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implants

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Vertical bone augmentation procedures—Part I

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[1] Jung R. E. et al., JCP 2013
[2] Geistlich Mucograft® Seal Advisory Board Report, 2013. Data on file, Geistlich Pharma AG, Wolhusen, Switzerland
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Prof. Dr Heiner Weber

Dear colleagues,

_As recently selected President of the DGZI, it is important to me to welcome you all and to gain your trust and assistance in this journey ahead of us. From my previous honorary executive positions, I am convinced that the executive board of a society has to establish a close contact with its members and, moreover, that this contact has to be re-established continuously.

While some dental societies do not admit non-academic members but nevertheless representing major important professions contributing essentially to our common goal of optimal patient care, I will definitely and consequently continue and enhance the idea of DGZI (German Association of Dental Implantology) of implantology as a team approach including dental technicians and dental hygienists.

Our new era of knowledge transfer which has been introduced recently by the DGZI via e-learning is an advancement from which both international and local residents can benefit. Likewise, the establishment of forums and podiums for scientific discussions by gathering speakers and participants from all over the world must be further promoted by the DGZI.

In addition, I would like to contribute my personal scientific and practical experience in this special disciplines as well as my international contacts to ensure the DGZI's future success. This encompasses possible congress topics, potential speakers as well as the expansion of international network, building especially on my close contacts to China and the Russian speaking countries. Based on the fact that a prosperous, successful future of any kind of human society is founded on well educated, trained young generations, the DGZI must invest in dental students and other related professional apprentices.

Not only in our clinical professional science, but also in industry, sports etc. it is a well-known fact that only a team can achieve highest levels of success and recognition. Team leaders do need team players, thus, I am happy to be in the "orchestra" of DGZI. The board as well as its members provide all the support being needed and possible for promoting our special discipline of implantology—and, thus, continuously strive for our patient`s sake.

With this in mind, I would like to ask all of you to contribute to our aims and endeavours. Thanking you in advance for your support, I remain with best regards,

Prof. Dr Heiner Weber
(Medical Director University of Tuebingen , President of the DGZI, Guest Professor of Bejing University, School of Stomatology/China, and Kyung Hee University, Seoul/Korea)


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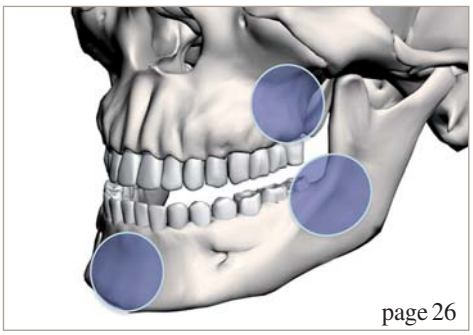
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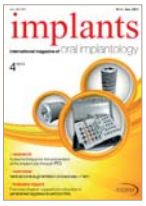

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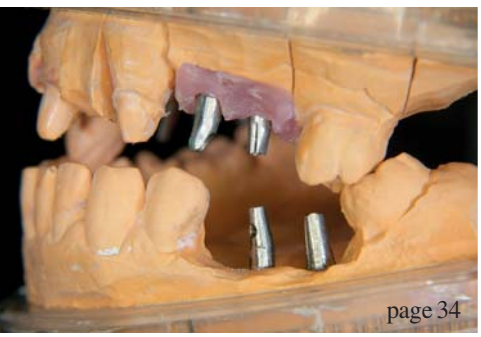
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Retromolar bone grafts prior to implant placement

Outcomes and complications—Part II

Authors_Andreas Sakkas, Carsten Winter, Frank Wilde & Alexander Schramm, Germany

_Introduction

The dental rehabilitation of partially or totally edentulous patients with oral implants has become common practice with reliable long-term results.[1] However, unfavourable local conditions of the alveolar ridge due to atrophy, periodontal disease, trauma sequel, malformation or neoplasia may cause insufficient bone volume, which may complicate the therapy of the masticatory function with dental implants.[2] When alveolar ridges lack the appropriate bone volume, additional surgical reconstructive procedures are required. This article concludes Part I (implants 3/2013) with results, an extensive discussion and the conclusion.

_Results

One hundred and four retromolar bone graft procedures were performed in 86 patients, 77 men and nine women, with a mean age of 37.9 (range 20.2–58.4 ±10.78 years). Of the 86 patients receiving grafts, 29 were smokers (Fig. 1). Seven patients were pre-diagnosed with general-advanced periodontitis, which was successfully treated before bone grafting and one patient with diabetes mellitus Type II.

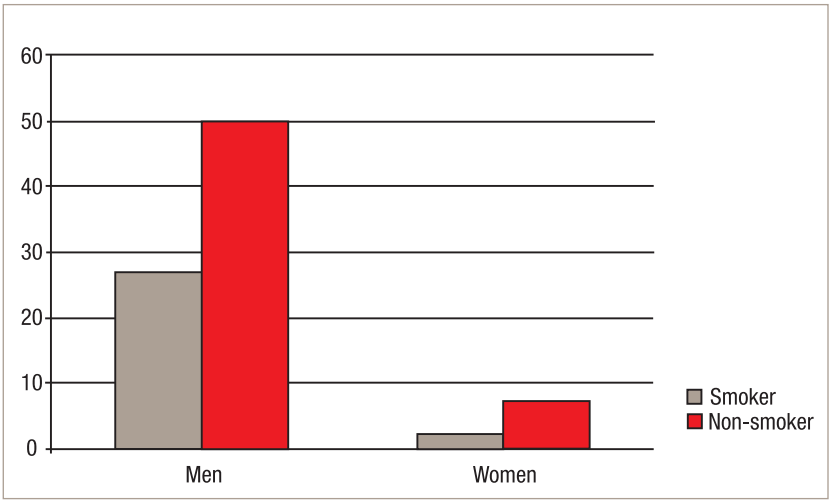


Fig. 1_Separation of the patients in men and women, according smoking habit.

Twenty-two procedures involved the maxilla and 82 the mandible. Also, fifteen patients were treated multiply in different alveolar sites. Regarding the alveolar crest situation, 32 cases were recorded as free-end situation, 27 as multiple teeth gap and 39 as single teeth gap. These as well as the intraoral area separation are presented in Table 4. In ten patients, two bone blocks were harvested in one single augmentation position.

Of the 104 onlay bone grafts, 81 (77.8%) were defined absolutely successful and 23 (22.2%) had minor adverse effects, such as incision-line dehiscence, swelling or wound infection with pus exit, or temporary paraesthesia. Only eight grafts (7.6%) in seven patients were defined as failures (i.e. graft exposure and screw mobilization). Of all the areas with complications, 15 were defined in the donor site, 23 in the recipient area and in four patients experienced complications in both donor and recipient site.

Regarding postoperative swelling following the bone grafting procedure, most of the patients suffered a minimal facial deformity lasting not longer than three days. Swelling was otherwise an expected complication after surgery. At two weeks after the operation, none of the 86 patients reported persistent pain. There was no significant association between periodontitis and complications ($p = 0.43$) (Fig. 2). There was also no relation between complications or failure rates of the recipient site and jaw areas ($p = 0.21$) (Fig. 3).

No major complications were observed regard to donor sites. One patient developed a wound infection with exit pus, and two patients developed an abscess, which had to be opened surgically in local anaesthesia.

No incision-line dehiscence occurred in the donor site areas. Eleven patients mentioned sensory deficits in the lower lip and mental foramen area and three of them experienced altered sensation in the mental and lower lip area as well as in the tongue. None of the patients experienced altered sensation localised in the region of the buccal nerve terminal branch. The incidence of temporary mental nerve paraesthesia was 10.5% (11/104). At the time of implant insertion, there were no reports of symptoms other than the persistence of altered sensation in two patients who had reported pareasthesia during suture removal. One of the patients experienced postoperative bleeding and was treated with local haemostasis (Tab. 5). A relation between smoking or medical history and complications of the donor site is not possible, because these incidents are usually caused iatrogenically.

In the ten patients who underwent impacted third molar tooth extractions combined with bone harvesting, a temporary paraesthesia or wound infection were observed in six of them. In the recipient sites, the frequency of complications was higher than in donor sites. Except the minor complications such as wound infection with pus exit or incision-line opening, graft exposure and screw mobilization as well as combinations of them (Tab. 6). In Figure 4, some complications in recipient sites are presented.

Seven (31.8%) of them were observed in smokers and 15 (68.2%) in nonsmokers in a total of 22 bone grafts. The temporary paresthesia on the percipient site observed by one patient was not taken in consideration. Figure 6 presents the separation of the postoperative complications both of the donor and recipient site according to smoking. Statistic significance between smoking and complications was to be considered ($p = 0.009$). In one diabetic patient, loss of bone particles after infection was observed and no implantation was realizable. Wound infection and graft exposure were also observed in two patients with preoperatively diagnosed general-advanced periodontitis. However, no association was found in this study between retromolar bone grafting complications and medical history, because of the low number of patients.

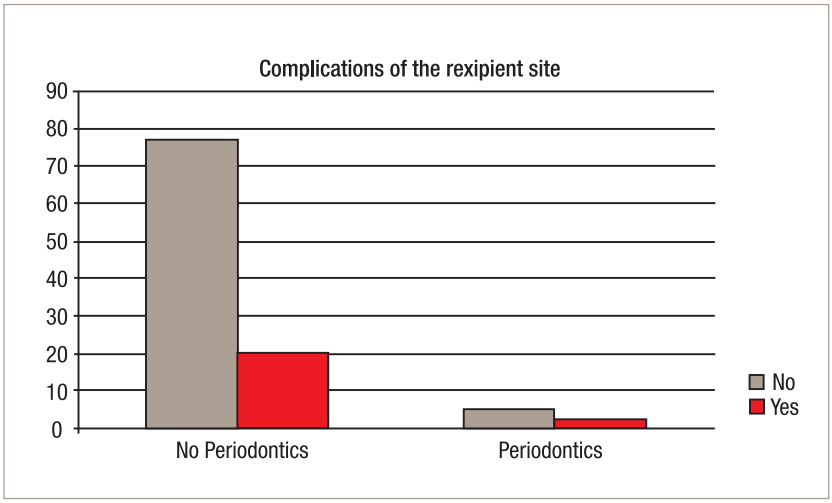


Fig. 2_Association between periodontitis and complications of the recipient site.

A great value was given to the management of the postoperative complications. Minor effects were treated conservatively with mouth rinse included chlorhexamid and antibiotics either orally or intravenously. Patients with abscess had to be treated surgically and were also covered with antibiotics. By graft exposure, the bone sequesters were removed and the bone block was refreshed, while the wound was closed with a buccal fat pad under antibiotic cover. By patients with screw mobilization, healing was uneventful after the removal of the screw. In eight (7.6%) of the cases, the bone graft was totally exposed combined with wound infection and exit of pus. The surgical removal of the graft was

Table 1_Complications associated with retromolar bone grafts.

Complications	Etiology	Prevention	Management
Infection, membrane contamination	Microbial contamination	Antibiotics and aseptic surgical procedure	Remove infection source, systemic antibiotics and antimicrobial mouth rinse
Incision line opening, membrane exposure, wound dehiscense, perforation of mucosa	Tension-free closure not achieved	Achieve tension-free primary closure	systemic antibiotics and antiseptic mouth rinse
Nerve dysfunction	Damage to infra-alveolar nerve		Know the anatomy, wait and sometimes palliative treatment may be needed
Graft mobilization	Inadequate fixation (insufficient screws, screw loosening)	Secure fixation screws, use >1 screw, ensure no-mobility and no dead space principle	Remove and regraft at later time
Loss of bone graft particles	Primary closure not achieved	Achieve tension-free primary closure, use of membrane	Do nothing and allow for proper healing

Autors	No. of patients	Reported complications
Girdler & Hosseini 1992	12	Temporary lingual paraesthesia
Raghoebar et al. 1996	7	none
Von Arx et al.1996	4	none
Misch 1997	19	Incision dehiscence
Schlegel et al. 1998	5	none
Von Arx et al. 1998	13	Hypoaesthesia n. V3, massive postop. bleeding
Cordaro et al. 2002	15	Bone resorption
Clavero 2003	24	Hypoaesthesia n. V3
Schwartz-Arad 2005	10	Graft exposure, Hypoaesthesia n. V3
Schwartz-Arad 2005	18	Incision dehiscence, Graft exposure, Hypoaesthesia n. V3

Table 2_Review of the literature on harvesting of retromolar bone grafts.

then inevitable. The wound healing was subsequently uneventful, but there was not enough bone for insertion of implants. A second augmentation procedure was then performed in only two cases. The patients with temporary paraesthesia by the suture removal always had control appointments until the healing of their nerve dysfunction (Tab. 7).

Bone resorption was easily visible on removing the osteosynthesis screws since the heads of the screws were always 1 to 2 mm above the grafted bone. On re-opening, the shape of the grafted block was rarely visible in most of the cases. Of the 104 bone reconstructions, 19 (18.2 %) required simultaneous augmentation at the time of dental implant placement.

The average healing period after bone harvesting was 125.8 days or 4.49 months, ranged from 91–276±66.23 days. 155 dental implants were placed, 39 in the maxilla and 116 in the mandible. All these implants were placed using the CoDiagnostiX® (IVS Solutions AG) program for guided surgery. All the implants were integrated at the abutment connection. To date (mean of six months after prosthetic loading) all the implants were successful, according to the Albrektsson criteria.[62] In eight of the cases (7.6 %), implant installation was not possible due to insufficient bone after augmentation procedures. Despite the complications, a significantly higher loss of bone grafts was not found. After the prosthetic rehabilitation, the oral function was completely re-established in all patients.

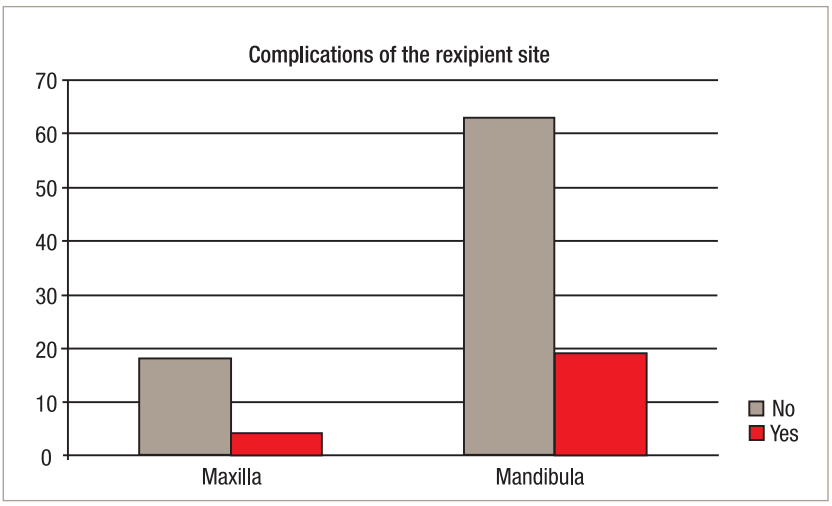


Fig. 3_Association between jaw and complications of the recipient site.

_Discussion

The use of endosseous implants may be limited by insufficient quality and quantity of available bone. Several grafting procedures have been described to create sufficient volume of bone for implant placement.[33] Autogenous grafts still remain the "gold standard" in reconstructive surgeries due to their osteoinductive, osteoconductive, and osteogenic potential, essential for bone morphogenesis.[34-35] Serra e Silva et al. conclude that autogenous bone grafts are the best option compared with allografts and xenografts due to its properties and constitute a viable form of treatment for patients with alveolar bone loss.[36] The placement of implants into healed bone grafts as a secondary procedure is similar to their use in jaws that have not been grafted.[37]

Several studies have reported on harvesting of grafts from the retromolar region.[13, 20, 22, 24, 26, 28] However, the number of complications is discordant when the different trials are compared. This seems to be because none of the studies is prospective and based on objective tests for the function of inferior alveolar and lingual nerves. Advantages of retromolar bone grafts are the use of local anaesthesia instead of general ansesthesia, no need to stay in hospital postoperatively, less morbidity at the donor sites, and lower costs.[38, 39] A disadvantage is the small volumes of bone offered.

Performing ridge augmentation and implant placement as two-stage surgery is still said to be more successful than the single-stage procedure.[31, 40] A healing period for mandibular grafts of four months has been recommended.[5, 13, 31] There is experimental evidence that grafts from membranous bone show less resorption than endochondral bone due to early revascularization, better potential for incorporation in the maxillofacial region because of a biochemical similarity in the protocollagen, and the inductive capacity is greater because of a higher concentration of bone morphogenetic proteins and growth factors. The early revascularization seems to explain the good maintenance of volume of the retromolar graft.[41] However, a major disadvantage of retromolar grafts remains. Only a confined amount of bone can be harvested from this donor

site. It has been described that the volume is half of what can be achieved from the mandibular symphysis.[13] The dense structure of cortical portion of the grafts offers the benefit of improved implant stability during placement and healing and may even improve interfacial stress transmission on implant loading.[5, 30, 42]

The aim of this study was to report clinical results of alveolar ridge augmentation in partially edentulous patients prior to implant placement, using bone blocks from the retromolar region and firmly secured to the recipient site with osteosynthesis screws with the use of barrier membranes. The clinical indication for the procedure was the lack of sufficient alveolar bone, a situation that could interfere with the correct placement of implants of the desired length.

In this retrospective study, the data reported were readily collected from the authors after the postoperative phase. The sample studied was small and the augmented sites differed in location and type of defect. In the absence of a control group, the statistical significance of the means calculated was not tested. A new surgical devise with piezoelectric ultrasonic generator (Mectron, Deutschland Vertriebs GmbH) recently developed, offers an alternative way of safely removing hard tissue without damaging soft tissue and is a useful tool of harvesting procedures from the ramus.

