
**Purpose:** To describe the use of a d-PTFE membrane for large bone grafting defect procedures.

**Materials and Methods:** A non-resorbable d-PTFE membrane (Cytoplast Regentex GBR-200 or TXT-200) was used in 2 case presentations.

**Findings:**
Case 1: A patient with maxillary trauma presented for extraction and immediate implant placement of a maxillary first pre-molar. The tooth was extracted w/out a flap followed by implant placement and bone grafting. A Cytoplast d-PTFE was placed over the extraction/implant site and sutured into place. At 6 weeks, the membrane was removed with a layer of osteoid tissue being noted. At 4 months, a thick keratinized tissue covered the site.

Case 2: A patient with maxillary trauma resulting in the extraction of teeth #6-10 presented. Following extraction, the area was debrided and d-PTFE membrane was placed covering the extraction sites. Autogenous, freeze-dried bone, and PRP was placed in the extraction sites and the membrane was sutured into place without achieving primary closure. At 4 weeks, the membrane was removed with osteoid tissue being noted underneath. At 6 weeks, epithelial migration occurred completely covering the osteoid tissue. An increase in the width of keratinized tissue was noted when compared to width prior to surgery.

**Conclusions:** The use of a d-PTFE membrane provides predictable regeneration of bone and soft tissue, and preservation of keratinized tissue, all without compromising the quality of the regeneration, the vascularity to the surgical site, or the soft tissue and esthetic concerns of the patient and the clinician.

**Purpose:** To make a qualitative evaluation of the autologous bone harvested by 9 methods: The bone harvested with each method was analyzed through microphotography and histomorphometric analysis, measuring the surface area of the bone fragments; surfaces without osteocytes having clearly-evident nucleus were considered non-vital

**Materials and Methods:** This histological investigation included 10 prepared bone specimens harvested from 10 different patients. The bone was harvested from the portion of the alveolar bone that had to be removed in order to extract third molar teeth surgically. The bone was harvested by the 9 following different methods:

1. Round bur on low-speed hand-piece  
2. Bur on high-speed hand-piece  
3. En bloc harvesting with a low-speed hand-piece  
4. Spiral implant bur  
5. Safe scraper  
6. Rhodes’ back action chisel  
7. Gouge shaped bone chisel  
8. Piezosurgery  

Histological and morphometric analysis was done on the samples. In the morphometric analysis the following parameters were evaluated (1) total surface area of the fragments (2) percentage of vital and of non-vital surface for each fragment (3) number of osteocytes per unit of surface area. Through the analysis, tissue was considered to be vital bone if osteocytes were present with clearly evident nuclei. Bone surfaces that were without osteocytes were considered non-vital.

**Findings:** The largest surface area fragments were harvested with the rongeur, and the smallest were from the spiral bur or the other bur. These very small fragments were non-vital. Piezosurgery produced middle sized particles similar to those taken with the gouge. Of the bone harvested with the scrapers, the safe scraper and back action contained particles of the smallest size. These fragments were non-vital. The bone harvested with the most vital surface area was with the rongeur pliers (84.3%), followed by en bloc (74%), the piezosurgery and gouge and back action had similar results at between 54% and 59% of vital tissue. The spiral bur achieved 48% of vital bone. The high speed and lows speed burs had no vital bone. The most osteocytes were in the en bloc harvests.

**Conclusions:** It appears that the methods that provide the most vital bone are gouge, the back-action, en bloc, the rongeur pliers and piezosurgery. The bone harvested with the high-speed and lows-speed burs, spiral bur, and safe scraper gave only non-vital bone which is not appropriate for grafting.
Purpose: To report the results of 10 years using the edentulous ridge expansion (ERE) technique in 1,715 consecutive implant site.

Material and Methods: The data for all patients in 7 different dental offices from 1992 to 2001 were studied. The data included the implants used (Frialit-2, dentsply/Friadent and 163 IMZ, IMZ/Friatec), patients’ general condition, surgical and prosthetic conditions. Patients were excluded if they showed poor OH, were smoking heavily (one pack/day), or immunosuppressed. Only implants in function for at least 2 years were included in the study. The procedure of ERE was as followed: A buccal partial thickness flap with the incision on keratinized mucosa was made over the edentulous site. Any vertical releasing incisions were avoided. A no.64 Beaver blade was used to make a crestal incision separating the buccal from the lingual bone and to make two beveled relaxing incision in the buccal bone plate. The horizontal distraction was done by using root elevators. The osteotomy sites were then prepared with a series of ball burs and completed with the burs of the selected implant system. Implants were placed by light tapping and manual screwing. The crestal gap in soft tissue was covered with a collagen sheet tucked under the flap margin and anchored with suture, and allowed the surgical sites to heal with secondary intention. A two-stage technique was used if the expansion were insufficient for implant placement. The sutures were removed 5-7 days after the surgery. The abutment connection was carried out 2 months in mandible and 4 months after implant placement in the maxilla. A provisional prosthesis was always used for 3-4 months with the aim of exerting a progressively increasing load on the implants and conditioning the soft tissue. The patients were followed routinely (every 6 months). Standardized radiographs were taken on the delivery of the provisional prosthesis, definitive prosthesis and annually thereafter.

