Augmentation: One important basis in implant treatment

By Dr. Frank Liebau and Dr. Ning Wu

In recent years, new issues have arisen in the field of implant dentistry. The 1980s was the decade of osseointegration; the 1990s, the era of guided bone regeneration. Recently, the focus has mainly been on the improvement of dental esthetics and methods of improving the aesthetic and functional results, the load-carrying capacity and the simplification of surgical techniques. These aspects should not be considered separately from each other, as they overlap.

In 1980, Philip Boyne first described procedures for sinus floor augmentation. Since then more than...
1,000 scientific articles on sinus floor augmentation have been published.

Today, the use of osseointegrated dental implants is an effective and reliable method for long-term treatment of patients with partial and total tooth loss. The success rate and predictability of implant treatment depends on several factors but are generally high. The goal is to make this rehabilitative process accessible to as many patients as possible, even those with poor bone quality and/or low bone mass.

Until now, an insufficient amount of bone and poor bone quality have been unfavorable or even a contra-indication for implant treatment. Because of poor bone quality and often-progressive bone resorption after tooth loss, the posterior maxilla especially is a high-risk area for the placement of dental implant restorations. If atrophic maxillary bone or a large maxillary sinus is present, the implant treatment is more difficult.

A solution in such cases is the use of shorter implants. However, certain clinical conditions must be met so that an unfavorable relationship between the implant and the restoration length (implant–crown ratio) does not lead to biomechanical problems, improper loading or premature implant loss.

In such cases, the implant treatment must be planned carefully and additional surgical procedures before dental prosthetics, such as a bone graft in the maxillary sinus, are often required to compensate for inadequate bone. In this way, optimal conditions for the insertion of implants in the posterior portions of the alveolar process of the maxilla are created.

In the past, dentists and maxillofacial surgeons avoided complex procedures that required access to the maxillary sinus through the oral cavity, provided such were not necessary. As early as 1984, Bränenmark demonstrated with clinical and experimental data that the apical end of an osseointegrated implant can be placed in the maxillary sinus without adversely affecting the health of the sinus area if the Schneiderian membrane remains intact.

Today, it is common knowledge that the long-term success of dental implants depends on the degree of osseointegration. This, in turn, is dependent on the primary stability, on the one hand, which is determined by the density of cortical bone and the bone quality, and on

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Fig. 2: Surgical site after surgical flap preparation shows fully ossified alveolus of tooth #14, six weeks after extraction.

Fig. 3: Pre-preparation of the bone window in region #16 with large Rosecutter to mark the finish line under continuous cooling.

Fig. 4: Extraction of the patient’s own (autologous) bone chips by Safescraper.

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the secondary stability, on the other hand. The latter results from the progressive deposition of bone along the implant surface.

If an implant that is inserted into bone with reduced height and width and that extends from one end into the sinus cavity shows a good primary stability with a sufficient contact to the bone, its anchor remains limited. Thus, osseointegration of the entire implant surface, which is critical to the long-term success, cannot be achieved. If a progressive loss of crestal bone takes place over time, the implant stability is further affected.

Therefore, in the posterolateral maxilla it is often necessary to perform a sinus floor augmentation if there is poor bone quality and insufficient alveolar process height. A sinus floor augmentation and significant pneumatization of the maxillary sinus are indicated in order to be able to use sufficiently long implants to guarantee the anchor in a region of high functional load.

In 1980, Boyne and James wrote their book on the rehabilitation of patients with endosseous implants in combination with sinus floor elevation. Access to the maxillary sinus was by means of the intra-oral antrostomy and the preparation of a “bone window.” This was then carefully advanced into the cavity and drawn. Therefore, a partial detachment of the Schneiderian membrane from the sinus floor was needed.

Subsequently, a bone graft was placed under the membrane and the opening was obturated again. Generally, the bone from the patients themselves was used as the graft. In a second step, several months after the sinus floor elevation, blade implants were successfully implanted. The prosthodontic reconstructions existed in fixed partial dentures, which were placed in the edentulous sections of the posterior maxilla.

Soon after, Tatum et al. worked on this surgical technique intensively, seeking to improve the results by means of modified procedures. Tatum Sun took on a key role in the development of the procedure for sinus floor elevation using an autogenous bone graft from the iliac crest for the preparation of the implant insertion (Tatum 1977, 1986).

Progress in the field of biomaterials and refined techniques and protocols for the rehabilitation of tooth loss by osseointegrated implants have increased the success rate and the predictability of implant treatment.

