

Artzi Z, Kozlovsky A, Nemcovsky CE, Weinreb M: The amount of newly formed bone in sinus grafting procedures depends on tissue depth as well as the type and residual amount of the grafted material. J Clin Periodontol 2005; 32: 193–199.

Purpose: To evaluate the amount of newly formed bone around synthetic bone graft material (beta tricalcium phosphate, β -TCP) and natural bone graft material (bovine bone mineral, BBM) when used in sinus floor augmentation procedures.

Materials and Methods: Twelve patients, ages 42-64 years of age, received bilateral sinus floor augmentation procedures. A total of 24 sinuses were treated- 19 of which had implants placed simultaneously, the remaining 5 had the implants placed 6 months following the sinus procedure because only 1-2 mm of alveolar bone was initially present. The subject was given dexamethasone and amoxicillin both pre- and post-operatively. For analgesia, ibuprofen was prescribed. For each subject, one sinus was randomly assigned to complete the procedure w/ 1:1 ratio of BBM and autogenous bone, the contralateral sinus was grafted w/ 1:1 ratio of β -TCP and autogenous bone two weeks later. Autogenous bone chips were harvested from the posterior mandible near the external oblique ridge via a manual bone scraper. The lateral window was covered w/ a double-layer collagen membrane and soft tissue closure achieved. The over screw was exposed at 12 months post-sinus augmentation procedure. A 2 mm diameter by 6-8 mm deep cylindrical bone sample was obtained w/ a trephine from the location of the lateral window as determined by periapical radiograph and measurements made at the time of the sinus surgery. All samples were trimmed to a length of 6 mm. Peripheral and deep ends were identified. The samples were fixed, decalcified, embedded in paraffin, then cut into 5 μ m sections. Analysis was completed on sections from the peripheral, middle and deep ends, each ~25 μ m apart. The area fraction of bone and of grafted material particles was measured using a point-counting procedure.

Findings and Conclusions:

1. Sixty-two implants were placed simultaneously and 15 implants were placed during a separate procedure. Only one implant, which was placed at the time of the sinus surgery, did not integrate and was removed after 1 month.
2. Bone area fraction demonstrated an increase from peripheral zones to deep zones. For β -TCP and autogenous bone, the increase was from 26% to 37.7%. For BBM and autogenous bone, the increase was 35.9% to 53.2%. At all depths, the bone area fraction was significantly greater for the BBM sites.
3. Particulate area fraction decreased from peripheral zones to deep zones. For β -TCP and autogenous bone, the decrease was from 27.9% to 23.2%. For BBM and autogenous bone, the decrease was 29.2% to 22.6%. At all depth zones, there was no difference between the two particle types.

At 12 months, both β -TCP and BBM demonstrated similar amounts residual graft material when combined with autogenous bone chips for sinus augmentation procedures; however, BBM + autogenous bone had a greater bone area fraction.

Batal SH, Cottrell DA. Alveolar distraction osteogenesis for implant site development. Oral Maxillofacial Surg Clin N Am 2004;16:91-109.

Purpose: To discuss phases, devices, indications, & complications of distraction osteogenesis.

Materials and Methods: Lit review and author opinion.

Findings and Conclusions: Definition: Distraction osteogenesis is a biologic process of bone formation occurring between the surfaces of vital bone segments that are gradually separated by incremental traction. It is based on the principle of “tension-stress” with gradual application of tensile forces stimulating Histogenesis. Traction of bone generates tension and stimulates new bone formation parallel to the vector of distraction. Biology of osteodistraction: following an osteotomy, activation of a distractor device led to formation of a gap between bone segments. With expansion of the segments, a bony gap was created and a “regenerate” found between the bone segments. Histology of the “regenerate” revealed 4 zones extending from the centre to the edge of the osteotomy segments: 1- zone of fibrous tissues, 2- zone of extended bone formation, 3- zone of bone remodeling, 4- zone of mature bone. The initial stage of healing in distraction is very similar to fracture healing. The sequential events of healing can be described as inflammation, soft callus formation, gradual traction of the soft callus, hard callus formation, & remodeling. High distraction rates (2.7mm per day) were found to impair the angiogenic response. Slow distraction rates (0.3mm per day) did not maximally stimulate angiogenesis. The greatest level of angiogenesis appears to be associated with distraction rates of 0.7 to 1.3mm per day. Phases of distraction: 4 distinct clinical phases; latency period, distraction, stabilization, & distractor removal.

