

Increase of the alveolar ridge horizontal dimension, utilizing the M.I.S. alveolar crest expander. One option for treating reabsorbed ridges.

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Summary

When teeth are lost the remaining bone is reabsorbed, it is a natural reaction of bone to the absence of stimulation, the absorption changes from person to person as it is influenced by several factors. Sometimes patients with alveolar ridge reabsorption in either horizontal or vertical dimension, come to the appointment for a placement of dental implants in these reabsorbed edentulous areas. Often they referred to the wish of not using any bone graft material for the reconstruction of the area, so the restoration options are minimized. In this paper, we present the use of M.I.S. ridge expander, for the rehabilitation with implants in the reabsorbed edentulous area in the front jaw.

Introduction

For a long time, it has been studied the patterns of bone reabsorption after a tooth extraction and the factors that may be involved in the precipitation of this phenomenon.

Enlow et al, in 1976, subdivides the maxilla and jaw bone in two processes, the basal process and the alveolar process.

Later describing a more stable basal process and with a not very significant degree of reabsorption, compared to the alveolar process with a significant and accelerated reabsorption, post tooth extraction. Based on these studies, Cadwood and Howell in 1988, ranked the edentulous jaws, taking into account the most common changes in the shape of the alveolar ridge of the jaw and the maxilla. The classification is as follows:

Class 1 – Ridge with teeth.

Class 2 – Ridge immediately post extraction.

Class 3 – Ridge rounded with proper height and length.

Class 4 – Ridge with knife edge, proper height, but inadequate length.

Class 5 – Plane ridge with inadequate height and length.

Class 6 – Ridge with gaps and evidence of basal bone loss.

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The placement of endosseous implants in the reabsorbed alveolar ridges is limited by the amount of reabsorption in the width and the height of the ridge. The reabsorption of the front bone after the loss of the tooth has shown a trend in which the labial aspect of the alveoli is the first to be reabsorbed, so the ridge is usually decreased initially in oral-lingual direction and then in height.

When given these cases of reabsorption, and the patient wishes segment rehabilitation using endosseous implants one should rebuild the area, creating an optimal environment that allows placing an implant of appropriate diameter and length in the area, in a position corresponding to the longitudinal axis of the pieces that are being restored. Also, one should be able to get intermaxillary relation with a radio crown: implant fit.

Among the options found in the literature to reconstruct reabsorbed edentulous segments, we can mention: guided bone regeneration using autogenous bone, allogeneic or other bovine and synthetic materials, and the bridge splitting. To these techniques we can add the osteogenic distraction.

Osteogenic Distraction

Osteogenic distraction was introduced to the world of medicine by a Russian orthopedist, Gavril Ilizarov, who in the 50's invented the "Ilizarov apparatus" for reconstruction and lengthening of bone in lower limbs. Subsequently it is also developed for the use of oral surgeons to correct cranial malformations and significant alveolar defects.

If we talk about the reconstruction of alveolar defects, the osteogenic distraction is a useful technique because it not only allows the formation of new bone, but also stimulates the regeneration of soft tissues (histogenetic distraction).

Osteogenic distraction consists of the movement either vertically or horizontally of a segment of bone to promote bone growth in the area formerly occupied by the segment. This movement is achieved through the use of different devices which can be divided in several classes; interosseous and extraosseous; uni, bi or multidirectional; absorbable or not absorbable; and non-prosthetic and prosthetic. These devices usually have three parts: an upper limb, a distraction bar and a lower limb.

This technique offers many advantages on guided bone regeneration procedures. Not requiring a second surgical site, the distraction of bone and soft tissue is achieved at the same time and the bone segment becomes a type of pedicle graft that never leaves the source of irrigation so the possibility reabsorption is decreased.

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Just like other procedures, it also has disadvantages, among which we can mention the difficulty in controlling the direction in which the segment moves and the possibility that this is reabsorbed. Besides the high morbidity is a drawback, since they have been reported a high number of postoperative infections. One of the most important points is the dependence of the patient's collaboration, the patient must exactly follow the instructions given to him for treatment to be successful.