Xenogeneic grafts

To spare patients an additional removal of autologous bone in other areas of the spine or of the iliac crest, homoharvested materials (xenogeneic grafts) are used increasingly today. Xenogeneic grafts now are mostly deproteinized (inorganic) bovine bone specimens. These grafts are used either alone or are mixed and used as part of a mixed transplant with autologous transplant patients and bone defect of the patient’s blood.

The implant survival rate with the use of xenogeneic grafts is statistically equivalent to the use of particulated autogenous bone grafts. Del Fabbro et al. conducted studies on various bone replacement materials in 2004. Aghaloo and Moy 2007 found a survival rate of 88 percent in pure autologous transplants, 92 percent in mixed grafts with autologous bone, 81 percent in pure alloplastic grafts, 95.3 percent in pure allogeneic grafts and 95.6 percent in pure xenogeneic grafts was found.

These figures are encouraging for dentists and indicate a positive long-term prognosis for implant treatment in the distal maxilla. However, in esthetically challenging zones, an implant insertion without augmentation procedures is almost impossible to achieve, for only connective soft tissue aided by bone or graft material can contribute to esthetically satisfying results.

Placement of grafts and implants

The graft material should be inserted starting from the areas that are the most difficult to reach and contact with the bone walls must be ensured to improve the healing of bone. If the sinus membrane (Schneiderian membrane) is very thin, it should be protected and stabilized with a collagen membrane.

The recesses are first filled anteriorly and posteriorly, and thereafter the area of the medial sinus wall was filled too. The graft should not raise the membrane further and must not be compressed too much, as then vascularization particularly with biomaterial will be hampered. The implants are then successively inserted into the prepared implant cavities. This achieves compaction of the loose cancellous tissue of the maxillary bone after the actual pilot hole with poor bone quality is achieved by means of bone-condensing instruments. This is also a useful and effective way to improve primary stability. After the insertion of the implants from the lateral side, the graft material is placed on the implants, all intermediate space and cavities are filled and the bone window is covered with a small collagen membrane.

The size of the collagen membrane should correspond to the existing bone window. The attachment can take place without the use of pins or absorbable sutures under the mucoperiosteal flap. New studies have shown that there are no differences between the results with the use of collagen membranes and those with membranes made of expanded polytetrafluoroethylene (ePTFE, Gore-Tex; Wallace et al. 2005). Because collagen membranes stick, they can be installed without screws or pins and, because of their absorbability, they do not have to be removed in a later procedure.

Suturing and wound care

For the final wound care, the defect is covered passively with the lobes. For this purpose, releasing incisions

Fig. 5: Careful dissection of the Schneiderian membrane by the use of a diamond bur.

Fig. 6: Illustration of the intact Schneiderian membrane in region #16.

Fig. 7: Carefully solution of the Schneiderian membrane from lateral to caudal.

Fig. 8: Lifting and moving of the Schneiderian membrane.
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Summary

It is generally in the interest of the patient to weigh the benefits of pure autologous grafts or some combination of autologous bone and the incorporation of synthetic bone materials and/or xenogeneic bone substitute materials. The use of foreign material leads to conservation of the patient’s own bone and avoids a second opening at a donor site, which creates an additional wound.

In principle, in treatment planning and advising clinicians must respect the patient’s desire that all surgical procedures proceed as smoothly, efficiently and, ultimately, as successfully as possible. It is through the combination of autologous bone grafts and foreign material, depending on the case and necessary use of membranes, that the long-term success of implant treatments is predictable. Clinicians should always be open to learning new methods, but must do so with the responsibility to their patients in mind.
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**Fig. 13:** After the insertion of the dental implant, loose filling with augmentation of the lateral side takes place.

**Fig. 14:** Coverage of the facial bone defects with residual Bio-Gide membrane.

**Fig. 15:** State after wound closure and preparation of trans-mucosal healing of ITI implants (Straumann Dental Implants).

**Fig. 16:** X-ray after external sinus lift shows no displacement of the augmentation material in the maxillary sinus.

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A major highlight of this year’s meeting is a course being taught by Daniel Alam, MD, on Thursday, Jan. 26, at 2 p.m. Dr. Alam is the current head of the Section of Facial Aesthetic and Reconstructive Surgery in the Head and Neck Institute at the renowned Cleveland Clinic in Ohio. He helped to make history in 2008 by being part of the multidisciplinary team who performed the first American near-total facial transplant.

