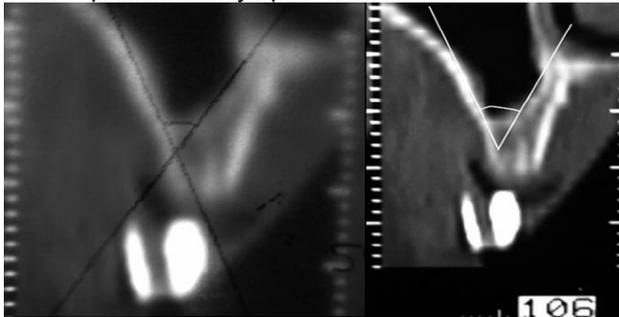


**Velloso GR, Vidigal GM, de Freitas MM, et al. Tridimensional analysis of maxillary sinus anatomy related to sinus lift procedure. Implant Dent 2006; 15: 192-6.**

**Purpose:** To evaluate the sagittal CT images in the second premolar, first molar, and second molar.

**Materials and Methods:** A total 26 maxillary sinuses in 15 patients participated in this study. Computerized tomographic images were taken from patients selected for sinus lift procedure. The patients have no teeth present at the areas, so they were either totally edentulous or had class I or II Kennedy's classification. Before tomographic examinations, a template was made for determining the position of each tooth. The template was fabricated with a semi-adjustable articulator and diagnostic wax-up. The oblique-sagittal cuts in the areas of posterior teeth were used. The angulations of the medial and lateral walls of the sinus were analyzed to determine the angle formed on the floor of the areas. The angles were traced tangential to the inner walls of the sinus at the apical portion. The same operator always performed the evaluation.



**Results:**

(1) Measurements of the angulations according to the areas

- Second premolar area (4/13):  $36.33^{\circ} \pm 10.53^{\circ}$
- First molar area (3/14):  $58.17^{\circ} \pm 12.74^{\circ}$
- Second molar area (2/15):  $47.73^{\circ} \pm 10.79^{\circ}$

(2) Comparisons of the angulations

- First molar area > Second molar area > Second premolar area (All significance  $P < 0.05$ )

**Conclusions:** The angles formed by the inner walls in the sites of the second premolar is shaper than those observed in the molar areas.

**Ferrigno N, Laureti M, Fanali S. Dental implants placement in conjunction with osteotome sinus floor elevation: a 12-year life-table analysis from a prospective study on 588 ITI implants. Clin Oral Impl Res 2006; 17: 194-205. (51 ref.)**

**Purpose:** The purpose of this article is twofold: 1) to evaluate the cumulative survival and success rates of osteotome-assisted surgery in single-stage surgical placement of 588-ITI implants in the maxilla with sinus floor elevation; and 2) to determine the cumulative success rates for the various implant lengths utilized in the study and the percentage of perforation of the Schneiderian membrane.

**Materials and Methods:** This was a 12-year prospective study that included a total of 323 systemically healthy, nonsmoking patients (males =142, females = 181 females, average age= 51 years.) All patients presented with residual alveolar ridge height of 6-9mm. The subject pool did not include individuals who exhibited any signs of severe intermaxillary skeletal discrepancy, bruxism, or drug or alcohol abuse. Patients who had received and lost implants, head and neck radiotherapy, and antineoplastic chemotherapy were excluded from the study. The most common indication for implant placement in the posterior region was a single tooth gap (28%.) Prior to implant placement, all subjects received panoramic radiographs and CT scans. From the radiographic examination and from casts and diagnostic wax-ups, a surgical stent was fabricated. The implants selected for this study was categorized according to implant type and implant length. Three types of ITI implants were placed: hollow-screw implants with 4.1 mm, standard solid-screw implants with 4.1 mm, and wide neck solid-screw implants with 4.8 mm. Of these three, the standard solid-screw implant was most commonly placed. The three different implant lengths were 8 mm long implants (103 implants,) 10 mm long implants (342 implants,) and 12 mm long implants (143 implants.)

All implants were inserted following sinus elevation. The sinus elevation technique is described as follows:

- 1) The osteotomy site was prepared in a stepwise manner using rotary spiral drills of increasing diameter. The investigators believe that patients feel more comfortable with rotary spiral drills compared to conventional malleting of osteotomes (Summers technique.)
- 2) Then a cylindrical osteotome with either a diameter of 3.5mm or 4.2mm (consistent with the diameter of the last drill used for implant placement) was used to fracture the sinus floor. An ITI depth gauge was used to gently elevate and manually displace the sinus membrane. Special attention was placed in elevating the maxillary sinus so that perforation of the Schneiderian membrane could be avoided. A negative Valsalva maneuver and tactile sensation verified an intact Schneiderian membrane. Unlike the conventional Summers technique, *no effort was made to apply pressure on the osteotomes upon re-insertion into the sinus.*
- 3) Subsequent to verification, autogenous bone particles harvested from the tuberosity, edentulous ridge, or the implant site was manually introduced into the sinus to elevate it 3-5 mm without perforation. Implant insertion was performed either with a hand ratchet or with a surgical adapter attached to a special contra-angle handpiece. Following surgery, patients were given antibiotics for 5-8 days, NSAIDs for 3-5 days, and detailed oral health instructions. A healing period of 6 months (this was later reduced to 4 months) was observed to allow for osseointegration.