Findings: The ERE were performed 79.4% in maxilla, 20.6% in mandible. Most of the implants (88.2%) were done by a one-stage technique. The survival rates were similar with one-stage and two-stage procedures. Fixed prostheses were used almost exclusively. There were 73 failures recorded for a success rate of 95.7%. 82.2% of the total failures occurred in maxilla (4.4% of maxillary implants); 17.8% total failures in mandible (3.7% of mandibular implants). Most failures happened before placement of the provisional prosthesis (71.2%). About 3.7% failure implants were in nonsmokers and 5.5% in smokers, the failure rate is significant different in two groups. The cylindric implant (only 9.5%of the total) showed higher failure rate (8.6%) than the root-form implant (3.8%), which was also significantly different. The percentage of failure increased with
increased in diameter, which also represented the proportion of expansion obtained. The success rate increased with an increase in the length of the implant. In maxilla, molar areas had the highest percentage of failure and lateral incisors had the least. When analyzing the two different type of implants (cylindric or root-form), no significant different were found with regard to implant length, position and the pts’ smoking status.

**Conclusion:** The percentage of failures in smoker was about 1.5X greater than nonsmoker. The failure rate of cylindric implants was about 2X greater than the root-form ones. The percentage of failures increased with increase diameter; the success rate increased with increased length because of primary stability increased. The high success rate (95.7%) of implants placed with ERE technique demonstrates that the results of the ERE technique are not influenced by the operator as long as the operator is experienced and trained.

Purpose: To compare 2 techniques for vertical bone augmentation: autogenous bone grafts protected by resorbable collagen barriers, supported by osteosynthesis plates (test) versus autogenous bone grafts protected by nonresorbable titanium-reinforced e-PTFE barriers (gold standard control).

Materials and Methods: 22 partially edentulous patients requiring vertical bone augmentation during implant placement were randomly assigned to either the test or the control group. All patients received prophylactic antibiotic therapy beginning 1 hour before the procedure. Autogenous bone was obtained from areas close to the implant site. When multiple implants were placed, measurements were obtained from the implant needing the most augmentation. Measurements at baseline were made from the bone crest to the implant platform at two sites: one where most augmentation was needed and one where least augmentation was needed and the measurements were averaged. Augmentation was done with autogenous bone grafts, osteosynthesis plates and resorbable membranes (1 or 2) in the test group; and autogenous bone and titanium-reinforced e-PTFE barriers in the control group. Primary closure was obtained. 4-5 months after this procedure, the implants were exposed and provisional restorations placed. All measurements were repeated and complications recorded. Data were subjected to statistical analysis.

Findings: Both procedures obtained adequate vertical bone height: 2.2 mm for the test group and 2.5 mm for the control group. There was no statistically significant difference in the amount of bone gain in the test and control groups. There was no statistically significant differences in the number of complications occurring in the test versus the control groups, although both groups had some minor and major complications.

Conclusions: Both methods result in statistically significant gain in vertical bone height. With both techniques, complications were common.

**Purpose:** To examine the effect of bone marrow penetration to guided bone augmentation.

**Materials and Methods:** Ten adult male Japanese white rabbits were included. An incision was made over each rabbit’s forehead and a full thickness flap was reflected. Two large circular grooves were drilled on each side of the sagittal suture using a trephine bur (8mm in diameter). Nine smaller holes were drilled around the central hole using a number 4 round bur (diameter, 1.4mm) to induce bleeding from the marrow space at the experimental side. A custom-made standardized stiff hemispherical titanium cap with a smooth surface was fixed to each calvarium. The rate of penetration was standardized at 28% in the experimental site. The flap was repositioned to cover the cap and closed with interrupted sutures. The rabbits were divided into two equal groups that were allowed to heal for 1 or 3 months. The specimen was prepared at a sagittal plan, from the central part of each cap, and any tissues that were generated within the cap. The final thickness of the specimen was 50 µm, stained with basic fuchsin and methylene blue and examined under a light microscope. The histomorphometric data for each specimen were recorded using a computerized image analysis system. The percentage of the height and total area of the tissue generated within each space were calculated. The mean numbers of osteoblast-like and osteoclast-like cells were measured.

