Journal of Indian Society of Periodontology

Home
Current issue
Instructions
Submit article

J Indian Soc Periodontol. 2017 Sep-Oct; 21(5): 417–421.
doi: 10.4103/jisp.jisp_211_17

PMCID: PMC5827512
PMID: 29491591

Horizontal alveolar ridge expansion followed by immediate placement of implants and rehabilitation with zirconia prosthesis

Tatiana Miranda Deliberador, Thalyta Verbicaro, Leonel Minerva, Rafaela Scariot, Allan Fernando Giovanini, and João César Zielak

Department of Dentistry, Universidade Positivo, Curitiba, PR, Brazil

Address for correspondence: Dr. Thalyta Verbicaro, Universidade Positivo, Rua Prof. Pedro Viriato Parigot de Souza, 5300, Curitiba, PR 81280-330, Brazil. E-mail: tverbicaro@gmail.com

Received 2017 Sep 7; Accepted 2017 Nov 27.

Copyright : © 2018 Indian Society of Periodontology

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Abstract

Go to:

In recent years, there have been a growing number of procedures involving dental implants. Most cases, though, are characterized by bone atrophy, especially horizontal atrophy. This clinical case aims to report a technique for the expansion of the horizontal alveolar ridge. A longitudinal fracture was created in the alveolar ridge to expand the bone, followed by immediate insertion of dental implants along with a particulate allogeneic bone graft. Eight implants were placed in the maxilla, and after 12 months, a surgical reopening was performed, along with rehabilitation with a protocol-type prosthesis, for which a zirconia infrastructure was made. The patient was observed during a 10-month follow-up period in which an effective osseointegration of all implants was achieved as a result of such a technique. The split-crest technique followed by the immediate placement of implants and a particulate allogeneic bone graft proved to be effective, with a predictable osseointegration.

Key words: Alveolar bone loss, dental implantation, osseointegration

INTRODUCTION

Go to:

In the past years, partial or complete edentulism has been addressed through prosthetic rehabilitation with the use of osseointegrated implants fixed in the remaining bone ridges.[1,2] A major horizontal deficiency of the alveolar ridge can render the placement of implants difficult or impossible due to insufficient bone volume to anchor defined-dimension implants.[3]

Most changes around the alveolus occur as a result of extractions, which end up altering the thickness and height of the ridge. This usually happens due to dental loss after a trauma or periodontal disease. Traumatic extractions can also cause a significant loss of the vestibular wall of the ridge.[4]

Therefore, the alveolar ridge needs a fair amount of bone volume so that dental implants can be inserted successfully. Quite often, bone defects are detected in the residual alveolar ridge during a preoperative planning, which represents an obstacle for safe prosthetic rehabilitation with osseointegrated implants. Consequently, several surgical options have emerged aiming to repair bone defects in the alveolar ridge, which would make subsequent placement of implants possible through bone grafts,[5] guided bone regeneration (GBR),[6,7] and the combination of both procedures.[8]

According to Mayur *et al*. 2014, priority should be given to simpler and less invasive procedures, involving less risk of complications and achievement of goals in a shorter period.

When the atrophy is more severe due to long-term edentulism, and the residual ridge is <3 mm thick, the remaining bone is often highly mineralized, characterized by the presence of cortical bone walls and separated by a thin layer of cancellous bone. In such situations, the ridge-split procedure is certainly the ideal treatment because it does not involve any bone removal from the implant site. Indeed, bone is displaced to increase the necessary amount of bone volume for the implant placement.[9]

In 1992, Simion introduced the split-crest technique, the purpose of which was to create a space through defects by splitting atrophic crests into two parts, causing a longitudinal “greenstick” for implant placement in between them. This is an effective technique for extremely thin alveolar ridges with horizontal bone loss. Unlike, the conventional maxillary expansion that is performed when the ridge is over 4 mm thick, the split-crest technique is indicated for ridges that are <4 mm thick.[10,11]

Ridge splitting with bone expansion is a technique of manipulation that aims to form a recipient site for an implant without removing any bone. The maxillary bone, due to its characteristics of flexibility, can be molded with the use of several instruments known as osteotomes and chisels. This technique provides an increase in bone quality around the entire implant, from the crest to the apex.[12]

There are few reports in the literature concerning the use of this technique for the placement of multiple implants in the maxilla, as well as for the future placements of protocol-type prostheses.[13]

Thus, the aim of this study is to report a clinical case of atrophic maxilla in which the surgical technique of horizontal alveolar ridge expansion was performed. After the expansion, eight dental implants were immediately inserted in the recipient site, along with a particulate allogeneic bone graft. Subsequently, prosthetic rehabilitation with protocol-type prostheses was performed with a zirconia infrastructure.