Implant placement followed standard protocol, so it was not covered in detail in this article.

Subjects remained in the experiment for a period of 144 months and were clinically and radiographically evaluated annually. Each annual examination assessed implant mobility and the periodontal status by utilizing the modified plaque index (mPI), modified bleeding index (mBI), probing depths, distance between implant shoulder and mucosal margin, attachment level, width of keratinized mucosa, and suppuration. An implant was defined as a success if there was an absence of persistent subjective complaints, an absence of recurrent peri-implantitis, an absence of mobility, and an absence of continuous radiolucency around the implant. On the other hand, an implant was deemed to be a failure if it tested positive for any of the aforementioned criteria. Furthermore, a life-table analysis was performed on all 588 implants to determine the cumulative survival rate (an implant was classified as a "survival

implant” when it was still in service, but did not fulfill the success criteria) and the cumulative success rate (an implant was classified as a “successful implant” if it fulfilled the criteria of success.)

**Findings:** Initially, all subjects had a residual alveolar ridge height that ranged between 6-9 mm. After the sinus elevation and implant placement, the mean distance between the implant apex and the initial sinus floor was approximately 2.6mm mesially and approximately 3.1mm distally. The mean height of the grafted material apically to the implant was approximately 1.2mm at the time of the first radiograph taken (at the end of the osseointegration period), however this distance decreased to a value of 0.5mm during the experimental period. 2.2% of the sites exhibited a positive perforation of the Schneiderian membrane.

At the end of the 6 month healing period, one implant was deemed to be an “early implant” failure due to mobility-- the “early failure” rate was only 0.17%. This would mean that 587 were ready to proceed to the restoration phase after the osseointegration period. During the follow-up visits, eight implants had to be surgically removed because they were deemed as “late failures” due to implant mobility (2), peri-implant infection (3), implant fracture (1), and progressive bone loss without clinical signs of peri-implant infection.

Life table analysis of 588 implants revealed a cumulative survival rate of approximately 95% and a cumulative success rate of 90%. This correlated with implant lengths: 8 mm long implants showed a cumulative success rate of 88.9%, while 10 and 12 mm long implants showed cumulative success rates of 90.5% and 93.4%, respectively. The investigators, however, caution that longer implants do not necessarily achieve better results than shorter implants. It was noted that the differences were so small that no strong, statistical conclusion could be made. Also, the 8 mm implants achieved satisfactory results if one considers the bone quality and the residual vertical bone height in the posterior region of the maxilla.

**Conclusions:** Since many implant sites have only a mild degree of alveolar resorption in the posterior maxilla, the osteotome sinus floor elevation technique may be preferred over the more aggressive lateral window technique. The osteotome sinus floor technique is minimally invasive and allows for the simultaneous gentle elevation of the Schneiderian membrane, possible bone grafting, and insertion of implant in one appointment. It is a predictable treatment modality with a high rate of success and a low risk of complications, such as “late implant failure” and perforation of the Schneiderian membrane. Nevertheless, the investigators admit that in situations where a severely resorbed maxilla exists, a lateral window technique may be more suitable.

**Marchetti C, Cornimaldesi G, Pieri F, et al. Alveolar distraction osteogenesis for bone augmentation of severely atrophic ridges in 10 consecutive cases: A histologic and histomorphometric study. J Periodontol 2007; 78: 360-6.**

**Purpose:** To analyze the bone healing in surgically osteodistracted areas histologically and histomorphometrically 70 and 180 days after the end of distraction.

**Materials and Methods:** From 1999 to 2002, 10 systemically healthy non-smokers (7M and 3F) participated in this study. The defects were anterior maxillary (2 patients) and mandibular (8 patients) vertical defects.

All surgeries were performed under general anesthesia. After a horizontal incision in vestibulum, a buccal mucoperiosteal flap was elevated without elevating the lingual/palatal side. Two vertical osteotomies were performed using a reciprocating saw, a fissure bur, and chisels. A third horizontal osteotomy was performed apically joining the vertical component. An alveolar bone segment was cut into an inverted trapezoidal shape and separated from the basal bone completely. The distraction device was positioned and fixed with in place with 1.5 mm titanium microscrews.

All patients received amoxicillin/clavulanic acid IV or orally for 1 week. Also, the patients received an NSAID (ketoprofen) and 0.2% CHX.

After 7 days of the surgery, the distraction device was activated (0.5 mm twice a day) until the required height was reached. The distractor was maintained in position for 70 days and was removed. The implants were inserted in the distracted area on the day of removal (70<sup>th</sup> day) in 6 patients or 180<sup>th</sup> day after the end of distraction in 4 patients. At the moment of implant insertion, cylindrical biopsies were taken from the zone of distraction callus with a trephine bur (2 mm diameter).

#### **Results:**

##### (1) Clinical and radiographic results

- An average of vertical height gain:  $10.9 \pm 1.1$  mm (range: 9-12 mm) as measured on the pre- and post-distraction panoramic radiographs.
- One of 36 implants (2.78%) failed to integrate and was removed at the moment of healing abutment connection. During loading period ( $\geq 2$  years), no implants were lost.