**Findings:** Surgical sites healed uneventfully with no signs of infection or exposure of the titanium cap. The newly generated tissue consisted of slender areas of mineralized bone and large marrow spaces in the parent bone. After 1 month of healing, the difference in newly generated tissue was not significant, but was significant after 3 months of healing. The percentage of area of mineralized bone in the newly generated tissue was not significantly different after 1 month, but significant after 3 months. The difference in the height of newly generated tissue under the cap was significant after 1 month, but not significant after 3 months of healing. The osteoblast-like cells was only significant after 3 months. No significant difference of the number of osteoclast-like cells was found in each healing interval.

**Conclusions:** This study demonstrated that marrow penetration augmented the generation of bone beyond the skeletal envelope into areas in which no bone had existed. A local increase in bone morphogenic proteins and other growth factors from the injured cortical surface, endosteal area, and wounded vessels may explain the increasing generation. Significantly, more osteoblast-like cells under the caps at the experimental sites were found. Marrow penetration might promote osteoblast activity. The relative
height of the newly generated tissue was significantly greater in the experimental sites than in the control sites at 1 month. This effect agrees with the regional acceleratory phenomenon (RAP) described by Frost. Bone augmentation is significantly greater with marrow penetration than without penetration. Bottom line: Bone marrow penetration significantly increases the bone augmentation rate during GBA in a rabbit calvarium model.

Purpose: The purpose of this study is to introduce a new technique for bone and papilla reconstruction in periodontal and implant therapy.

Materials and Methods: The sample consisted of thirty five patients referred for dental fractures or periapical and periodontal lesions in the maxillary anterior teeth. 3 patients were treated with free gingival graft for root coverage and reconstruction of the papilla, the other 32 received a free gingival-bone graft to reconstruct post-extraction defects. Teeth were extracted without flap elevation, surrounding gingival walls were de-epithelialized with a diamond bur or with a blade, root planing was performed at the adjacent teeth and periosteum of the soft tissue surrounding the entire site with a small elevator. Trephine burs to obtain both gingival and bone tissue graft from the donor site, preferably the posterior maxilla. The graft was placed in the post-extraction socket and sutured. Sutures were removed 14 days later and periapicals radiographs were taken every month. Histologic samples were obtained and examined.

Findings and Conclusions: Twenty-five of the 35 patients healed without complications, epithelium was regenerated spontaneously in all cases, all implants were successfully osseointegrated and restored. This technique presents an advantage on hard and soft tissue reconstruction

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: Ninety-four subjects (50 treated with bilateral sinus lift, 44 treated with unilateral sinus lift) with an average bone thickness on the sinus floor of 4mm was used for the study. A total of 369 implants were placed into the sinuses with 9 different biomaterials used as grafting materials (DFDBA, Biocoral, Bioglass, Fisiograft, Pep-Gen p15, calcium sulfate, Bio-Oss, Fingeranule, and hydroxyapatite). Prior to surgery, the mouth was rinsed for 2 min with 0.12% chlorohexidine gluconate. Follow local anesthesia, a crestal incision was made with vertical releasing incision. The sinus was accessed and elevated. Grafting material was mixed with venous blood. Patients were placed on antibiotics and pain medication. During the 2nd stage procedure, bone cores were harvested. Core specimens were prepared for histologic and histomorphometric analysis.

Findings: All implants were stable with radiographic exam showing dense bone around the implants. In total 7 implants failed. All materials were found to biocompatible with histology demonstrating all types of materials being surrounding by bone. Some materials were found to resorb faster than others.

Conclusions: All biomaterials examined resulted in being biocompatible and seemed to improve new bone formation in maxillary sinus lift.
Purpose: (1) To evaluate the bacterial contamination of autogenous particulate bone collected intra-orally with a piezosurgery device and bone trap; (2) to evaluate the efficacy of treatment of bone debris with rifamycin SV to reduce bacterial contamination; and (3) to determine, through histomorphometric techniques, the dimensions of the collected bone chips.

