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 adequate implant placement and implant success. A residual bone with a vertical dimension less than 1 cm or a bone block with a crestal height of less than 5 mm is considered to be insuffi cient for treatment with standard-diameter implants without the urgent need for any horizontal bone augmentation.3,4 Distant donor sites like the anterior iliac crest and intracranial areas like the retroorbital and the interfascial regions 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 intrarstral bone harvesting can be performed ambulatory and under local anaesthesia.3,5

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.1,2

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 the crestal 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 fi tting prostheses in the lower and in the upper jaw. The remaining fi ve 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 signifi cant signs of gingival fl at chronic periodontitis, insufficient root treatments and prosthetic superstructures as well (Fig. 1). The medical history of the patient was without any signifi cant pathological fi ndings.

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 signifi cant 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 insuffi cient method for the appreciation of the horizontal bony dimensions.6

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

The oral examination and the CBCT–scan (SCANORA, Soredex, Schutterwald, 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 1.0–5.0 mm in the implantation zone. The CBCT–scan revealed a horizontal crestal bone thickness of 2.1 cm in region 32 and 1.7 cm in region 44.

Treatment planning and augmentation procedure

After patient consultation, we opted for a two-stage surgery with an intrarstral 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 suffi cient enough for placement of implants with a standard length, we decided to cut off 5 cm 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 complies in our view the advantages 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, Setzingen-Oberflacht, Germany, Fig. 5).

Subsequently, the graft was detached from the anterior mandible with chisel (bone splitting system, Helmut Zepf Medizintechnik GmbH, Setzingen-Oberflacht, Germany, Fig. 6) and a corticocancellous bone block was obtained (Fig. 7). The bone graft was fi xed at the buccal side of the anterior mandible (re...
The four implants with a diameter of 3.75mm and a length of 11.5mm (RECO-Semados® RSX, RECO Implant Systems) were inserted epi- crestally in regions 33, 34, 43 and 44, using the freehand method without a surgical guide (Fig. 13). 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 osteointegration without any signs of bone resorption (Fig. 14). Due to a lack of keratinised gingiva, we decided to perform gingival grafting. This was performed by attaching the membrane using resorbable 4.0 polyglycolic acid sutures. The root apex of the onlay graft was exposed by performing mucogingival surgery including apicectomy to the apex of the root of the second premolar.

The osseous graft was covered with a PRGF membrane and a barrier membrane for GBR. After elevating the flap, an appara- taneous onlay graft for the horizontal augmentation, resulting in an ex- tended operating time.3

**Discussion**

In our case presentation, the patient suffered from an extremely hori- zontal bone resorption, resulting in a size of 3.75mm, and the knife-edged alveolar crest. Since standard diam- eter dental implants need a certain crestal bone volume for an adequate stabilisation and a good and predict- able osteointegration, augmenta- tion procedures had to be performed prior to implant treatment.4

A recently published meta-analysis showed that dental implant survival has probably to be seen indepen- dently of the biomaterial used in augmentation procedures.5 Since this evidence is limited in literature, the fact that defected, augmented volume, and regenerative capacity are scare- rely described in literature, an au- tonomous bone is still recommended as the gold-standard for augmentation in the deficient alveolar ridge. Simul- taneous grafting and augmentation is the standard procedure in ridge augmentation, resulting in an ex- tended operating time.

Fortunately, as the vertical dimen- sion of the anterior mandible was high enough in our clinical case, we were able to harvest an adequate au- tonomous bone block from the thin alveolar crest, in order to use it as an onlay graft for the horizontal aug- mentation of the anterior mandible. This procedure avoided donor site morbidity, and resulted in less op- erating time and a reduced patient discomfort.