##### (2) Histologic and histomorphometric results

- 70<sup>th</sup> day: Several bony trabeculae organized in an ordered structure and the distracted bone consisted of mature vital lamellar bone with many Haversian canals and osteons. No inflammatory cells were present.
- 180<sup>th</sup> day: The amount of bone tissue apposition did not differ from that at 70<sup>th</sup> day. The bone was more compact and mature, with well-organized osteons.
- Marrow space: 35% (70<sup>th</sup> day) and 45% (180<sup>th</sup> day)
- The osteocyte lacunar area:  $80.11 \mu\text{m}^2$  (70<sup>th</sup> day) and  $70.4 \mu\text{m}^2$  (180<sup>th</sup> day) – No significant difference.

**Conclusion:** There is similar bone formation in the distracted area for 70-day or 180-day healing period.

**Krennmair G, Krainhofner M, Maier H et al. Computerized tomography-assisted calculation of sinus augmentation volume. Int J Oral Maxillofac Implants. 2006 Nov-Dec;21(6):907-13.**

**Purpose:** to calculate the sinus augmentation volume for a sinus augmentation procedure based on cross-sectional computerized tomography (CT) scans for 2 different augmentation heights.

**Materials and Methods:** 31 subjects with unilateral or bilateral edentulous posterior maxillae. 44 edentulous sites were scheduled for sinus augmentation procedure. Dental CT was performed and reformatted in cross-sectional CT scans. The volume of additional alveolar bone height needed was calculated. Measurements of augmentation height (AH), residual alveolar ridge height (RRH) were taken; total height and overall volume were calculated. (TH = AH + RRH). Total height was the residual bone plus the amount by which it would be necessary to augment the sinus to place a desired length implant. Utilizing these data the amount of bone volume needed to augment the sinus floor to heights of 12 and 17 mm were determined. ( $V = n \times A_n$ , n = sum of surface areas of individual cross sections CT images). Augmentation heights of 12 and 17 mm were selected for 10 and 15mm long implants to provide 2mm safety margin.

**Findings:** The maxillary posterior area had a mean  $\pm$  SD RRH of  $4.5 \pm 2.1$  mm. To achieve a sinus floor height of 12 mm, it was necessary to increase the height by a mean of  $7.2 \pm 2.1$  mm (range, 3.0 to 10.5 mm), depending on the residual ridge height; to achieve a height of 17 mm, a mean of  $12.4 \pm 2.0$  mm (range, 8.5 to 15.5 mm) was required. The calculated augmentation volume for an augmentation height of 12 mm was  $1.7 \pm 0.9$  cm<sup>3</sup>; for an augmentation height of 17 mm, the volume required was  $3.6 \pm 1.5$  cm<sup>3</sup>. Increasing the height of the sinus lift by 5 mm, for an instance, increasing from 12 mm to 17 mm augmentation height, increased the augmentation volume by 100%. A significant correlation was found between augmentation height and the calculated sinus lift augmentation volume.

**Conclusion:** preoperative knowledge of sinus augmentation volume is helpful as a predictive value in deciding on a donor site if harvesting autogenous bone is desired.. Calculation of the augmentation size can help determine the surgical approach and also perioperative treatment and surgical procedure cost.

**Scarano A, Degidi M, Lezzi G, et al. Maxillary sinus augmentation with different biomaterials: a comparative histologic and histomorphometric study in man. *Implant Dent* 2006;15:197-207. (95 refs.)**

**Purpose:** To make a histologic and histomorphometric comparison of the results obtained with the use of different graft materials in maxillary sinus augmentation procedures in man.

**Materials and Methods:** A total of 94 patients participated in this study, ranging in age from 52 to 68 years (mean 61). The average bone thickness of the sinus floor was 4mm. A total of 362 implants were inserted in the elevated sinus augmented with autologous bone, DFDBA, Biocoral, Bioglass, Fisiograft, PepGen P-15, calcium sulfate, Bio-Oss, or HA. In all procedures, material was used 100% and mixed with blood. At the sinus lift surgery with by lateral window technique, the remaining sinus space around the implants was completely packed with the graft material. Postoperatively, antibiotics and analgesics were given for 1 week. The second stage surgery was performed after 6 months, harvesting bone-cores from the lateral wall using a 4x10 mm trephine. The harvested bone cores were histologically analyzed.

**Findings:** There were 6 implant that failed, including 1 that inserted in a sinus augmented with Biocoral, 1 with autologous bone, 1 with DFDBA, 2 with Bioglass, and 1 with HA.