This procedure is contraindicated when there is not enough bone to allow the device to be safely placed without damaging important structures such as the maxillary sinus, nasal cavity, the lower alveolar nerve or the roots of the surrounding teeth. It is also contraindicated in severe cases of osteoporosis or other systemic diseases that could compromise the stability of the device or the proper bone regeneration.

Clinical Case

45 year old male patient, known healthy, presents himself for consultation. Patient explains that he cannot eat properly due to lack of the right lower molars. Patient seeks a type of permanent restoration with dental implants.

Clinical examination is performed in which the reabsorption in buco-lingual direction of the area is observed and also we can observe by means of x-rays that the ridge has an appropriate height for the implant placement. Therefore it is classified, according to Cawood and Howell, as a class 4 ridge with knife edge.

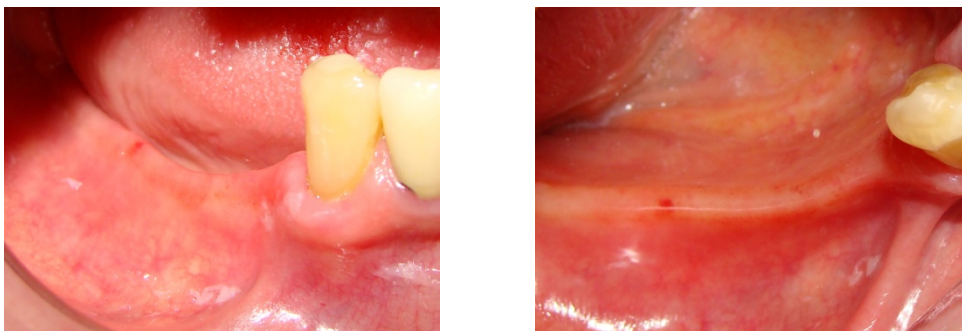


Fig. 4-5 Clinical Exam

We explained to the patient the different options for alveolar bone reconstruction in order to obtain a proper ridge width, within the options we include: guided bone regeneration using block or particles grafts, autogenous or alogeneic, and osteogenic distraction.

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Patient does not accept the use of any corpse bone or other species and at the same time is skeptical to the use of autogenous bone. Therefore we decided to perform osteogenic and histogenetic distraction using the alveolar crest expander of the M.I.S. commercial house.

M.I.S. Crest Expander

The M.I.S. crest expander is an osteogenic distraction device classified as intraosseous, uni-directional, non-reabsorbable and non-prosthetic. It is a very simple instrument comprised of four arms, two on each side, connected to pin guides and an activator screw.

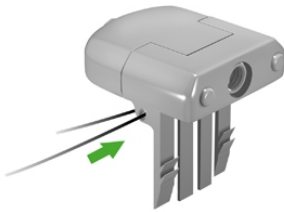


Fig. 6 M.I.S. crest expander.

Indications

- Prepare a horizontally reabsorbed alveolar crest for the placement of endosseous implants without the need for bone grafts.
- Distraction of the soft tissues before the placement of the implants.
- Prepare the ridge for the mesialization or distalization of a molar tooth.

Contra indications

Due to the size of the active components of the M.I.S. crest expander we requires a minimum of 10mm of bone in the vertical plane to perform a proper insertion of the device and therefore an optimal osteogenic and histogenetic distraction.

Another contraindication for this type of procedure is the absence of the medular component of the bone between the buccal and lingual cortical of the bone segment we wish to increase.

Advantages

It is a surgical procedure that involves minimal trauma, and if you add the use of Piezosurgery or any other ultrasonic instruments to perform the osteotomies, the postoperative pain and edema decrease.

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Among other advantages we could mention there is, since there is not an extensive dissection of the area done, the reabsorption observed in the area is minimal or absent.

In addition, with this type of alveolar distraction we can achieve an increase in soft tissues, so we can achieve a primary closure of the area and an adequate volume of the gum attached in the area.

There is no second surgical site, thereby decreasing the morbidity of the procedure.