CASE REPORT

Go to:

Assessment of the patient

This case involves a female, 40-year-old patient. The patient came to the Dental Clinic at Positivo University complaining that her maxillary dentures were lacking satisfactory retention, which was causing her embarrassment when she was eating or talking. During the clinical assessment, it seemed highly probable that it was a case of extensive horizontal bone loss in the maxilla. After palpation, it was evident that the patient could not be rehabilitated with implants through the conventional technique. Her atrophic maxilla needed to be treated before the placement of osseointegrated implants. The computed tomography (CT) showed that the average width of the bucco-palatal ridge was 3.2 mm, with the presence of cancellous bone measuring between 1.5 and 2.0 mm inside a bone crest initially measuring 4 mm in height. The bone width increased progressively toward the apical area. There was enough cortical and cancellous bone for a ridge-split and expansion procedure.

Prosthetic planning

A detailed analysis of some important features of the patient was conducted to check the height of her smile and the good condition of the labial support without the maxillary dentures. Then, a diagnostic wax-up was performed in the patient's mouth. The lower arch was partially dentate, and the patient used a removable partial prosthesis. After that, an implant-supported prosthesis with a zirconia infrastructure was chosen for the finalization.

Surgical procedure

The surgery was performed under local anesthesia. A full-thickness flap of the alveolar crest was opened with two posterior relaxing incisions in the second molar region, aiming to expose the remaining bone ridge.

A sagittal split osteotomy of the bone ridge was performed vertically with a diamond disk 945B (Komet Brazil, Brazil). After that, a surgical Wagner chisel (Quinelato, Schobell Industrial Ltda, Brazil) and a surgical mallet (Surgical mallet, Bicon, LLC, USA) were used to split the ridge. The chisel was introduced about 5 mm deep [Figure 1].

After the delineation of the osteotomy, bone expanders (Kopp Implants, Brazil) were introduced in the remaining ridge to expand the cortical bone, as well as creating a guidance for positioning the dental implants [Figure 2].

Tapered implants for the Morse taper platform (Kopp Implants, Brazil) measuring 3.5 mm × 11 mm in diameter, with the exception of the implant of the upper left second molar region that measured 4.3 mm × 11 mm, were carefully placed with the aid of a manual driver (Kopp Implants, Brazil) [Figure 3]. After the implant placement, the remaining spaces (gaps) in between the dental implants were filled with particulate allogeneic bone (METB-Musculoskeletal Tissue Bank, Curitiba, Brazil) through the use of a pestle (Kopp Implants, Brazil). The same bone was also grafted onto the vestibular wall of the maxilla [Figure 4].

The full-thickness flap was then divided to relieve the suture tension and provide primary healing. The flap was coronally positioned through a continuous suture with 4–0 silk suture thread (Ethicon, Inc., USA) [Figure 5].

The patient was given an ampule of intramuscular Diprospan as preoperative medication. The following postoperative medications prescribed were as follows: amoxicillin 500 mg and Spidufen 600 mg. The postoperative guidelines included a liquid/pasty and cool/cold diet for 2 days and the use of mouthwash, 0.12% chlorhexidine gluconate, every 12 h for 10 days. The sutures were removed 10 days after surgery. After this period, the patient could wear the total prosthesis that had been previously adjusted.

The patient was followed up with every 3 months, and after a period of 10 months, a new tomography was required to confirm the osseointegration of the dental implants [Figure 6].