Barrier membranes have been used to achieve alveolar ridge augmentation in implant surgery in a staged approach, or at the same time as implant placement.[6, 10, 43] The use of barrier membranes in combination with particulate grafts and implants to augment the alveolar ridge and obtain ideal positioning of implants is reported to be an effective procedure in both humans and experimental animals.[6, 31, 44] The use of barrier membranes over particulate bone grafts seems to reduce the tendency for bone graft to be reabsorbed during the healing phase. It must be pointed out that the tendency of bone grafts to resorb during the healing phase also occurs if the graft is protected by a membrane and no complications arise.[6] However, the use of barrier membranes generally may be followed by soft tissue dehiscence, membrane exposure and plaque colonization and, in very few cases, by the need to remove the barrier. This complication jeopardizes the whole procedure.[45-46] According to Buser et al (1996), if a staged approach is used, complications involving membrane exposure, suture dehiscence and loss of the graft are minimal.[6]

Fixation of an onlay graft to the recipient site can influence the revascularization of a graft.[47] A loose graft may become nonunioned and encapsulated. Fixation screws for the onlay graft should be tightened to ensure close adaption. Infection is usually a consequence of poor aseptic control of the surgical field. Rinsing with chlorhexidine before surgery is a preventive measure to reduce the risk of infection. Tension-free flap closure is essential so exposure of the membrane or fixation screws can be prevented.[48]

Etiology	N
Caries/Periodontitis	97
Trauma	3
Hypodonty	4
Total	104

Table 3_Etiology of tooth lost.

Alveolar ridge Situation/ jaw	Maxilla	Mandibula	Summary
Free-end situation	7	30	37
Multiple teeth gap	12	16	28
Single tooth gap	3	36	39
Summary	22	82	104

Table 4_Distribution of alveolar ridge situation and jaw separation prior to implant placement.

Type of complication	N
Wound infection with pus	1
Swelling/abscess	2
Hypoesthesia N. mental	11
Hypoesthesia N. mental and lingual	3
Postoperative bleeding	1
Total	18

Table 5_Type and number of post-surgical complications in donor sites.

The limits of the retromolar area are dictated by clinical access, as well as the coronoid process, molar teeth, and inferior alveolar canal. A rectangular piece of bone up to 4 mm in thickness may be harvested from the ramus. This morphology conforms especially well as a venner graft to gain additional ridge width.[49]

A vestibular incision that extends well beyond the mucogingival junction creates easier access but produces more soft tissue bleeding and intraoral scar formation. Haemostatic materials are placed into areas of osseous bleeding, and postoperative pressure dressings reduce the development of haematoma formation, incision line dehiscence and infection. The use of glucocorticoids is helpful in reducing postoperative oedema.[50-52] The ramus graft patients appeared to have fewer difficulties in managing postoperative oedema and pain.

Pain is also reduced in the first day after surgery. No adverse effects for single dose or a negative effect on

Table 6_Type and number of postsurgical complications in recipient sites.

Type of complication	N
Incision line opening	4
Swelling/wound infection with pus	6
Swelling/abscess	4
Graft exposure	1
Wound infection with pus und graft exposure	5
Graft exposure und screw mobilization	2
Hypoesthesia N. infraorbital	1
Total	23

wound healing have been reported. Since our patients were sent home a day after the end of the bone grafting procedure, our aim was to reduce swelling as much as possible. Intraoral or intravenous antibiotic therapy postoperative was not given. There is no evidence that prolonging antibiotic therapy after the first day gives additional protection if antibiotic prophylaxis is correctly prescribed.[47] Besides these considerations, many surgeons when using bone grafts or membranes describe the use of intraoral antibiotics for a period varying from three to ten days postoperatively.[6, 53]

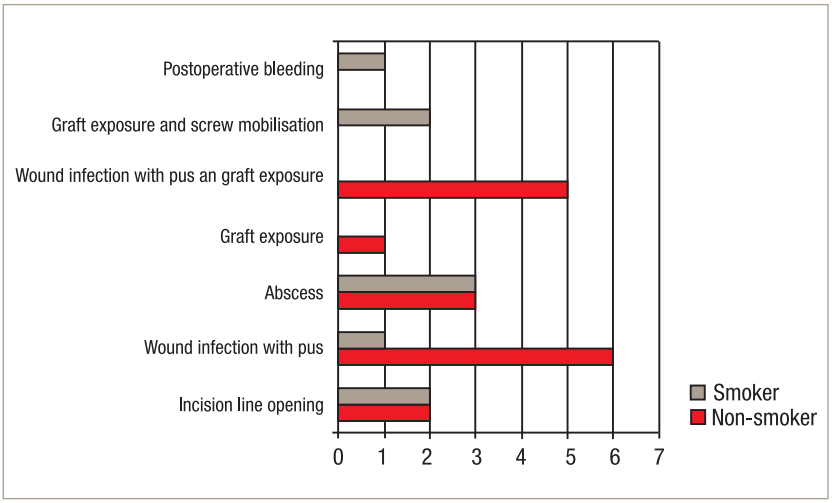
The potential for damage to the inferior alveolar nerve, as opposed to its peripheral mental branches, is of greater concern with the ramus graft technique. To prevent nerve injury, harvest of bone from this area requires knowledge of the mandibular canal anatomy. Although the position of the canal is variable, anatomic averages are helpful in surgical planning. The mean anteroposterior width of the ramus is 30.5 mm, with the mandibular foramen located about two thirds of the distance from the anterior border.[54, 55]

The mean vertical distance between the superior edge of the canal and the cortical surface along the external oblique ridge is approximately 7 mm in the second molar region, 11 mm in the third molar region, and 14 mm at the base of the coronoid process.[55] Although the buccolingual position of the mandibular canal is variable, the distance from the canal to the medial aspect of the buccal cortical plate (medullary bone thickness) was found to be greatest at the distal half of the first molar (mean = 4.05 mm).[55] Therefore, when larger grafts are planned, the anterior vertical bone cut should be made in this area.[56] Damage to the neurovascular bundle could also occur during sectioning of the graft. Care must be taken to parallel the lateral surface of the ramus when using the thin chisel along the external oblique osteotomy. If the inferior ramus cut is below the level of the inferior alveolar canal, graft separation should not be completed until it can be ascertained that the neurovascular bundle is not entrapped in the graft. Sometimes, the exposure of the inferior alveolar nerve is accompanied by massive bleeding, because of injury to the inferior alveolar artery.[22]

Patients were less able to discern neurosensory disturbances in the posterior buccal soft tissues than in the lower lip. Although the incision along the external oblique ridge could possibly damage the buccal nerve, reports of postoperative sensory loss in the buccal mucosa are rare, and most go unnoticed by the patient.[57] No specific treatment was required, and all patients recovered completely.

It is noteworthy that the failure rate was, in reality, lower because graft exposure was considered as failures, even though part of the graft remained intact in most of these cases. Leaving part of the exposed graft in place usually was adequate to allow sufficient bone for implantation.

Fig. 4_Incidence of complications noticed in donor and recipient sites according to smoking.



Generally, patients who suffer from diabetes show significantly higher failure rates and have more postoperative complications. Since diabetes increases the risk of infection and delays wound healing, it is possible that this kind of ridge augmentation is not suitable for these patients. A significant failure of diabetics in this study was, because of lack of fails, not presentable. However, more research should be conducted to determine how to perform a harvesting procedure in diabetic patients without the risk of graft failure.[58] Smokers demonstrate a high failure rate and more postoperative complications.[59] Smoking was found to impair the revascularization of the bone in regenerative procedures such as bone grafting, mainly due to its effect on vasoconstriction of the artery.[59] The altered oral flora from smoking increased the infection rate by two to three times in smok-

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Wound-freshening and plastic recovering	4
Bone graft removing	6
Abscess-incision and antibiotic i.v.	3
Re-bone harvesting	2
Abscess-incision, wound-freshening and antibiotic i.v.	1
Haemostasis	1
Total	26

Table 7_Management and surgical treatment of the postoperative complications after retromolar bone grafting.

ers, which adversely influenced the complications of bone grafting procedures.[60] Patients with history of smoking have a higher failure rate of implants, regardless of the amount of cigarette consumed.[61] Association between retromolar bone grafting complications and smoking habits was also found in this study. Dentists, oral surgeons and treating physicians should urge their patients to quit smoking since it reduces the success rate of ridge augmentation. Higher implant failure rates have been reported when implants are placed into grafted sites.[22] However, in this study, despite the number of complications, rehabilitation with oral implants was not possible in only 7.6 % of all bone grafting procedures. Aghaloo and Moy have already indicated similar success rates between implants placed into grafted sited compared with implants placed into native bone.[38]

Small amounts of particulate bone grafts may be collected from the implant area during implant site preparation, and the resulting bone chips can then be used to fill small defects. The main disadvantage of this technique is the contamination with oral bacteria. In accordance with Chiapasco, only bone blocks maintain the architecture of bone and appear to adapt easily to the recipient area, whereas particulate bone grafts were associated with bone blocks in case of simultaneous grafting procedures or as a filling material around or between bone blocks.[2] Reports on simultaneous bone grafting and implant placement have revealed complications such as graft fracture and wound dehiscence with exposure of implants and graft, with a higher implant failure rate than that of a staged approach.[15, 27, 29, 42]

A staged surgery permits implant placement for ideal prosthetic alignment without the concern of graft fixation or remodelling.[56] Staged implant placement also allows for any initial graft resorption and thus should provide a more stable foundation. None of the complications influenced the success of rehabilitation significantly. Despite the need for two surgical procedures, the patients were compliant with the entire treatment. Not only was the planning a key factor of every successful case, it was also essential to learn exactly what the patient expected from the surgery and to design the surgical procedure to achieve that goal.

_Conclusion

The clinical data presented in this study showed that onlay block grafts harvested from the retromolar region are a safe, effective and simple method of treating localized alveolar ridge hypoplasia in partially edentulous patients for implant placement. It must be considered that the postoperative phase of stage-one surgery is comparable to the discomfort felt following major dentoalveolar surgery and that the procedure can easily be carried out in an outpatient environment. The risks and morbidity of retromolar bone grafting can be associated with some complications, which do not significantly compromise rehabilitation when appropriate treatment is established.

This retrospective study of bone grafting surgeries can serve as a guide in the prevention of possible failures and consequently improve the quality of future procedures. More studies to determine which donor sites provide sufficient bone with the least patient discomfort and risk of complications are needed. Additional studies are needed to evaluate the long-term results of the described method with regard to implant stability and resorption of bone around the implants._

Disclosure
The authors do not have any financial interests, either directly or indirectly, in the products listed in the study.

Editorial note: A list of references is available from the publisher.

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A new technique for the preparation of the implant site

Through Piezoelectric Surgery (PES)

Authors_Prof. Mauro Labanca, Prof. Lugi F. Rodella & Prof. Paolo Brunamonti Binello, Italy

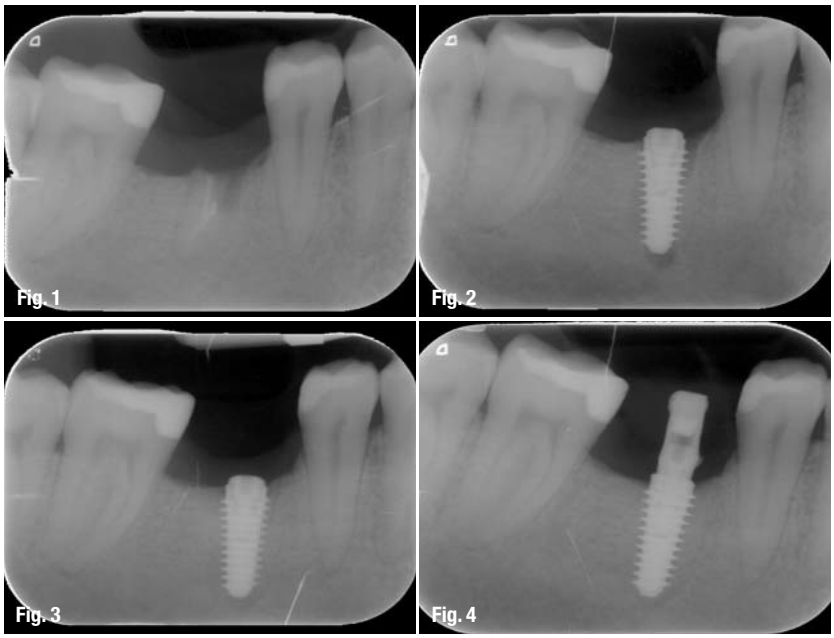

Fig. 1_PA Rx with a residual root in a alveolar process (4.5 position).
Fig. 2_PA Rx after insertion with the described combined technique. We can see the periapical defect after the extraction.
Fig. 3_Three months after, good healing of the periapical defect.
Fig. 4_After three months of loading, good osseointegration with no residual bone defect and perfect maintenance of the bone profile around the implant neck.

_Introduction

Piezosurgery (PES) is a surgical technique born in the 90s; because of its versatility and effectiveness, it immediately spread from the oral surgery field to many other specialised surgical branches, such as, for example, maxillofacial surgery, orthopaedics and neurosurgery.[1]

This method exploits the well-established physical principle of cavitation according to which the ultrasonic microvibrations with modulate amplitude ranging between 60 and 200 microns are able to perform incisions even on markedly mineralised tissues, such as bone tissue, tooth enamel and dentin.[2]

These incisions are characterised by the following features:
– Ease of execution
– Reproducibility
– Standardisable procedure
– High accuracy (linear and conservative incisions)
– Minimal to no trauma to the surrounding soft tissues compared with traditional techniques
– Drastic reduction in harmful complications suffered by the sensitive anatomical structures of the orofacial region (Schneiderian membrane, inferior alveolar nerve, arteries, etc.), in the event of direct accidental contact.

For the above-mentioned reasons, PES has deservedly gained immediate success even in implantology.

Considering the current state of the art, in fact, many rehabilitation protocols involve the use of PES not only in more advanced and complex medical conditions (split-crest, sinus floor lift, etc.)[3-10], but also in less complex cases, like the normal preparation of individual implant sites.[6, 11,12] In fact, even in not-advanced implantology, that does not involve the simultaneous regeneration of the residual alveolar process for the insertion of the fixture, there are clinical conditions that pose real difficulties, at least during the early stages of preparation of the surgical site.

Here are some examples of such situations:
– Positioning of immediate post-extraction implants at the level of the anterior region.
– Positioning of immediate post-extraction implants at the level of inter-radicular bifurcation.
– Positioning of implants at the level of the edentulous alveolar process with morphological irregularities at the crest level or with very low residual profile.
– Positioning of implants at the level of the edentulous alveolar process with the presence of buccal-lingual undercuts (or buccal-palatal if the upper jaw is concerned, Figs. 1–4).

For the experienced operator, such circumstances do not pose particular problems, but they still encumber

the initial preparation of the implant site, using only the pilot dental drills available in all implant-prosthetic systems on the market (Figs. 13–14). This is due to the fact that the rotation of the bur, and therefore its macro-movement, makes its stabilisation exactly where desired by the operator in the initial phase extremely difficult, also in case a lance-tip bur is used. In this sense, the use of the PES is an important improvement for the clinician, as it is a safe and reliable method with clear benefits from both an intraoperative (technology-related) and biological point of view (see Labanca et al 2008 for review, Figs. 5–10).

The main technical-executive advantages for the operator can be summarised as follows:
– It allows for more stable positioning of the guide insert on the crestal profile for the creation of the first implant hole.
– It allows the definition of a more correct implant axis, favouring the success of the implant-prosthetic rehabilitation.
– It allows for possible intra-operative corrections of the implant axis above mentioned.
– It makes the crestal cortical osteotomy procedure safer, since the piezoelectric ergonomic handpiece is not subject to tilt and therefore does not pose those "shaking" phenomena, specific to each rotating system initial working phases.
– It makes the initial osteotomy less traumatic, fully exploiting the cavitation process with constant irrigation.
– It reduces the emotional impact on the patient, who does not feel the annoying vibrations caused by the dental drill.

The biological advantages are in any case technical-related and consist of (Figs. 20–23):
– Reduction of thermal stress on bone tissue;
– better bone vitality;
– greater respect of the osteoblastic turnover and better bone response after resection;
– preservation of soft tissue and of any noble anatomical structures (inferior alveolar nerve, Schneiderian membrane, etc.) adjacent to the osteotomy.

This paper will therefore illustrate the fundamental execution techniques, aimed at achieving the best possible clinical success both from a biological and functional and aesthetic point of view, in order to achieve implant-prosthetic rehabilitation more likely to meet the daily demands of both the clinician and the patient.


Fig. 5


Fig. 6

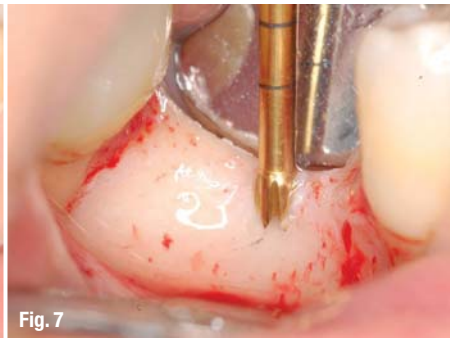
Fig. 7

Figs. 5–7_Implant site preparation with only the use of piezo inserts.

The technique proposed by the authors is intended to use the piezoelectric surgery in the initial stage of preparation (Fig. 11), in order to benefit from its undisputed advantages, namely in the drilling phase of the cortex, the definition of the working length and the inclination of insertion and complete, however, the implant site preparation with dedicated burs (Fig. 12).

The authors think that in the final stages of preparation the level of friction, and therefore the overheating level of the bur on the bone, is remarkably reduced, while it is essential for a correct fitting of the implant, and a proper compliance with the surgical protocol suggested by the various dental implant manufacturers, that the burs have the shape and length suitable and specifically dedicated to the implant concerned. The universality of the implant insert does not allow a final preparation that is exactly congruent with the multiplicity of existing implants, thus risking losing retentive capability or fitting accuracy.

The paper is aimed at describing the results obtained and observed after a 36-month trial, assessing the effectiveness of the technique from both a clinical and histological point of view; a technique which provides for the use of piezoelectric inserts, instead of other surgical methods, during the first stage of preparation of the implant site.

_Materials and methods

As already pointed out in the introduction, the goal of the research was to set up—on a random sample of patients—a comparison between the preparation of the implant site using piezoelectric inserts only during the early stages, compared to the conventional technique with dental drills, or that is the exclusive use of piezoelectric inserts.

The main evaluation parameters considered were the following:
– Immediate biological response, assessed by histology of tissue removed during surgery (Figs. 15–16).
– Successful implant-prosthesis on medium (12 months) and long term (36 months), checked with intraoral periodic X-rays (Figs. 17–19), and peri-implant plaque and bleeding indices every six months from the placement of the final prosthesis.