Materials and Methods: Ten patients (five females and five males, aged 13-35 years, mean age 18.7 years) in need of surgical extraction of the impacted lower third molar were selected. Surgery was performed and bone tissue samples were collected with a bone trap. The trap filter was equipped with a removable internal mesh with a pore diameter of 300 µm. Two distinct systems were used for aspiration and bone collection. The first system, devoted to the control of saliva and bleeding, was positioned approximately 1.5 cm from the ostectomy site. The second aspiration system was sterile and disposable, and comprised a filter for collecting bone chips and a plastic suction tube. The net weight of the material was obtained by subtracting the weight of the filter. The filter was opened in aseptic conditions and three aliquots were collected at random: two of the three aliquots, 0.4 g each, were transferred to two 50-ml Falcon screw-capped, sterile tubes. The third aliquot, the amount of which was variable, was immersed in formalin and used to carry out the histomorphometric evaluation. 16 ml of 0.5% rifamycin SV solution was added to one Falcon tube. The drug was diluted according to the manufacturer’s instructions, i.e. 90 mg of active ingredient (rifamycin SV) in 16.20 ml of water for injectable preparations. In the second test bottle, used as a control, 16 ml of sterile physiological solution was added. Microbiological analysis of sample and isolation of bacterial species resistant to treatment with rifamycin SV was done. Genotyping of bacterial species was done by using PCR. The bone chips, fixed in 10% formalin in phosphate buffer 0.2 M (pH 7.3), were embedded in paraffin and coloured with haematoxylin-eosin. Linear measurements of the largest and smallest diameters of each bone chip were taken through an operative system comprising an optical microscope, a video camera, hardware and Image Pro-plus 4.1 software. The results obtained were analysed using the Wilcoxon signed-rank test.

Findings: The quantity of material collected with a bone trap was, on average, 0.93 g (range 0.82-1.45 g). The average bacterial count for the samples in physiological solution was $1.707 \times 10^5$ CFU/ml [(S.D.) $2.281 \times 10^5$]. The samples treated with rifamycin SV had an average microbiological count of $0.0131 \times 10^8$ CFU/ml. This reduction was found to be statistically significant. The collected bone chips presented great variability with regard to their dimensions. For each bone chip observed, the maximum and minimum diameters were recorded. The average dimensions were 1451.649 µm x 460.26 µm.

Conclusion: The piezo-electric surgical device proved to be a valid device for collecting autogenous particulate bone. The stringent protocol followed in this study has proved...
valid for collection of material, and treatment with rifamycin SV was found to reduce bacterial contamination in collected material.

**Purpose:** To evaluate clinically and histologically barrier bio-durability and integrity in sites with cross-linked and non-cross-linked collagen barrier membranes.

**Materials and Methods:** 52 patients (22M and 30F) participated in this study. Inclusion criteria were the following: immediate post-extraction defects implant placement; at least 5 mm of the buccal plate was missing after tooth extraction or implant retrieval; and non-smokers. After extraction or implant removal, defects were thoroughly debrided and the bony walls were slightly decorticated using hand instruments. Defects were augmented using deproteinized bovine bone mineral (Bio-Oss®) and covered with either a CLM (cross-linked collagen membrane, Ossix™) or an NLCM (non-cross-linked collagen membrane, Bio-Gide®). Primary soft tissue closure was achieved by coronally positioning the mucogingival flaps over the membrane with 3-0 silk. At 6 months post-operatively, before osteotomy for implant placement procedure was made, the mucosa over the augmented site was biopsied using a surgical punch (3 mm diameter). A total of 19 CLM and 21 NCLM sites were suitable for punch biopsies.

**Findings:** (1) **Clinical observations**
- During the first 2 weeks, 36.5 % (19/52) perforations were recorded: CLM – 50% (13/26) vs. NCLM – 23.1 % (6/26) (P<0.05)
- Perforation lesions clinically re-epithelialized 2-4 weeks after membrane exposure in all sites.
- Exposed NCLM showed rapid membrane disintegration and were clinically undetectable 1 week after exposure.
- Perforations over CLM showed gradual replacement by soft tissue, lasting from 2 - 4 weeks.

(2) **Histologic observations**
- NCLM specimens revealed no membrane remnants in any of the specimens retrieved from both intact and perforated sites.
- CLM were present in 14 of 18 specimens examined.
- Isolated islands of vital bone and DBBM particles were observed in the deepest part of several specimens from both groups.
- Under intact mucosa, CLM ossification at or within the membrane occasionally occurred.

**Conclusions:** CLM are more resistant to tissue degradation than NCLM.