Surgical Procedure

The patient presents to the clinic under local anesthesia and we perform three mucoperiosteal incisions. There is much controversy whether performing dissection or not, due to the periosteum being the primary source of blood to the bone. Recent studies show that the alveolar irrigation is given mainly by the lingual portion of periosteum, so the dissection of the oral portion should not cause any problems within irrigation.

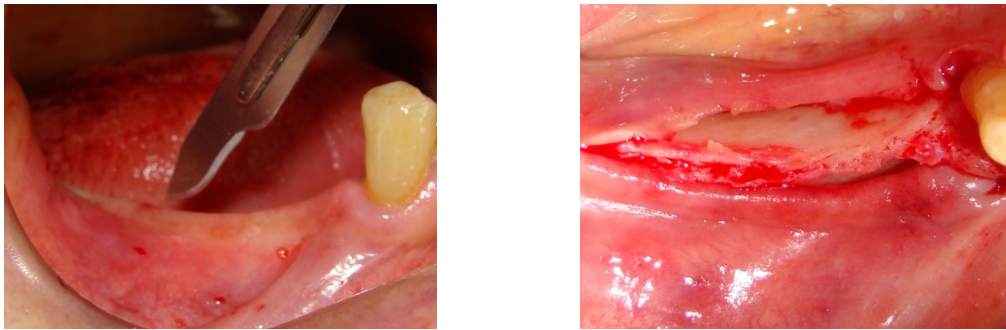


Fig. 7-8 Initial incision.

Once the incision and the flap lifting are performed, we proceed with the osteotomies, just like the incisions we will perform three osteotomies, one at the crest level and two in the most distal and most mesial portion of the segment in treatment. Upon completion of the osteotomies we must performed the separation of the segments using a small chisel, and one must be sure that the segment is mobile.



Fig. 9 Osteotomy using a Piezosurgery

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The next step is the insertion of the distraction device, in this case, the M.I.S. crest expander. Before placing the expander, the proper functioning of the same has to be tested at the same time that we should place a wire or nylon suture or black silk, to secure the appliance to adjacent tooth while it is in the mouth.

The distracter is placed in the highest part of the crest and, with a soft hammering; it is brought to the desired position. After placing the expander the surgeon must ensure that the bone segment is mobile, making two complete turns to the key in a counter clockwise direction.

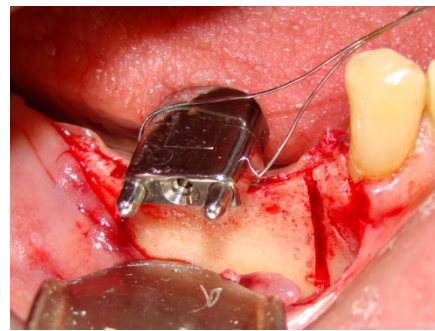
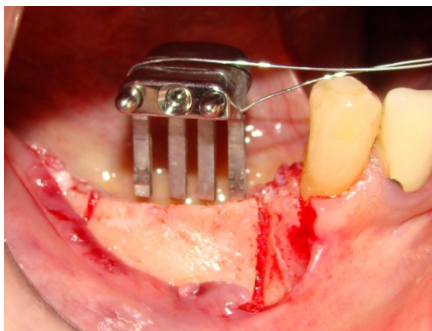


Fig. 11- 12 Placement and insertion of the M.I.S. crest expander.

The area is stitched and the patient returns home. He is recopied with antibiotics and analgesics.



Fig. 13-14 Expander in place, activated secured to the adjacent tooth

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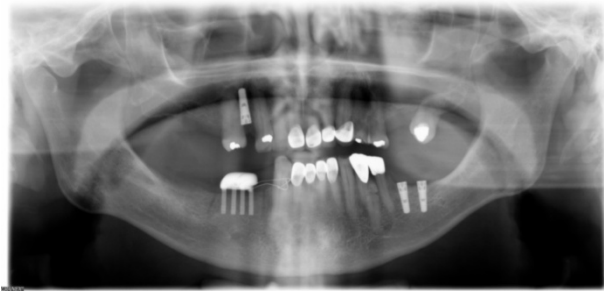


Fig. 15 Post operative x-ray

Activation

Activation is done with a key movement in counter clockwise direction, either by the patient or a family member. By rotating the activation screw, each pair of arms move away from the other two arms, pushing or separating the oral portion of the cortical bone from the lingual portion. The activation begins 5 to 7 days after the insertion of the device. By separating the cortical portions, new bone is formed between them, following the concept of osteogenic distraction. Soft tissues follow the bone in the distraction process.