Prosthetic treatment

A surgical reopening with the placement of healing abutments was performed 12 months after the placement of the dental implants. After 21 days, prosthetic abutments were selected and placed [Figure 7]. Then, functional impression, pouring stone cast, and infrastructure in wax were performed. The infrastructure in wax was then scanned so that a definitive infrastructure in zirconia could be made through the computer-aided design and computer-aided manufacturing method. A perfect adaptation between the zirconia infrastructure and the prosthetic abutments [Figure 8] was achieved. Then, the color of the artificial teeth and gum was decided. After this, a ceramic veneer was placed by a technician, and the esthetics and occlusion were checked. Then, the surface was coated with glaze, which resulted in an excellent outcome [Figure 9]. Subsequently, the lower arch was rehabilitated with implants and a zirconia prosthesis.

DISCUSSION

Go to:

Alveolar atrophy may represent an anatomical limitation for the placement of dental implants. Several techniques have been developed with the aim of obtaining a gain in bone thickness, including bone graft, [14,15] the use of membranes for GBR,[16,17] and the ridge-split procedure.[10,11,18] Bone split/expansion can only be applied when vestibular and palatal/lingual walls are separated by cancellous bone.[19]

Simion *et al*., 1992, introduced the split-crest technique and concluded that there was an alveolar crest gain of 3 mm in width over a period of 6 months. The maxilla gained more thickness in comparison with the mandible, and the histological study showed that there was bone regeneration in between the split crests.

In this clinical case, the ridge-split technique enabled the simultaneous placement of dental implants during the same surgery, the first purpose of which was to gain horizontal maxillary bone. This procedure proved to be faster and less invasive. However, it is important to emphasize that this technique only aims at horizontal bone gain. For vertical ridge augmentation, other techniques are required.

Some studies have shown that the alveolar ridge-split technique provides high survival rates of dental implants. Engelke *et al*., 1997, observed 44 patients who had 123 implants placed in a period of 34 months. During the surgery, the ridge-split technique was performed with the use of a diamond disc for the immediate placement of dental implants into the expanded ridge. Then, the vestibular cortical bone was

fixed with the use of a titanium microplate and a titanium micro screw. The authors observed a success rate of 86.2%.

Regarding this technique, Chiapasco *et al*., 2009, achieved success rates ranging from 98% to 100%. The most common complication during these procedures was the fracture of the vestibular wall. Implant survival rates ranged from 91% to 97.3% (a mean of 94%) while success rates ranged from 86.2% to 97.5% (a mean of 95.5%).

Garcez-Filho *et al*., 2014, conducted a longitudinal study with a 10-year follow-up. The aim of the study was to assess the implant survival and success rates of 21 patients who had undergone the split-crest technique. At the end of the period of this study, the implant survival rate was 97% while its success rate was 95%, but with some loss of marginal bone.

This case also showed that the technique achieved clinical success. Furthermore, some advantages should be taken into consideration, such as a shorter period of time for the treatment, the immediate placement of implants, a lower risk of infections, and a decrease in bone resorption.

However, the ridge-split technique also has its limitations. One of these is an inclination that does not favor the placement of implants in expanded areas. This technique can lead to an excessive vestibular inclination of implants, which can create esthetic and functional problems. When there is an unfavorable bone position, GBR or bone grafting techniques seem to be more appropriate.[6] In this specific case, however, the position of the dental implants was correct and did not spoil the prosthetic rehabilitation.

Bone split/expansion appears to be a reliable and noninvasive technique for the correction of narrow ridges. The survival and success rates of implants placed in expanded ridges are similar to those of implants placed in native, nonrebuilt bone. The gap created by the sagittal osteotomy/expansion undergoes spontaneous ossification, following a mechanism similar to the process that occurs in fractures. Bone neoformation enables a consolidation between the vestibular and the palatine/lingual walls of the alveoli, and implants placed in expanded ridges seem to bear the amount of load demanded.[20] In this clinical case, particulate allogeneic bone grafting was performed simultaneously with the placement of dental implants due to the extension of the operated area. The objective was to promote bone healing because of the osteoconductive capacity of this type of graft, and hence, avoid healing through soft tissues.