- 1) Autologous bone: No osteoclasts or macrophages were present. No resorption phenomena were present. In many areas, it was possible to see the presence of compact, mature cortical bone.
- 2) DFDBA: the particles of DFDBA that were located near preexisting bone were surrounded by newly formed bone, whiel particles at a distance did not show remineralization and new bone formation.
- 3) Biocoral (natural calcium carbonate): Almost all Biocoral particles were surrounded by mature bone. Only around some particles was it possible to observe the presence of osteoid material. No osteoblasts were present. Areas of resorption were present at the surface of some graft particles.
- 4) Bioglass (silica, calcium and phosphate groups): the particles were surrounded by newly formed bone.
- 5) Fisiograft (synthetic sponge of resorbable polylactic and polyglycolide acids): In some areas, it was possible to see no yet mineralized bone. No inflammatory cells were observed. The biomaterial appeared to be almost completely resorbed and substituted by newly formed bone.
- 6) PepGen P-15 (a natural anorganic bovine-derived HA matrix and synthetic cell-binding peptide): Many resorption lacunae were present on the surface of thee particles. Newly formed bone was found n most areas to be about 100-200um away from the particles' surface. Tissue constituted the space between the bone and graft, where it was possible to find small capillaries, fibroblasts, and macrophages.
- 7) Calcium sulfate: In some areas, small residues of calcium sulfate were present and surrounded by newly formed bone.
- 8) Bio-Oss (calcium-deficient carbonate apatite, bovine-derived): In some fields, osteoblasts were observed in the process of apposing bone directly on the particle surface. At higher magnification, the bone presented wide osteocytic lacunae. In almost all particles, the haversian canals appeared to be colonized by capillaries and cells. The inner surface of som e haversian channels was lined by osteoblasts depositing an acid fuchsin positive not yet mineralized material. Only in a few areas was it possible to see multinucleated giant cells.
- 9) HA: Newly formed bone with the presence of large osteocytic lacunae, lamellar bone, and

**Table 1.** Histomorphometry of Percentage of Newly Formed Bone, Marrow Spaces, and Residual Grafted Materials

	Newly Formed Bone	Marrow Spaces	Residual Grafted Materials
Autologous bone	40.1% ± 3.2%	40% ± 2.1%	18% ± 2.3%
Deminerallized freeze-dried bone	29% ± 2.3%	37% ± 1.6%	34% ± 1.2%
Calcium carbonate	39% ± 3.1%	40% ± 1.5%	22% ± 2.8%
Bioactive glass	31% ± 1.9%	49% ± 1.8%	18% ± 2.4%
Polymer of polylactic and polyglycolide acids	33% ± 2.1%	59% ± 2.3%	3% ± 2.1%
Bovine-derived bone and peptide	37% ± 2.3%	23% ± 1.6%	37% ± 3.2%
Calcium sulfate	38% ± 3.2%	45% ± 1.3%	13% ± 2.1%
Bovine demineralized bone	39% ± 1.6%	34% ± 1.6%	31% ± 1.4%

haversian systems were present. Some times, osteoblasts were observed near the HA particles.

**Conclusion:** All biomaterials examined resulted in being biocompatible and seemed to improve new bone formation in maxillary sinus lift.

**Froum SJ, Elian N, Tarnow DP. Comparison of mineralized cancellous bone allograft (Puros) and anorganic bone bovine matrix (Bio-Oss) for sinus augmentation: Histomorphometry at 26 to 32 weeks after grafting. Int J Periodontics Restorative Dent 2006;26:543-51. (49 refs.)**

**Purpose:** The purpose of this prospective, blinded, randomized, controlled investigation was to compare the efficacy of solvent-dehydrated MCBA to ABBM in producing vital bone by 26 to 32 weeks following sinus augmentation.

**Materials and Methods:** 13 subjects (46 to 75 years) requiring bilateral sinus augmentations, with less than 5 mm of crestal bone below the sinus floor as determined by an axial CT scan were enrolled in the study. Each subject was required to take 500 mg Amoxicillin (or 300 mg Clindamycin) 1 hr prior to the surgery. If the bony window was removed to facilitate elevation of the membrane, it was not added to the grafted bone. MCBA was placed in one sub-antral compartment and ABBM was placed in the contra lateral compartment. The mixture for each material was composed of 50% 0.25 -1mm particles and 50% 1-2 mm particles. Depending on the sinus anatomy, 3-10 g of material was placed into each sinus. Sinus augmentations were performed simultaneously or at two separate appointments 6-8 weeks later. Bio-Mend Extend was hydrated for 1-5 minutes and was extended at least 3 mm beyond the limits of the prepared window and pressed against the bone. Provisional fixed or removable appliances were relieved over the edentulous area prior to re-insertion. Following surgery, subjects were placed on antibiotic coverage for 10 days. Tylenol #3 or #4 or Ibuprofen was given for pain relief. At the time of implant placement at 26-32 weeks, a trephine core sample was retrieved near the superior position of the original lateral window osteotomy. Blinded histomorphometric analysis was performed on the bone core samples to determine the vital bone content, connective tissue content and residual graft material content.

**Results:** 13 bilateral sinus augmentations were performed on 13 patients. 2 subjects were dropped from the study. 8 patients provided bilateral cores. 2 other patients had intact MCBA cores but inadequate ABBM cores. Another patient had an intact ABBM core but an inadequate MCBA core. Small schneiderian membrane perforations that occurred during surgery were reported in 29% of the treated sinuses. All perforations were repaired with Bio-Gide. Histomorphometric analysis of the 10 MCBA cores revealed a 35.90% average total bone volume, of which an average of 76.9% was vital. This resulted in an average vital bone content of 28.25%. Analysis of ABBM cores revealed an average of 12.44% bone content, all of which was vital the average percentages of marrow and connective tissue were 64.1% and 54.5% respectively for the MCBA and ABBM treated sinuses. Average residual xenograft material of 33% and 7.65% were found with ABBM and MCBA cores. From a histologic point of view, both ABBM and MCBA particles appear to be osteoconductive. Osteoblasts and osteoid were seen in conjunction with new bone formation around the ABBM particles. The MCBA particles were surrounded by greater amounts of new bone and osteoid.