During Alam’s presentation, “Facial Transplantation Versus Conventional Reconstruction,” he will discuss the groundbreaking operation, including the basic scientific research, ethical considerations and technical challenges of such a procedure.

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New study shows 100 percent success with Straumann Bone Level implants

Survival rates at 36 months, minimal crestal bone resorption

By D. Buser, J. Wittneben, M.M. Bornstein, L. Grutter, V. Chappuis and U.C. Beiser

Early implant placement following the extraction of a single tooth is a procedure used by many clinicians in the maxillary anterior zone, but there is a lack of documentation on the esthetic outcomes. When esthetic results have been reported, mucosal recessions have been observed.

The aim of this study was to prospectively investigate esthetic outcomes of early implant placement in single tooth extraction sockets in the esthetic zone with Straumann Bone Level implants.

Materials and methods

A total of 20 patients requiring single-tooth replacement in the anterior maxilla were entered into the study. After flapless tooth extraction, the socket was allowed to heal for four to eight weeks. Bone level implants were subsequently placed and sealed with healing caps, with simultaneous contour augmentation using locally harvested autogenous bone with anorganic bovine bone mineral and a collagen membrane. Reopening was performed eight to 12 weeks later. Within seven days, provisional crowns were placed, which were gradually enlarged if necessary to optimize soft-tissue contours. Final all-ceramic restorations were placed after six months.

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- Modified plaque index (mPPI)
- Modified sulcus bleeding index (mSBI)
- Probing depth (PD)
- Width of keratinized mucosa (KM)
- Distance from implant shoulder to first bone-to-implant contact (DIB)
- Pink esthetic score (PES)
- White esthetic score (WES)

Standard soft tissue parameters such as mPPI, mSBI, PD and KM were assessed after three, six, 12 and 36 months from baseline. These parameters were assessed with the crown in place. Mean mPPI and mSBI values at 36 months were 0.40 and 0.20 respectively (Table 1). The mean PD value increased from 0.89 mm at the 3-month visit to 4.00 mm at the 36-month visit. However, the change was not statistically significant. A wide KM band was seen at three months, which remained stable at the following points in time (Table 1).

Radiographic evaluation/DIB values

Periapical radiographs were taken from baseline (BL) at every visit. The distance from implant shoulder to the first bone-to-implant contact was assessed (DIB). At baseline the mean DIB was 0.0 mm. It increased showing remodelling patterns from 3 to six and to 12 months with values of 0.09 mm, 0.14 mm and 0.18 mm, respectively. The mean value remained stable at 0.18 mm thereafter until 36 months (Fig. 1).

Frequency analysis of crestal bone showed that 18 patients had a bone loss of 0.5 mm or less after three years.

Esthetic parameters

The maximum for both pink and white esthetic scores is 10, and the threshold for clinical acceptability is 6/10 for each index. Mean PES and WES scores remained stable between 12 and 36 months with values of 8.10 and 8.65, respectively (total score of 16.75), indicating a favorable esthetic outcome (Table 2).

Conclusions

• Strict success and survival criteria were fulfilled resulting in 100 percent success and survival rates at 36 months.
• Minimal crestal bone resorption was demonstrated.
• Stable crestal bone after 12 months was shown.
• Good esthetic and clinical results were seen at 12 and 36 months.

Note: This study originally appeared in Dental Tribune Asia Pacific, Edition No. 7, 2011.
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Mucograft® is indicated for covering of implants placed in immediate or delayed extraction sockets, localized gingival augmentation to increase keratinized tissue (OK) around teeth and implants, alveolar ridge reconstruction for prosthetic treatment, recession defects for root coverage.

For full prescribing information, please visit us online at www.osteochond.com or call 1-800-874-2334

Osteochond 
210 Sutro St, Suite 202, San Francisco, CA 94118
Win a trip to New York City and join us for the Dental Tribune Awards

Dental Tribune is the largest dental newspaper worldwide, published in more than 25 languages with a readership of 650,000-plus dentists, and it is one of the best known brands in the global dental community. In 2011, we will launch the Global Dental Tribune Awards to celebrate excellence in dentistry.

This is a fantastic opportunity for practices and companies to show just how remarkable they are and compete against others in their own areas on friendly terms.

The winners will receive a free economy flight to New York City to join us at the award ceremony, which will be held at the Greater New York Dental Meeting on Nov. 28 in the special events hall.