CONCLUSION

Go to:

In cases of severe alveolar bone atrophy, the split-crest technique followed by the immediate placement of implants and a particulate allogeneic bone graft proved to be effective, with a predictable osseointegration. In addition, this treatment is less invasive and requires a shorter period of time.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

Go to:

1. Basa S, Varol A, Turker N. Alternative bone expansion technique for immediate placement of implants in the edentulous posterior mandibular ridge: A clinical report. Int J Oral Maxillofac Implants. 2004;19:554–8. [PubMed: 15346753]

2. Blus C, Szmukler-Moncler S. Split-crest and immediate implant placement with ultra-sonic bone surgery: A 3-year life-table analysis with 230 treated sites. Clin Oral Implants Res. 2006;17:700–7. [PubMed: 17092230]

3. Chiapasco M, Zaniboni M, Boisco M. Augmentation procedures for the rehabilitation of deficient edentulous ridges with oral implants. Clin Oral Implants Res. 2006;17(Suppl 2):136–59. [PubMed: 16968389]

4. Ferrigno N, Laureti M. Surgical advantages with ITI TE ® implants placement in conjunction with split crest technique: 18-month results of an ongoing prospective study. Clin Oral Implants Res. 2005;16:147–55. [PubMed: 15777323]

5. Triplett RG, Schow SR. Autologous bone grafts and endosseous implants: Complementary techniques. J Oral Maxillofac Surg. 1996;54:486–94. [PubMed: 8600266]

6. Dahlin C, Sennerby L, Lekholm U, Linde A, Nyman S. Generation of new bone around titanium implants using a membrane technique: An experimental study in rabbits. Int J Oral Maxillofac Implants. 1989;4:19–25. [PubMed: 2599578]

7. Seibert J, Nyman S. Localized ridge augmentation in dogs: A pilot study using membranes and hydroxyapatite. J Periodontol. 1990;61:157–65. [PubMed: 2156985]

8. Buser D, Dula K, Hirt HP, Schenk RK. Lateral ridge augmentation using autografts and barrier membranes: A clinical study with 40 partially edentulous patients. J Oral Maxillofac Surg. 1996;54:420–32. [PubMed: 8600258]

9. Kumar NS, Piezo SN. Surgical mandibular ridge expansion for immediate implant placement. Int J Oral Implant Clin Res. 2012;3:47–50.

10. Duncan JM, Westwood RM. Ridge widening for the thin maxilla: A clinical report. Int J Oral Maxillofac Implants. 1997;12:224–7. [PubMed: 9109273]

11. Simion M, Baldoni M, Zaffe D. Jawbone enlargement using immediate implant placement associated with a split-crest technique and guided tissue regeneration. Int J Periodontics Restorative Dent. 1992;12:462–73. [PubMed: 1298734]

12. Khairnar MS, Khairnar D, Bakshi K. Modified ridge splitting and bone expansion osteotomy for placement of dental implant in esthetic zone. Contemp Clin Dent. 2014;5:110–4. [PMCID: PMC4012101] [PubMed: 24808709]

13. Engelke WG, Diederichs CG, Jacobs HG, Deckwer I. Alveolar reconstruction with splitting osteotomy and microfixation of implants. Int J Oral Maxillofac Implants. 1997;12:310–8. [PubMed: 9197095]

14. Jensen J, Sindet-Pedersen S, Oliver AJ. Varying treatment strategies for reconstruction of maxillary atrophy with implants: Results in 98 patients. J Oral Maxillofac Surg. 1994;52:210–6. [PubMed: 8308618]

15. Sindet-Pedersen S, Enemark H. Reconstruction of alveolar clefts with mandibular or iliac crest bone grafts: A comparative study. J Oral Maxillofac Surg. 1990;48:554–8. [PubMed: 2341935]

16. Nevins M, Mellonig JT. Enhancement of the damaged edentulous ridge to receive dental implants: A combination of allograft and the GORE-TEX membrane. Int J Periodontics Restorative Dent. 1992;12:96–111. [PubMed: 1521999]

17. Schultz AJ, Gager AH. Guided tissue regeneration using an absorbable membrane (polyglactin 910) and osseous grafting. Int J Periodontics Restorative Dent. 1990;10:8–17. [PubMed: 2394557]

18. Shimoyama T, Kaneko T, Shimizu S, Kasai D, Tojo T, Horie N, et al. Ridge widening and immediate implant placement: A case report. Implant Dent. 2001;10:108–12. [PubMed: 11450409]