Thirty patients were randomly selected.

In order to create protocol uniformity, the patients were required to necessarily meet the following basic requirements:
– Aged between 30 and 50;
– good general health (absence of decompensated systemic diseases);
– no smoking;
– interlayer edentulism;
– residual alveolar process in the edentulous area sufficient to the insertion of an implant not less than 10.0 mm long and not less than 4.0 mm wide;
– lack of necessity for regenerative surgery.

In order to standardise the surgical procedures, the following common features were chosen:
– Use of submerged implants with surface obtained by subtraction.
– Implant dimension not <10.0 mm in length and not <4.0 mm in diameter.
– Use of grafting materials avoided.
– Bone density between values 2 and 4, according to the classification of Misch.
– Implant placement only in edentulous areas with the exception of the incisal areas and distal ones at the sixth teeth .
– Implant placement through surgical "full thickness" flap.
– Implants inserted at least four months after tooth extraction.

Figs. 8 & 9_Final result of the implant site preparation; a modest vestibular dehiscence is evident.

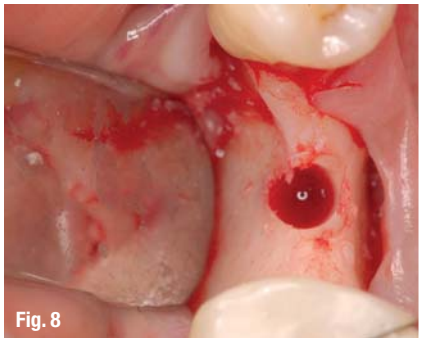
Fig. 8

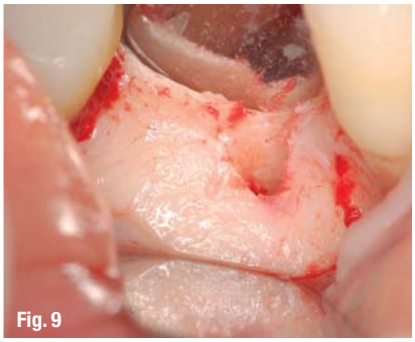
Fig. 9

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Fig. 10

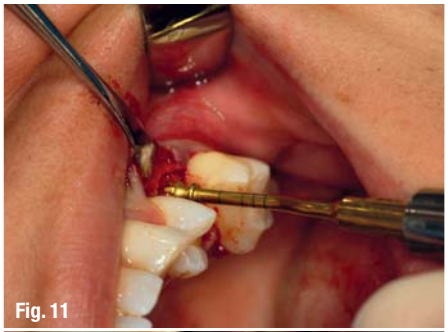
Fig. 11

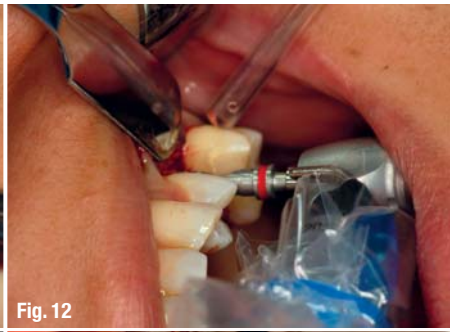
Fig. 12

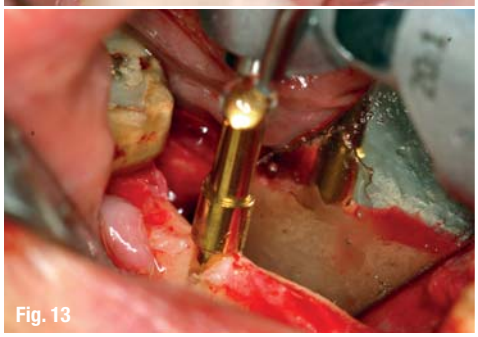
Fig. 13

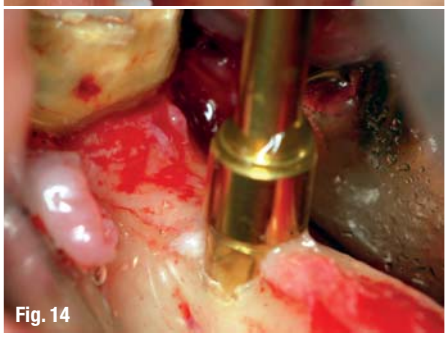
Fig. 14


Fig. 15

Fig. 10_Implant in site. It is visible the neck profile exposed in the vestibular aspect.
Fig. 11_Implant site preparation with the authors suggested technique: first steps with piezo inserts.
Fig. 12_Final preparation of the same area with drills suggested by the implant company.
Figs. 13 & 14_Implant site preparation with rotating instruments.
Figs. 15 & 16_It is evident how the bone chips remain around the drill.

The patients selected for the trial were subsequently divided into three groups of ten each, according to the following criteria:
– Group 1: Ten patients undergoing implant site preparation through exclusive use of conventional dental drills, dedicated to the corresponding implant system.
– Group 2: Ten patients undergoing implant technique with site preparation carried out only using piezoelectric inserts.
– Group 3: Ten patients undergoing initial preparation of the implant site with piezoelectric inserts, while the final phase of preparation of the same surgical site was completed with the burs specifically dedicated to the implant system (technique proposed by the authors and subject to the verification of this study).

For each patient treated—after a specific consent form—samples of bone tissue were taken during surgery at the area corresponding to the implant site, implementing the three different methods described above, in order to compare, histologically, the extent of bone tissue damage created during each different preparation method.

All patients treated were subjected to antibiotic therapy as follows:
– Amoxicillin + Clavulanic acid 1 g tablets, 1 tablet every 8 h (3 tablets/day) for 6 days, Start therapy p.o. (by mouth) 1 day before surgery.

All patients were also prescribed post-surgical daily mouthwashes with 0.2% Chlorhexidine Gluconate up to the removal of the sutures. All patients were sutured with Ethicon Vicryl Plus 4.0®, braided synthetic absorbable suture, Triclosan-coated, in order to improve prevention against surgical site infection. Therefore, according to the above parameters, a total of 64 implants were inserted, including 28 in the lower jaw and 36 in the upper jaw. The 36-month follow-up after surgery also included the following steps:
– 1 intraoral X-ray examination approximately every month;
– 1 intraoral X-ray examination when uncovering;
– 1 intraoral X-ray examination at the end of definitive prosthesis placement;
– 1 intraoral X-ray examination every six months after definitive prosthesis placement.

As regards the prosthesis, the following criteria were chosen and applied:
– Traditional prosthesic timing (a waiting time of three months for the implants placed in the mandible (lower jaw) and six months for those placed in the maxilla (upper jaw).
– ISQ value detected through Ostell® compared with that recorded at the end of the surgical procedure.
– Prosthetic procedure with provisional abutment and provisional, screwed resin crown.
– Reduced intercuspidation of posterior elements.

After an appropriate period of load and clinical and functional checking (on average three months) the definitive prosthesis was placed, always subject to verification of the ISQ value, by placing the titanium abutment tightened with a torque wrench according to the instructions of the implant company and cementing the metal-ceramic crown with ImplaCem Precision (Dentalica). The following steps were carried out for the preparation of the implant sites with the mixed technique object of this trial.

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Laboratory Abutment	Straight Snap-On	Straight Contoured	15° Angled Contoured	Gold/ Plastic	Zirconia/Ti Abutment	Plastic Temporary Abutment	Ball Attachment	GPS™ Attachment	Angled GPS™ Attachment	Multiple-Unit w/Cap & Transfer Straight	Multiple-Unit w/Cap & Transfer Angled
€60	€75	€75	€75	€90	€90	€30	€68	€90	€90	€75	€90

Legacy™1	Legacy™2	Legacy™3
Standard "V" Threads Matches Screw-Vent®	Spiral Threads for Increased Stability	Buttress Threads for Increased Surface


Fig. 16


Fig. 17

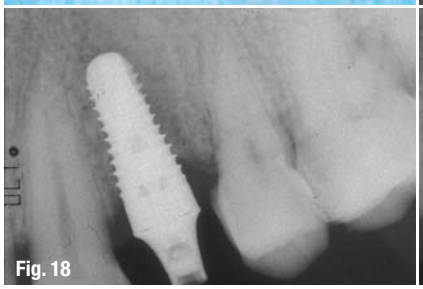


Fig. 18

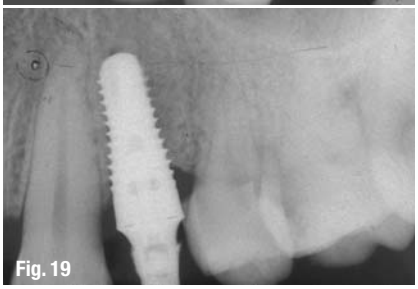


Fig. 19

Fig. 17_Rx pre op.
Fig. 18_Rx after three months of loading (preparation with mixed technique).
Fig. 19_Rx after six months of temporary loading with a perfect bone level.

_Mixed technique for the initial preparation of the implant site through piezoelectric inserts

Once an appropriate full-thickness flap is executed in order to expose the edentulous area, the technique of initial preparation of the implant site through piezoelectric inserts provides the following three intra-surgical fundamental phases:

1) Initial pilot osteotomy by using a Mectron IM 1S piezoelectric insert.
2) Use of the IM 2 insert (A or P depending on the area treated). Optimization of the concentricity of the implant site preparation between 2/3 mm in diameter through an IP 2–3 piezoelectric insert, OT 4 in case of need for correcting the inclination.
3) If required, further enlargement of the implant site through a Mectron IM 3 piezoelectric insert (A or P depending on the area treated).

The next stage of completion and optimisation of the implant-prosthesic site was carried out using a handpiece implant rotating bur specifically dedicated to the system used, needed to obtain, at the end of the preparation, the exact diameter expected by the operator for both the implant and the type of bone concerned. It is known that, depending on the chosen implant system or the type of bone concerned, different preparation methods are required (over- or under-preparation). The authors believe that this approach offers the following advantages:
– High precision;
– possibility to optimise the inclination of the implant axis;
– reduced tissue trauma;
– compliance with the operating sequence of the implant system implemented;
– more predictable clinical success.

_Results

In total, 64 implants were inserted, including 25 in the lower jaw and 39 in the upper jaw, divided as follows:
– 21 implants placed in Group 1 (exclusive use of conventional dental drills, specifically dedicated to the corresponding implant system), including 13 in the upper jaw and 8 in the lower jaw.
– 22 implants placed in Group 2 (exclusive use of piezoelectric inserts), including 12 in the upper jaw and 10 in the lower jaw.
– 21 implants placed in Group 3 (use of piezoelectric inserts only during the initial preparation of the implant site, while the last phase of preparation of the same surgical site was completed with the burs specifically dedicated to the implant system implemented), including 14 in the upper jaw and 7 in the lower jaw.

The terms of clinical success were divided in short (removal of the suture knots in the eighth day), medium (6/8 weeks after surgery) and long term (about 36 months after the definitive prosthesis placement).

As mentioned above, the following criteria were used to assess the clinical success:
– Primary stability measured by the torque in Nm (and detected using the surgical motor Bien Air model iChiropro, Fig. 24) and with verification of the Implant Stability Quotient (ISQ) through Ostell® (Fig. 25)
– Secondary stability (through ISQ)
– Periimplant bleeding indices (from 1 to 3)
– Plaque indices (from 1 to 3)
– Degree of Patient's satisfaction (from 1 to 3).

In all rehabilitated cases, the long-term success was noticed and none of the 64 implants inserted failed. However, due to the aforementioned intraoperative histological samples taken (see the previous section "Materials and Methods"), considering the histological point of view, significant differences were observed in the bone tissue damage between the three different methods of implant site preparation implemented (Figs. 20–23). In particular, in the cases treated with mixed technique (Group 3), better results were noticed in terms of:
– Correct positioning of fixtures;
– healing in the medium-and long-term;
– localised tissue trauma.

With respect to the histological findings, in both techniques providing the use of piezoelectric inserts, a better health condition of the bone margin adjacent to the implant site preparation was observed.

_Conclusions

Based on the results achieved, as well as on data reported in the literature[12], we can say that the use of

piezoelectric inserts—limited to the initial preparation of the implant site and combined with the use of handpiece rotating burs specifically dedicated to the implant system during the final phases of the procedure—improves clinical outcomes, allowing the achievement of the following key objectives:
– Correct positioning of fixtures.
– Excellent initial fitting and excellent primary retention.
– Excellent secondary bone retention and excellent maintenance of bone peaks.
– Optimal recovery in the medium and long-term.
– Extremely reduced local tissue trauma.

The above is more predictable and repeatable than the techniques of preparation exclusively carried out with rotating burs or with piezosurgery inserts.

Technical advantages together with the biological benefits are valid only if the piezoelectric instrument is used in a proper and correct manner, and of course if the piezosurgery system chosen meets the characteristics described in the introduction of this paper.

Actually, there are studies that show how, under certain circumstances, an improper use of the piezosurgery may be potentially risky, even iatrogenic, when compared with traditional osteotomies made with dental drills. In particular, some studies show that an excessive and prolonged pressure exerted by the operator on the handpiece (and then on the vibrating insert) during cutting, as can erroneously occur in the case of extended osteotomies and in the presence of particularly high bone densities, can generate temperatures greater than those generated by traditional burs on hard tissues.[13-16]

As known, the thermal stress induces a consequent significant tissue damage and interferes with the neoangiogenesis. Such an intraoperative case is particularly important, especially when the bone dimensions are minimum, as is usual in implantology or, more generally, in oral surgery.[17]

In addition, it should be noted that not everything that vibrates falls within the field of piezosurgery. It is possible to find systems on the market that, although described as useful for this procedure, do not have the appropriate characteristics, are not accompanied by the necessary validating histological studies or do not allow the appropriate mode and frequency of use. It follows that the unwary purchase of a wrong system may lead the operator to rely purely and simply on the benefit of piezosurgery concepts but, because of the incorrect choice, obtain a clinical and biological result worse than that achievable with conventional rotary instruments. In view of these considerations about the pros and cons on the use of piezosurgery in oral surgery and objective data provided by a rich literature of EBM and in that sense exhaustive, the authors deem the implementation of a surgical protocol advisable, reproducible and standardized, which provides for the use of piezoelectric device only during the initial phase of preparation of the implant site, then completing the site preparation with the burs provided by the implant protocol chosen by the operator.

Finally, these highly satisfactory results, therefore, encourage clinical research in this direction and the procedure described is, in the opinion of the authors, a viable alternative—albeit not a substitute—to conventional techniques already thoroughly discussed in the literature._

Editorial note: A complete list of references is available from the publisher.

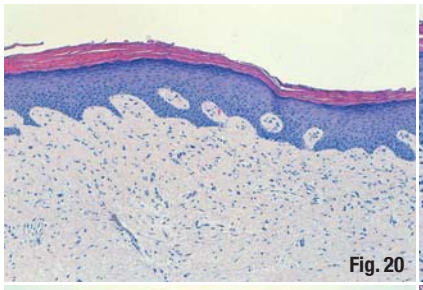
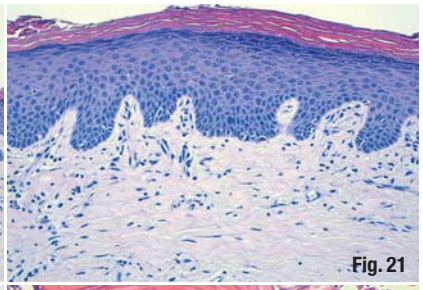


Fig. 20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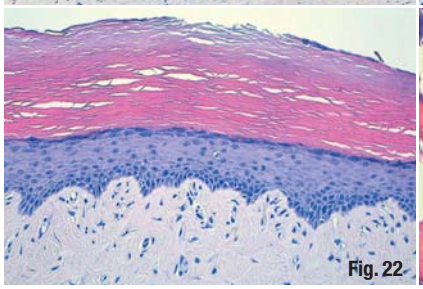
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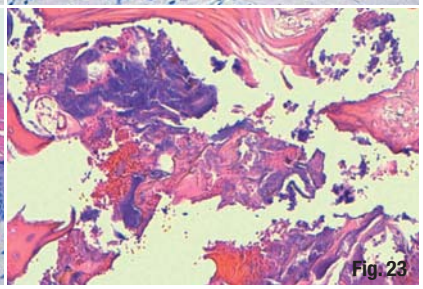
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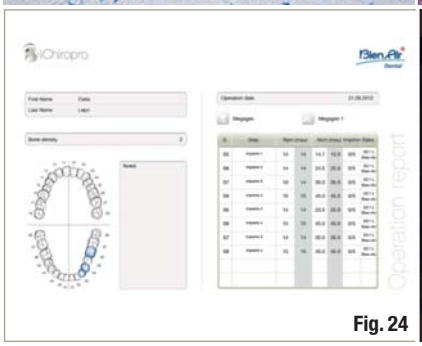
Fig. 24

Fig. 25

Fig. 20_Histologic of bone tissue in mixed technique for the initial preparation of the implant site through piezoelectric inserts with a visible reduction of the cortical and basal level.
Fig. 21_Drawing of bone tissue in mixed technique for the initial preparation of the implant site through piezoelectric inserts with only an initial reduction of cortical level.
Fig. 22_Histologic of healthy bone tissue in technique for the preparation of the implant site only with piezoelectric inserts.
Fig. 23_Histologic of bone tissue in technique for the preparation of the implant site only with dental drills. We can see an objective tissue's damage, with a lot of necrotic areas.
Fig. 24_The example of torque measurement.
Fig. 25_The example of ISQ measurement.

_contact implants

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Ridge augmentation for an atrophied posterior mandible—Part III

NanoBone block versus allograft bone block

Authors_Dr Omar Soliman, Prof. Dr Dr Mohamed Nassar, Ass. Prof. Dr Mahmoud Shakal & Ass. Prof. Dr Eman Mohy El-din Megahed, Egypt

_Introduction

The aim of the present study was to compare the clinical outcome and radiographic bone changes in augmented ridges utilizing a synthetic NanoBone block versus an allograft bone block, and to investigate histologically the success of a synthetic NanoBone block versus an allograft bone block for ridge augmentation. In the previous issues of *implants: international magazine of oral implantology*, the authors gave a detailed introduction to their topic and explained the materials and methods used in their study (*implants* 1/2013) and the results of clinical outcomes & radiographic bone changes (*implants* 2/2013). In this issue, their report is completed by the histological results of their investigations and an extensive discussion.

