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Alveolar Distraction Osteogenesis Analysis by Radiographic Mean for Vertical Reconstruction Of Alveolar Ridge: A Novel Research Approach.

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ABSTRACT

Aim and objective: The aim and objective of the current study was to evaluate the effectiveness of alveolar distraction osteogenesis technique radiographically for vertical reconstruction of atrophy alveolar ridges in partially edentulous patients.

Materials and Methods: A total of 120 vertical distraction osteogenesis procedures were performed in 110 patients. Two panoramic radiographies were performed in all patients, one the day before the beginning of distraction, and one after consolidation period, 18 weeks postoperatively. The radiographic analysis consisted of obtaining the amount of the vertical bone gain in each radiography. For this, we obtained initially the magnification factor of each panoramic radiography by dividing the real size of the activation rod among the image size of the activation rod. After this, to obtain the VGB, we measured initially the length of the distractonpre activation (LD1), which consisted of the distance between the superior portion of the basal plate and the superior portion of the transport plate, multiplying by the magnification factor. Then, we measured the length of the distraction postactivation (LD2), using the same method described before, in radiographies performed 12 weeks postoperatively. The vertical bone gain was obtained using the following formula: vertical bone gain = LD2 — LD1. The results were applied to descriptive statistical analysis.Complications were also investigated during all of the treatments.

Results: The mean alveolar distraction achieved in 120 cases was 7.21 (range, 0 to 10.83 mm). According to the region treated, 50.8% were in the posterior mandible (mean vertical bone gain , 4.60 mm, DP: 2.04), 37.68% were in the anterior maxilla (mean vertical bone gain,7.46 mm, DP: 2.28), 7.33% were in the anterior mandible (mean vertical bone gain, 6.73 mm, DP: 2.04), and 4.33% were in the posterior maxilla (mean vertical bone gain, 6.32 mm, DP:2.65)).

Conclusions: The Alveolar Distraction Osteogenesis technique was demonstrated to be an effective tool to treat vertical defects of the alveolar ridge with a success rate of 92.64%. Our radiographic analysis seems to be an important tool in verifying the technique as well as planning implant placement after Alveolar Distraction Osteogenesis.

Key words:- Distraction osteogenesis technique, vertical reconstruction, Radiograph.

I. INTRODUCTION

Alveolar distraction osteogenesis is a technique that is based on the principles described by Ilizarov,[1,2]who is credited with having defined and established the biological bases for the clinical use of osteogenic distraction in the management of different bone deformities. Block et al[4,5]applied these principles experimentally and were the first to publish studies on the use of Alveolar Distraction Osteogenesis in animals in 1996. The techniques traditionally used in patients who present with alveolar ridge atrophy in order to achieve adequate bone height for osseointegrated implant placement are mainly asedontheuseofautogenousbonegrafts[1]wellasalloplasticmaterials.[6,7] The high morbidity rate and bone resumption have been widely described in the literature.[7]Theuseof all plastic materials does not offer an ideal bed for rehabilitation with osseointegrated implants.[5,6]Inaddition, none of these methods offer

predictable results and they all require a greater waiting time between surgeries to increase the ridge and the placement of theimplants.[7]

In the same year, Chin and Toth[8]reported the clinical use of Alveolar Distraction Osteogenesis as a treatment in alveolar ridge deficiencies in the upper maxillary. Recently, Uckan et al[9]and Rachmiel et al[7]described the use of Alveolar Distraction Osteogenesis for the reconstruction of atrophic alveolar ridges. Other reports have described the increase of the ridge by the use of an implant-distractor (Gaggl et al[10]and Klein et al[11]). The Alveolar Distraction Osteogenesis is a method that allows augmentation of alveolar ridge height with new bone formation[3,9,12]as well as obtaining a significant increase in the sur- rounding soft tissues, offering a predictable result, with low morbidity and infection rates and a significantly shorter waiting period for rehabilitation with implants (10 weeks) in comparison with the tradition- ally used methods.[13]

In the literature, some studies show the efficacy of this technique,[14,]but neither of these reports describes there algaininb one in these cases. Here, we reportastudyof55patientswhounderwentAlveolar Distraction Osteogenesis for vertical alveolar reconstruction in which we deter- mined the real bone vertical gain with a specific protocol in which we analyzed the measurement of the magnification.