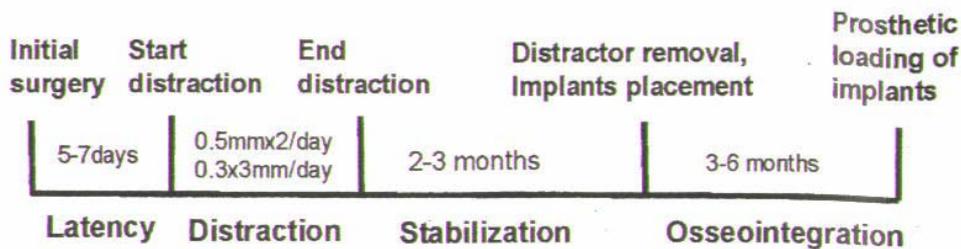
1- Latency period: the time from surgery to commencement of distraction. It ranges from immediate distraction to 14 days. 2-5 days is indicated in young patients and adults when minimal surgical trauma was encountered. 7-14 days is recommended in older patients or when increased surgical trauma was noted.

2- Rate of distraction: the distance the bone is lengthened each day. A rate of 1 mm per day is considered optimal for bone formation. (Less than 0.5mm leads to premature ossification. 2mm leads to increased fibro-connective tissue formation)

3- Rhythm of distraction: the number of distraction events per day. A rate and rhythm of 0.25mm 4 times a day or 0.5mm twice a day is clinically acceptable. Continuous distraction through motorized devices improves quality of the regenerate.

4- Stabilization: the ability of the distractor to stabilize the newly formed bone within the distraction gap is a key to the formation of healthy regenerate. Stable devices lead to direct osteogenesis without intervening cartilage formation.

5- Consolidation period: follows active distraction and continues until device removal. The length of this period is influenced by patient's age, distance and time of distraction, & the amount of surgical trauma at the time of surgery. In general 6-8 weeks is necessary until radiographic evidence of bone healing is noted.



Alveolar distraction devices: they are classified as extraosseous (Track-Plus distraction device) or intraosseous devices (Lead system, distraction implant). Extraosseous devices generally are easier to place because they are applied laterally on the bone, but they may complicate patient comfort and esthetics. Intraosseous devices generally are placed within the transport segment, making precision placement more crucial. Adequate bony thickness is crucial with most intraosseous devices.

Indications: vertical augmentation of the alveolar bone for implant placement is the most common indication. Horizontal alveolar distraction has been reported but has met with inconsistent results. Vertical deficiencies in soft tissues are an excellent indication for distraction, while horizontal correction of a soft tissue deficiency may be best corrected with other grafting procedures. Distraction of a malpositioned implant with surrounding bone to a more appropriate position is another indication.

Surgical principles: the surgical approach for distraction osteogenesis will vary with the type of distractor used, anatomic location, & surgical goals. The basic principles include gentle soft tissue handling, avoidance of vertical incisions, avoidance of roots, & maintenance of blood supply to the free segment.

Treatment planning: 4 major anatomic locations are recognized and defects are divided into 3 types (vertical, horizontal, & combination)

Treatment options for implant site development

Defect type	Defect location				
	Anterior maxilla	Posterior maxilla	Anterior mandible	Posterior mandible	Soft tissue deficiencies
Horizontal	1, 2, 3, 5	1, 2, 3	1, 2, 5	1, 2, 3, 5	7, 9
Vertical	4, 1, 2	8	4, 1, 2	4, 1, 2	4, 9, 7
Combination	6, 1, 2	1 and 8	5, 1	6, 1	6, 9, 7

Options are ranked in order of preference. Individual treatment considerations may result in treatment decisions not noted above. 1 = onlay bone graft; 2 = guided bone regeneration; 3 = ridge split; 4 = distraction osteogenesis; 5 = overdistracted followed by alveoplasty; 6 = onlay bone graft followed by distraction; 7 = connective tissue graft; 8 = sinus lift; 9 = nonresorbable hard tissue graft support soft tissue.

Survival of implants in distracted bone: controversy exist over timing of implant placement in the newly distracted bone. Recommended waiting periods range from 3 weeks to 3 months. Implant survival in distraction-generated bone appears comparable to non-distracted bone.

Complications of distraction osteogenesis: can be divided into 3 major categories:

1- Intraoperative complications:

- Inability to mobilize the transport segment
- Interference of the distraction device with occlusion
- Damage to adjacent teeth, neurosensory disturbance, & injury to flap.