_Bone regeneration process

Phase 1: Bone regeneration[1]

Within the graft, whether for a mandibular continuity defect, a sinus augmentation surgery or dental implant is placed in a dead space filled with clotted blood. The platelets entrapped in the clot degranulate within hours of graft placement, releasing PDGF, TGF-b1 and TGF-b2. Both of these factore begain the bone regenerative process. PDGF binds to endothelial cells to initiate the ingrowth of capillaries, while TGF-b1 and TGF-b2 bind to the endosteal osteoblasts and marrow mesenchymal stem cells to initiate mitosis to increase their numbers as well as stimulate their production of osteoid. This continues during the first 3 days of the graft, at which time capillaries are already seen to be entrapping the graft. However, by this time, the platelets have degranulated and are no longer a primary source of growth factors to drive the bone regenerative process. At these times, macrophages take over this role. Macrophages were initially attracted to the graft as circulating monocytes of free tissue cells by inherent oxygen gradient in the graft. Thus, the inherent properties of the wound, particularly the oxygen gradient, PDGF and TGF-b, initiate early angiogenesis from surrounding capillaries and mitogenesis of the transferred osteocomponent cells. The complete revascularization of the graft is seen by day 14. By this time, the endosteal osteoblast have already laid down osteoid on the original bone trabeculae and the marrow stem cells have dramatically increased in number and have begun differentiating into osteoblasts. The stem cell population and endosteal osteoblasts produce small amount of osteoid.

During the first 3 to 4 weeks, the biochemical and cellular phase of bone regeneration proceeds to clinically consolidate the graft by coalescing individual osteoid islands, surface osteoid on cancellous trabeculae and host bone. This process is essentially transplanted osteogenessis. However, it uses the fibrin network of the grafts as a framework. This is referred to as osteoconduction, which provides a scaffold for what has been call (creeping substitution). That is, the normally non motile

Figs. 1a & b_X100, H&E stained section showing ostoid bone formation.

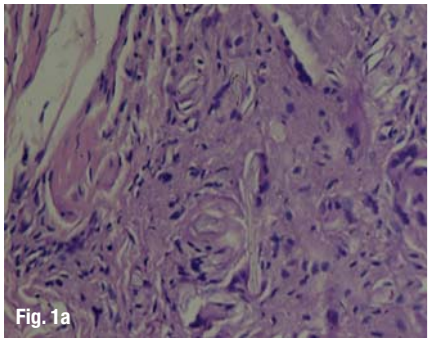


Fig. 1a

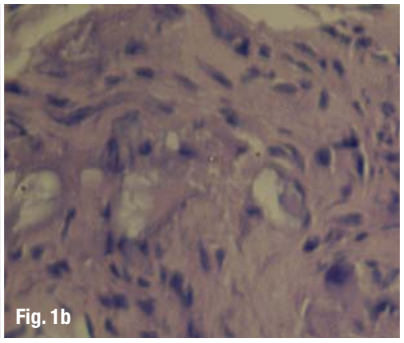


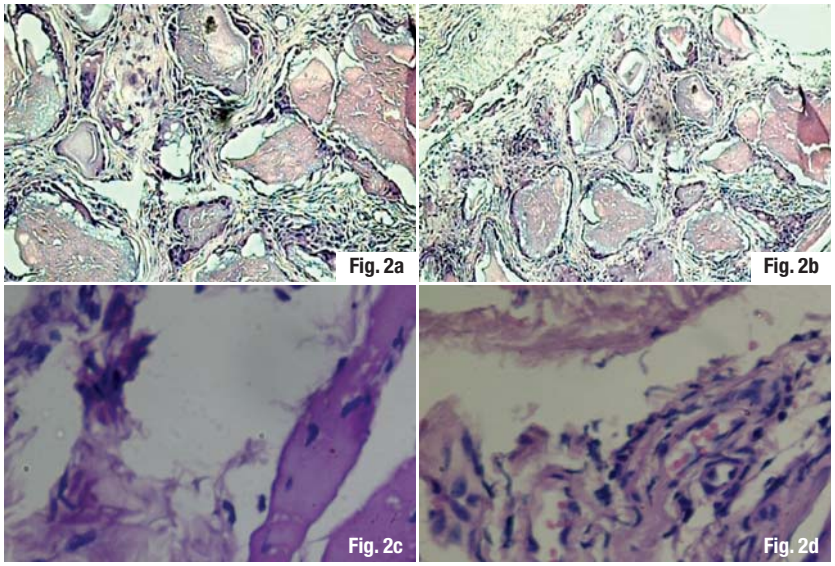
Fig. 1b

osteoblasts can be somewhat motile via the process of endocytosis along a scaffold like fibrin.

The process of endocytosis is merely the transfer of cell membrane from the retreating edge of the cell, through the cytoplasm as a vesicle, to the advancing edge to reform a cell membrane and thus increase the cellular surface area at the advancing edge. This mechanism slowly advances the cell and allows it to secrete its product in the process. In this case, the product is osteoid on the fibrin network. This cellular regeneration is often referred as phase 1 bone regeneration or woven bone phase. By the time it is nearly complete (4 to 6 weeks), sufficient osteoid production and mineralization have occurred to permit graft function. At this stage, the bone has formed without going through a chondroblastic phase and histologically appears as random cellular bone that a pathologist would refer to as woven bone.

Phase 2: Bone regeneration 1

The cellular bone regeneration that has occurred in phase 1 produces this disorganized woven bone that is structurally sound but not the degree of mature bone. The random organization and hypercellular nature of this bone is similar to that seen in fracture callus. This bone will undergo an obligatory resorption and replacement type of remodeling. Eventually, it is replaced by phase 2 bones, which is less cellular, more mineralized and structurally more organized into lamellar bone.



Figs. 2a–d_X400, H&E stained section showing new bone formation.

The replacement of phase 1 by phase 2 bone (woven bone by lamellar bone), like all bone remodelling, is initiated by osteoclast. Osteoclasts are fused monocellular cells that arrive at the graft site through the newly de-

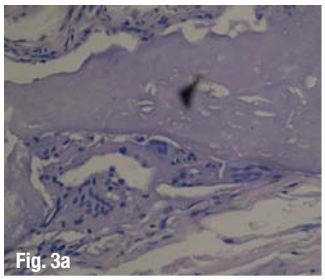


Fig. 3a

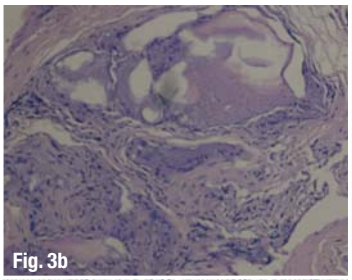


Fig. 3b

Figs. 3 & b_X400, H&E stained section showing NanoBone granules undergoing degeneration by osteoclast cells, surrounded by dense connective tissue with plentiful osteoblast cells.

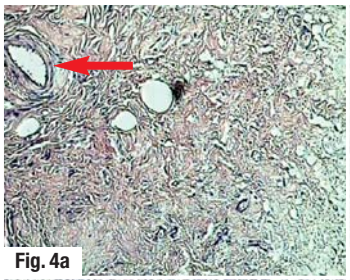


Fig. 4a

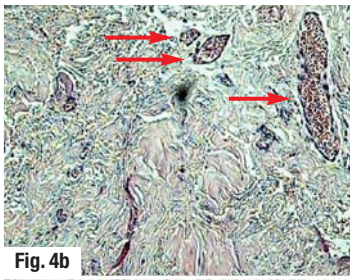


Fig. 4b

Figs. 4a–c_X100, H&E stained section showing numerous blood vessels in NanoBone graft.

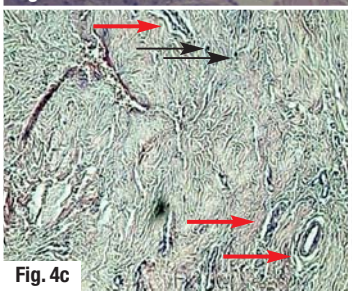


Fig. 4c

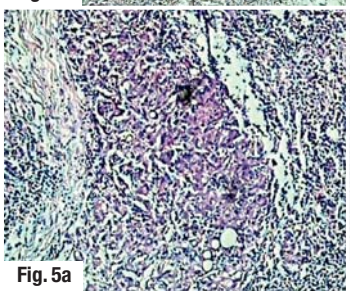


Fig. 5a

Figs. 5a & b_X100, H&E stained section showing numerous inflammatory cells, few blood vessels and few new bone formation in the Fisiograft group.

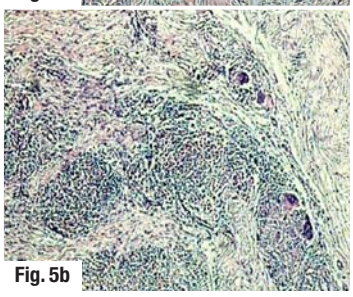


Fig. 5b

veloped vascular network. It is theorized that these osteoblasts resorb phase 1 bone in a normal remodelling replacement cycle. As both the phase 1 bone and non-viable original cancellous bone trabeculae are resorbed, bone morphogenic protein and IGF-I and IGF-II are release. As with normal bone turnover, BMPs, IGF-I and IGF-II act as the link between bone resorption and new bone apposition. Such growth and differentiation factors are deposited into the mineral matrix of bone by osteoblasts during osteoid production. Stem cells in the graft from local tissues and the circulation respond to the released BMPs, IGF-1 and IGF-II by osteoblast differentiation and new bone formation. This new phase 2 bone forms as the jaw and graft in function. It responds to the demands placed on it and develops mature Havarsian systems and lamellar bone capable of withstanding the normal shear forces placed on the jaw. The bone is capable of tolerating the forces typically of implant prosthetic functions. Histologically, the grafts enter a long-term remodelling consistent with normal skeletal turnover. A periosteum and endosteum develop as part of this long term remodelling cycle. The graft cortex never becomes as thick as a normal jaw cortex, and the graft itself remains a dense, cancellous trabecular pattern. This pattern is advantageous in promoting osseointegration and is adaptable to a variety of functional stresses. Over several years, the graft takes on the radiographic morphology and cortical outlines of a mandible or maxilla.

_Histological results

During processing of NanoBone and Fisiograft samples, we noticed that the samples of augmented bone do not need more than ten days to be decalcified in EDTA while the remaining part (normal bone) of the bone core still calcified. A microscopic analysis at x100 magnification allowed the author to observe numerous mineralised areas of newly formed bone of various sizes, which were scattered in all the NanoBone group (Figs. 1–3), and limited in the Fisiograft group (Fig. 5). These bone areas were surrounded by an osteoid layer composed of osteoblasts, which synthesize the organic component of the extracellular matrix (the osteoid substance) and control its mineralization. Microscopic observation of the sample at higher magnification showed some osteoclast cells were found near the remaining spicules of the bone graft, multiple osteoblasts and numerous osteocytes situated within well-defined lacunae (Fig. 3). In some areas, new bone contained small islands of residual bone graft; these could be distinguished from live bone by empty osteolytic lacunae (Figs. 5–7). They were showing signs of continuous resorption by osteoclasts and simultaneous deposition of bone. The presence of large amount Fisiograft remnants was seen in all group sections (Fig. 6), while in NanoBone group specimens the NanoBone graft remnants were few and at the periphery of the specimens (Fig. 6). The presence of blood capillaries, defined by endothelial

Fig. 6_X400, H&E stained section showing less vascular vessels and large remnants of Fisiograft.

Fig. 7_X100, H&E stained section showing small remnants of NanoBone graft.

Figs. 8a & b_Showing NanoBone block immediately after augmentation (a) and six month after augmentation which was firm and strongly attached to natural bone (b).

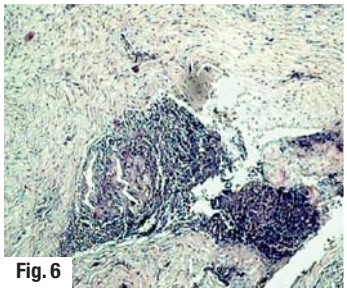


Fig. 6

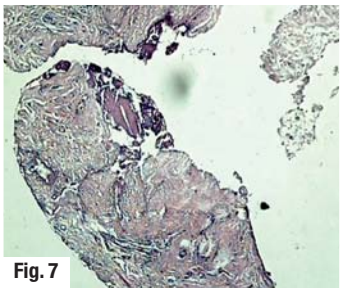


Fig. 7

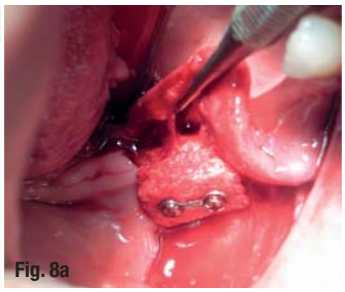


Fig. 8a

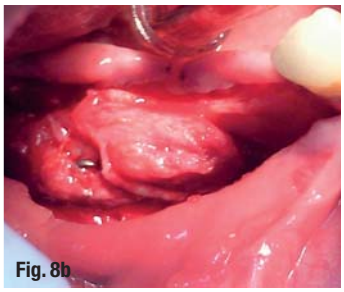


Fig. 8b

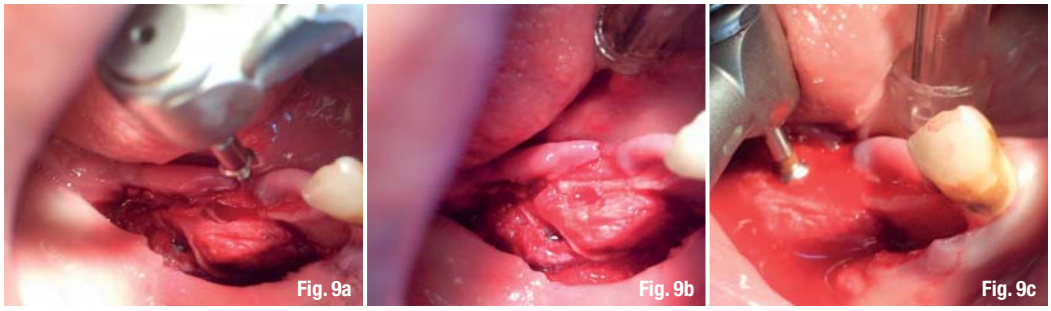


Fig. 9a–c_Showing copious bleeding during drilling in NanoBone graft six months after augmentation.

cells, demonstrated well differentiated capillary vascularization was numerous in all NanoBone group specimens (Fig. 4), while it was few or absent in the Fisiograft group specimens. There was no evidence of acute or chronic inflammatory infiltrate in all sections of NanoBone group. Inflammatory cell infiltration within the new bone, primarily mononuclear cells such as lymphocytes and macrophages, was seen in all samples of the Fisiograft group (Fig. 5). The inflammatory cells were considered indicative of a significant inflammatory or immune response. Histologically, NanoBone granules exhibited adequate vascularization and high biocompatibility comparable to Fisiograft bone, as indicated by the fact that in NanoBone groups, signs of angiogenesis and large vessels and cells could be observed in the center of the tissue (Fig. 4), while Fisiograft bone was invaded by small vessels and cells (Fig. 5).

_Discussion

Bone substitutes act as space maintainers by providing a scaffold that allows them to colonize by bone-promoting cells and to replace by newly formed bone.[2] One of the major challenges in the application of bone substitutes is adequate vascularisation and biocompatibility[3] and rapid vascularisation of the block graft is paramount for successful neo-osteogenesis.[4] Our histological results showed that NanoBone architecture allows better vascularisation (Fig. 4), as well as colonisation of the bone graft by the host progenitor cells and promotes the osteoconductive properties of the material. On the other hand, the Fisiograft samples showed less vascularisation (small vessels and cells, Figs. 5 & 6). Our histological results showed furthermore that inflammatory cells infiltration within the new bone, primarily mononuclear cells such as lymphocytes and macrophages, was seen in all samples of Fisiograft group (Fig. 6). The inflammatory cells considered indicative of a significant inflammatory or immune response. This finding is not consistent with the finding of Scarano et al., who stated that Fisiograft is free from inflammation effect.[5] Our histological results showed that, in the NanoBone group specimens, the NanoBone graft remnants were few and at the periphery of the specimens, ongoing resorption and surrounded by osteoclasts. This is consistent with Heinemann et al., who postulate that nanocristalline HA has osteoconductive and biomimetic properties and is integrated into the host's physiological bone turn over at a very early stage.[6,7] And it is also consistent with Cannolo et al., who proposed that the newly formed bone in NanoBone was already found at three months of healing and new trabecular bone was found at six months of healing.[8,9] During implant placement, the quality of grafted bone was evaluated clinically, especially during drilling and implant placement. In all NanoBone group patients, the grafted bone was firm and strongly in contact to the natural bone (Fig. 8). Copious bleeding occurred during drilling in the grafted bone (Fig. 9). This is consistent with the histological results which showed better vascularisation, as well as colonisation of the bone graft by the host progenitor cells and promotes the osteoconductive properties. We also noticed that, during crestal incision and flap reflection, it was difficult to dissect the mucosa over the augmented NanoBone block and we used a scalpel to dissect it. We refer that to an absence of the periosteum that covers the grafted NanoBone block. On the other hand, in Fisiograft group patients, the grafted bone had no string contact to natural bone and little bleeding occured during drilling in the grafted site.

_Conclusions

NanoBone block (NanoBone, ARTOSS) showed faster bone formation, better vascularisation, as well as colonisation of the bone and less inflammatory cells, while Fisiograft showed less vascularisation and numerous inflammatory cells. NanoBone graft degraded earlier than Fisiograft._

_contact implants

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Vertical bone augmentation procedures—Part I

Authors_Prof. Dr Dr Florian G. Draenert & Dominic Hützen, Germany

_Introduction

The success of an implantological procedure largely depends on the alveolar situation and the bone supporting the soft tissues. Until today, complex augmentation procedures pose high demands on the clinician and there is still a great need for research in this field. The following article discusses the basics of implantology relevant to bone augmentation and presents an overview on complex bone augmentation techniques. Part I of this consecutive article series introduces basics in bone morphology, biomaterials and transplants. To be continued in 2014 with issue 1/2014.

