Getting best value from your patients

Jacqui Goss explains how to considerably increase treatment plan take-up

How much is a washing machine? What about a car tyre? Or a pair of Christian Louboutin shoes? I suggest most people have some idea about the cost of most things – except dental treatments. I know of no dental practices with a window display showing a set of false teeth with a £750 price tag or advertising braces from £1500. The website www.cosmeticdentistryguide.co.uk promises information about the cost of dental implants but only gives a heavily qualified price of £600.

On www.privatehealth.co.uk the cost of an implant in the UK (based on the Branemark system) is given as £2,000, excluding the crown.

With members of the public having little experience and knowledge to go on, are you surprised that the cost of your implant treatment plans will come as a (unwelcome) shock to most patients?

It doesn’t get better if the patient decides to go home and think about it. With equally little knowledge of the cost of specialist dental treatments, friends and relatives are likely to express similar shock at the price. “You could buy a (insert consumer product/holiday/item of furniture) for that!” will be a typical reaction. And someone is bound to Google ‘implants UK’ and see headline figures of £555, £495, £440 and so on.

So if you don’t want lots of proposed treatment plans to hit the dust, what’s the answer? It comes in two forms – the provision of information and the employment of a patient coordinator.

Presentation, presentation, presentation

If you expect a patient to spend £000s for a life-changing treatment such as implants you need to do more than scribble the cost on the back of an appointment card. The best dental practices I deal with give their patients an excellently presented treatment plan. Enclosed in a posh looking (but not necessarily expensive) folder, a comprehensive treatment plan may run to several pages. Each stage of the proposed treatment is itemised with the dental terminology explained in layman’s language. For example, when first mentioned, periodontitis is followed by ‘gum disease’ in brackets. There may be a reference to it being commonly referred to in the practice as ‘perio’. That way, when the receptionist asks if a patient has arrived for a perio appointment, the patient will understand.

Even when you avoid dental jargon, you still need to consider the words used. Describing a dental implant as a ‘small screw made of titanium, which is inserted into the jaw bone while the patient is under local anaesthetic’ sounds scary just writing it! Try instead: ‘an artificial replacement for a tooth root’.

By all means include images but they should be of the problem and the anticipated solution, not the process. On YouTube there are animations and videos of all sorts of medical procedures for everything from breast enhancement to knee joint replacement. Informative they may be but the visual effect of seeing drills going the jaw for a dental implant tends to draw comments such as: ‘that looks scary’, ‘ouch, that must hurt’ and ‘I hope I never have that done’.

Include the costs on the treatment plan – broken down for each stage and totalised. Why not itemise labour and materials costs separately? I haven’t seen this on a treatment plan yet but it could usefully make the patient aware that some costs (laboratory charges, cost of the implant fixture and so on) are outside the

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The treatment plan should include information about payment terms. Can payment be made in stages (no more than four to avoid conflict with consumer credit regulations)? Are interest free and/or low interest rate finance options available? Do you offer a warranty for the successful integration of the implant?

Be aware that if you offer a patient the option of either paying in full for the treatment at a discounted price or of spreading the cost of the full fee with finance, you will be in breach of the Consumer Credit Act. When interest-free finance is offered, the cash price and the interest free price must be the same. I double-checked this with my local Trading Standards Manager and he confirmed it to be the case, referring me to The Consumer Credit (Total Charge for Credit) Regulations 2010, which came into force in February this year.

In the treatment plan pack, why not include a printed leaflet giving general information about dental implants? Written in easily understood language (use the Plain English Campaign website to help you), it should answer many questions patients will have. It may also get passed to friends and relatives and result in referrals.

And now for the patient coordinator:

Here is part of my report of a conversation I had with a potential implant patient, while acting as a remote patient coordinator for a practice.

She is well aware that the treatment is something that she has to have done but she resents being in that position. She has the money to proceed but keeps focusing on what else she could do with it. She has no issues with the practice. Last year she was going to go ahead with the treatment because she was in frequent pain. However, the pain has subsided and with it her resolution to proceed…

The treatment was costed at £25,600 – a significant potential income for a practice. It took me seven attempts over four days to speak with her, which I eventually did by ringing her mobile phone.

Lack of space prevents me detailing the full range of duties of a patient coordinator. However, in relation to treatment plans they should discuss these with patients a day or two after they leave the practice. A phone call in the evening will find most patients relaxed but with queries (and possibly concerns) about the plan – having discussed it with relatives and/or friends.

The patient coordinator should answer queries (being conversant in the procedure is an obvious must) and allay any concerns. This is not a pure sales role but the patient coordinator must put across all the benefits to persuade the patient to proceed with what is, after all, clinically necessary treatment.

If you’re sceptical about the value of a patient coordinator, the conversion rate over a three-month period was 44 per cent in one of my practices and 33 per cent in another. On average, uptake in treatment increases by at least 25 per cent. Practices referred these patients to me because they appeared to be undecided.

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About the author
Jacqui Goss is the managing partner of Yes!RESULTS. By using Yes!RESULTS dental practices see an increase in treatment plan take-up, improved patient satisfaction and more appointments resulting from general enquiries. Yes!RESULTS turns good practices into great practices.

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Lateralisaton of the inferior alveolar nerve
Dr Bernd Quantius describes the surgical technique used to minimise probable risks

Depending on the anatomical situation, the lateralisation of the inferior alveolar nerve may be one, or perhaps the only, solution to manufacture a fixed prosthesis for a patient with a free-end situation.