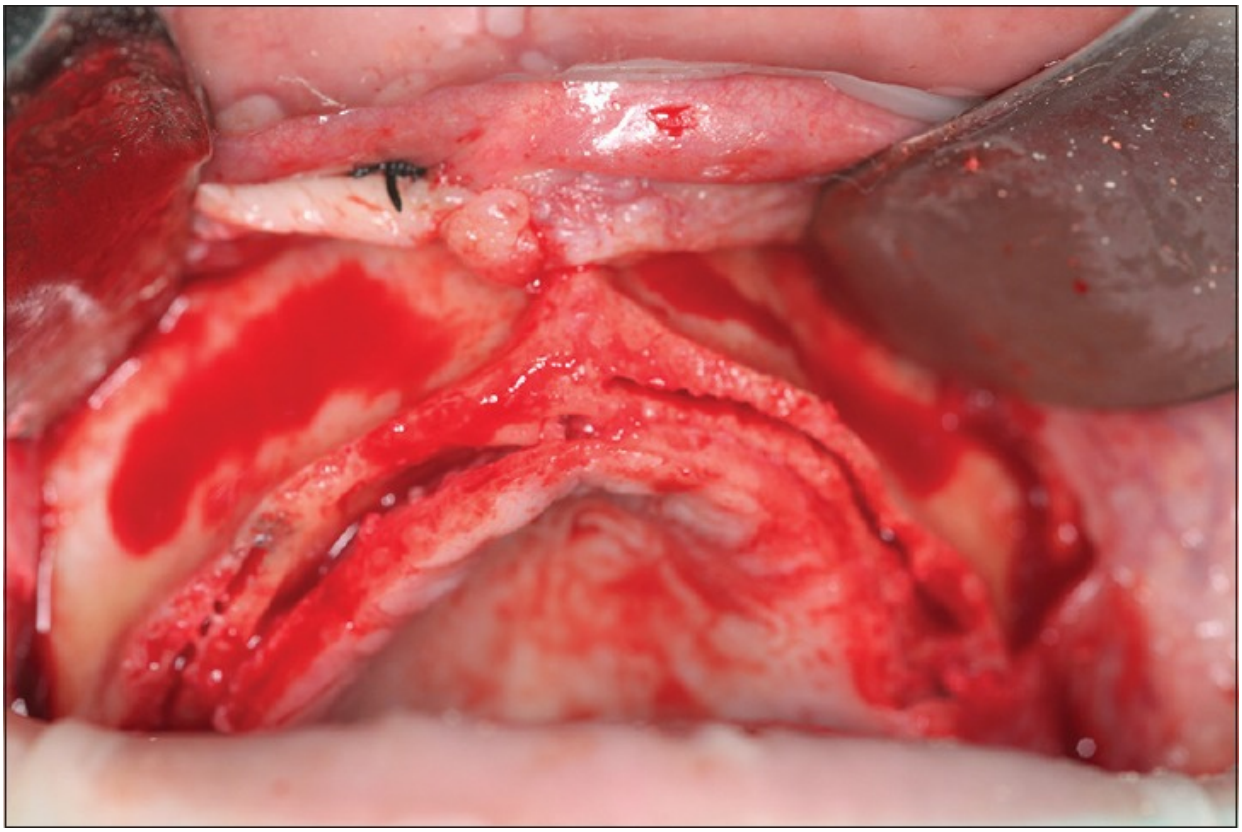
19. Chiapasco M, Casentini P, Zaniboni M. Bone augmentation procedures in implant dentistry. Int J Oral Maxillofac Implants. 2009;24(Suppl):237–59. [PubMed: 19885448]

20. Garcez-Filho J, Tolentino L, Sukekava F, Seabra M, Cesar-Neto JB, Araújo MG, et al. Long-term outcomes from implants installed by using split-crest technique in posterior maxillae: 10 years of follow-up. Clin Oral Implants Res. 2015;26:326–31. [PubMed: 24438355]

