Augmentation and implant treatment
Two-stage surgery in the severely resorbed edentulous mandible

By Dr Marko Nikolic, Croatia

Introduction
An adequate bone volume at the future implant site is a prerequisite for ideal implant placement and implant success. A residual bone with a vertical dimension less than 1 cm would indicate a cut-off point and implies the need of additional augmentation procedures in connection with implant insertion, whereas higher values of the alveolar crest thickness of 7.0 mm are considered to be sufficient for treatment with standard-diameter implants without the urgent need of any horizontal bone augmentation.3 Distant donor sites like the anterior and posterior iliac crest and intraradicular areas like the retronymandibular and the interforaminal region of the chin are common sources for harvesting autogenous bone grafts. Depending from the donor site, patient and surgeon should be aware of the possible confrontation with various advantages but also disadvantages when harvesting the bone. Harvesting bone from the iliac crest requires patient hospitalisation, and surgery under general anaesthesia, whereas intraradicular bone harvesting can be performed ambulatory and under local anaesthesia.1,2

The main problem with autogenous bone grafting is represented by the high risk of patient morbidity, causing pain, swelling, and healing problems at the donor site.1

The aim of this case presentation is to demonstrate a predictable, two-stage operating protocol for the horizontal augmentation of the severely resorbed, edentulous anterior mandible with an autogenous bone graft, harvested from thecrest alveolar ridge at implant site, in order to create a sufficient bone volume for the later implant therapy, without donor morbidity for the patient.

Patient data
The 47-year-old male patient visited our dental office in order to renew his old and poor fitting prostheses in the lower and in the upper jaw. The remaining five teeth 32–43 in the front of the lower jaw had been removed three months previously due to a chronic periodontitis in our dental practice. Nearly all remaining teeth in the upper and the lower jaw showed significant signs of gingival and chronic periodontitis, insufficient root treatments and prosthetic superstructures as well (Fig. 1). The medical history of the patient was without any significant pathological findings.

Diagnostic procedures
In cases of long-term edentulism, the dental surgeon is almost always confronted with a reduced bone volume, representing both a major challenge and a significant demand for the use of diagnostic imaging methods prior to augmentation and implant treatment. Conventional X-ray images contain only a two-dimensional information concerning the vertical height of the alveolar bone. Therefore, they represent an insufficient method for the appreciation of the horizontal bony dimensions.4

In comparison, three-dimensional (3D) diagnostic tools like cone beam computed tomography (CBCT) offer the advantage of the visualisation of the so-called ‘3-axes’, representing the bone volume in the horizontal, i.e. bucco-lingual dimension of the alveolar crest respectively. A proper treatment planning and the use of 3D diagnosis are therefore crucial parameters for a predictable and sustainable final treatment outcome in implant therapy, especially in patients with severe resorption of the jawbone, like in our presented patient case.

The oral examination and the CBCT Scan (SCANORA, SoreDEX, Schuttern, Germany) revealed a distinct bone resorption in the lower jaw, showing a more pronounced horizontal atrophy in the anterior part of the mandible (Figs. 2 & 3). According to the clinical measurements and the values of the 3D CBCT scan, the interforaminal vertical bone height was between 22.0–25.0 mm.

The horizontal bone volume amounted to between 1.0–3.0 mm in the implantation zone. The CBCT scan revealed a horizontal crestal bone thickness of 1.25 mm in region 32, and 1.75 mm in region 44.

Treatment planning and augmentation procedure
After patient consultation, we opted for a twostage surgery with an intraorally harvested autogenous bone-graft and a delayed implant treatment after a healing period of at least four months. As the vertical dimension of the implant region appeared to be sufficient enough for placement of implants with a standard length, we decided to cut off 5 mm of the thin and sharp-edged alveolar ridge by osteotomy, in order to create an autogenous lateral onlay bone-graft for horizontal augmentation in the anterior alveolar ridge. This protocol permitted in our view the advantage of the avoidance of donor morbidity, because the donor site was the receptor site as well. After creation and mobilisation of the mucoperiosteal flap, the very thin and sharp edge of the atrophied alveolar crest became visible (Fig. 4).

The osteotomy of the bone was performed with a saw (Bone splitting system, Helmut Zepf Medizintechnik GmbH, Setingen-Oberhalden, Germany, Fig. 5).

Subsequently, the graft was detached from the anterior mandible with chisel (Bone splitting system, Helmut Zepf Medizintechnik GmbH, Setingen-Oberhalden, Germany; Fig. 6) and a corticocancellous bone block was obtained (Fig. 7). The bone graft was fixed at the buccal side of the anterior mandible (re-
The four implants with a diameter of 3.75mm and a length of 11.5mm were inserted epis- terically in regions 33, 31, 41 and 43 using the freehand method without any surgical guide (Fig. 15). The insertion torque of the implants was 35Ncm with good primary stability.