**Conclusions:** Based on this comparison of the histomorphometric healing response following the use of Tutoplast-processed MCBA and ABBM in sinus augmentation procedures, MCBA material should be considered a viable alternative to the use of 100% autogenous bone or 100% ABBM.

**Nedir R, Bischof M, Vazquez L, et al. Osteotome sinus floor elevation without grafting material: a 1 year prospective pilot study with ITI implants. Clin Oral Impl Res 2006;17:679-86. (52 refs.)**

**Purpose:** To evaluate (1) the predictability of an osteotome sinus floor elevation procedure with ITI-SLA implants without placing a bone grafting material, and (2) the possibility to gain bone height without filling the created space with a bone grafting material.

**Materials and Methods:** Seventeen patients (14 females and 3 males) ranging in age from 38-69 years were treated with 25 implants. Inclusion criteria included the following: 1) requirement of implant placement in the posterior maxilla, 2) an osteotome sinus floor elevation (OSFE) was performed without placing a grafting material, 3) 10mm implants were used except when membrane perforation was encountered, 4) bone height between the crest and sinus floor was  $\leq 8$ mm on at least implant side, 5) at least 1mm of bone was required on each side for implant stability, 6) implants penetrated at least 2mm in the sinus floor on one side, 7) implant primary stability was obtained, 8) wearing a RPD during healing period was not permitted. Antibiotic prophylaxis was provided 1 day prior to surgery and consisted of either 750mg of amoxi-basan 3X/day for 6 days, or 300mg of dalacin C 3X/day for 5 days. Flap elevation was performed with a mid-crestal incision without a vertical or periosteal release incision followed by cortical perforation with round burs of increasing size (1.4mm-3.1mm). A 2.8mm ITI sinus osteotome was used to push axially on the sinus floor without touching the walls of the osteotomy site. The sinus floor was broken followed by elevation of the Schneiderian membrane. The osteotome site was then enlarged to 3.5mm. ITI-SLA implants were then placed without tapping. All implants achieved primary stability. The flap was sutured around the neck of the implant and was remained prosthesis free over the entire healing period. Implants placed consisted of the following: twenty one 10mm implants, three 8mm implants, and one 6mm implant. Twenty 4.1mm diameter and five 4.8mm diameter implants were placed. Eight implants were inserted in type 2 bone, 12 in type 3, and 5 in type 4. The residual bone height (RBH) was measured after implant placement on both the mesial and distal sides. Implant stability and radiographic appearance was evaluated after a 3-4month healing period. The following radiographic assessments were made: bone anchoring height immediately after implant placement, the change in endo-sinus bone level, and the change in the crestal peri-implant bone level. PA radiographs were taken immediately after placement, then after 3 months, 6 months, and 1 year.

**Findings:** Membrane perforation was noted in 4 implants sites. The mean healing time for abutment tightening was approximately 3 months. At 1 year, all implants were clinically stable with the definitive prostheses in function. In regards to the radiographic evaluations, all implants gained endo-sinus bone with the average gain being  $2.5 \pm 1.2$ mm. After placement, implants protruded into the sinus an average of  $4.6 \pm 2.1$ mm on the mesial and  $5.2 \pm 1.4$ mm on the distal. At one year, the protruding lengths were decreased to  $2 \pm 1.1$  and  $2.3 \pm 1$ mm on the mesial and distal respectively. The mean crestal bone loss was  $1.2 \pm 0.7$ mm.

**Conclusion:** Elevation of the Schneiderian membrane without bone grafting is able to create a space for predictable bone formation beyond the sinus floor. A healing period of 3-4months was sufficient to resist a torque of 35Ncm during abutment tightening. Formation of new bone was identified radiographically with an average of an endo-sinus bone gain of 2.5mm. This study demonstrated a 100% implant survival rate.

**Mardinger O, Manor I, Mijritsky E, et al. Maxillary sinus augmentation on the presence of antral pseudocyst: a clinical approach. Oral Surg Oral Med Oral Pathol Oral Radiol Endod;103:180-4. (19 refs.)**

**Purpose:** To present the outcomes and complications in patients who have undergone sinus augmentation procedures in the presence of an antral pseudocyst.