The dimensions of the graft were ideal for lateral augmentation, so that there was no need for any ad- ditional cutting of the bone block. As mean bone gain after healing of the onlay graft was 3.9mm in region 34–44, and 4.43 in region 32 respectively, representing a mean bone gain of 3.6mm (Fig. 16). After three months of submerged healing, a successful implant osteointegra- tion without bone resorption was visible on the panoramic X-ray. Due to a lack of keratinised mucosa around the surgical site in the anterior mandible, resulted in a significant horizontal bone gain, and took to a good osteointegration of both, au- tonomous and onlay grafts.4 The described grafting procedure has not been previously reported in litera- ture. Despite of any experi- ence reports, our method revealed nonetheless a successful combi- nation with an implant-supported, screw-retained prosthetic rehabilita- tion, and is still in function without any biological or technical problems after a three-year follow up.

**Conclusion**

The staged approach with the use of an autogenous bone graft, harvested from the surgical site in the anterior mandible, resulted in a significant horizontal bone gain, and took to a good osteointegration of both, au- tonomous and onlay grafts. The described grafting procedure has not been previously reported in litera- ture. Despite of any experi- ence reports, our method revealed nonetheless a successful combi- nation with an implant-supported, screw-retained prosthetic rehabilita- tion, and is still in function without any biological or technical problems after a three-year follow up.6

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The Full Arch Promise

By Dr Frank R. LaMar Jr, USA

When patients seek dental implant treatment, 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 delivery, two-day gift delivery 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 kept up with the 24-hour-turnaround promise as simply as they had envisioned. That first denture conversion? It was just step one of what turns out to be a multi-step process. Teeth right away... plus more time. A little bit longer than the patient had originally thought.

In addition, healing and prosthetic failures are much 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 married to an unhappy patient, working hard to satisfy them – every extra minute in your chair adding to additional frustration for you both.

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 push with increased unprofitable chair time – patients hold our reputations in their hands.

Today, dental services and other health care 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.

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 top answers shouldn’t surprise you: a natural look, the ability to eat all types of foods, and long-lasting implants. But don’t limit yourselves to the obvious.

Patients have many other desires, from the ability to eat plants that don’t require special care. Some want to give up smoking or go on a diet. Others want to lose weight or improve their appearance. They may want to be at the center of attention, or to be a part of a specific community. For some, the desire to be respected by their peers is paramount.

We encourage patients who are shopping around to really understand the failure rates and the actual time-to-completion with our competition, especially those who make unrealistic promises. What sounds too good to be true usually is.

Yes, patients carry fears with them. They 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.

The end, patients want a trusted advisor. Someone who knows what they are talking about and can deliver on the promises they are making. Someone who is honest about the risks and can speak to the different options available.

The Ultimate Promise

Every patient asking for dental implant treatment is seeking one common goal: a successful outcome.

They require their doctors to balance hopes with expectations. The ultimate promise to your patients is that you will see them through to the finish line, creating a healthy mouth and lastig smile that will match all their most important expectations.

Bioactive implant coating stimulates healing process

By DTI

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 resolving the issue of implant rejection by coating implants with a biologically active compound that is an analogue to the cytokine interleukin-4. This substance can combat 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 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 Blankevich, 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 orthopedic and oral surgery. Therefore, the Russian scientists hope that their development will be universally applicable in implantology. Currently, they are at the stage of synthesising 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 a gold medal at the RusBioTech international exhibition in 2016, according to the university.

Dr Frank R. LaMar Jr. Dr. LaMar is a Doc- tor of Dental Surgery specializing in prosthodontics and dental rehabilitation.
Novel implant coating could facilitate bone integration

By DTI

LEIOA, Spain: Oral infections are regarded as one of the main reasons that dental implants fail. Spanish researchers are currently developing antibacterial implant coatings that are capable of preventing and eliminating potential bacterial infections while providing the implants with osseointegration properties.

The quest for surfaces that are capable of preventing bacterial colonisation 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 osseointegration 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 resolving the tremendous resistance that bacterial strains are capable of developing against conventional antibactericides. “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 Palla.

The Spanish researchers used sol-gel synthesis to tackle the problem. This involves mixing the precursors with the preparation of a precursor solution (sol), which, if it is 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 and works 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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