Pre-prosthetic surgery and prosthetic rehabilitation

After three months of uneventful submerged healing, the panoramic X-ray showed a successful implant osseointegration without any signs of bone resorption (Fig. 14). Due to a lack of keratinised gingiva, we decided to use a barrier membrane.9 A combination of autogenous bone chips and particu- lated xenograft (RECO OSS, RECO Implant Systems, Bremen, Germany) was placed in the small remaining space between the bone block and the alveolar process, as well as around and on the bone graft. The augmented site was covered with a platelet rich in growth factors (PRGF) membrane (BHT Biotechnology Insti- tute, Blue Bell, USA) and additionally with a barrier membrane for guided bone regeneration (GBR). Bio-Gide (Geistlich Biomaterials, Wertheim- sellschaft mbH, Baden-Baden, Ger- many) was used. The healing of the graft was uneventful and without any complications, like membrane ex- posure, being classified as a frequent post-operative complication.10 The patient was provided with a removable provisional prosthesis.

Re-entry and implant surgery

The re-entry for the delayed implant placement protocol was planned af- ter a healing period of four months. With regard to the soft aspect of the augmented area of the anterior mar- ginal, the dimensions of the alveolar ridge appeared sufficient enough for implant placement (Fig. 10). The CBCT data confirmed the assumption, demonstrating a significant gain of bone volume in the interfor- mal raminal region of the mandible after augmentation. The appendage is well described in literature, autog- enous bone grafts with guided bone regenera- tion (GBR) is apparently associated with a two-stage protocol. Even though this evidence is limited by the fact, that defect size, augmented volume, and regenerative capacity are scarce- ly well described in literature, a two-stage protocol in favour to resorb- tion (GBR) is apparently associated with a two-stage protocol. Even though this evidence is limited by the fact, that defect size, augmented volume, and regenerative capacity are scarce- ly well described in literature, a two-stage protocol in favour to resorb- tion (GBR) is apparently associated. The re-entry for the delayed implant placement protocol was performed af- ter a healing period of four months. With regard to the soft aspect of the augmented area of the anterior mar- ginal, the dimensions of the alveolar ridge appeared sufficient enough for implant placement (Fig. 10). The CBCT data confirmed the assumption, demonstrating a significant gain of bone volume in the interfor- mal raminal region of the mandible after augmentation. The appendage is well described in literature, autog- enous bone grafts with guided bone regenera- tion (GBR) is apparently associated with a two-stage protocol. Even though this evidence is limited by the fact, that defect size, augmented volume, and regenerative capacity are scarce- ly well described in literature, a two-stage protocol in favour to resorb- tion (GBR) is apparently associated.

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Discussion

In our case presentation, the patient suffered from an extremely hori- zontal bone resorption, resulting in a 3.9 mm gain in region 44 and 3.3 mm in region 32. The dimensions of the graft were 3.5mm in region 42 and 4.49 in region 32. The augmentation procedure resulted in a horizontal bone gain of about 3.9 mm in region 44 and 3.9 mm in region 32 respectively, representing a mean bone gain of 3.6mm (Fig. 10). After elevating the flap, an appar- ently good osseointegration and stabilisation of the autograft with the underlying pristine bone could be noticed (Fig. 11). Prior to implant placement, the fixation screws were removed.

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The Full Arch Promise

By Dr Frank R. LaMar Jr, USA

When patients seek dental implant treatments, not only do they bring specific needs, they also bring hope. Health care marketing today has only increased these expectations, and has set up more doctors to fail to meet them. Not because they aren’t capable, but because they haven’t reset their patients’ expectations at the beginning. Many dentists end up struggling to fulfill their own promises, and it can ultimately impact their reputations for years to come.

The Promise of Great Teeth, Right Away

One of the biggest challenges we face as dentists is our patients’ expectations of immediacy. Throughout their lives, consumers have been delivered things fast. Fast food, overnight deliveries, two-day gift deliveries from across the globe. People have been trained to believe that fast is best. This has become true in the dental implant / full arch delivery space as well, despite the fact we know that the human body requires time to heal and adjust. Biology just hasn’t trained to believe that fast is best. This is how we end up with delayed results and less than ideal outcomes for patients.

Today, dental services and other healthcare providers are ranked online along with car dealerships and dry cleaners. Negative word of mouth harms our reputations, but bad reviews and horror stories shared online can not only affect perceptions, but also search engine results for all to see. In the end, patients want a trusted advisor. Someone who knows what their ultimate goals are. Their hopes and dreams, and their own long-term satisfaction.

The Risk to Our Reputations

Patients rely on us to help them expand their understanding of the full arch process, and especially of what is healthy. When we don’t reset expectations, explain the best way to achieve optimal results, and then deliver to those promises, patients have every right to be unhappy. Unfortunately, practitioners don’t only pay with increased unprofitable chair time – patients hold our reputations in their hands.

Although we inevitably talk about health and wellness, patients don’t want to be without teeth for any period of time; they don’t want to be embarrassed by their appearance; they don’t want to experience discomfort much less any real pain. Many don’t think longer-term, but quite a few have done enough research to ask about healing and success rates.