_Basics

Bone morphology

The histomorphology of bone distinguishes between lamellar bone of complex structure and plexiform bone.[1] Plexiform bone does allow fast healing and growth, but only simple structures of orthogonal primary osteone structure with a mechanical overall weakness of evolutionary relevance in large organisms. It is therefore often found in small mammals like mice, rats, and in part rabbits. Larger mammals including pigs, dogs and humans have a complex lamellar bone structure. Ontogenesis of bone in humans starts with embryonal plexiform bone structures leading to the mature bone structure with secondary osteons (Haversian system). The two morphological forms of bone are cancellous and compact bone. Cancellous bone shows a trabecular structure with an internal lumen containing bone marrow with several function including pluripotent stem cells and vessels. Healing starts in a lamellar fashion from the bone marrow space. Cortical bone is a compact more stiff structure with higher mechanical stability and no internal remodelling capabilities. The internal structure of both bone tissues is lamellar as described above. Osteons with central Haversian canal containing osteocyte and vessels surrounded by mineralised matrix lamellae is the structure principle of compact bone and surrounded by interstitial lamellae (Fig. 1). Osteocytes are connected with each other via gap junctions through the Canaliculi ossei. The bony part of cancellous bone is similar in structure. Periosteum separates bone from surrounding connective tissue and consists of two layers Stratum fibrosum (external) and Stratum osteogenicum (internal) containing nerves, vessels and also osteogenic progenitor cells allowing chemotactic migration during bone healing. Bone tissue consists of cells and matrix (ossein). Ossein contains anorganic minerals, mostly hydroxyl apatite, and organic molecules mostly collagen type I.[2] The organic matrix also contains several other molecules with complex functions including proteoglycans like aggrecan with its glycosaminoglycan arms and multiadhesive proteins but also its hyaluronic acid cores or newly discovered fibrils and other structures under current research.[3-5]

Fig. 1_Bone Augmentation with compacta and spongiosa (left). Sequence marking with tetracycline in the rabbit at two different times makes the shell-like bone structure observable.

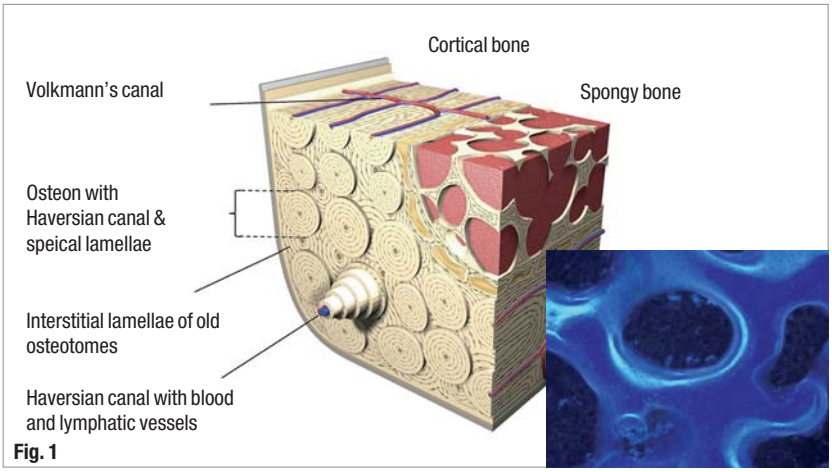

Fig. 1

Bone healing

Healing of augmented bone transplants and biomaterials at the interface site is analogous to defect fracture healing[1,6-16] aseptic inflammation and chemotactic cell migration; loose preliminary tissue (soft callus); mineralised immature bone (hard callus); remodelling resulting in full functional bone (Fig. 2).[17] This mode of healing concerns all free avascular transplants including guided bone regeneration (GBR) and block augmentations contact healing is therefore not an issue in all of these augmentations and would require both sides of the healing site to be vasculated vital bone tissue (Fig. 2). The gap healing in bone augmentations includes lamellar healing at the interface site and the periosteum

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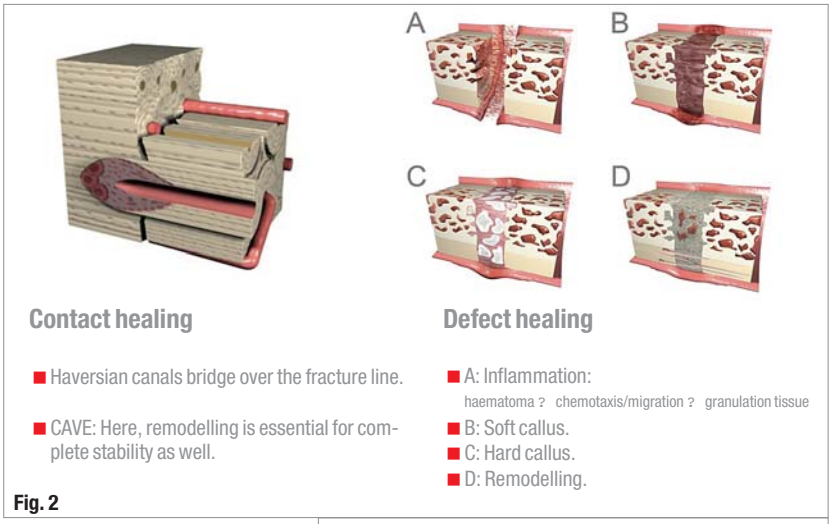

Fig. 2

Fig. 2_Synopsis of the types of bone healing: contact healing (left), defect healing (right).
Fig. 3_Synopsis of the subperiosteal implant healing.

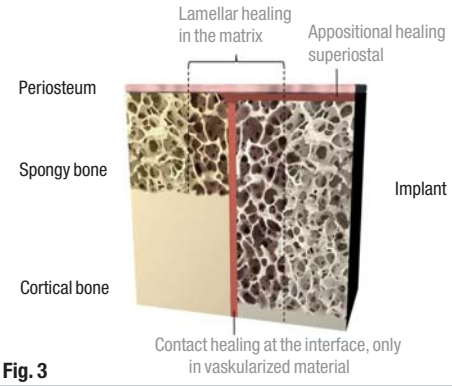

Fig. 3

with cell recruitment from blood, bone marrow and the periosteum depending on the local anatomy (Fig. 3). This cell recruitment includes local osteoblast progenitors (human trabecular bone derived cells - HTBs), and blood-derived CD-34-positive embryogenic progenitor cells (EPCs).[18-21] Differentiation of local adult stem cells is not well understood yet. However, the differentiation of EPC follows a stepwise change into an osteoblast while losing pluripotent capabilities from the EPC with high CD34-positive cells, followed by the stage of "circulating osteoblast lineage cell" towards the "blood mesenchymal precursor cell" (BMPC) direct differentiation into osteoblasts with continuously rising percentage of stromal cell-derived factor-1 (SDF-1) CXCR4–receptor.[18] Vascular cells in newly formed bone tissue are also derived from EPCs.[22,23] Osteoclast however are part of the mononuclear phagocyte system and derived syncytia formations of these cell lineages.[24] Vicerocranial bone of the facial area is mesektodermal tissue derived from the branchial arch rather than mesenchymal tissue derived bone in the remaining skeleton.[25-28] This issue is often not fully considered when discussion bone of the skull.

Cell induction in bone tissue: osteoinduction and neoangiogenesis

The time course of bone healing is influenced by many factors. This includes the stability and morphology of the transplant or mesh graft with biomaterial as well as biological factors. Those factors are osteoconductivity, osteoinductivity/vasoinductivity and osteogenicity present in the bony implant bed and the graft or mesh. Osteoconductivity concerns macro and micromechanical and morphological properties that to promote a bone tissue specific activity and differentiation including matrix-cell-interactions, but also pore-size, surface properties and interconnectivity of pores in biomaterials and bone grafts, and finally also external mechanical influences like shock waves.[29-34] Osteoinductivity leads to bone growth and differentiation by specific ligand-dependent cell activation by growth factors and other molecules, that are mostly related to the TGF-ß family, like BMPs (bone morphogenic proteins) e.g. BMP-2 oder BMP-7, or basic FGF and VEGF.[16,35-44] The last ones are also strong vasoinductive factors. There are several approaches to apply growth factors in clinics.[45-53] However, this application will remain limited to specific problematic conditions due to some main reasons. On the one hand, tissue healing is limited by cell activity, including the described phases of bone healing with cell recruitment, chemotaxis, differentiation and specific tissue matrix production that cannot be accelerated beyond biological limits and external growth factors are therefore not relevant even if certain effects can be shown *in vitro* and *in vivo*.[17,54] On the other hand, it is a fact that application of growth factors bears the immanent risk of carcinogenic transformation.[55,56] Osteogenic properties concern the continuity of living bone cells after transplantation that can be achieved with small bone pieces combined with fast revascularisation (e.g. particulate bone augmentation), press-fit in cancellous bone healing (clinically not relevant in oral- and maxillofacial surgery), and microvascular transplants like fibula flaps. Main signal transduction in bone cells includes classic general elements like ras und MAP-kinases, but also Smad-dependent pathways and integrin-associated signaling.[57-60] Smad-dependent signalling includes specific second messengers like RunX2 and consists of a complex system of sub-elements depending on the associated ligand-system. BMPs activate Smad 1, 5 and 8 complex that binds Smad 4 and others as DNA-binding complex.[58-60] Integrins on the other hand represent an element of signal transduction activation by specific matrix binding.[32-34]

_II. Biomaterials and transplants

Bone transplants and alloplastic biomaterials

We will not discuss the wide field of biomaterial products in depth as already published elsewhere.[61,62] Materials for bone augmentation are divided into alloplastic (artificial) biomaterials and transplants alongside with their natural xenogenic, allogenic or autologous derivatives.[63-73] Most common alloplastic materials are: ß-tricalciumphosphate[72] bioactive glasses,[71] and hydroxylapatite.[73] Bone material can be further

characterized as: autologous (fresh or frozen), allogeneic (e.g. DBM "demineralized bone matrix"), and xenogeneic. Important material properties concerning bone healing are pore size and interconnectivity, resorbability without severe inflammation and macro stability of particle material.[74] Some of these factors are evaluated scientifically like pore sizes and surface properties, while other factors are mostly clinically bases experiences like macro stability.[29,30] Materials can be further characterized by their potential to influence bone healing:[6] osteoconductive (promotes bony ingrowth); osteoinductive (induces bone tissue generation by receptor-mediated cell activation); osteogeneic (material contains living bone cells or bone cell precursors). Most common particulate materials are bone chips from the implant site, milled bone blocks, scraped bone chips, mesh grafts with alloplastic materials (Fig. 4). Growth factors and tissue engineering are future option in compromised bone healing and complex reconstructive surgery.[18, 22, 39, 41, 44-47, 75-81] Conceptional problems arise, if these novel techniques concerning cost and carcinogenic risks of growth factors are not addressed.[18, 22, 45, 45, 47, 76, 82, 83] Dental implantology therefore offers limited indications for these options.

Donor sites for bone transplants

Choosing the appropriate donor site for bone transplants is the second step after analysis of the defect and augmentation planning. Most common donor sites are:[74]

- Mandible
  (chin, angle, linea obliqua, corpus mandibulae)[84]
- Maxillary
  (tuber, spina nasalis, crista zygomaticoalveolaris)
- Calvaria (tabula externa)
- Pelvic rim
- Tibia.

Local donor sites are of special interest for applications in oral and maxillofacial surgery. Intraoral donor sites are shown to be less painful for patients (Fig. 5).[85] Big defects require extraoral donor sites mostly from the pelvic rim region. Quality and healing properties of various bone transplants concern their ontological origin in particular. While local skull bone is branchial tissue of mesektodermal origin, pelvic and most other bone transplants are mesenchymal tissues.[25-28] Mandibular bone is the most common transplant in dentistry with several donor regions: chin, linea obliqua, angle, corpus mandibulae, lingual exostosis.[69, 74, 85, 86] Bone is harvested as a block for either immediate transplantation or generation of particles in a bone mill or similar device.[84, 87] Using a scraper is a modern way of directly generating bone chips.[87] The chin region bears more donor site morbidity problems due to the mental muscle attachment and should be limited to augmentations in the same region to avoid a second surgery site or other serious indications.[85] The linea obliqua area offers a versatile donor site with limited risks and complications if the anatomy of the alveolar nerve is carefully evaluated.[74] The area of the mandibular angle is another site in the same area and similarly difficult with risks for the local nerve like the lingual exostosis. The maxilla offers only limited amounts of bone material. However, using tuber bone or scraping chips from the anterior wall in combination with sinus lift surgery can be the right option. Harvesting bone from the pelvic rim is the method of choice for most indications requiring large amounts of autologous bone due to limited risks and good approach.[88-90] There is an anterior and a posterior approach.[88, 89, 91] It is discussed that the rarer posterior approach is offering more bone and less morbidity.[88, 89, 92] Complications of this donor site are pain, bleeding, nerve lesions (N. cutaneus femoris lateralis), and fractures of the pelvic bone.[88]_

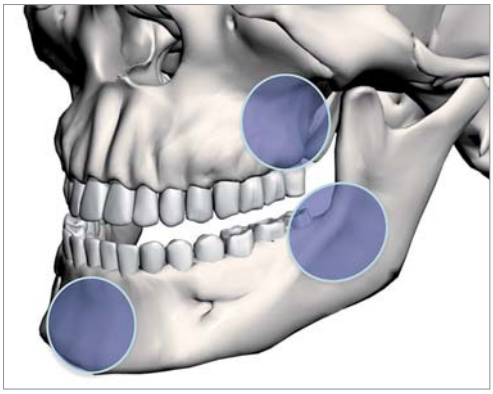

Fig. 4a–f_Common augmentation materials: a) bone chips from the implant bed, b) bone mill for particularization of blocks, c) bone scraper, d) commercial biomaterial.
Fig. 5_Bone harvesting sites in the jaw: metal, Crista zygomaticoalveolaris and Tuber maxillae; Linea oblique of the mandibula and the angle of the jaw.

Editorial note: To be continued in implants 1/2014 with osteotomy and complex bone augmentation techniques. A complete list of references is available from the publisher.

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A revision of an unaesthetic reconstruction

Author_Dental Campus

_Introduction

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Users are given a wealth of information, as shown in the following sample case study. This case study is the first in a series of articles designed to introduce you to Dental Campus. The complete case is available as a demo on Dental Campus free of charge. We hope you enjoy your planning and treatment of this case.

_Initial examination

A 70-year-old female patient was referred for a prosthetic revision. She was unsatisfied with the aesthetics of her old maxillary bridge (Fig. 1). She was particularly displeased with the yellowish color and bulky size of the crowns. In addition, a tooth in the mandible was extracted due to a root fracture. Besides chronic periodontitis, this patient also presented with wear facettes on the lower front teeth. The patient was healthy and a non-smoker. Clinical charts and periapical radiographs as well as other relevant patient information were collected in the initial consultation (Fig. 2).

_Interactive diagnosis

Detailed information on this case and different treatment options can be found online on Dental Campus. With a few clicks you make your own diagnosis, define a prognosis for each tooth and plan the case with the help of an electronic dental scheme (Fig. 3). Give this feature a try! Compare your assessment with that of the responsible dentist and start to discuss it in the forum.

_Treatment

a) Pre-treatment

After removal of the maxillary bridge, sufficient remaining dental structure was revealed. The abutment teeth would allow to be restored with a new fixed one-piece bridge (Fig. 4). The use of implants could allow for a segmented restoration design in the


Fig. 1a


Fig. 1b


Fig. 1c


Fig. 1d


Fig. 1e


Fig. 1f

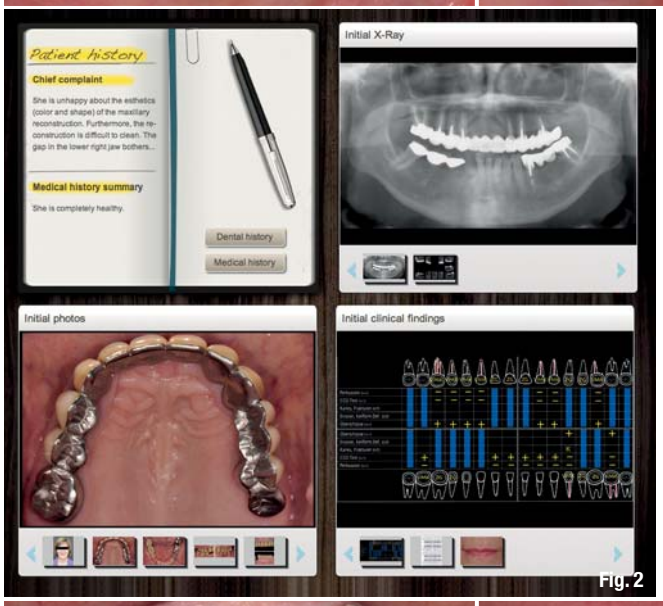

Fig. 2

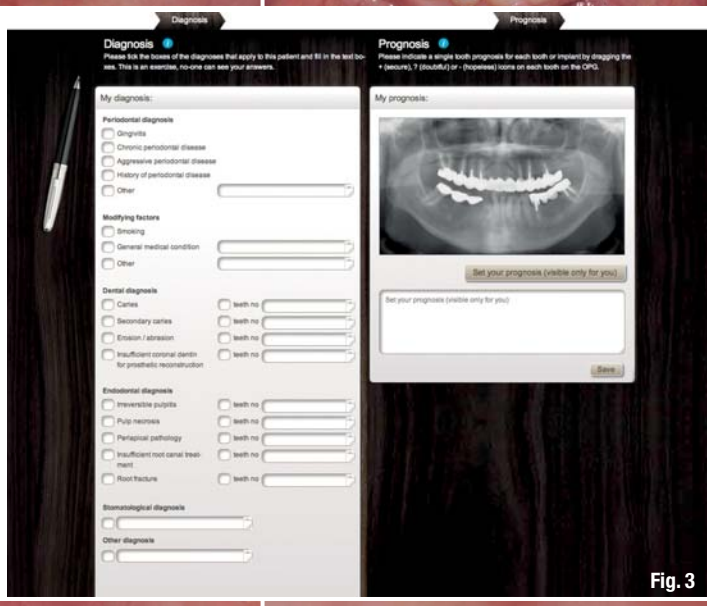

Fig. 3


Fig. 4a


Fig. 4b


Fig. 4c


Fig. 5

Fig. 1_Clinical images of initial examination.
Fig. 2_Dental Campus screenshot of initial findings. In addition to clinical images, the user has simultaneous access to X-ray and clinical findings as well as other relevant patient information. The presentation simulates the practitioner's "desktop view".
Fig. 3_Users can create their own diagnosis and tooth prognosis on screen, then compare with those of the treating dentist.
Fig. 4_Clinical situation after bridge removal.
Fig. 5_Clinical situation following extraction of left mandibular abutment tooth.

