. These surgeries are performed with caution by the experts to reduce the unwanted complications.

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