All Dental Tribune readers worldwide are cordially invited to submit their applications online without registration fees by Oct. 21 for the following award categories: Clinical Research of the Year; Dentistry in a Crisis Zone; Premier New Dentist; Innovation in Dentistry; Dental Marketing Campaign of the Year; Premier Dental Educator; Lifetime Achievement; Implant Practice of the Year; Endodontic Practice of the Year; Pediatric Practice of the Year; Best Office Design; Outstanding Individual of the Year; and Outstanding Dental Website.

Simply choose the categories you wish to enter and produce an entry to impress. Please submit one PDF document online, consisting of 500-1,000 words as well as up to six images in JPG format with captions. Explain why your practice or the individual/team deserves to win. You can nominate yourself, a team or an individual.

The final deadline for all entries is Oct. 21.

Applications will be judged by a jury of renowned opinion leaders from all parts of the world, including Dr. Robert Edwab, executive director of the Greater New York Dental Meeting; Dr. Lorin Berland, fellow of AACD; Dr. Denis Forest, directeur des Journées dentaires internationales du Québec, Canada; Dr. Sergio Cacciacane, director Escuela Superior de Implantologia, Argentina; Dr. Adolfo Rodriguez, president Dominican Dental Association, Dominican Republic; Dr. Stefan Holst, clinical associate professor at the Friedrich-Alexander-University, Germany; Prof. Dr. Norbert Gutknecht, president of the World Federation of Laser Dentistry, Germany; Dr. Sushil Koirala, president of the South Asian Academy of Aesthetic Dentistry (SAAAD), Nepal; and Dr. So-Ran Kwon, president of the Korean Bleaching Society, Korea.

There is no registration fee. Submit your application online at www.dental-tribune.com/awards.

Good luck!
DoWell aims to raise the bar

DoWell established its business in 2006 with a desire to raise the bar in the United States agency space including worldwide, according to the company. DoWell’s motivation is always to maintain the highest standards.

Driven to excellence, the company’s expectation is to satisfy its customers with the highest quality of service. DoWell Dental Products uses only genuine manufacturer parts, and the company says it is focused on attention to detail and hopes its product speaks for itself.

The company’s products vary from your basic equipment to dentistry’s most popular tools.

Top-notch equipment experience does not stop with a purchase, DoWell says. Additionally, the company offers factory-direct prices.

As a DoWell Dental Products customer, you have access to factory state of the line materials and professionals to illustrate the equipment. Every equipment purchase from DoWell Dental Products is the best products you will obtain from today’s market, the company says.

Building customer relationships is the main essence of DoWell’s success, the company states. At DoWell Dental Products, part of delivering smile after smile is having friendly, knowledgeable representatives to help you with any question.

For more information, see www.dowelldentalproducts.com.

At the AAP

To hear more, stop by the DoWell booth, No. 252, at the AAP Annual Meeting.

‘Top-notch equipment experience does not stop with a purchase.’

Got Torque?
Adapting with nature

OsseoSpeed™ TX Profile – anatomically designed implants for sloped ridges

Imagine being able to achieve 360° bone preservation around the implant, also in cases with sloped ridges. Now you can.

With OsseoSpeed™ TX Profile – a uniquely shaped, patented implant, specifically designed for sloped ridge situations - you no longer have to choose between buccal and lingual marginal bone preservation and esthetics, you can have it all – 360° around the implant.

As with all Astra Tech implants, OsseoSpeed™ TX.Profile is based on the documented key features and benefits of the Astra Tech BioManagement Complex™. Used in combination with patient-specific Atlanticz™ Abutments, you and your patients can look forward to long-term function and esthetics.

For more information, please visit www.astratechdental.com

To learn more, visit us at booth #517 at the American Academy of Periodontology Annual Meeting.
Osteogenics launches Vitala, a natural porcine-derived collagen membrane

_Vitala™_, the latest GTR barrier membrane product from Osteogenics Biomedical, is now available in the United States.

Vitala, a porcine-derived collagen membrane, features the advanced handling characteristics of a soft, supple, flexible and adaptable membrane with superior tensile strength.

Vitala is a natural porcine collagen membrane manufactured using a proprietary decellularization protocol designed to maintain the natural, microporous, three-layered architecture of the tissue.

Vitala is biologically cross-linked, eliminating the need for cross-linking chemicals and agents.

Vitala is now available for purchase and is offered in four sizes to tailor to a variety of defects. In addition to Vitala, Osteogenics offers a complete line of dental bone-grafting products.