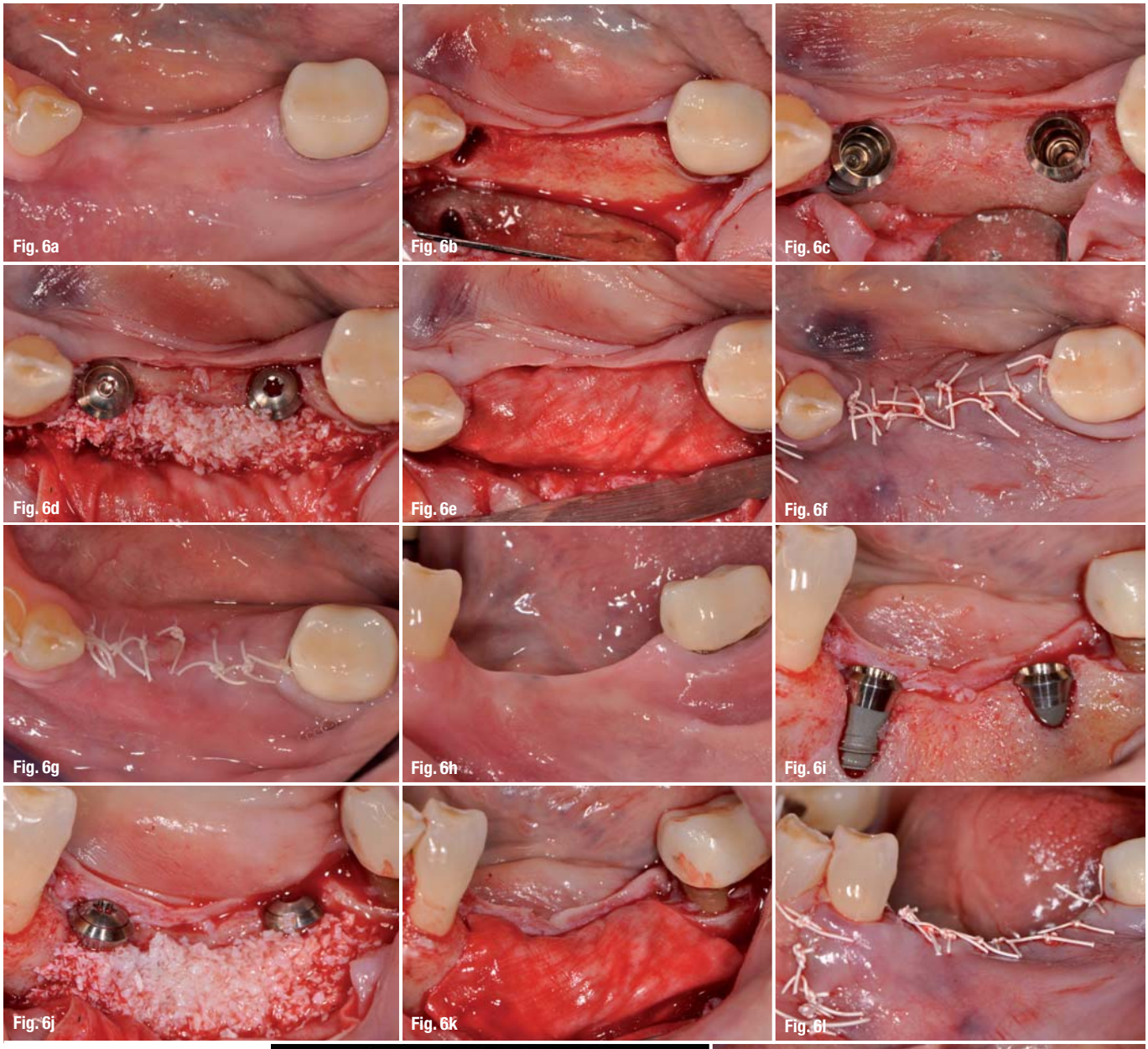

Fig. 6_Clinical situation during implant insertion and bone augmentation, including X-ray.
Fig. 7_Maxilla: fitting of four roots caps.
Fig. 8_Denture try-in with bite verification.


Fig. 9


Fig. 10a


Fig. 10b


Fig. 10c


Fig. 10d


Fig. 10e


Fig. 10f

Fig. 9_Preparation of veneers for raising the bite.
Fig. 10_Final examination.

maxilla assuring short span bridges. Since the patient was unable to bear the additional costs of a fixed reconstruction in both jaws, a removable reconstruction was planned in the maxilla. In the lower left jaw, an abutment tooth needed to be extracted (Fig. 5). Implant-supported fixed partial dentures were planned to restore the extended edentulous spaces in the lower jaw.

b) Surgical phase

In both sides of the mandible two implants were placed (Fig. 6). Peri-implant bone dehiscences were simultaneously augmented with a bone substitute material and a collagen membrane. During abutment connection, the soft-tissue quality was improved with a free gingival graft from the palate. The soft-tissue volume gained could be conditioned with temporary dentures to optimally shape the pontic area.

c) Prosthetic treatment

After a short time, the mandibular implants were restored with provisional screw-retained bridges. In the upper jaw, endodontic revisions were performed on two teeth and all teeth were shortened. Subsequently, the definitive set-up could be established (Fig. 7). In the maxilla, four abutment teeth were prepared for root caps. The mandibular framework try-in took place simultaneously with the maxillary framework try-in, onto which the definitive set-up was transferred (Fig. 8). This enabled a verification of the correct bite before the final veneering of the bridgeworks was performed. Subsequently, the dental technician completed both dentures in the upper and lower jaws. At the end the lower front teeth needed to be elongated due to the rise of the bite. The teeth were prepared traditionally to receive veneers (Fig. 9). The final outcome revealed a highly appealing full restoration, both functionally and aesthetically. The patient was extremely satisfied (Fig. 10).

_Join in the discussion

The presented case is a typical example of Dental Campus' case studies and is available as a free demo case (www.dental-campus.com/DTEcase1). Comprehensive background information and the detailed presentation of the treatment steps enable you to closely follow the planning and the treatment. This maximizes the practical benefit for your own patients.

Do you agree with the case assessment and the selected treatment as presented here? Register as a user and create your own treatment plan. Then, compare and discuss this plan with those provided by your fellow dental colleagues._

Dentist: Dr. Sven Mühlemann
Dental technician: Andreas Graf

_contact implants

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Extensive implant-supported restoration in generalised aggressive periodontitis

Author_Dr Dr Philipp Plugmann, Germany

_Introduction

Particularly young patients under the age of 30 experience high levels of psychological strain when faced with episodic loss of several teeth as a result of generalised aggressive periodontitis. The influence of this disease on the patients' social life and their careers can be enormous.

_Case presentation

In February of 2012, the patient presented in my practice at the age of 28. Despite his young age, he had already lost several teeth. The probing pocket depth was 3.5–5 mm, the plaque control record (PCR) was at 100 % and the gingival bleeding index (GBI) was at 90 %. Several different treatments were necessary: teeth 21 and 23 needed endodontic treatment and root canal fillings, a long-term temporary restoration was necessary for teeth 21 to 23, and a ceramic inlay was indicated for tooth 46. In addition, the patient suffered from halitosis. The combination of the symptoms proved a great burden on the patient.

The patient described an episodic loss of teeth in the course of the past four years and a family history of tooth loss starting at the early ages of 20 to 25. The patient smokes. The patient was healthy otherwise and there were no further pathological findings.

The patient gave up smoking in March of 2012 and improved his oral hygiene, thereby lowering the PCR to 12 % and the GBI to 8 % and permanently establishing them below a value of 10–15 %. The preservative treatment was finished and the treatment of the periodontitis was concluded with a closed curettage.

During regular follow-up care, the patient received supporting periodontitis therapy and showed excellent compliance. In March of 2013, we started to plan an implant-supported restoration.

The patient's oral situation before proceeding: Multiple gaps in the upper and lower jaw. Additionally, a terminal gap can be seen at the far end of the upper jaw (right side on the patient). Good amount of bone available in the posterior tooth area. Less bone available in the upper incisal area. The presurgical panorama X-ray shows the initial situation before the implantation (Fig. 1). The implants were inserted in March of 2013.

Fig. 1_Presurgical panorama X-ray.
Fig. 2_Flap exposing the surgical field, first quadrant.
Fig. 3_Display of the vestibular bone structure, first quadrant.

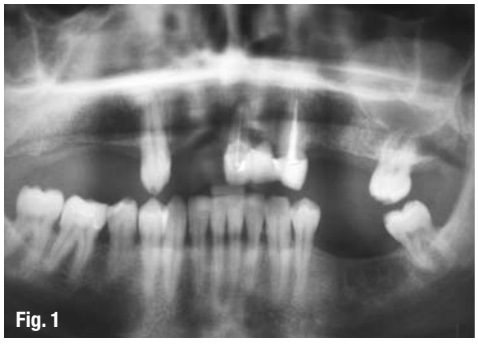
Fig. 1

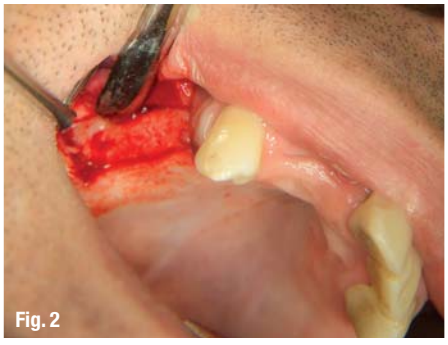
Fig. 2

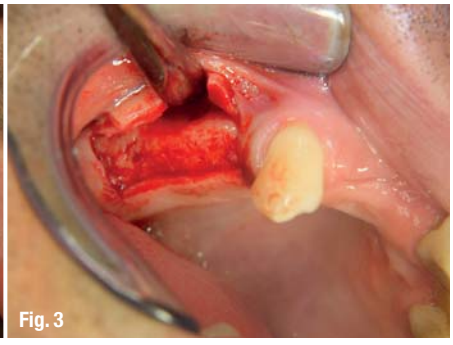
Fig. 3

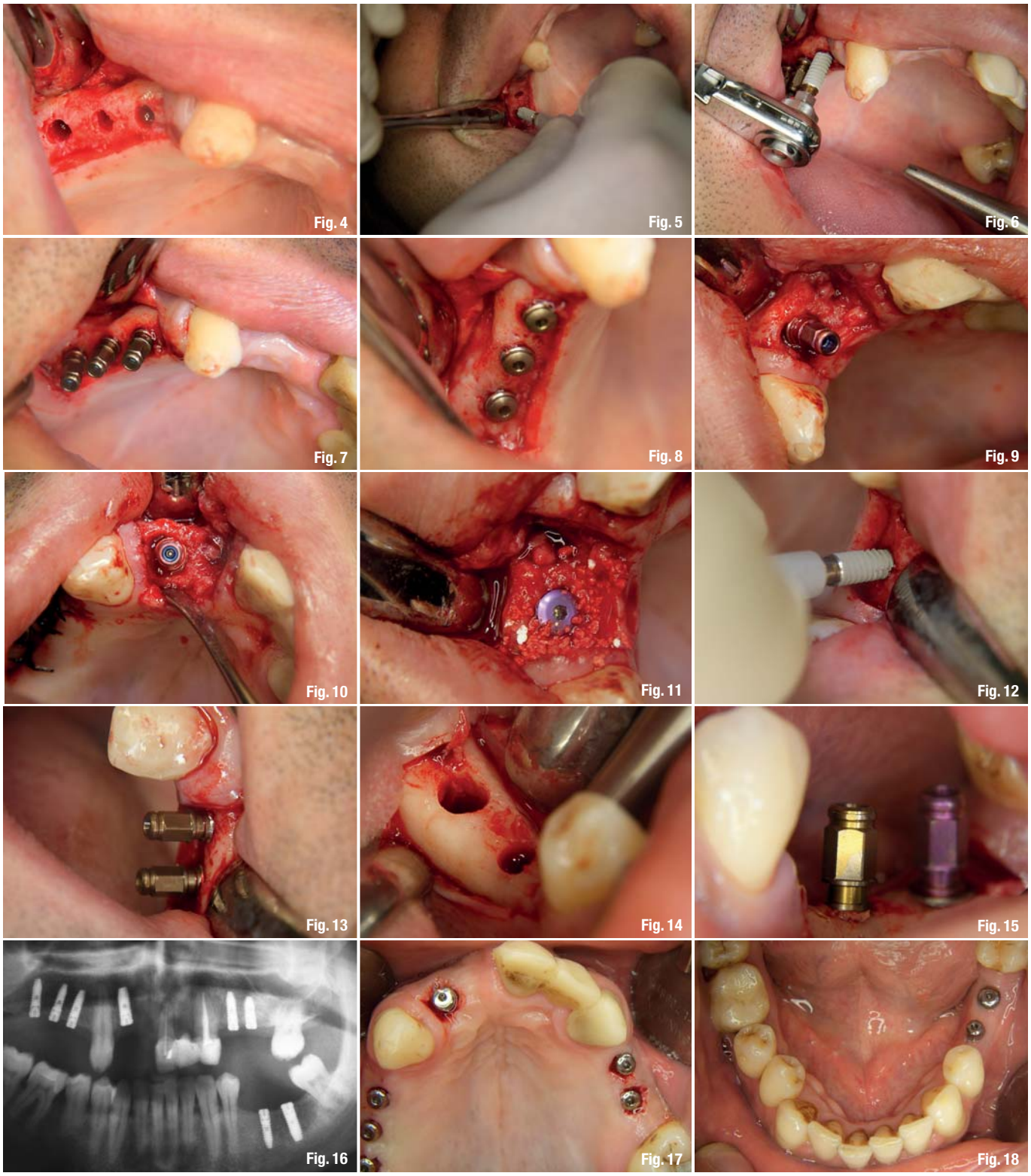

Fig. 4_Prepared implant bed, positions 14, 15 and 16.
Fig. 5_First step, manually screwing the implant in.
Fig. 6_Second step, further screwing in with the adjustable IMPLA ratchet, 30 Ncm for primary stability.
Fig. 7_Insertion posts on top of the implants, positions 14, 15 and 16.
Fig. 8_Healing caps in positions 14, 15 and 16.
Fig. 9_Inserted implant with insertion post, position 12.
Fig. 10_View of the bone situation.
Fig. 11_Implant with a healing screw and bone augmentation material.
Fig. 12_Screwing the implant into position 25.
Fig. 13_Parallel implants with insertion posts in positions 24 and 25.
Fig. 14_Implant bed, positions 35 and 36.
Fig. 15_Implants with insertion posts, positions 35 and 36.
Fig. 16_Postsurgical panorama X-ray.
Figs. 17 & 18_Insertion of gingival formers.

Figs. 19–21_Unscrewing of the forming posts and inner screws for the impressions.
Figs. 22–26_Placing of the abutment onto the model.
Fig. 27_Panoramic X-ray with abutments.
Figs. 28–30_Permanently fixed restoration.


Fig. 19


Fig. 20

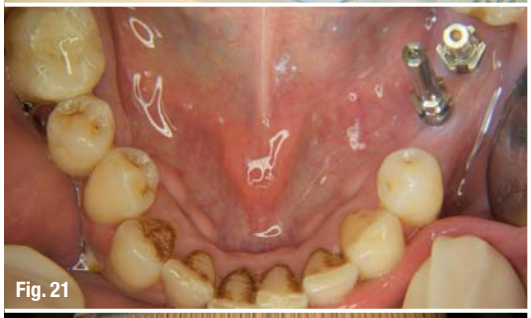
Fig. 21


Fig. 22


Fig. 23


Fig. 24


Fig. 25


Fig. 26


Fig. 27


Fig. 28

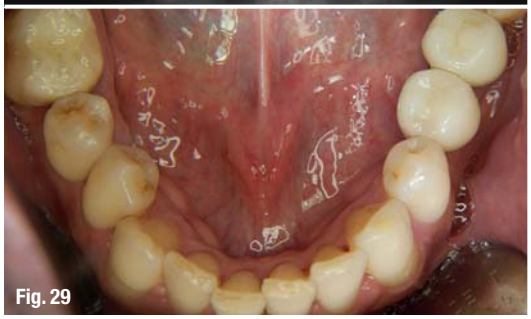
Fig. 29


Fig. 30

_Surgical procedure

First, I exposed the bone using a scalpel and a sharp curette. Because this case deals with a D4 bone, I decided to use an IMPLA Cylindrical implant from Schütz Dental. Thanks to the cylindrical structure and especially coordinated thread sides, this implant offers a high primary stability in cases such as this one (Figs. 2–4).

Thanks to the self-tapping thread of IMPLA Cylindrical implant, I only had to apply the pilot and extension drilling techniques. With the help of the acrylic insertion aid and "no-touch" technology, I could insert and screw the implants quickly and easily into the drill holes (Figs. 5–7).

After taking off the insertion posts and screwing on the healing caps, the mucous membrane was fitted with several 4.0 interrupted sutures (Ethicon, braided silk, non-absorbable, Fig. 8). While I was exposing the bone in position 12, I noticed that the available bone structure would not be sufficient (Fig. 9).

Here, I chose an augmentative bone construction using the bone augmentation material CERASORB from the company Riemser as well as a resorbable Epiguide membrane. After I inserted the implant and screwed on the healing cap, I remodelled the bone structure using bone augmentation material. This made sure that the neck of the implant wouldn't be seen after surgery (Figs. 10–13). After inserting the implants and removing the insertion posts, the implants were sealed with the healing caps.

While treating the lower jaw, I came across a D1 bone. Once again, I chose to use the IMPLA Cylindrical implant, only this time for its self-tapping properties. This made the screwing in of the implant so much easier in such compact bone as this (Figs. 14 and 15). The postsurgical panorama X-ray shows the situation with the inserted implants (Fig. 16).

_Implant prosthetics

In September of 2013, six months after implantation, the implants in the upper and lower jaw were exposed. Then, the appropriate gingiva formers in gingiva heights 2 and 3 were inserted (Figs. 17 and 18).