2- Complications during active distraction:

- improper vector of distraction
- distraction prevented by premature consolidation or bindings
- loss of distractor

- infection
- perforation of the mucosa by the transport segment
- dehiscence of the incision
- fracture of the mandible
- resorption of the transport segment

3- Postdistraction complications:

- Bone formation defects

Boix D, Gauthier G, Guicheux J et al. Alveolar bone regeneration for immediate implant placement using an injectable bone substitute: An experimental study in dogs. J Periodontol 2004;75:663-71.

Purpose: The aim of this study was to assess the injectable bone substitute (IBS) influence on bone regeneration around titanium dental implants placed immediately after tooth extraction.

Materials and Methods: The biomaterial used in this study was a composite combining a polymer and a calcium phosphate mineral phase. 3 4-year old female adult beagle dogs were used for this study. The gingival health of all animals was checked before experimentation and teeth were scaled and polished under GA. Antibiotic treatment (spiramycin and metronidazole) was given for 5 days. Gingival incisions were made from the mesial of the first premolar to the distal of the molars. After raising full thickness flaps, vertical interradicular sectioning of each tooth was undertaken and the roots were elevated out of the sockets. Distal sockets were then drilled for placement of dental implants. The inter radicular bone was then resected to create a mesial bone defect adjacent to the mesial socket which was 6 mm high, 4 mm wide bucco-lingually and 5 mm wide mesio-distally. On the left side, mesial sockets were filled with IBS injected into the defect and in direct contact with the implant. On the right hand side, implants were placed following the same procedure but without IBS. Surgical sites were then sutured closed. Animals were sacrificed three months after surgery. Bone samples were then taken of both filled and unfilled sites and sent for histometric analysis using light and scanning microscopy. With image analysis, three parameters were measured in mesial bone defects and distal sites: (1) the number of threads in contact with bone in relation to the total number of threads (TN); (2) the bone to implant contact (BIC) with a percentage ratio studied at two different heights, the endosseous part of the implant (EH) and a 3 mm cervical height limited to the bone defects (DH) and (3) the peri-implant bone density (PBD) inside the DH on three zones at a 0.5 mm thickness, zone a: from the implant surface to 0.5 mm, zone b; from 0.51 to 1mm and zone c: from 1.1 to 1.5 mm. X-ray microanalysis was performed using an energy dispersive system. Calcium, phosphate, magnesium and sodium values were measured at four different locations with regard to bone defects, alveolar bone and basal bone.

Findings and Conclusions: A bone to implant contact was observed on all the distal threads and on most mesial threads in filled defects. An exposure of the first or the second thread was observed in five unfilled defects. Bone tissue in filled defects showed the same histological characteristics observed in the distal sites but large unmineralized area were observed in unfilled defects. Scanning electronic microscopy showed new bone formation more homogenous and dense in the filled sites compared to the unfilled sites. For EH, BIC in filled defects showed a significant increase when compared with unfilled defects. In all sites, PBD was always lower for zone a compared to zone b and c. IBS induced a significant increase in PBD in zones a, b and c.

Del Fabbro M, Testori T, Francetti L, Weinstein R. Systematic review of survival rates for implants placed in the grafted maxillary sinus. Int J Periodontol and Rest Dent 2004; 24: 565-77. (59 Refs)

Purpose: To review the survival rates of implants placed in grafted maxillary sinuses (lateral window approach exclusively), based on clinical reports from 1986 to 2002, and evaluated graft material, implant surface, simultaneous versus delayed placement, and the influence of implant surface on survival rate.

Materials and Methods: A computer search of MEDLINE and the Cochrane Central Register and hand search of data bases from years 1986-2002 was performed. The search was limited to human subjects. [39 articles out of 252 were chosen based on criteria established by the authors. Of these remaining articles, existing differences or heterogeneity among data reported prevented the authors from applying a meta-analytic technique to quantitatively evaluate abstracted data. 39 articles consisted of 3 randomized controlled trials, 7 controlled trials, 10 case series reports and 19 retrospective studies.]

Findings and Conclusions: Graft Material: Data was used from 37/39 studies and subgrouped into 3 categories; Autogenous, Combined (Autogenous combined with one of 7 different graft materials(bone substitutes)), and Bone substitutes alone. Implant survival was 87.7% with 100% Autogenous grafts; 94.88% Combined grafts; and 95.98% using bone substitutes alone. Within the autogenous subgroup, the influence of using the graft either as a block or in particulate form was examined. Survival rates considering the block grafts, block plus particulate, and particulate alone were 82.9% (1,458 implants), 89.4%(1,225 implants) and 92.5% (490 implants) respectively.

