Case Report

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One- Stage Indirect Sinus Augmentation: A Clinical Report.

Abstract :
The success of implant therapy depends upon proper case selection, executed with good surgical protocol and proven by radiographic and functional outcome. This clinical report presents successful outcome of one- stage indirect sinus augmentation technique using osteotomes.

Key words: maxillary sinus, minimally invasive, one- stage, osteotomes, sinus augmentation techniques, xenograft.

Introduction:

Anatomical considerations play a vital role in determining the possibility of placement of implants in a particular region. Most important among these is the presence of maxillary sinus.1, 2 Post extraction bone resorption, pneumatization of maxillary sinuses and poor quality of residual alveolar bone are the factors responsible for reduced vertical bone height in the posterior maxilla.3 Elevation of the maxillary sinus floor is an option to solve this problem for implant therapy in this region. Direct or indirect approach can be used to augment the sinus floor.4, 5 The indirect approach has demonstrated to be effective, less invasive and associated with reduced morbidity.6,7,8 Indirect sinus augmentation can be performed using osteotomes, trephine burs, piezoelectric tips, inflatable balloon and calcium phosphosilicate putty (hydraulic pressure). All these techniques carry risk of membrane perforation if not performed carefully. This clinical report presents successful radiographic outcome (bone height gain) of one- stage indirect sinus augmentation technique using osteotomes.

Clinical Report:

A 44-year-old male patient reported with the chief complaint of wanting to replace a maxillary removable prosthesis with a fixed prosthesis. The patient was a known case of diabetes and was on oral medications. Intraoral examination revealed presence of interim partial denture with 16, 17 and 24, 25, 26, 27; five unit fixed porcelain fused metal prosthesis with 44, 45, 46, 47 and 48; three unit fixed porcelain fused to metal prosthesis with 35, 36 and 37. Absence of posterior sound abutment tooth ruled out the option of replacing removable prosthesis with conventional fixed prosthesis. Complete blood count and glycosylated haemoglobin counts were evaluated. Patient was scheduled for implant surgery only when glycosylated haemoglobin value was 7. Thorough presurgical intraoral assessment for gingival health, inter-occlusal space and bone tomography was done. CBCT scan was done and it was found that the alveolar bone height and width was 5.7mm and 10.3mm in 17; 6.5mm and 7.2mm in 16 region respectively (Fig 1 A and B). Also the alveolar bone height and width was 6.3mm and 5.4mm in 25; 6.4mm and 4.6mm in 26; 4.6mm and 6.9mm in 27 region respectively. Treatment approaches direct and indirect sinus augmentation techniques were discussed with patient. As the patient did not

[1]DARSHANA MUNDHE, [2]PRAKASH KALKE, [3]VASANTHA VIJAYARAGHAVAN, [4]MADHURA JADHAV
[1,3,4]Bharati Dental College and Hospital, Pune
[2]SIHS, Pune

Address for Correspondence : Dr. Darshana Mundhe
Assistant Professor,
Bharati Dental College and Hospital, Pune
Email : darshana.p.mundhe@bharatividyapeeth.edu

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want to undergo an elaborate surgical procedure of direct sinus augmentation, the patient was scheduled for implant placement in 16 and 17 region using one- stage indirect sinus augmentation technique using osteotomes. Diagnostic impressions were made and diagnostic mounting was done. Surgical stent was fabricated. Prophylactic antibiotic was given. Patient was also asked to take his routine dose of hypoglycaemic drugs.

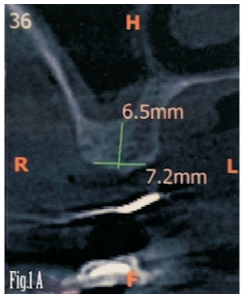

Fig 1A: Preoperative Alveolar Bone Height and Width in 16 region

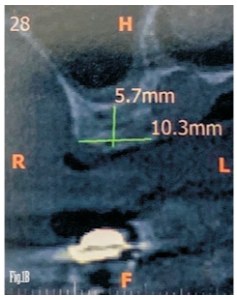

Fig 1B: Preoperative Alveolar Bone Height and Width in 17 region

Surgical protocol:

Patient preparation was done.