Figures and Tables

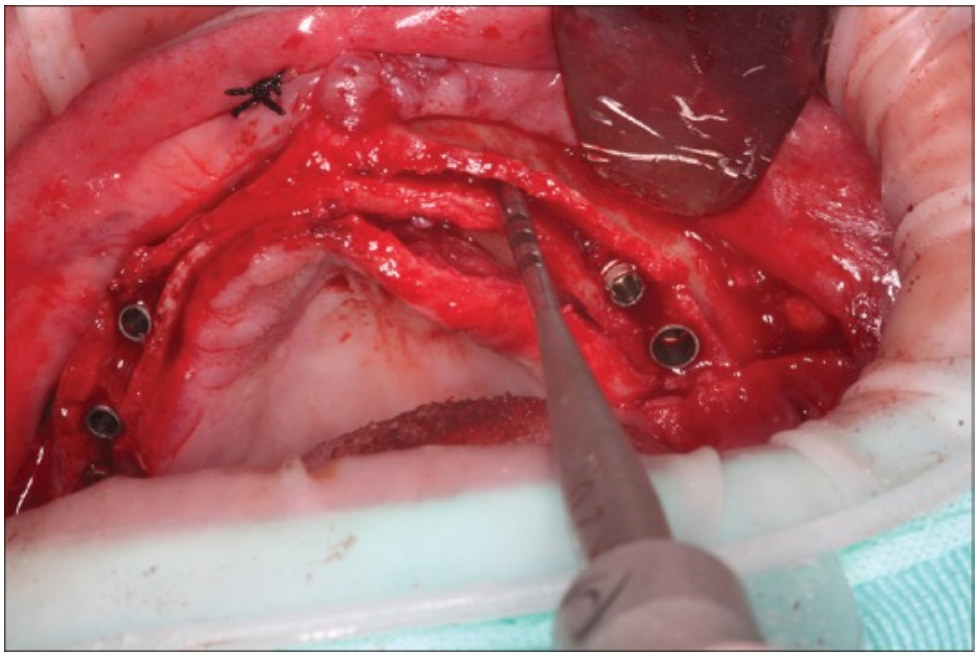
Go to:

Figure 1



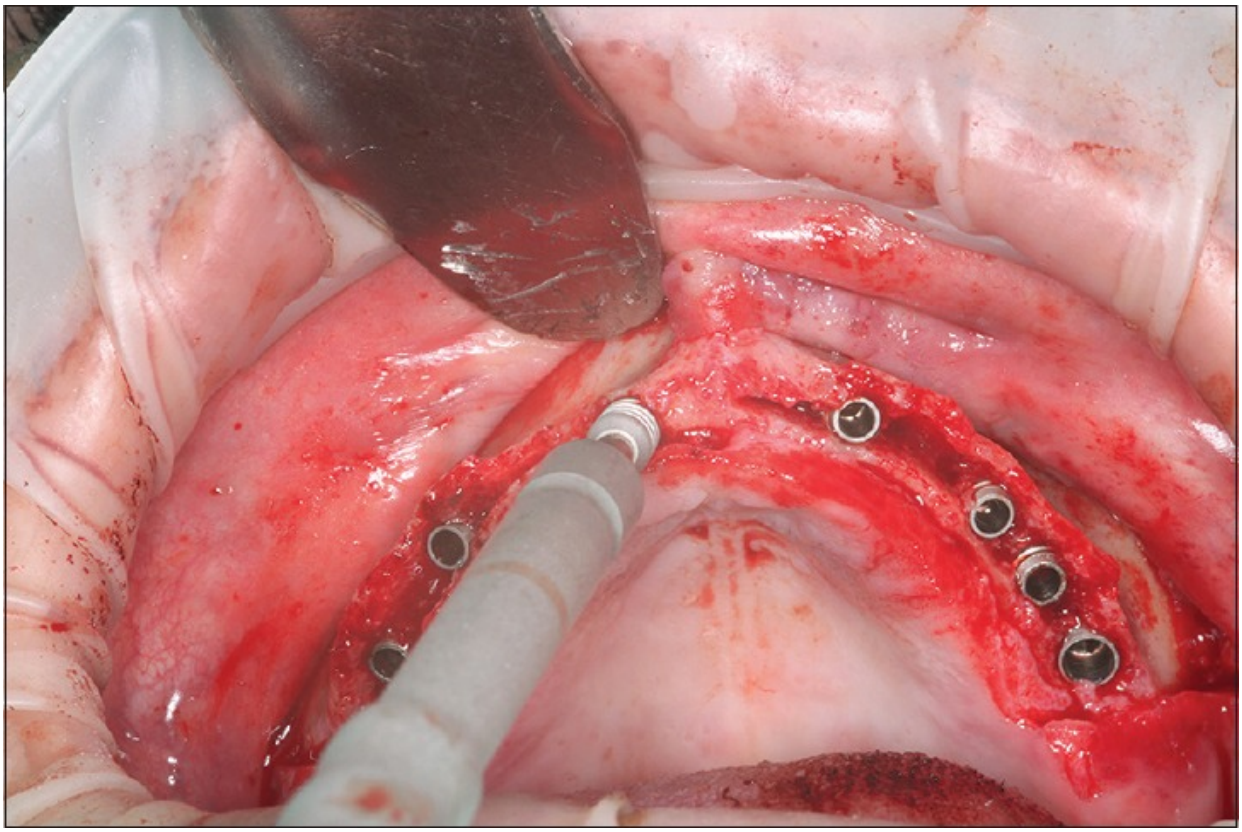
Vertical osteotomy of the alveolar ridge