Implant Surface: Implant survival rates comparing rough and smooth surface (without consideration for degree of roughness, type of coating, or procedure to roughen surface) and yielded the following results; Smooth surface implants had an 85.64% survival rate versus textured implants displaying survival of 95.98%.

Combining Graft Material and Implant Surface: Of the studies selected 69.5% of all implants placed in autogenous bone had a smooth surface and accounted for 87.8% of total failures reported for autogenous bone. Rough surface implants displayed the highest success rate at 95.98% and were placed in bone substitute grafts; 94% with particulate autogenous. By contrast, smooth surface implants displayed an 87.89% survival rate in bone substitute grafts.

Implant Placement Timing: Using articles similar enough for comparison, survival rates were nearly identical for delayed versus simultaneous placement, 92.93% and 92.17%, respectively.

Take Homes-1. Rough implants showed superior performance over smooth.

2. Bone substitutes were as effective as autogenous bone when used alone or in combination.

Fiorellini J, Nevins M. Localized ridge augmentation/preservation. A systematic review. Ann Periodontol 2003;8:321-27.

Purpose: The aim of this paper is to evaluate dental implant survival rates in patients who have been treated with ridge augmentation or preservation techniques.

Materials and Methods: The authors utilized Medline and Cochrane Oral Health Group databases to search for their studies. The subjects of these studies were patients with inadequate bone to insert dental implants who were treated with localized ridge augmentation /preservation utilizing techniques such as guided bone regeneration, distraction osteogenesis and various augmentation techniques such as ridge splitting/expansion and vertical ridge augmentation. Vertical ridge augmentation was performed utilizing DFDBA allograft with autograft, recombinant human bone morphogenic protein-2 (rhBMP-2) Absorbable collagen sponge (ACS) or no graft. The type of outcomes assessed were: primary outcome: implant survival rate; secondary outcomes: implant survival rate and change in bone height/width; patient centred outcome: functional dental implant status; adverse outcomes: membrane exposure and effects of smoking.

Findings and Conclusions: A total of 18 studies could be utilized for this paper and they were divided into two different main categories: guided bone regeneration (13 studies) and distraction osteogenesis (5 studies). Distraction osteogenesis had a mean sample population of 17.7 patients compared to guided bone regeneration which is a more established treatment modality and had a mean sample population of 133.9 subjects. The mean observation time for DO was 18.6 ± 19.4 compared to GBR, which was 56.5 ± 25.5 . For implants placed in GBR sites Borcard et al, Nevins et al and Fugazzatto et al showed survival rates of 92.5%, 97.5% and 97.6% respectively. Investigations by Dahlin et al, Jovanovic et al and Buser et al showed survival rates of 100 % .Mayfield et al found no difference in implant survival with or without GBR. Zitzman et al reported a 1.5 % greater survival rate in the control group compared to GBR. Corrente et al demonstrated a survival rate of 92.3% in GBR group as compared to 98.3% in native bone. Becker et al and Brunel et al had a lower survival rate of 85.7% and 86% respectively. For dental implant survival rates following distraction osteogenesis, McAllister reported an average vertical augmentation of 7 mm and a 100% implant survival rate of 16 implants over 13 to 30 months. Jensen et al showed survival for implants up to 4.4 years following functional loading of 90.5% in DO sites. Engelke et al placed 121 implants in 44 patients in conjunction with ridge splitting and obtained a survival rate of 90.3% for up to 34 months. Scipioni et al reported a 98.5% implant survival rate in 170 patients following ridge splitting. Simion et al reported a survival rate of 97.5% in a 1-5 year follow up period, for implants placed in vertically augmented bone. They achieved mean vertical augmentation of 3.14 mm with DFDBA and 5.02 mm with autograft. Tinti et al reported a mean vertical augmentation of 4.95mm. Howell et al and Cochran et al reported utilizing rhBMP-2 in a total of 12 patients. Cochran et al reported a 100% implant survival rate over a 3-year period. Fiorellini et al reported on buccal wall defects following tooth extraction treated with rhBMP-2/ACS, ACS alone or no graft

and reported more bone formation than the ungrafted of ACS-alone treated groups. Dental implants in rhBMP-2 sites had similar success rates as those placed in native bone after 3 years in function. However implants could not to be placed in ungrafted control sites.

Froum, Stuart ; Cho, Sang-Choon; et al. Extraction sockets and implantation of Hydroxyapatites With Membrane Barriers. A Histologic Study. Implant Dentistry 2004; 13:153-164.