What Patients Really Want

When we first meet with patients regardless of why they say they’ve come to the office – we should ask what their ultimate goals are. Their hopes, dreams, and their own long-term satisfaction.

In addition, healing and prosthetic failures are more common in immediate load cases. The lost time and patient inconvenience often creates a less than ideal sense of a dentist’s satisfaction with this part of the practice. By taking the fast track, patients ultimately spend more time in your chair, reducing your profitability. You end up marked as an unhappy patient, working hard to satisfy them – every extra minute in your chair leading to additional frustration for you both.

Bioactive implant coating stimulates healing process

By DITI

TOMSK, Russia: One of the reasons for dental implant failure is rejection of the implant owing to the body’s immune response. Immune cells identify the implant as a foreign body and cause inflammation and finally rejection. A new bioactive coating for medical implants, developed by Russian scientists, may be able to invert this immune mechanism and encourage healing around the implant.

Scientists at Tomsk Polytechnic University have proposed solving the issue of implant rejection by coating implants with a biologically active compound that is an analogue to the cytokine interleukin-4. This substance is capable of controlling the behaviour of the innate immune cells, the macrophages, forcing them to stimulate the healing process instead of rejecting the implant.

“A feature of macrophages is their enormous plasticity under different conditions the same immune cells can either fight off the implant or, conversely, stimulate the healing process. We are trying to synthesize these compounds, which could force macrophages to differentiate into a positive phenotype,” said project manager Ksenia Stankevich, a PhD student at the Department of Biotechnology and Organic Chemistry at the university’s Institute of High Technology Physics.

According to the researchers, the coating could be used for polymeric and titanium implants, which are employed in implant dentistry, as well as orthopaedic and oral surgery. Therefore, the Russian scientists hope that their development will be universally applicable in implantology. Currently, they are at the stage of synthesizing the compound and are conducting experiments to determine its optimal composition.

The research project has received the support of the Russian Foundation for Basic Research and was awarded a gold medal at the RusBioTech international exhibition in 2016, according to the university.
Novel implant coating could facilitate bone integration

By DTI

LEIOA, Spain: Oral infections are recognized as the primary cause of dental implant failures. Spanish researchers are currently developing antibacterial implant coatings, which are capable of preventing and eliminating potential bacterial infections while providing the implants with osteointegration properties.

The quest for surfaces that are capable of preventing bacterial colonization and adhesion in the areas surrounding the implant "is a subject of undoubted interest, borne out of the huge number of studies that have been undertaken in this field," according to Beatriz Palla, researcher at the Biomaterials Group of the Department of Polymer Science and Technology at UPV/EHU, University of the Basque Country. "About 10 per cent of implants have to be removed due to osteointegration problems or because of the onset of infection," she explained.

When designing strategies to combat these problems, the challenge is to give the surface of the titanium implant antibacterial properties, while simultaneously overcoming the tremendous resistance that bacterial strains are capable of developing against conventional antibiotics. "We have already created coatings that facilitate bone generation around the implant, thereby facilitating anchoring to the bone. In a bid to go a step further, we looked at how we could turn these coatings into bactericides," said the Palla.

The Spanish researchers used sol-gel synthesis to tackle the problem. This novel route was chosen in the preparation of a precursor solution (sol), which, if left on its own for a while, turns into a gel that can be used to coat the surface of the titanium screw. After heat treatment at a high temperature in the kiln, it adheres to the screw that will be implanted. "We used silica as the precursor, because in many studies this compound has shown to be osteoinductive, so it meets one of the objectives that we were after," she explained.

In a related study, Palla developed three types of coatings using various antibacterial agents. Each of the coatings is able to tackle bacterial infections, either prophylactically by preventing the bacteria from adhering or instantly against subsequent infection by eliminating it as soon as it develops.

One of the requirements of the prophylactic coating was to create "a material with a very low degradability time so that it would adhere to the screw and work for as long as possible, while preventing bacteria from adhering," said Palla. In the coatings that were designed to eradicate an infection that has already taken hold, however, "a rapidly degrading material is needed so that it can release the antibacterial agent as quickly as possible to attack the infection. Furthermore, one of the coatings that were developed for this purpose is designed to be used in situ, at the dentist’s surgery itself, on the infected screw without any need to extract the implant from the patient." This new material is in the process of being patented and remains a trade secret, the researcher stated.

In view of the results, Palla believes that "it is possible to confirm that coatings with antibacterial capabilities, which do not affect the proper integration of the implant into the jawbone, have been developed." However, she also admits that there is still a long way to go until these can be applied and used at dental surgeries. "She explains that "apart from all the trials that remain to be carried out, it would also be advisable to further pursue the research a little in order to optimise the results”.

The study, titled “Control of the degradation of silica sol-gel hybrid coatings for metal implants prepared by the triple combination of alkoxysilanes,” was published in the December 2016 issue of the Journal of Non-Crystalline Solids.

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