II. MATERIALS AND METHODS

110 patients (74 women and 36 men; mean age, 39 year) underwent alveolar reconstruction with distraction osteo- genesis. These patients had undergone a total of 120 alveolar ridge distractions, using an extra-alveolar device

III. DISTRACTION TECHNIQUE

All of the surgeries were performed with the patients under local anesthesia. After a horizontal incision was made in the vestibulum, a buccal mucoperiosteal flap elevation was performed, exposing the lateral cortex, without elevation of the crestal mucosa. Pre bending and adaptation of the distractor device were initially performed before the osteotomies. The transport segment was cutinto an inverted trapezoidal shape with diamanted discs, sagittal saws, and chisels. The transport segment was totally mobilized, although it remained attached to the lingual mucoperiosteum. After this, the distractor was positioned and fixed in place with 1.5-mm monocortical screws. Variations in size of the transport disc and distract or device occurred with each case. The device was activated to test for transported bone without interference. The system was returned to its initial position and the flap was closed with 4.0Vicryl suture Alatency period of 7days was used with a rate of 0.33mm every 8hour size (1mm/day)for6to12days,

According to the planning for each particular case. After 90 days, the distractor was removed and implants were placed during the same surgery. If additional bone grafting was needed forgainin width, the procedure was made at that time and implant placement was performed 5 months later. After 6months of implant placement, the prosthetic restoration was performed.

Clinical follow-up examinations were performed at 7, 10, 15, 20, 30, 60, and 90 days. The follow-up examination included a search for complications such as infection, tipping of the transport disc, paresthesia, epithelium invagination, and fracture of the transport disc or transport plate. After a consolidation period of 3 months after the last day of distraction, the patients with cases classified as successful received endo-osseousim plants.

IV. RADIOGRAPHIC ANALYSIS

Two panoramic radiographies were performed in all patients, one the day before the beginning of distraction and one after the consolidation period, 12 weeks postoperatively. The radiographic analysis consisted of obtaining the amount of the vertical bone gainineachradiography. For this, we obtained initially the magnification factor of each panoramic radiography by dividing the real size of the activation rod among the image size of the activation rod. After this, to obtain the VGB, we measured initially the length of the distract on preactivation (LD1) which consisted of the distance between the superior portion of the basal plate and the superior portion of the transport plate multiplied by the magnification factor. Then, we measured the length of the distraction post activation (LD2), using the same method described before, in radiographies performed 18 weeks postoperatively (fig-1).

Figure 1. Length of the distraction postactivation (LD2).

V. RESULTS

The statistical method used in this study was descriptive analysis. The mean alveolar distraction achieved in 120 cases was 7.21 (range, 0 to 10.83 mm). According to the region treated, 50.8% were in the posterior mandible (mean vertical bone gain , 4.60 mm, DP: 2.04), 37.68% were in the anterior maxilla (mean vertical bone gain,7.46 mm, DP: 2.28), 7.33% were in the anterior mandible (mean vertical bone gain, 6.73 mm, DP: 2.04), and 4.33% were in the posterior maxilla (mean vertical bone gain, 6.32 mm, DP:2.65)). The increased radiopacity of the distracted region could be observed in a 18-week period after surgery. The overall complications rate that compromisedthesuccessofthetechniquewas8.44%. 10 patients (8.44%) had major complications; all of them presented with some kind of problem with the activation of distraction device, resulting in less than 1 mm of real bone gain; one of these patients also had a fracture of the transport disc.

VI. DISCUSSION

With Alveolar Distraction Osteogenesis, the bone can be gradually lengthened, which leads to the generation of new bone via secondary osseous wound healing. The Alveolar Distraction Osteogenesis is a relative new method that, compared with onlay grafts or guided bone regeneration, had less mobility, better previsibility, and less bone resorption and enables the lengthening of the soft tissues and vessels by histogenesis.

Compared with other techniques of regeneration, the Alveolar Distraction Osteogenesis permits less treatment time because the distraction segments are well formed in 12 weeks.

The method used to obtain the magnification factor permitted radio- graphic analysis to be performed at different radiology departments, making the identification of real bone gain more accurate. This radiographic analysis seems to be an important tool to verify the technique's success as well as in planning the implant length.

The real vertical bone gain has a fundamental role in the surgical planning, because it will be important in planning the length of the implants to be used. The mean of vertical bone gain obtained for each of the operated regions was 4.12mm to the posterior mandible region, 7.46 mm for the anterior maxilla, 6.09 mm in the anterior mandible, and 6.32 mm in the posterior mandible, with a general mean of 5.99 mm. Polo showed a mean resorption of 1 mm for each 10 mm distracted. Based on his results and our clinical experience, we believe that resorption of transported bone is not a major problemin this technique because it is minimal and does notinterfere with ideal implant placement if we include it in the planning. Measurements were confirmed in the study of Jensen et al in 2002,[14] where they evaluated for 5 year the anterior maxillary region that under-went Alveolar Distraction Osteogenesis and obtained a vertical increase of 6.5 mm. In our study, we showed a large number of cases(120) with a high success rate (92.64%). Compared with other reconstruction techniques, our results were more predictable for vertical reconstruction of alveolar ridges.