Purpose: To compare, and histologically evaluate, the healing of extraction sockets implanted with either an absorbable or nonabsorbable hydroxyapatite and covered by an ADMA or an ePTFE membrane.

Materials and Methods: 16 teeth scheduled for extraction, for periodontal or prosthetic reasons, and replacement with an implant were selected in 15 patients (9 males, 6 females) with an age range of 26 to 71 years (average, 48.1 years) and with deficient buccal plates of ≥ 5 mm. Following tooth extraction, sockets were randomly divided into 4 treatment groups: 1) AH covered with ADMA, 2) AH covered with an ePTFE membrane, 3) ABB covered with ADMA, and 4) ABB covered with an ePTFE membrane. Primary coverage was not attempted or obtained in any of the 16 treated sockets. Six to 8 months postextraction at the time of implant placement, cores of the treatment sites were obtained. These cores were processed, stained, and histomorphometrically analyzed. Vital bone, connective tissue and marrow, and residual graft particles were reported as a percentage of the total core.

Findings and Conclusions: Clinically, all sockets exhibited a normal healing response at the time of implant placement and core removal. Without primary flap coverage over the extraction socket, 1 of 8 ADMA barriers and 6 of 8 ePTFE barriers had to be removed prematurely because of infection before the 6- to 8-month time period when implants were placed. The mean vital bone was 34.5% (AH with ADMA), 41.7% (ABB with ADMA), 27.6% (ePTFE and AH), and 17.8% (ePTFE and ABB). The average percentage of vital bone in the 8 sockets covered with ADMA was 38% compared with an average percentage vital bone of 22% in the 8 sockets covered with ePTFE membrane barriers. Because of the small number of specimens in the 4 groups, statistical analysis was not possible. However, in this pilot study, ADMA-covered sites resulted in more vital bone present 6 to 8 months postsocket treatment than obtained in the ePTFE-covered sites regardless of bone replacement materials used. Extraction socket treatment with ADMA barriers produced more vital bone 6 to 8 months postextraction than did ePTFE membranes, whether placed over AH or nonabsorbable ABB mineral. 2) The combination of ADMA covering ABB produced the greatest amount of vital bone at 6 to 8 months. 3) This pilot study demonstrates the need for a much larger sample size to more accurately follow the trends in the healing responses.

Gasparini DO. Double-fold connective tissue pedicle graft: a novel approach for ridge augmentation. Int J Periodontics Restorative Dent. 2004 Jun; 24(3):280-7.

Purpose: To describe a new technique of correcting ridge defects with a double-fold connective tissue pedicle graft

Materials and Methods: Case report

Findings and Conclusions: The author describes a technique of augmenting alveolar ridge defects with soft tissue, which would be effective in treating Class I, II, & III (Seibert's classification) deformities of the alveolar crest that involve one or more of missing teeth.

Surgical technique: This is essentially a modification of Scharff and Tarnow's technique; he modified the technique in order to overcome the difficulties and limitations of it. The new technique involves reflecting a thin epithelial connective tissue flap towards the palate. A full thickness vertical incision is made from the mesial aspect of the crest of the deformed ridge toward the palatal aspect. The length of the incision will depend on the length of connective tissue graft desired. The palatal incision meets a partial thickness horizontal incision made on the crest of the edentulous ridge that continues as an intracrevicular incision palatal to the teeth distal to the defect. After a triangular epithelial connective tissue flap is reflected, the underlying connective tissue is outlined to be used as a graft. The mesiodistal size of the graft must exceed and almost duplicate the mesiodistal size of the ridge defect. The palatal graft is reflected coronally to reach the crest of the ridge defect. From the ridge crest, sharp dissection is performed near the periosteum to create a pouch between the vestibular mucosa and alveolar ridge. The distal half of the connective tissue graft is then folded below the mesial half, giving rise to the first fold. With the aid of a suture from the vestibular surface the whole graft is rolled or folded into the vestibular pouch, giving rise to the second fold. The graft is secured with sutures. Once the graft is in place, the palatal epithelial connective tissue flap is replaced on the denuded bone and secured with sutures. One of the main drawbacks of ridge augmentation with soft tissue lies in the fact that the gain in volume depends on the graft size, which is usually limited. In this procedure the mesiodistal dimension of the graft is almost double the mesiodistal dimension of the defect, which gives us a larger graft and more tissue volume. The other advantage is the blood supply to the graft is maintained by both recipient site and pedicle.