Posterior superior alveolar and greater palatine nerve blocks were given using 2% lignocaine with 1: 80,000 adrenaline concentration.

Midcrestal incision was placed and full thickness mucoperiosteal flap was elevated. The buccal and palatal flaps were reflected adequately to allow clear visibility of the available alveolar crest.

Surgical stent was then used and the implant positions were marked using round bur. Then pilot drill of 2mm diameter with stopper was used to prepare implant site 1mm short of the sinus lining.

The depth and position of pilot drills were verified with radiograph.

Consecutive drills of larger diameters were used sequentially to increase the width to 0.5mm smaller of the implant diameter (4.5mm in 17 region and 4mm in 16 region) to be placed.

The sinus floor was then fractured using osteotomes of 4mm and 3.5mm diameter in 17 and 16 region respectively with gentle malleting force.

Then small amount of bone graft (GGG21 G- Graft, G. Surgiwear Ltd, India) was mixed with normal saline and placed in implant osteotomy site using graft carrier.

Osteotomes of respective diameters were again used to progressively raise the sinus floor in 0.5-1mm increments till the desired depth of 2mm was achieved.

Then implants (Osstem TSIII SA fixture, Osstem Implant Co., Ltd, Korea) of respective dimensions were placed into the prepared site and tightened with help of torque ratchet at 40Ncm. Primary stability was evaluated and cover screw placed and tightened.

Post operative radiograph immediately after implant placement was taken and implant positions were confirmed (Fig 2)

The mucoperiosteal flap was then repositioned and sutured in place with interrupted sutures using 3.0 Vicryl.

Patient was placed on antibiotic, anti-inflammatory regimen for 5 days and was instructed to use 0.12% chlorhexidine mouth rinse twice daily for 15 days.

Suture removal was done after 10 days.

Patient was evaluated after 6 months, optimum bone formation and 5-6 mm bone height gain was noted on the radiograph (Fig 3)

Splinted screw-cement retained metal ceramic crowns were placed following standard impression making protocol.

Patient was evaluated clinically and radiographically 3 months after loading and it was noted that the bone levels were maintained without any crestal bone loss. (Fig 4)

Comparative assessment of preoperative and 3 month post loading radiograph shows successful bone height gain of 5-6mm in 16 and 17 regions.

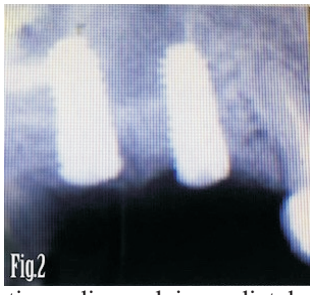

Fig 2: Postoperative radiograph immediately after placement of implants in 16 and 17 region

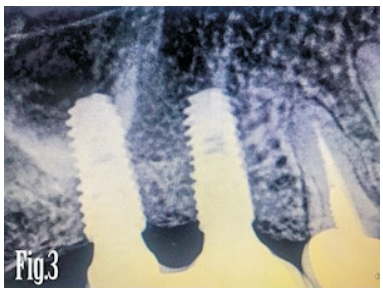

Fig 3: Radiograph showing optimum bone formation and bone height gain of 5-6mm, 6 months after augmentation.

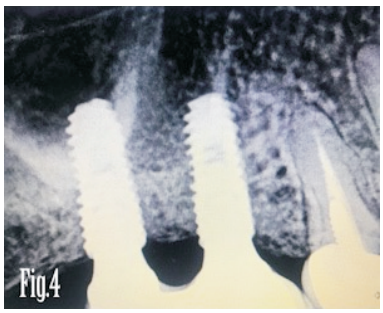

Fig 4: Radiograph showing maintained bone levels 3 months after loading

Discussion:

Sinus floor elevation can be performed using different surgical techniques with a lateral window approach or a transalveolar approach. The transalveolar approach of sinus floor elevation using osteotomes with increasing diameters was described by Summers (1994).6 The amount of residual bone available dictates the selection of technique for sinus augmentation. Misch classified treatment options as subantral (SA) category 1 to 4 based on the available bone height below the sinus floor where SA1 stands for available bone height greater than 12mm and conventional implant treatment can be done; SA2 stands for available bone height of 10-12mm and requires sinus lift with simultaneous implant placement; SA3 stands for available bone height of 5-10mm and requires lateral wall approach sinus lift with delayed implant placement; SA4 stands for available bone height less than 5mm and requires lateral wall approach sinus lift with delayed implant placement with increased healing time.9 Fugazzotto et al suggested that the maxillary sinus floor be elevated with bone graft and one- stage surgery when residual bone height is greater than 5mm.10 According to Kendrick DE two-stage lateral sinus augmentation is indicated when available bone height is 3mm, one- stage lateral sinus augmentation when 3-4mm of bone height is available and one-stage crestal approach when available bone height is above 4-5mm.11 Also Krasny K et al recommend using two-stage closed sinus lift technique when alveolar ridge height is less than 3mm.12 The Lateral approach for sinus augmentation is more invasive and prone to more complications.13 In this clinical report, one-stage transalveolar approach using osteotomes was selected as the available residual bone height was greater then 5mm (residual bone height was 5.7mm in 17 and 6.5mm in 16 region respectively) and the procedure is less invasive.9 The one- stage transalveolar approach also reduces healing time by 50% and omits the need of a second surgery to place implants. This technique has high survival rates, allows for localized sinus floor elevation, is more conservative, has low postoperative morbidity and shorter implant loading time. Osteotomes were used as they cause less trauma and generate little or no heat and also conserve bone by compressing it.14 Sinus floor augmentation using osteotome technique is also reported to have few complications.15 Tilotta et al have reported a mean sinus membrane perforation rate of 3.8% using the osteotome technique.16 The sinus membrane was elevated upto 2mm as Nkenke et al suggested that the sinus membrane elevation should be limited on an average to 3.0± 0.8mm using the osteotome technique to prevent perforation.17 Wallace and Froum in their systematic review have demonstrated 91.8% of implant survival with lateral window technique and 93.5% of implant survival with osteotome technique.18 Survival rates of 98.7%, 98%, 95.7% and 96% have been reported after 6, 12, 24 and 36 months of

loading respectively in a meta-analysis of studies of cases with osteotome placement of implant.19 Del Fabbro M et al in their systematic review suggested that the implant survival will be more (96-100%) when the pretreatment residual bone height is greater than 5mm.20 Pal US et al in their comparative analysis of direct and indirect sinus lift procedure concluded that osteotomy technique results in 3-4mm of bone height gain when residual bone height is more than 6mm which can be seen in the postoperative follow-up radiograph. 21 (Fig 4) Although autograft is the golden standard for bone augmentation; it dictates the need of a second surgical site and increases the number of possible complications.22 Wallace has reported high susceptibility of autografts to resorption.18 Kim et al evaluated the sinus bone graft resorption and marginal bone loss around the implants when allograft and xenograft were used and concluded that a combination of bone graft with demineralized bone matrix for maxillary sinus bone grafting had no significant short-term merit in bone healing and stability of implants compared with an organic bovine bone alone.23 Pal US et al from their comparative analysis have found that bovine bone can be successfully used as a scaffold for bone regeneration.21 Pjetursson et al have reported radiographic bone height gain of 4.1mm in a group of 88 implants installed by transalveolar technique where deproteinized bone material was placed.24 The G- Graft used is made of Calcium Hyroxyapatite with collagen and is derived from Bovine Bone. It is absorbed slowly by the body and allows osseointegration by maintaining the space for new bone infiltration and bone formation. The graft also acts as a shock absorber during incremental elevation of the sinus membrane. The bone height gain and stable bone levels at the follow-up visit after loading prove the suitability of the material for sinus augmentation procedure. Splinted screw – cement retained crowns were placed as interocclusal clearance was sufficient to gain access to the internal screws. Splinting would evenly distribute the forces around the implants. The successful bone height gain and its maintenance following loading can be attributed to the careful execution of the procedure using standard operating protocols as well as proper case selection following thorough preoperative evaluation.

Conclusion

Numerous techniques and materials are available for sinus augmentation using the indirect approach. Thorough preoperative evaluation and careful execution of the selected technique will give satisfactory and long lasting results.

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