Subsequently, alginate impressions were taken to produce plaster models and individual impression trays. The individual impression trays were to serve for individual impressions with impression posts and the posts 21 and 23 to be prepared. The forming posts and according inner screws for the impressions were unscrewed directly after removing them from the package (Figs. 19–21). Afterwards, an extensive function analysis and function diagnostics were performed.

Fig. 31_Panoramic X-ray of the final result.

At our own lab, the necessary models were produced from the impressions, taking into account the results of the function diagnostics. Next, the models were articulated. Finally, the designated abutment were screwed onto the model and worked on (Figs. 22–26).

During the next session, the implant abutments and the framework were fitted intraorally. The fit of the abutments was additionally documented by and checked with a panorama X-ray (Fig. 27, panorama X-ray with abutments). At a later date, the abutments were screwed in permanently and the openings were covered with Cavit.

The restoration was set in for a test period of two weeks. At the end of September, the restoration was permanently fixed (Figs. 28–30).

Finally, a panorama X-ray was taken for documentation and to check the result (Fig. 31).

_Conclusion

When dealing with major tooth loss after a generalised aggressive periodontitis, implant-supported individual crowns are an excellent solution, as they offer the patient optimal possibilities for oral hygiene. First, however, a complex and tedious pre-treatment phase is necessary, as only a highly motivated and contributory patient, who will show up to each follow-up care session, can avoid a recidivism and complications of peri implantitis in the long run._

_contact implants

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Immediate implant placement with the NNC implant

Author_Joachim S. Hermann, Switzerland

_Introduction

In the past, the restoration of narrow tooth gaps with Straumann® Soft Tissue Level implants (maxillary lateral incisors/mandibular incisors) was only possible with the Straumann® Narrow Neck Implant (NN). Due to the prevailing external, hexagonal connection geometry and correspondingly larger dimensioned abutment components it was somewhat difficult to achieve hygienic and aesthetically demanding restorations, particularly in the anterior region of the mandible. The new Straumann® Narrow Neck CrossFit® implant (NNC) now offers an established internal taper connection which allows more intricate prosthetic work in the emergence profile region. Due to the harder implant material—NNC made of TiZr (Straumann® Roxolid®) vs. NN made of pure titanium grade 4, cold-worked—one can expect multi-unit bridges, as described in this case, to also have a better long-term prognosis from a biomechanical point of view.

_Initial situation

At the beginning of the treatment, the patient was 48 years old and in good general health. For decades, the patient had suffered from a severe, aggressive, generalised periodontitis (type III B, Fig. 1), which could be healed completely prior to implant restoration (Perio-Healing™ Concept; Fig. 2).

_Procedure

Treatment planning

At first, the diseased anterior mandible was to be healed in a regenerative and biological manner and without bone replacement materials, among others

Fig. 1_Initial situation.
Fig. 2_Radiographic status after periodontal healing.
Fig. 3_Clinical situation after periodontal healing.
Figs. 4-6_Clicinal and radiographic status with depth gauges *in situ* immediately after extraction.


Fig. 1

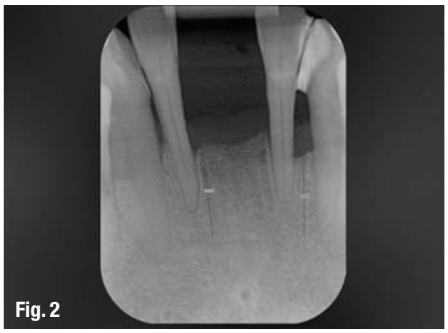
Fig. 2


Fig. 3

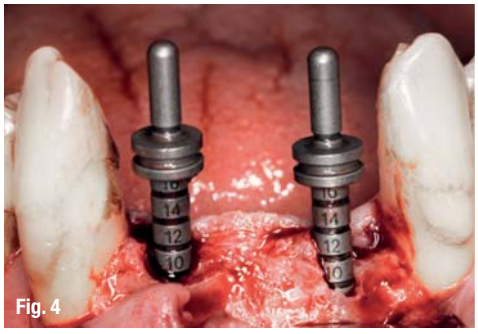
Fig. 4

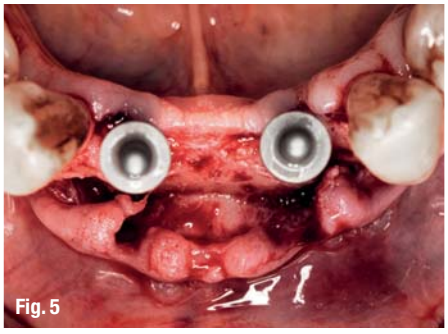
Fig. 5

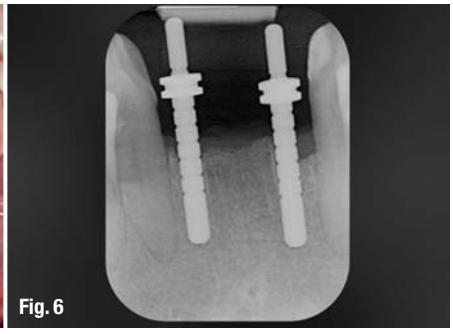
Fig. 6

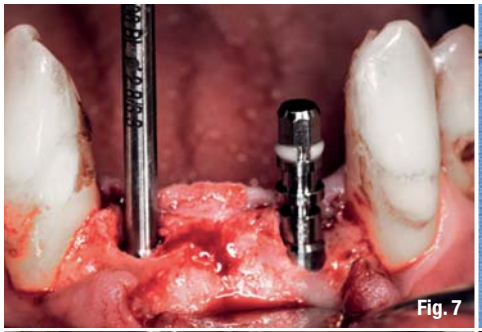
Fig. 7


Fig. 8

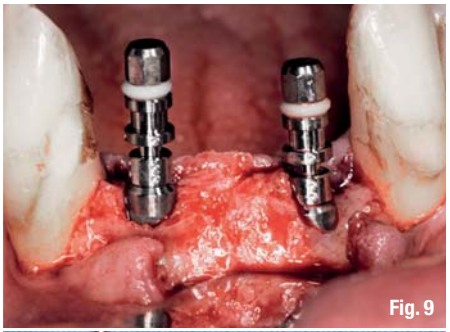
Fig. 9

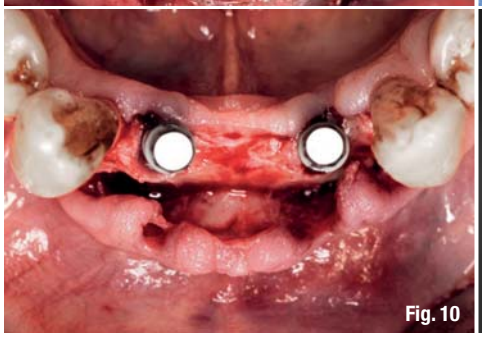
Fig. 10

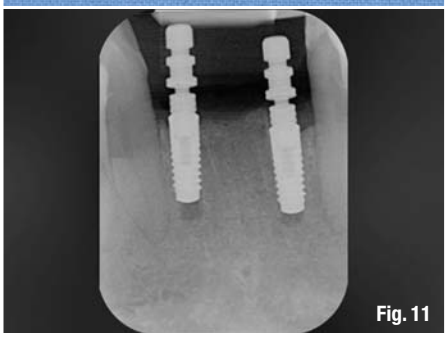
Fig. 11

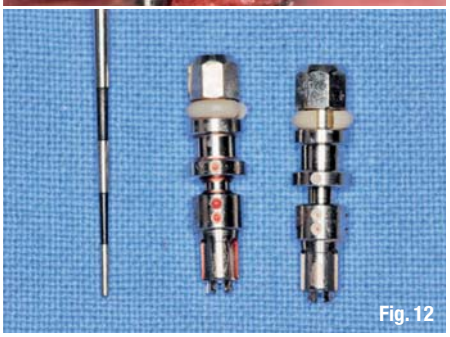
Fig. 12

by employing enamel matrix proteins (Straumann® Emdogain) in the sense of 'Socket Preservation' prior to immediate implant placement at 32 and 42 (Fig. 2).

From the Cone-Beam Computer Tomogram (CBCT) it could already be presumed preoperatively that simultaneous augmentation in the sense of a less invasive procedure could be dispensed with by precise implant placement at the soft tissue level, and that a four-unit fully functional porcelain-fused-to-metal bridge (PFM) could be inserted without difficulties due to the more stable implant material (Roxolid®).

Surgical procedure.

Following periodontal healing (Fig. 3), teeth 32 and 42 could each be extracted in toto from the healthy tissue without fracturing, in particular of the buccal *lamellae*. The clinical and radiological examination employing combined depth gauges showed a four-unit anterior bridge to be possible under these conditions (Figs. 4–6). There had also never been the necessity for simultaneous bone augmentation (Osteogenic Jumping Distance).

Using the NNC profile drill, the crestal bone was expanded minimally in the present type 2 bone prior to implant placement of the two 10 mm NNC implants in each case (Ø 3.3 mm to 3.5 mm; Figs. 7 & 8).

Attention was paid during the implant placement of the two NNC implants, that the Microgap could be placed precisely 2 mm coronal of the buccal *limbus alveolaris*, so as not to obtain crestal bone or soft tissue loss following appropriate tissue maturation (Tissue-directed Implant Placement[1,2]; Figs. 9–11). The new NNC insertion device enables perfect aesthetic analysis of the insertion depth in relation to the variable thickness of the periimplant gingiva (Biologic Width: 2.25–3.75 mm[1,2]) and can be fixated again in the implant at any time for fine adjustment prior to suturing due to the tapered press-fit design (Fig. 12), which allows obtaining an optimal, biocompatible intrasulcular position of the Microgap following complete healing and remodeling.

During the final alignment of the implants, one then needs to again ensure that the semi-spherical recesses on the insertion devices are placed precisely in buccal direction, so that the prosthetic abutment components can be aligned precisely later on. Using 3 mm NNC healing caps (Figs. 13 & 14) provides ideal conditions for soft tissue maturation (up to six months) in combination with an appropriate temporary restoration (Fig. 15). This also dispenses with the need for a second surgical intervention (uncovery).

Prosthetic procedure

The base of the temporary prosthetic restoration, which should be supported occlusally (Fig. 15), must not touch the healing caps statically and functionally during initial healing. This can be checked with a silicone paste (Fit Checker®). Five months *post implantationem* the Biological Width[1,2] has become perfectly established in the healthy mouth (see comparison Figs. 13 & 16). Using a screw-retained, open implant impression (Fig. 17) it was possible to fabricate the 4-unit PFM bridge 32xx42 with great precision (Fig. 18*), which allowed an adequate outcome in terms of hygiene, chewing comfort, aesthetics and phonetics (Fig. 19). Here it is recommended to communicate the exact dimensions of the individually determined interdental tooth brushes (Fig. 19), which are to be tested *in vivo* on the patient and re-

Figs. 7 & 8_New NNC crestal profile drill adjustment.
Figs. 9–11_Tissue-directed Implant Placement.[1,2]
Fig. 12_New NNC press-fit insertion devices.

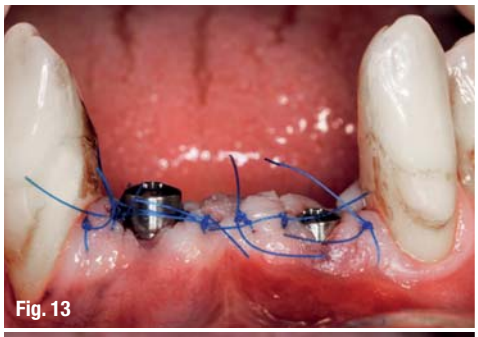
Fig. 13


Fig. 14


Fig. 15


Fig. 16


Fig. 17


Fig. 18

Figs. 13 & 14_3 mm healing caps *in situ*.
Fig. 15_Temporary restoration.
Fig. 16_ Clinical status five months post-op.
Figs. 17 & 18_Fabrication of the porcelain-fused-to-metal-ceramic bridge using a screw-retained, open implant impression technique.

evaluated during try-in (gingiva resilience vs. plaster cast).

_Final outcome

The one-year long-term follow-up showed stable and healthy hard and soft tissue conditions analogue to established biological principles for Soft Tissue Level implants (Figs. 20–22).[1,2] The probing measurements were all at ≤ 3 mm with negative BOP bleeding values (Bleeding-on-Probing) as well as a broad band of attached periimplant gingiva. Surprisingly, the implant mobility values (PTV Periotest Values) were significantly lower (i.e. reduced mobility) than known from the Straumann® Narrow Neck implants (NN) to date, which may be due to the harder implant alloy and/or better hard tissue integration of the hydrophile SLActive® surface.

_Conclusion

Straumann® Narrow Neck CrossFit® implants are a further asset to the comprehensive Straumann® product portfolio and extend the indication field, particularly in very narrow spatial conditions. As Soft Tissue Level implants they provide good aesthetics, while at the same time offering good preservation of the periimplant hard and soft tissue architecture._

Editorial note: A complete list of references is available from www.straumann.com/stargetref. Capitalisation is subject to the author.

**Technical dental work by MDT Thomas H. Seitner, Stuttgart-Ostfildern/Germany.*

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Fig. 19_Insertion of the bridge with the use of individually determined interdental tooth brushes.
Figs. 20–22_Follow-up showing stable hard and soft tissue conditions.


Fig. 19


Fig. 20


Fig. 21

Fig. 22

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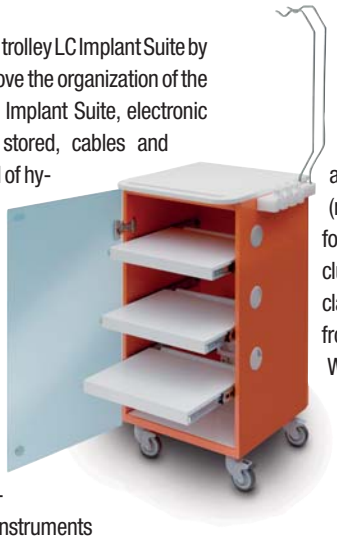
Omnia

LC Implant Suite



The multifunctional surgical trolley LC Implant Suite by Omnia is developed to improve the organization of the dental office. Thanks to LC Implant Suite, electronic equipments are properly stored, cables and wirings are hidden, the level of hygiene in the whole office is improved, and the organisation of the surgical room is quicker as all the instruments are ready for usage.

LC Implant Suite is an essential instrument for those who practice oral surgeries and implants using Phisiodispenser or Piezosurgery instruments and for those who practice endodontics and parodontics. LC Implant Suite is the ideal solution for the equipment in any modern surgical room.

Main features are the flat tray with scratch proof surface and integrated handle (45 x 54 cm) and two removable supports for cooling liquids. It is available with three removable shelves with safety stop and adjustable height (ref. 30.E0050) or two removable shelves with adjustable height and an internal drawer (ref. 30.E0060). In addition, Teflon support for three handpieces/contrangles is included—inside part removable and autoclavable. Furthermore, the scratch proof front glass window can be opened at 270°. Whereas the lower part is for pedals or various accessories, the lateral opening is for equipment cables and/or cords. The socket comes with an automatic spool.

Omnia S.p.A.
Via F. Delnevo, 190sx
43036 Fidenza, Parma, Italy

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www.omniaspa.eu

Straumann

New implants reduce treatment invasiveness

Straumann is introducing Roxolid SLActive implants in a new range of sizes that help dental professionals to avoid bone augmentation procedures, saving patients trauma, discomfort, time and money. The key to the new implants is the unique material Roxolid, which is considerably stronger than pure titanium. Roxolid implants also feature the SLActive surface for accelerated osseous healing and Loxim, a new transfer piece that detaches faster and easier from the implant after placement in the patient. Experience gained in an extensive clinical program has provided the basis for Straumann to supply all its implants in Roxolid with the goals of minimising invasiveness and making treatment possible for patients with insufficient bone. Consequently, Straumann Soft Tissue Level and Bone Level Implants are now available in Roxolid in 3.3, 4.1 and 4.8 mm diameters. Straumann is also launching a new short implant, which is just 4 mm in length—making it the company's smallest implant. Designed to avoid extensive augmentation procedures in patients with insufficient vertical bone for conventional implants, the new implant is available in a soft tissue level design and in 4.1 mm and 4.8 mm diameters.

Institut Straumann AG
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4052 Basel, Switzerland

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www.straumann.com

Dentaurum Implants

Flexibility meets efficiency

The newly developed instrument set in the tioLogic© ADVANCED surgical tray offers maximum flexibility for the implant site preparation with fewer instruments. The drilling protocol of the ADVANCED instruments allows an atraumatic preparation individually adapted to the bone quality and an individual regulation of the drilling depth for maximum primary stability. All preparation instruments in the tioLogic© ADVANCED surgical tray can be used for the insertion of tioLogic© and tioLogic© ST implants.

For the tioLogic© ST implant, the macro and micro design of the tioLogic© implants has been further developed under biomechanical aspects. The new modified self-tapping thread geometry combined with the reduced thread pitch allows a fast and atraumatic implant insertion with a constant insertion torque, as well as high primary stability. In addition, the tioLogic© ST 7.0 mm implant expands the range of indication for reduced vertical bone availability. The tioLogic© ST implant also follows the well-proven S-M-L-concept of the tioLogic© implant system and is, thus, compatible with all existing prosthetic abutment lines of tioLogic© implants. They are perfectly aligned with the accredited tioLogic© product range.

Dentaurum Implants GmbH
Turnstr. 31
75228 Ispringen, Germany

info@dentaurum-implants.de
www.dentaurum-implants.de

Schütz

Small in size, great in performance

Only three steps lead you to a safe implant restoration: a pilot hole, extension-drilling and the insertion of the implant. If a two-piece-implant is not an option for your patient, you can now offer an economic alternative: one-piece IMPLA Mini implants. They feature a blasted and etched surface and are available with two different heads: Mini-balltop is excellently suited to the overdenture-technique while Mini-conetop was developed specifically for supporting bar constructions, if there is limited space available. The one-piece implants offer you a minimally invasive procedure and a short drilling protocol. The result: shorter surgery times. This means both you and your patient will benefit from a more economic implant restoration. IMPLA Mini implants can be inserted with the IMPLA surgery tray. Alternately, you can use the small IMPLA Mini surgery tray, especially put together for this purpose. Of course, all these products are "quality made in Germany".