Hallman M, Sennerby L, Zetterqvist L et al. A 3-year prospective follow-up study of implant-supported fixed prostheses in patients subjected to maxillary sinus floor augmentation with a 80:20 mixture of deproteinized bovine bone and autogenous bone clinical, radiographic and resonance frequency analysis. Int J Oral Maxillofac Surg 2005;34:273-80.

Purpose: To evaluate the 3-year outcome of 30 maxillary sinus floor with an autogenous bone-deproteinized bovine mixture (20:80).

Materials and Methods: 20 healthy patients with severe of the alveolar atrophy process in the posterior maxilla were included in the study. Nine of the 20 patients were smokers and 7 had an earlier history of smoking. Cortico-cancellous chin grafts were harvested under local anesthesia, sedation and antibiotic prophylaxis. The autogenous bone particles were mixed with DBB (Bio-Oss) in a 20:80 mixture. After 6 months of graft healing, 108 self tapping, pure titanium implants with a machined surface (Brånemark system), 7-18mm in length, and 3.75 mm wide were inserted. After a healing period of 6-8 months, the implants were exposed and healing abutments were connected. Clinical recordings of implant stability were carried out at the time of abutment connection, as well as after 1 and 3 years of functional loading, with the bridge removed prior to the recordings. A rotation mobile implant or registered pain during rotation was classified as a failure. The marginal bone level was measured of the each implant on radiographs made at base line (time of abutment connection) and after 1 and 3 years of loading. The stability of implants was evaluated by means of resonance frequency analyses (RFA).

Findings and Conclusions: After 3 years of functional loading with fixed bridges, 15 of 108 implants were lost giving a cumulative survival rate of 86%. The mean marginal bone loss was 1.3mm after 3 years. There were no statistically significant differences between implants placed in autogenous bone (AB)-DBB or placed in only residual bone. Implant stability quotient measurements showed a mean value of 66.2 for all implants with range of 53-76. Examination with CT showed that 67% of the maxillary sinuses were healthy prior to treatment and 71% after 3 years of loading. It is concluded that a mixture of 20% autogenous bone and 80% deproteinized bovine bone used as grafting material in maxillary sinus floor procedures prior to implant surgery, is a long-term predictable procedure.

Peñarrocha M, García-Mira B, Martínez O. Localized Vertical Maxillary Ridge Preservation Using Bone Cores and a Rotated Palatal Flap. INT J ORAL MAXILLOFAC IMPLANTS 2005;20:131-134.

Purpose: To describe a technique for surgical preservation of the anterior maxillary process using maxillary bone from the surgical site and a rotated soft palatal flap.

Materials and Methods: A 28 year-old patient underwent bilateral extraction of maxillary laterals with bone grafting to preserve alveolar bone and apical surgery on both maxillary centrals. Vertical and horizontal alveolar defects were noted after extraction of both maxillary laterals. Small bone shavings were used to partially fill each extraction socket. Then bone cores, measuring 6 x 3 mm (diameter x thickness), were harvested from the buccal vestibular canine areas. Each bone core was placed over the extraction socket and tapped into place for stabilization. Rotated soft tissue palatal flaps were utilized to achieve primary closure over the surgical site.

Findings and Conclusions: Adequate preservation of ridge architecture occurred after 3 months to allow for the placement of 2 Defcon implants, 3.6 x 14 mm, for each maxillary lateral. The implants were submerged and then uncovered 12 weeks later to allow for prosthetic restorations. No problems or complications have been observed after 2 years of follow-up. This procedure demonstrates that the use of bone cores and a rotated palatal soft tissue flap can be used to maintain alveolar bone in the maxillary anterior and ultimately lead to implant success.

Pini Prato GP et al. Prevention of alveolar ridge deformities and reconstruction of lost anatomy: A review of surgical approaches. Int J Periodontics Restorative Dent 2004; 24:434-445.

Purpose: To review the different approaches for the prevention and treatment of ridge deformities.

Materials and Methods: Literature review and authors opinion.

Findings and Conclusions: Prevention and treatment of alveolar ridge deformities aim at preserving and or reconstructing soft and hard tissues of the edentulous areas. Different surgical techniques may be used to prevent ridge collapse and reconstruct lost ridge anatomy. Prevention of ridge collapse: Different surgical approaches may be attempted to preserve soft and hard tissues at the time of tooth extraction. Most of these approaches are used in cases of: osseous fracture occurring during tooth extraction or because of trauma; bone resorption of the vestibular cortical plate; or risk of osseous resorption of thin cortical bone during healing. Some of the approaches reviewed by the author are

- i) Flap approach for tooth extraction;
- ii) Bone grafts for ridge preservation;
- iii) GBR for ridge preservation;
- iv) Post extraction implants.