**Materials and Methods:** This study evaluated 109 patients with an age range of 24 to 78 years who presented for 1- or 2- stage maxillary sinus floor augmentation. The patients who presented for the study were either completely or partially edentulous in the posterior maxilla. Prior to the surgical procedure, a questionnaire was distributed to the patients in order to obtain information on demographic data, medical and dental history, and smoking status. A comprehensive periodontal exam was employed to determine both the dental and periodontal status of the patients. Criteria for sinus augmentation included a maxillary vertical dimension of less than 8 mm with at least 1 mm of original bone present. Patients were excluded from the study if they presented with current immunosuppression, poorly controlled diabetes, or other factors which could impede surgical wound healing. A radiographic evaluation was performed utilizing both an orthopantomogram and coronal and axial computerized tomographic (CT) scans. All patients with a radiographic finding of a dome-shaped radiopacity compatible with an antral pseudocyst were included. Sinus augmentation procedures were performed according to the guidelines of Jensen (1999). After the procedure, the patients were instructed not to use any removable prosthetic appliances for the first 2 weeks postoperatively. Patients medical files were reviewed by the authors for information regarding surgical approach, operative complications (i.e. perforation of the Schneiderian membrane), and difficulties in reflecting the membrane. Postoperative complications such as acute and chronic sinusitis and graft contamination were also recorded.

**Findings:** Of the 129 sinus floor augmentations, no radiographic signs of any pathologic lesions were found in 121 sinuses. Intraoperative perforations were present in 16 patients, and postoperative sinusitis was seen in 6 patients. Antral pseudocysts were diagnosed in 8 patients. All pseudocysts were dome-shaped in radiographic appearance. The radiographs revealed a faint radiolucency at the lower border to the maxillary sinus indicative of the presence of a pseudocyst. The average size of the lesion was 5.09 cm<sup>2</sup> with a range of 1.17 to 10.00 cm<sup>2</sup>. All but 1 patient had a 1-stage implant procedure following augmentation and within the study group, 24 implants were placed. Intraoperative complications were rare and included minor perforation in 2 patients. In one patient, the perforation was associated with fluid leakage into the graft and implantation was postponed for 4 months. In another patient, the perforation was in an area where the membrane was thin and not near the pseudocyst. Postoperative complications were also found to be rare among the study population. Acute sinusitis was observed to develop in one of the patients in which fluid leakage was associated with a perforation. The patient was subsequently treated with antibiotics. The mean follow-up time for the study was 20 months and all patients demonstrated successful healing with well-functioning implants.

**Conclusions:** Sinus augmentation procedures may be successfully employed in the presence of pseudocysts within the maxillary sinus. The low frequency of sinus membrane perforation and post surgery sinusitis found in this study should provide some evidence of the relative safety of this treatment modality. However, in patients that present with large radiographic lesions in which a diagnosis of an antral pseudocyst becomes questionable, further diagnostic evaluation is required prior to employment of any surgical procedures.

**Guida L, Annunziata M, Belardo S, et al. Effect of autogenous cortical bone particulate in conjunction with enamel matrix derivative in the treatment of periodontal intraosseous defects. J Periodontol 2007;78:231-38. (48 refs.)**

**Purpose:** Recent studies have indicated that the combination of EMD with bone substitutes, such as bovine porous bone mineral and demineralized freeze-dried bone allograft, has the potential to enhance the reconstructive outcome compared to EMD alone in terms of clinical attachment level gain or bone fill. The purpose of this study was to assess the additional clinical benefit of autogenous cortical bone particulate when added to enamel matrix derivative (EMD), compared to EMD alone, in the treatment of deep periodontal intraosseous defects.

**Materials and Methods:** A total of 28 intraosseous lesions in 27 patients with advanced periodontitis were included in this controlled clinical trial and randomly assigned to the EMD group, which consisted of 14 defects, or a group of EMD plus autogenous bone particulate, which consisted of 14 defects. Just prior to surgery and at 6 and 12 months probing depth, clinical attachment level, and gingival recession were recorded. The included defects were also measured radiographically at baseline and at 12 months. Post-surgically patients were placed on monthly recall visits, which included professional cleaning, for the first 6 months and every 3 months thereafter until 12 months.

**Findings:** Probing depth and attachment levels significantly improved from baseline in both groups and no significant differences could be detected in terms of attachment levels and probing depth reduction between the two groups. There was a significantly greater recession increase in the EMD group when compared the EMD plus autogenous bone group at 12 months. ( $1.1 \pm .07\text{mm}$  compared to  $0.3 \pm 0.8$  mm respectively).

**Conclusion:** The data from this study indicates that regenerative procedures based on EMD combined with autogenous bone led to a reduced post-surgery recession and increased proportion of defects with substantial clinical attachment gain when compared to EMD alone in treating the same defects.

**Ellegaard N, Baelum V, Kelsen-Petersen J. Non-grafted sinus implants in periodontally compromised patients: a time-to-event analysis. Clin Oral Impl Res 2006;17:156-64. (66 refs)**

**Purpose:** To compare the outcomes of the use of a non-graft sinus membrane lift procedure for implant insertion with those obtained when inserting conventional implants in the same patients who were periodontally compromised. Also, this paper presented an analysis of the determinants of implant failure.