Complications may occur but in general are minor. Only 8.44% were classified as technique failure, resulting in less than 1 mm of real bone gain or other situations such as formation of a bridge by the transport disc without bone formation underneath, dehiscence and infection, or transport disc necrosis. We agree with the literature that Alveolar Distraction Osteogenesis has a potential for use in augmentation of the alveolar ridge with predictable results. But we also think that the main indication is for treatment of vertical ridge defects. Our large experience shows better results for horizontal defects using other techniques such as only bone grafting.[14]

After a 18-week period following distraction, we placed 74 implants in 34 cases classified a successful. In 40 cases it was necessary to use only bone grafting (38 in anterior maxilla and 2 in anterior mandible) because the bone that was formed was thin. This study presents a short-term follow-up. A long-term follow-up is needed in order to know the behavior of the implants placed in distracted bone.

In the maxilla, the alveolar ridge formed is thin. We prefer to first perform Alveolar Distraction Osteogenesis to gain vertical bone and soft tissue and then only bone graft to gain horizontal bone, combining the 2 techniques produces esthetic results that are better than those produced using only bone grafts.

The Alveolar Distraction Osteogenesis technique was shown to be an effective tool to treat vertical defects of the alveolar ridge, with a success rate of 92.64%. Our radiographic analysis seems to be an important tool in verifying the technique as well as planning implant placement after Alveolar Distraction Osteogenesis.

REFERENCES

[1]. Ilizarov GA: The tension-stress effect on the genesis and growth of tissues. Part I: The influence of stability of fixation and soft-tissue preservation. Clin Orthop 238:249,1989

[2]. IlizarovGA:The tension-stress effect on the genesis and growth of tissues. Part II: The influence of the rate and frequency of distraction. Clin Orthop 239:263,1989

[3]. Block MS, Almerico B, Crawford C, et al: Bone response to functioning implants in dog mandibular alveolar ridges augmented with distraction osteogenesis. Int J Oral MaxillofacImpl 13:342,1998

[4]. Block MS, Chang A, Crawford C: Mandibular alveolar ridge augmentation in the dog using distraction osteogenesis. J Oral Maxillofac Surg 54:309,1996

[5]. ArxT,vonHardtN, WallkammB:The TIME technique: A new technique for localized alveolar ridge augmentation prior to placement of dental implants. Int J Oral MaxillofacImpl 1:387, 1996

[6]. Caplanis N, Sigurdsson TJ, Rohrer MD, et al: Effect of allogeneic, freeze-dried, demineralized bone matrix on guided bone regeneration in supra alveolar peri-implant defects in dogs. Int J Oral MaxillofacImpl 12:634,1997

[7]. Rachmiel A, Srouji S, Peled M: Alveolar ridge augmentation by distraction osteogenesis. Int J Oral Maxillofac Surg 30:510, 2001

[8]. Chin M, Toth BA: Distraction osteogenesis in maxillofacial surgery using internal devices: Review of five cases. J Oral Maxillofac Surg 54:45,1996

[9]. UckanS, Haydar SG, Dolanmaz D: Alveolar distraction: Analysis of10cases.OralSurgOralMedOralPatholOralRadiolEndod 94:561,2002

[10]. Gaggl A, Shultes G, Kärcher H: Distraction implants: A new operative technique for alveolar ridge augmentation. J Crani- omaxillofac Surg 27:214,1999

[11]. Klein C, Papageorge M, Kovacs A,etal: Initial experiences with a new distraction implant system for alveolar ridge augmentation. Mund Kiefer Gesichtschir3:S74,1999

[12]. Garcia AG, Martin MS, Vila PG, et al: Minor complications arising in alveolar distraction osteogenesis. J Oral Maxillofac Surg 60:496,2002

[13]. Oda T, Sawaki Y, Ueda M: Alveolar ridge augmentation by distraction osteogenesis using titanium implants: An experimentalstudy.IntJOralMaxillofacSurg28:151,1999

[14]. Jensen OT, Cockrell R, Kuhlke L, et al: Anterior maxillary alveolar distraction osteogenesis: A prospective 5-year clinical study.IntJOralMaxillofacImpl17:52,2002

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