Reconstruction of lost ridge anatomy: Severe ridge deformities often impair esthetics and function. Soft tissue, hard tissue, or combination augmentation may be attempted to reduce these defects. Soft tissue reconstruction is useful in the treatment of ridge deformities, especially in cases of mild or moderate ridge defects. Severe defects may require a staged approach or hard tissue augmentation. The selection of the surgical treatment also depends on the prosthetic treatment. When an FPD is scheduled, soft tissue augmentation may be sufficient to solve ridge defects, where as hard tissue augmentation is preferred when implant therapy is selected. Soft tissue augmentation should be performed at the time of second stage surgery. Soft tissue augmentation: Some of the surgical techniques reviewed by the author are:

- i) Roll technique
- ii) Pouch procedure and connective tissue grafts
- iii) Interpositional (inlay) grafts
- iv) Onlay graft procedures
- v) Combination onlay-interpositional graft procedures.

Hard tissue augmentation: Some surgical techniques reviewed by the author are:

- i) GBR in ridge deformity
- ii) Bone grafts, allografts, or xenografts or synthetic bone substitutes.
- iii) Orthodontic treatment for hard tissue augmentation.
- iv) Ridge expansion techniques.
- v) Distraction osteogenesis.

Different surgical techniques have shown acceptable esthetic outcomes. Nevertheless, many of these results are case reports or series, and outcomes are often related to the skill of the operator. Generally, the published cases show short term results. Long term stability of the regenerated tissues should be proven in longitudinal studies.

Polimeni G, Koo K-T, Qahash M, et al. Prognostic factors for alveolar regeneration: bone formation at teeth and titanium implants. J Clin Periodontol 2004; 31: 927-932. (26 Refs)

Purpose: To assess the effect of alveolar bone width and space provision on bone regeneration at teeth and titanium implants, and to test the hypothesis that the regenerative potentials at teeth & implants are not significantly different.

Materials and Methods: Histologic specimens from 3 study groups including total 14 adult young dogs were evaluated. G1& G2: 6 & 4 animals respectively, with 6mm supra alveolar periodontal defects surgically created around mandibular premolars & molars; and G3: 4 animals, with 5mm supra alveolar peri-implant defect created around turned & acid-etched surface implant in the premolar region. G1 received e-PTFE membranes, G2 & G3 received a bioresorbable collagen sponge underneath the e-PTFE device. Post-operative care included soft diet, broad-spectrum antibiotics for 14days, & plaque control with application of 2% CHX. Sutures were removed at 8 days post surgery. At 8 weeks the animals were euthanized & block sections were prepared & sectioned. Parameters such as wound area, bone width & height of regenerated bone were calculated. Statistical analysis was performed using linear mixed models.

Findings and Conclusions: Both the bone width & wound area had significant effects on the extent of bone regeneration. The relationships of bone regeneration with these two variables were not significantly different between teeth & implants. Mean bone regeneration was somewhat higher at periodontal than implant sites, although the difference was not statistically significant. The horizontal dimension of the alveolar bone influences space provision. Space provision & horizontal dimension of the alveolar bone appear to be important determinants of bone regeneration at teeth & implants. Extent of bone formation around implants is limited compared with that at periodontal sites.

Simion M, Fontana F, Rasperini G, et al. Long-term evaluation of osseointegrated implants placed in sites augmented with sinus floor elevation associated with vertical ridge augmentation: a retrospective study of 38 consecutive implants with 1- to 7- year follow-up. Int J Periodontal Restorative Dent 2004;24(3):208-21. (45 Refs)

Purpose: To retrospectively evaluate 38 implants placed in severely atrophied posterior maxilla treated by means of a sinus elevation and concomitant vertical ridge augmentation