**Materials and Methods:** This study represents a prospective cohort, longitudinal 12 year study (June 1990-June 2002). The sample size included 68 patients who were diagnosed and treated for periodontitis and thus demonstrated a reduced periodontal support around their remaining natural teeth. The majority of patients utilized in the study were both female and smokers at the time of implant placement. A total of 262 implants were inserted. Patients had at least 2 implants inserted into either the maxillary sinus region or the maxillary molar and premolar area (conventional implants). The sinus implants which were placed tended to be shorter than the corresponding conventional implants (non-sinus protruding implants). The implant systems used consisted of either a 2 stage submerged implant system (ASTRA) and a 1 stage non-submerged system (ITI). Standard procedures for implant therapy were implemented for all patients including a pre-surgical evaluation, surgical procedures, post-surgical care, maintenance care and follow-up examinations. For the surgical procedures involving the maxillary sinus, a periosteal flap was raised followed by production of a 10 mm fenestration of the lateral sinus wall which was 5 mm above the anticipated sinus floor. The sinus membrane was then lifted away and the implants were inserted protruding into the sinus cavity. The sinus membrane was then allowed to settle on the implants which created a void for the formation of a blood clot and coagulum formation. Following cleaning of the surgical field, the incision was closed and sutured. Immediate stability was present in all implants placed in the sinus. Implants that did not involve the maxillary sinus were inserted utilizing the appropriate ASTRA or ITI protocols. All patients were instructed in postoperative implant care with chlorhexidine oral rinse and soft toothbrushing for the nonsubmerged ITI implants. Roughly 5-6 months after implant insertion, the submerged implants were exposed and healing abutments were placed. For the maintenance phase, patients were evaluated every 3 months. A total of 14 implants in 9 patients were treated for peri-implantitis which was identified via the presence of radiographic bone loss and suppuration. For the follow-up examinations, the following parameters were evaluated around the implants: 1) presence/absence of plaque; 2) presence/absence of BOP; 3) pocket probing depth; and 4) radiographic crestal bone levels. The implant survival as a function of time under observation was analyzed using the Kaplan-Meier analysis. The influence of implant survival with respect to 7 covariates (gender; smoking; number of teeth; implant length; implant type (conventional/sinus); implant Brand (ASTRA/ITI); and time period) were also analyzed via the cox regression analysis.

**Findings:** The 50 conventional ASTRA implants were observed for an average of 67.7 (range 0-128) months, while the 59 ASTRA sinus implants, the 81 conventional ITI implants, and the 72 ITI sinus implants were observed for 64.2 (0-128), 61 (0-147), and 57.5 (0-143) months, respectively. The proportion of implants that had not failed after 5 years ranged between 88.7% for the ITI sinus implants and 97% for the conventional ASTRA implants. For the 10 year follow-up, the proportion of implants that were still present ranged between 59% for the ITI conventional implants and 97% for the ASTRA conventional implants. Between 53% of ITI conventional implants and 82.5% (ASTRA sinus implants) remained free from bone loss  $\geq 1.5$  mm after 10 years. More than 87.8% of the ITI conventional implants remained free from bone loss  $\geq 3.5$  mm after 10 years. Few implants evaluated in this study remained free from pockets  $\geq 4$  mm after 10 years. Between 65.5% of ITI conventional implants and 90.4% (ASTRA sinus implants) remained free from pockets  $\geq 6$  mm after 10 years. The cox regression analysis demonstrated that the type of implant (conventional/sinus) was an influential factor in the rate of development of bone loss  $\geq 1.5$  mm and pockets both  $\geq 4$  mm and  $\geq 6$  mm. Sinus implants were shown to develop bone loss  $\geq 1.5$  mm at a rate that was statistically significantly lower than that of conventional implants. Sinus implants developed pockets at a rate that was 0.6 to 0.7 times lower than that of conventional implants. The implant brand (ASTRA/ITI) was shown to be influential in the rate of explantation of implants (HRITI=2.8); for the development of pockets  $\geq 4$ mm (HRITI=1.5) and pockets  $\geq 6$  mm (HRITI=2.4); and for the development of bone loss  $\geq 1.5$  mm (HRITI= 1.9). Although not statistically significant, smokers demonstrated a rate of explantation that was 2.2 times higher than seen in nonsmokers. Implants which were placed in patients with 20 or greater teeth present were explanted at a

rate that was 3.8 times higher than in patients with less teeth present. Implants which were  $\leq 10$  mm were explanted at a rate that was 3.1 times higher than observed for longer fixtures. Implants which were inserted after 1994 were observed to experience bone loss  $\geq 1.5$  mm at half the rate of implants inserted before 1995 (HR1995-2002=0.5). Bleeding on probing was detected at a rate that was 1.6 times higher than for implants inserted before 1995 (HR1995-2002=1.6).

**Conclusions:** The success rate for non-grafted sinus implants placed in periodontally compromised patients is “broadly similar” to the success rate observed for conventional implants inserted in the same patients. When analyzed via the Cox regression models, factors which influenced implant failure included the following: type of implant; implant length; smoking; and patient possessing at least 20 natural teeth. Survival analysis demonstrated that the proportion of implants that had not been explanted or failed after the 5 year and 10 year follow-up for the ASTRA conventional implants was 97%. At the both the 5 year and 10 year follow-up, the proportion of ITI sinus implants and ITI conventional fixtures remaining *in situ* was 88.7% and 59%, respectively.