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For more information on Vitala, visit [www.osteogenics.com](http://www.osteogenics.com), or contact customer service at (888) 796-1923.

**About Osteogenics Biomedical**

Headquartered in Lubbock, Texas, Osteogenics Biomedical is a leader in the development of innovative dental bone-grafting products. Osteogenics offers a complete line of bone-grafting products including enCore™ Combination and Mineralized Allografts, Cytoplast® barrier membranes, Vitala collagen membranes and the Pro-fix™ Precision Fixation System.
Vitala™ – the latest development in GTR membranes – is a natural, porcine-derived collagen membrane. It features the advanced handling characteristics of a soft, supple, exceptionally flexible and adaptable membrane with superior tensile strength.

Vitala™ is biologically cross-linked, eliminating the need for cross-linking chemicals and agents.

Natural, Adaptable & Durable

Learn more at Booth 839 at the AAP

osteogenics.com/vitala | 888.796.1923
Zimmer CurV: redefining ridge augmentation

Zimmer Dental, a leading provider of dental oral rehabilitation products and a subsidiary of Zimmer Holdings, is pleased to announce the availability of the Zimmer CurV™ pre-shaped collagen membrane — stemming from an exclusive distribution agreement with Osseous Technologies of America (OTA).

Developed to provide focused bone augmentation, allowing for vertical bone growth, the biocompatible membrane is intended to create an oral environment more suitable for implant placement.

Composed of type 1 collagen derived from bovine Achilles tendon, the Zimmer CurV membrane is a unique and convenient solution for retaining grafting material during the bone remodeling process.

Pre-shaped for custom molding to the posterior or anterior defect site, the collagen membrane can effectively house Puros® Particulate Allograft or other grafting material with minimal migration (when affixed with tacks or screws).

Unlike traditional, more cumbersome methods, the Zimmer CurV membrane does not require additional structural support such as tenting screws or titanium mesh to hold its form once it is placed in a patient; and because it is made from resorbable collagen, removal is unnecessary.

For decades, Zimmer Dental has gained the trust of thousands of clinicians worldwide who count on its comprehensive line of products to deliver successful patient outcomes and the best value in the industry.

This latest agreement with OTA further reinforces Zimmer Dental’s industry-leading family of regenerative products.

Contact a Zimmer Dental sales consultant or customer service at (800) 854-7019, (760) 929-4300 (for outside the United States), or visit www.zimmerdental.com for more information.

Zimmer CurV pre-shaped collagen membrane. (Photo/Provided by Zimmer Dental)

MIS Implants promotes Noel Wilford

MIS Implants Technologies, a leader in dental research and manufacturing, recently promoted Noel Wilford, RDH, to director of its oral health division.

In this newly created position, Wilford will be responsible for the success of PeriZone™, MIS Implants’ first non-implant brand, focused on providing dental professionals with effective non-invasive oral care products. PeriZone’s first product is the PerioPatch®, which promotes natural healing and provides relief from the signs and symptoms of inflammation by forming a protective seal over inflamed gingiva and oral mucosa and absorbing wound exudates and blocking additional irritants.

Wilford has extensive experience in the dental industry. Following her graduation from the Forsyth School of Dental Hygiene and the University of Connecticut, she spent time as a hygienist in a periodontal practice. She moved into the corporate side of the business when she became a sales representative and regional trainer for CollaGenex Pharmaceuticals. She joined MIS Implants in 2007, where she worked in both human resources and product-specific training.

About MIS Implants Technologies

MIS Implants Technologies is a global leader in dental manufacturing, with a client base in almost 70 countries around the world. The company is known for its cutting-edge research and innovative products, mainly in dental implant products and technology. For more information, visit www.PeriZoneOnline.com.
Innovative Bonding Graft Material & Fully Synthetic Bone Substitute

The MIS Bone augmentation materials include a line of fully synthetic bone grafts. BONDBONE® is a resorbable, osteoconductive bone grafting material, taking the best qualities of hemihydrate and dihydrate calcium sulfate and combining them into a unique product. It can be used on its own, or mixed with other granular bone grafting materials to form a composite that will help to prevent migration of particles and often eliminate the need for a separate barrier. 4BONE SBS is a fully synthetic bone graft composed of HA (60%) and βTCP (40%). Permeable interconnected micro and macro porosity promotes invasion of osteogenic cells by osteoconduction, which permits the diffusion of biological fluids, leading to fast formation of bone.
DID YOU KNOW?
Straumann is the #1 dental implant system worldwide