Schütz Dental GmbH
Dieselstr. 5–6
61191 Rosbach, Germany

impla@schuetz-dental.de
www.schuetz-dental.com

Sunstar GUIDOR

Preparing for the future of implant dentistry

Congress & presentation [Website]

The 22nd Annual Meeting of the European Association for Osseointegration (EAO) took place in Dublin and Ireland from 17–19 October 2013, with the theme "Preparing for the Future of Implant Dentistry".

SUNSTAR GUIDOR®

Nearly 70 speakers and more than 3,000 delegates from around the world were expected to participate in the congress. The Sunstar Foundation sponsored the Breakfast Symposia on Friday, October 18, 7:45–8:45 am where Prof. Dr Dr Engelke, University Göttingen, lectured about „Alveolar Ridge Preservation using Endoscopically assisted Root Enucleation in Anterior Maxillary Extraction Sites".

As a silver sponsor Sunstar presented their products at the commercial exhibition which ran throughout the period of the congress.

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Founded in 1887 by the German Frank Ritter in New York, Ritter is one of the oldest prestige brands of finest dental equipment worldwide. Today Ritter products are more than ever an essential element in dental practices worldwide.

The Ritter implant-ivory-line provides two-piece-implants (implant plus separate abutment) as the spiral-implant (QSI) and twin-fissure-implant (TFI) as well as one-piece-implants (implant and abutment already connected) called mono-compress-implant (MCI). The system contains logically reduced and clearly arranged components of tools and abutments with the best features for all clinical cases. Due to the super nano-surface, a quick and reliable osseointegration is guaranteed. Clever and easy handling is provided by self-tapping threads and a coloured system of drills and implants according to their diameters.

All Ritter implants and accessories are made by highly modern CNC manufacturing machines. A combination of advanced machining and hand-finishing creates the most accurate tools possible for the marking of ceramic drills.

The Ritter brand stands for high quality, state-of-the-art-technology and innovative products made in Germany. Our credo is to always provide customers and clients with the best services and prices combined with the most comprehensive dental solutions in the market.

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88400 Biberach, Germany

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www.ritterimplants.com

Geistlich Pharma

Mucograft Seal for good soft tissue outcome

Aesthetic treatment results are important to patients. A key factor for success is the condition of the soft tissue. Many dentists take the opportunity to optimise soft tissue immediately after an extraction by sewing a tissue punch from the palate into the new socket. However, graft removal from the palate is painful and creates a second wound.

By using a Geistlich Mucograft® Seal collagen matrix instead of autologous soft tissue, the dentist spares the patient pain and surgery time. The 8 mm disk is made of the same proven material as Geistlich Mucograft® collagen matrix and displays the same properties. It protects the graft and creates soft tissue that matches perfectly the colour and texture of its surroundings. Geistlich Mucograft® Seal is sewn over an extraction socket that has been filled with Geistlich Bio-Oss® Collagen during a ridge preservation procedure. An undamaged buccal bone plate is a prerequisite for this. Products from Geistlich Biomaterials are marketed only after they have been scientifically tested and have demonstrated clear clinical value. This also applies to Geistlich Mucograft® Seal. An international advisory board, under the direction of Prof. Mariano Sanz, Spain, assessed the new product and observed that a combination treatment of Geistlich Bio-Oss® Collagen and Geistlich Mucograft® Seal prepared the soft tissue well for different therapeutic options. The experts' clear opinion was that ridge preservation in combination with Geistlich Mucograft® Seal is a predictable and recommended approach.

Geistlich Pharma AG
Bahnhofstr. 40,
6110 Wolhusen, Switzerland

www.geistlich.ch

Nobel Biocare

Delivering predictable outcomes for dental implant patients

With its heritage dating back to Per-Ingvar Brånemark's discovery that titanium could integrate with human bone in 1952, Nobel Biocare has long been synonymous with innovation. One of the latest in the company's long line of pioneering solutions for dental professionals is the NobelClinician Software—advanced diagnostics and implant planning software offering a predictable outcome for the patient. The NobelClinician Software allows dentists to plan dental implant treatments with precision and confidence by assessing detailed 3-D patient scans. Implant options can be brought to life on screen, taking into account important factors such as the availability of bone and prosthetic needs. Precise measurements can be taken and the software has the ability to advise caution when a treatment proposal sees implants placed close to areas marked by the user as sensitive, such as nerves or roots. Teeth can also be extracted virtually, meaning all possible treatment options can be explored. The world has changed a lot since Per-Ingvar Brånemark's pioneering discovery but the value of a healthy looking smile has not. NobelClinician brings together the latest technology to make selecting the right dental implant treatment as smooth as possible for dentist and patient alike. The software showcases Nobel Biocare's continuing capability to push the frontiers of dentistry as it has done for over 40 years, spurred on by the mission "Designing for Life".

Nobel Biocare
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8058 Zurich Airport, Switzerland

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Practice-oriented implantology at the DGZI Annual Congress

_**„From practice—for the practice"** is the DGZI's main topic leading the way for the 43rd International Annual Congress, which took place from 4 to 5 October at the Berlin Hotel Palace. Dr Roland Hille, Vice President of the DGZI and scientific director of the congress stated that "Compiling practicable and proved concepts 'from practice—for the practice' has always been one of the DGZI's main topics". "Each year, we invite speakers from around the world—this is a DGZI trademark. These speakers present the participants with practicable and sustainable treatment concepts which can be decisive for the participants' implantological success." International speakers impressed the audience with their scientific knowledge on the international podium with simultaneous interpretation on the first day of the congress, among them Prof. Dr Monish Bhola and Dr James R. Winkler/ University of Detroit Mercy, US, Dr Keiichi Naruse, Yamagata, Japan, Dr Khaled A. Abdel-Ghaffar, Kairo, Egypt. At the same time, speakers from the fields of dentistry and dental technology discussed prosthetically-oriented points of view. However, the congress also addressed the implantological assistants and qualified dental assistants.

One of the press conference's most important aspects was the new education concept introduced by Dr Roland Hille. This concept is based on the latest e-learning modules and a complex international network. In this regard, DGZI member of the board and dental technician Christian Müller pointed out the specialist exams for dental technologists which specifically address dental technicians with implantological ambitions.

Dr Rolf Vollmer, DGZI Vice President and treasurer, informed about the works of the numerous DGZI study groups, which meet regularly all over Germany. In addition, he presented the extensive specialist literature which has been distributed successfully by the DGZI for years. Among them are the "Glossary of Oral Implantology English/German" and the compendium "Topographical and Clinical Anatomy of Maxillofacial Surgery". Finally, Dr Vollmer pointed out the DGZI "Practical Guide", which gives advice for the daily routine in an implantological practice. In the end, the newly elected DGZI President Prof. Dr Heiner Weber introduced himself at the "President's Minute" and formulated his ideas on his new tasks in the DGZI. He confirmed his wish to promote innovation and thanked the DGZI members of the board for the trust they have invested in. Prof. Dr Weber hopes that he can make "a humble contribution" to the DGZI's internationalization. He stated that especially China and Russia will become more central to the DGZI's efforts. In addition, Prof. Dr Weber wants to include students and dental assistants more strongly in education programmes offered by the DGZI. Concluding, he expressed his wish for good cooperation and success._


Fig. 1

Fig. 2


Fig. 3


Fig. 4

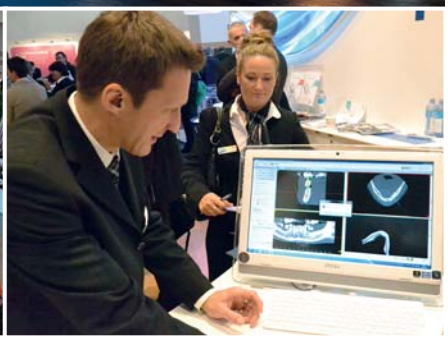

Fig. 5


Fig. 6

Fig. 1_Past President of the DGZI Prof. Dr Dr Frank Palm.
Fig. 2_Prof. Dr Heiner Weber, President of the DGZI.
Fig. 3_Dr Roland Hille, scientific director of the congress.
Fig. 4_Dr Georg Bach.
Fig. 5_Dr Rolf Vollmer, Dr Georg Bach, Prof. Dr Herbert Deppe and dental technician Christian Müller.
Fig. 6_Prof. Dr Mazen Tamimi, Dr Rolf Vollmer and Dr Rainer Valentin.

22nd Annual Scientific Meeting of the EAO

Source _Dental Tribune



_Implants have come a long way since they were introduced to dentistry in the early 1950s. Future concepts and trends in the field were recently discussed by experts at the 22nd Annual Scientific Meeting of the European Association of Osseointegration (EAO) in Dublin, which took place from 17–19 October at the city's new state-of-the-art Convention Centre. Held for the second time in the Irish capital after 1995, the event did not only focus on current issues in the field, like periimplantitis and the challenges linked to the treatment of an increasing elderly population, but also reflected on new developments and methods in the field, such as computer-assisted implant rehabilitation and tissue regeneration. Moreover, a number of sessions also focused on risk factors, treatment planning and different learning techniques.

"There is a discrepancy between what a general dentist is expected to know/perform in implant dentistry and what the current education in most schools is teaching, " explained Dr Nikos Mattheos from the University of Hong Kong's Faculty of Dentistry, EAO presenter and co-organiser of an implant education workshop recently held in Hungary. "All dental schools have increased the amount of teaching in the area of implant dentistry in the past five years and in many cases preclinical and clinical education components have been introduced. However, it is clear that there is still room for improvement."

New products for treatment outcomes that are more predictable and an improved workflow in dental practices and laboratories were also presented at an industry exhibition, which was supported by 87 corporate sponsors from around the world this year. Among others, MIS and Henry Schein showcased their latest tools for a complete digital workflow. In addition, Danish digital dental solutions provider 3Shape had its recently launched TRIOS intra-oral scanning system on display. New and improved implant systems were presented by Implant Direct and a number of other companies. Straumann, for example, announced that its dental implant material Roxolid is now available for all diameters and all implant lines.

In addition to the Royal College of Surgeons in Ireland and the Oral Surgery Society of Ireland, the meeting received support from the Irish Society of Periodontology and the Prosthodontic Society of Ireland. Attendance figures for the congress were not available when this edition of implants went to print, but first predications indicate that less dental professionals set off for Dublin that originally expected by the organiser. Last year's anniversary gathering in Copenhagen saw more than 2,500 professionals participating. The association's next Scientific Annual Meeting will take place in Rome in Italy next year. The event is scheduled to take place from 25–27 September. More details are expected to be announced by the EAO in the upcoming weeks._

Schütz Dental and DGZI host "Implantology and Anatomy"


Fig. 1


Fig. 2

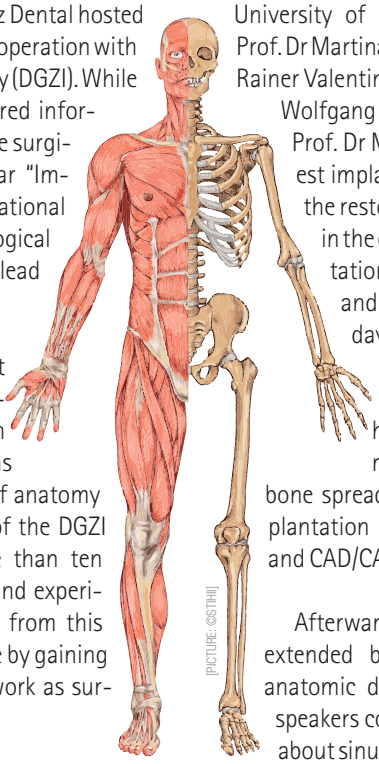

Fig. 3


Fig. 4


Fig. 5


Fig. 6

_From 11 to 12 October, Schütz Dental hosted a special implantological event in cooperation with the German Society for Implantology (DGZI). While students of dental medicine gathered information on theory and practice of the surgical anatomy in the special seminar "Implantology and Anatomy", an international expert group discussed implantological techniques in the DGZI Curriculum lead by Dr Mazen Tamimi.


[PICTURE: ©STIHII]

The clearly structured concept consisting of a theoretical introduction, live demonstrations on human cadavers and practical exercises was designed exclusively for the field of anatomy and has become an integral part of the DGZI Curriculum Implantology in more than ten years. In two days, both students and experienced implantologists can benefit from this balanced mix of theory and practice by gaining extra confidence for their future work as surgeons or implantologists.

Students of the 9th semester took part in the trial course which took place at the anatomic dissection hall of the MTZ (Medical and Theoretical Center) of the University of Dresden/Germany. The speakers Prof. Dr Martina and Prof. Dr Rolf Vollmer, Prof. Dr Rainer Valentin, Prof. Dr Werner Götz und PD Dr Wolfgang Schwab as well as Dr Uta Voigt and Prof. Dr Mazen Tamimi introduced the latest implantological techniques, especially the restoration of the edentulous maxilla, in the course of their theoretical presentations as well as live demonstrations and practical exercises on human cadavers.

At the same time, the speakers held the international DGZI Curriculum on topics such as sinus lift, bone spreading, bone extraction and transplantation as well as surgical implantation and CAD/CAM diagnostics.

Afterwards, the theoretical knowledge was extended by practical application in the anatomic dissection hall. On Saturday, the speakers continued to inform their speakers about sinus lift, piezo surgery, bone splitting, autologous bone harvesting and transfer as well as suture techniques. The event ended on Sunday by a final discussion and exams._

Fig. 1_Anatomic dissection hall of the University of Dresden.
Fig. 2_Students of the 9th semester took part in the trial course anatomy.
Fig. 3_Prof. Dr Martina Vollmer and Prof. Dr Rolf Vollmer during their live preparation on Friday.
Fig. 4_Prof. Dr Rainer Valentin (left) und Prof. Dr Mazen Tamimi.
Fig. 5_Participants of the international DGZI Curriculum.
Fig. 6_Prof. Dr Werner Götz.

NEWS

Straumann sets

New standards with Roxolid SLActive

Demographic data shows that populations around the world are becoming increasingly older, which leaves dental professionals with a high number of compromised patients and risk factors when it comes to dental implant treatment. Therefore, the demand for products that might reduce the need for invasive grafting procedures is high.

Straumann intends to meet the demand by broadening its Roxolid SLActive implant portfolio. At the EAO congress in Dublin, the global market leader in dental implantology introduced its unique dental implant material Roxolid for all diameters and all implant lines. Moreover, the company announced the launch of a new 4 mm short Roxolid SLActive implant line to be used in clinical cases with limited vertical space, as with severely atrophied jawbone. All Roxolid SLActive implants feature the new Loxim transfer piece to simplify the handling. The combination of the high mechanical strength of Roxolid with the excellent osseointegration properties of the hydrophilic SLActive surface may allow dental professionals to avoid GBR procedures by choosing smaller sized implants, Straumann said.

Research has shown that the use of smaller diameters or shorter implant lengths can reduce the invasiveness of implant treatments and increase patient acceptance if invasive grafting procedures can be eliminated. Therefore, clinicians can reduce the treatment time, preserve vital peri-implant structures, decrease post-surgical complications, and gain new implant patients by offering products that seek to eliminate guided bone regeneration procedures. In these cases, patients can benefit from a less traumatic, less expensive and shorter treatment with a lifelong implant solution. All implants are covered by Straumann's lifelong implant warranty.

Breath tests may help

Diagnose lung cancer quickly

New research has suggested that samples of exhaled breath could be a cost-effective and cheap alternative for diagnosing lung cancer compared to conventional methods. In the most extensive study to date, the researchers were able to diagnose the majority of cases of lung cancer correctly using a special screening technology.

In the study, researchers at the University of Latvia collected breath samples from 252 lung cancer patients, 223 patients diagnosed with other lung diseases and healthy individuals, 265 non-smokers, and 210 smokers. Assessing the samples with an electronic nose, a technology that detects different profiles of volatile organic compounds (VOCs) in breath samples, 128 non-smokers and 114 smokers were correctly diagnosed as having lung cancer. Overall, only ten people were misdiagnosed. Although the researchers have not yet clearly identified which VOCs are linked to different diseases, this study


[PICTURE: ©SEBASTIAN KAULITZKI]

suggests that this method can be used to differentiate between lung cancer, other lung diseases and healthy people. According to the European Lung Foundation, lung cancer is the leading cause of cancer mortality in Europe and worldwide. It accounts for an estimated 20 per cent of all cancer deaths. The findings were presented at the European Respiratory Society's annual congress that was held from 7 to 11 September in Barcelona.

Boston welcomes

International VIP Meeting 2013

From 13 to 15 September, Boston/USA became the meeting point of renowned speakers from Germany, Italy and the USA. They all followed the exclusive invitation by Bicon Dental Implants to their International VIP Meeting 2013 at the Harvard Club of Boston.

In addition to numerous implantological presentations and exceptional evening events, a visit to the Bicon headquarters was an essential part of the diversified programme. The event was hosted by Prof. Dr Mauro Marincola/Rome, Italy. His opening remark was that shortness does not always mean a disadvantage—a reference to the Bicon Short Implants, which have been applied in the practice successfully for over 28 years and for which Bicon has become famous.

SHORT® Implants were introduced to the market in 1985. Since then, they offer innovative solutions for implantologists worldwide. The special plateau design makes the application of short implants possible. In contrast to other implant systems, the Bicon system shows restorative flexibility which is achieved by the 360° universal positioning of the abutments. In addition, the "sloping shoulder" results in excellent aesthetics of the gingiva. Since the bone is supported by the implant shoulder, it can in turn support and thus preserve the interproximal papilla.

Numerous international speakers gave recent insight into the world of implantology, among the Bicon president Vincent J. Morgan, DMD, USA, with his speech "Past, Present, and Future of Bicon".

The editors of implants would like to thank all authors for dedicating their time and efforts to this year's issues.

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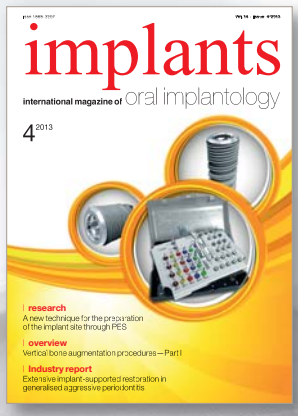

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❑ Yes
❑ No

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