Kaplan-Meier estimates of the percentage of implants that did not fail (explanted) at the 1, 5, or 10 year time period

Time after insertion (years)	ASTRA (Conventional)	ASTRA (Sinus)	ITI (Conventional)	ITI (Sinus)
1	100%	98.1%	98.7%	98.5%
5	97%	91%	90%	88.7%
10	97%	85.4%	59%	79.9%

**Boyapati L, Wang HL. The role of platelet-rich plasma in sinus augmentation: A critical review. *Implant Dent* 2006;15:160-70. (55 refs)**

**Purpose:** To review the clinical benefits of incorporating platelet-rich plasma (PRP) into the sinus graft during sinus augmentation procedures.

**Materials and Methods:** Literature review

**Findings:**

- Following activation and placement of PRP, the  $\alpha$ -granules contained within the platelets release a high concentration of growth factors (PDGF, IGF, TGF- $\beta$ , PDAF, VEGF) up to 7-10 days.
- Thorwarth et al. confirmed a lack of osteoinductive capacity of PRP. Studies have shown that PRP will result in accelerated bone formation if target cells such as osteoblasts and osteocytes are present.
- Rationale for using in sinus augmentation procedures: accelerated vascularization of the graft, improved soft tissue healing, less postoperative morbidity, enhanced bone regeneration. One mechanism of action by which PRP increases angiogenesis is by increased blood vessel penetration.
- Animal studies: Studies by Jakse et al. and Butterfield et al. failed to demonstrate any beneficial effects of PRP when used with iliac crest grafts. Furst et al., Roldan et al., and Thorwarth et al., demonstrated similar results when PRP was combined with anorganic bovine bone. Grageda et al. found no additional benefit of using PRP along with FDBA. Ohya et al., and Lucarelli et al. demonstrated that using PRP along with mesenchymal stem cells may be a promising method.
- Human studies: Marx et al. used PRP along with cancellous marrow grafts for mandibular reconstruction following tumor removal and found a higher graft maturity index at 2 months but declined until 6 months when compared to cancellous marrow grafts alone. Schmitz and Hollinger concluded that the effects of PRP may be short-term only. Similar results were found when PRP was used with  $\beta$ -TCP, where an improved bone regeneration was seen at 2 weeks, but not at 12 weeks. A major advantage of using PRP is reduced healing time and upto 50% reduction in healing time has been claimed by some studies. An average reduction time in exposure of implants has also been reported with the use of PRP. Kassolis and Reynolds noted a slightly increased rate of bone formation when PRP was added to FDBA and similar results were reported by Wiltfang et al. when PRP was combined with  $\beta$ -TCP. Steigmann and Garg compared sites augmented with PRP alone or with  $\beta$ -TCP and after 6 months they found that the side augmented with PRP alone had all newly formed bone where as there was some residual graft material on the other side. Froum et al. reported that PRP did not make a significant difference in the production of vital bone or BIC in sinuses grafted with Bio-Oss. Similar results were reported by Raghoeber et al when PRP was used with autogenous bone graft from iliac crest.

**Conclusions:** Currently, there is not enough data to demonstrate the beneficial effects of PRP in sinus augmentation procedures. Further prospective clinical trials are needed to support the use of this material.

**Merli M, Bernardelli F, Esposito M. Horizontal and vertical ridge augmentation: a novel approach using osteosynthesis microplates, bone grafts and resorbable barriers. Int J Periodontics Restorative Dent 2006;26:581.**

**Purpose:** The aim of this case series was to illustrate a novel approach for regenerating bone horizontally and/or vertically simultaneously with implant placement.

**Materials and Methods:** Three selected cases were used for this study:

- Case 1: a 30 year-old female who required a replacement of the maxillary left first premolar with a large horizontal bony defect after implant placement.
- Case 2: a 59 year old woman presented with a hopeless canine and first and second premolars in the maxillary right quadrant owing to periodontal disease, were the compromised teeth were extracted and implants were placed immediately, sinus lift was need it for this patient.
- Case 3: a 54year-old woman with a completely edentulous atrophic maxilla, 8 implants and bilateral sinus lift procedures were need it.

At the beginning all patients received antibiotic prophylaxis (amoxicillin, 1g 1 hour prior to surgery and 1 g twice a day for 6 days postoperatively). Implants were placed in the desired locations following indications provided by surgical stents, the amount of bone to be regenerated was evaluated, and titanium osteosynthesis plates were shaped, cut, and fixed with self-tapping, titanium miniscrews adjacent to the area to be regenerated. The bone in the area to be regenerated was drilled to stimulate bleeding, and one or more resorbable collagen barriers (Bio-Gide) were positioned on the lingual side. Autogenous particulated bone, which had been retrieved with a bone trap in the suction device or harvested from the operating areas or other intraoral locations, was packed between the barrier and the osteosynthesis plates in the desired amount and shape, periosteal incisions were made as coronally as needed to release the flaps. Flaps were sutured with horizontal mattress sutures and patients were instructed to use chlorhexidine gel (Corsodyl) for the following two weeks and to avoid brushing and trauma at the surgical site. After 5 to 7 months the re-entry operation was performed and the osteosynthesis plates were removed, the implants were tested for stability, and healing abutments were placed.

**Findings and Conclusions:** After evaluating the cases the use of osteosynthesis plates with bone grafting and resorbable barriers for ridge augmentation simultaneously with implant placement can provide excellent results. However, to determine predictability and efficacy, this technique must be tested in properly designed randomized clinical trials with a sufficient number of patients.