The recommended frequency is of one-quarter turn twice a day (.45mm each full turn), doing 4 days of activation with one day of rest. It is recommended to make an extra 1mm of distraction to offset possible retraction. Once you get the desired width, approximately 15 to 25 days, the activation stops. And the distracter is left for 1 to 2 more weeks for the consolidation of the segment. If the device becomes loose during the consolidation period, it must be removed under local anesthetic and the implant should be placed in the same surgical act or 5 days later.



Fig. 16 15 days post surgery.

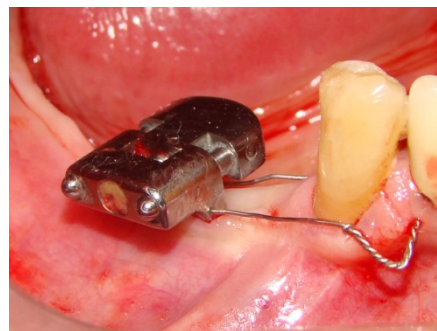


Fig. 17 One month post surgery.

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Removal

The activator screw must be rotated three full turns to disengage the retentive indentations. This is done under local anesthesia and requires no closure of soft tissue.



Fig. 18 Post removal of the distracter

We can perform the placement of the implant approximately between 5 to 8 weeks post distraction of the segments.

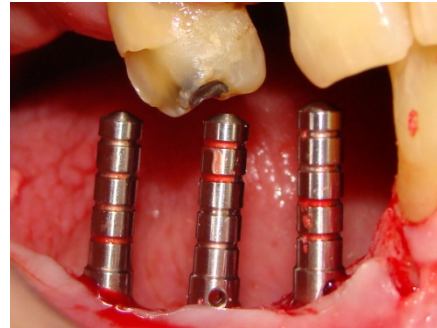
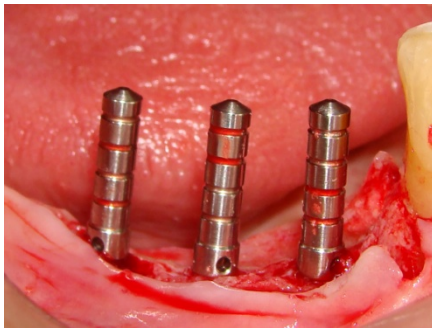


Fig. 19-20 Parallelism pins in position.

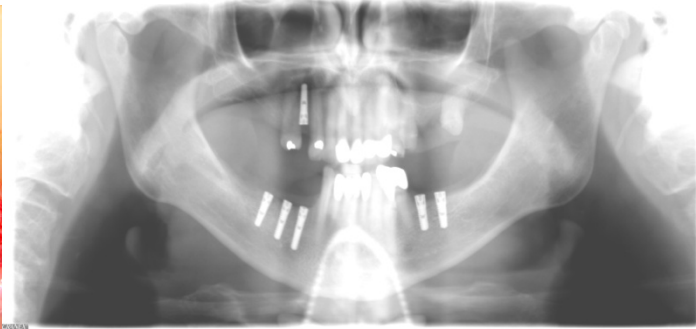


Fig. 21-22 Implants in position.

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Conclusions

The osteogenic distraction is an option that we must have in our arsenal, and offer it to our patients, as it offers many advantages if done the right way. Many times the use of allogeneic or synthetic materials, causes our patients to reject our treatments, so if you have a choice as osteogenic distraction, the treatment plan becomes more attractive. Many studies have been conducted on the distraction of bone segments in a vertical direction, but there is still a need for more studies related to the horizontal segments, this in order to have better control over the variables and that the final outcome of the treatment would be more predictable.

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