Materials and Methods: 14 patients who had severe crestal atrophy and significant pneumatization of the sinus (Class D; bone crest is located more than 3 mm apical to the CEJ of the adjacent teeth and residual alveolar bone height is less than 6 mm) were treated either by one-stage surgery (vertical ridge augmentation and implant placement at the same time- 16 implants) or two-stage surgery (6-13 months of healing time prior to implant placement- 22 implants), depending on availability of minimum 6 mm height for primary stability. Only Branemark Implants with lengths between 10-15 mm were placed. Autogenous bone graft was harvested from either ramus or mandibular symphysis using 8-10 mm trephine bur. The authors recommended that at least 3 mm of intact bone be left over inferior alveolar nerve canal and the length of graft be about 5-6 mm in symphyseal region. The coronal limit of the harvesting should be 5 mm apical of the root apex, and apical limit 5 mm coronal to inferior border of chin. Laterally, the limit of the graft is located about 5 mm mesial to mental foramen. The harvested bone was then particulated using a bone mill. For sinus graft material, a mixture of particulated autogenous bone and BioOss was used. In two patients, a block bone graft was positioned instead of particulated form. For vertical augmentation, only autogenous bone was utilized. In the one-stage group, implants were placed protruding 2-7 mm from the top of the crest. In the two-stage group, two tenting screws (Osteomed) were positioned, first. GTAM (TR6Y or TR9W) was trimmed, adapted and partially fixed with mini screws on palatal side. Particulated graft material was then placed underneath of the membrane. Definitive fixation on buccal side was followed. All patients were put under antibiotic coverage for 1 week, starting one day ahead of the surgery. In the one-stage group, the membrane was removed at the time of healing abutment connection. In the two-stage group, implants were placed following removal of membrane and tenting screws. 13 patients out of 14 underwent maintenance program. The follow up period was between 1-7 years.

Findings and Conclusions: Two membranes were exposed during the healing period (at 1 week and 5 weeks). The survival rate of the implants was 92%, whereas success rate was 76.3%. All the failed implants were associated with membrane exposure. The mean crestal bone loss between the time of abutment connection and the last examination was 1.65 mm at the mesial side and 1.68 mm at the distal side. The authors concluded that the regenerated new bone in the maxillary posterior region via sinus floor elevation and vertical GBR technique showed the same biologic behavior as native bone; however, its remodeling pattern seemed to determine higher crestal bone resorption.

Schwartz-Arad D, et al. The prevalence of surgical complications of the sinus graft procedure and their impact on implant survival. J Periodontol 2004; 75: 511-6.
(17 Refs)

Purpose: The purpose of this study was to evaluate the incidence of surgical complications following sinus graft procedure and the consequent influence over the implant survival rate.

Materials and Methods: The study consisted of 70 healthy patients, 25 men and 45 women, mean age 52 years old who were selected to perform a total of 81 sinus graft procedures and posterior placement of 212 screw shaped implants on the grafted sites. Fixed ceramo-metal prosthesis was used as a final restoration. All patient were evaluated pre and post-operatively from pathologic conditions of the sinus using orthopantographs plus radial and computerized tomography. Follow-up for implant ranged from 24 to 84.8 months. Prophylactic premedication using Amoxillin (1g) and Dexamethasone (8mg) with 0.5 % chlorhexidine rinse for 2 min was used 1 hour prior the surgical procedure. Clindamicyn (600 mg) was used in patient allergic to penicillin. Vertical incision was made distal to the tuberosity, and a mucoperiosteal flap was elevated. Lateral wall approach was used for the sinus grafting. Sinus membrane was reflected from the sinus floor to the medial sinus wall. To examine perforations of the membrane the Valsalva maneuver technique was used. If perforations was observed a collagen membrane was placed to repair it. Implant placement was performed either by one or second stage placement depending of the implant stability. After implant placement grafting material was condensed and a collagen resorbable membrane was placed on the fenestrate lateral wall of the maxillary sinus. Mucoperiosteal flap were repositioned and then sutured. Post-operative instructions were given. Post-operative complications were recorded, as well as smoking habit. Kaplan- Meier survival test was used to calculate the accumulative survival rate and the Chi-square test to determine the relationship between the survival rate and the complication.

Findings and Conclusions: Most of the sinuses showed no evidence of pathologic condition before the surgery. The most frequent intraoperative complication (44%) of the cases was the Schneiderian membrane perforation, followed by (10%) complication due to the sinus graft procedure (cyst, infection). Post-operative complications either specific (swelling, hematoma, etc) or non-specific (sinus congestion, cyst formation, infection, etc), were strongly associated with membrane perforation ($P < 0.001$), however no association was found between membrane perforation and implant survival rate. Accumulative survival rate for implant over 7 years was 95.5%. A total of 9 implants failed to integrate and 5 of these failures were on implants placed on heavy smokers patients. For this study could be concluding that some intraoperative complications may produce postoperative complications. Complications due to the surgical procedure did not influence significantly the implant survival rate.