Figure 2



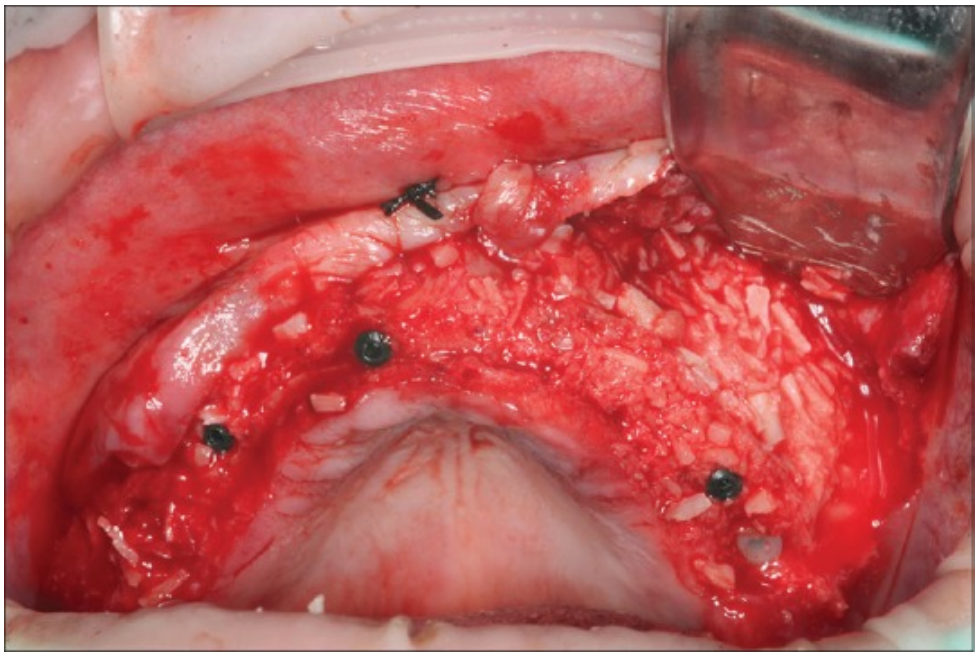
The use of expanders to accomplish maxillary expansion in its apical portion

Figure 3



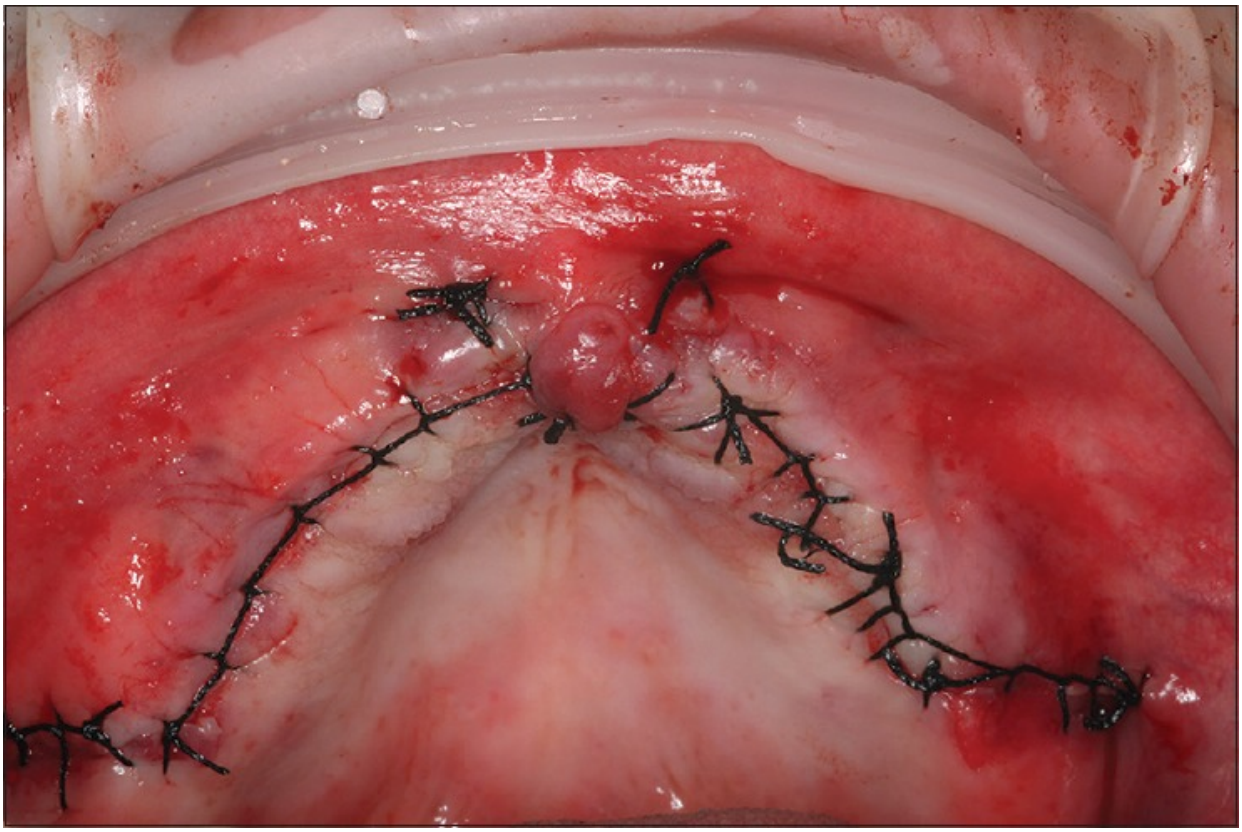
Implants were inserted with the aid of a manual driver

Figure 4



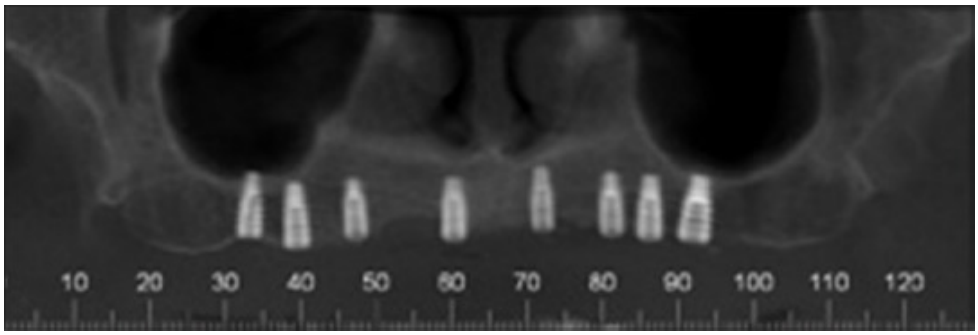
Gaps in between the dental implants were filled with particulate allogeneic bone, which was also grafted onto the vestibular wall of the maxilla

Figure 5



Flap coronally positioned with continuous suture

Figure 6



Computed tomography scan 10 months after surgery. The osseointegration of the dental implants was accomplished

Figure 7

Placement of prosthetic abutments

Figure 8

Check on the zirconia structure

Figure 9

Prosthetic finalization

Articles from Journal of Indian Society of Periodontology are provided here courtesy of **Wolters Kluwer -- Medknow Publications**