Problems
If a patient with conservative residual dentition in the anterior mandibular area with a free-end situation requires an implant-supported restoration, problems may arise regarding the route of the inferior alveolar nerve. If the route of the nerve runs too far toward the crestal bone, or if there are already signs of atrophy in the crestal part of the jaw, a restoration with a common implant may be difficult, or even impossible.

Here are several solutions for this problem.

One solution is the use of short implants (<10mm). The minimum length of common implant systems is 7–9mm. Therefore, the bottom line for a conventional implant should be calculated with a safety margin of 2mm, provided that there are approximately 9–11mm of crestal bone. As observed in the mandible, the survival rates of 8mm long implants are similar to the survival rates of longer implants (Grant, 2009).

Another alternative is a vertical augmentation with autogenous bone or allogenic materials. With respect to resorption, the long-term prognosis is controversial. Schlegel states a resorption rate of approximately 50 per cent after five years. Moreover, this solution must be excluded for those cases in which atrophy of the jaw bone is not due to insufficient crestal bone, but to the crestal route of the inferior alveolar nerve (Fig 1). This method requires the usage of pelvic bone, which implies a second surgery site.

Probable rates of long-term complaints in this area are partially stated as 11 per cent (Cricchio, 2005).

Another option is the osteo-distraction in the lateral mandibular area. In order to place the distractor cranially to the nerve canal, a minimum of 8mm residual bone substance is necessary for the application of this technique. Here, the resorption rate is lower than in cases of vertical augmentation (Esposito, 2009).

Thus, the lateralisation of the inferior alveolar nerve facilitates implantation in the lateral mandibular tooth area. There are two operative approaches cited in literature that suggest how to change the route of the nerve, and how to make implantation possible. This article describes a technique which minimises risks thanks to exact planning and by using Piezo surgery.

Surgical techniques
In 1987, Jensen and Nock were the first to publish this technique developed for the translocation of the mental foramen.

The technique shows the exit of the inferior alveolar nerve at the mental foramen. Being observed and taking care of the nerve, the foramen is extended.
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This technique carries the important risk of temporary or even permanent irritation of the nerve, which may lead to anesthesia, hypesthesia or paraesthesia. Several studies have considered this risk.

In his 1992 study Rosenquist12 demonstrated that 12 months later sensory disorders could not be observed in all 10 patients (26 implants). Peleg’s10 2002 study did not show any permanent disorders either. Jensen7 quoted 10 per cent sensory disorders after 12 months. In 2005 Ferrigno3 reached the same results, and he also agreed with the figure stated by Watzek.14 The interesting retrospective study by Kan9 1997 is the only one that compares both surgical techniques, the "displacement of the foramen" and the "lateralization of the inferior alveolar nerve". He analysed 21 surgeries (64 implantations) after 10 to 67 months. He found out that sensory disorders occurred significantly more often in cases of displacement of the foramen (66.7 per cent) compared to the lateralisation of the nerve (33.3 per cent).

These results show that in this regard, lateralisation is less risky. The implant survival rate stated in the above-mentioned studies is between 93.8 per cent and 100 per cent. Kan describes for example another probable complication, ie a fracture of the mandible at the operation site.

The mandible is weakened by the removal of the buccal corticalls, and by the crestal implantation at the same time, and thus there...
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prepared in the cancellous bone.

Usage of the diamond-coated part of the Piezo device is recommended for this procedure. After preparation, the nerve will be encircled with ethiloop silicone slinga.

The preparation of the nerve is followed by the insertion of the implant. In order to obtain sufficient primary stability, there must still remain enough bone in the buccal area after the preparation of the cavity. If there is not enough bone left, the buccal bone lamella may break during insertion, which might endanger the primary stability of the implant. The preparation of the counter corticalis is also suggested, provided that the implant is long enough. A previously manufactured—by means of 3-D diagnosis—orientation template, can be used for the bucco-lingual and mesio-distal positioning of the implant.

The nerve can be repositioned directly on the implant (in this case a CAMLOG Screwline, 4.5 x 15mm, was used, Fig 10 and 11) without taking any further measures. Some authors (Rosenquist11, Friberg 4) state that the contact with sharp thread edges often causes chronic irritation. Use of implants with a low incisive thread is therefore recommended in order to avoid nerve irritation. After repositioning the nerve the bone cavity will be filled with bone chips, which were obtained by grinding the buccal compact bone. Afterwards, the cavity will be covered with the collagen membrane, which will be fixed with membrane nailsb. The wound is carefully closed with successive single interrupted sutures. After a waiting period of three months, the fixed prosthetic restoration can be done. During this time the operative site should not be irritated.

Discussion
The lateralisation of the inferior alveolar nerve offers patients the possibility of obtaining a fixed prosthesis in the mandible, provided that they have a conservable anterior residual dentition and a free-end situation.

This is sometimes the only feasible procedure to help patients obtain a fixed prosthesis, especially in those cases where there is only very little residual bone height left due to the route of the inferior alveolar nerve rather than atrophy. Other advantages are the fixation in the pre-existing bone, and the one site surgery, which make augmentative procedures unnecessary. This also avoids the disadvantages of other procedures for example the risk of resorption. The evaluation values for implant survival rates are similar to those for standard implantations. However, there are two reasons that might advise against a lateralisation of the inferior alveolar nerve: (i) the complicated surgical technique requires a skilled surgeon and (ii) the risk of nerve irritation.

Patients have to consider six-eight weeks of lasting paraesthesia of the mental nerve, and the possibility of a permanent paresthesia cannot be excluded. It is therefore of utmost importance to inform the patient in detail beforehand. A rather rarely-occurring complication is a mandibular fracture in the area of the bony window. In 10 of the 11 lateralisation surgeries carried out in the authors clinic, the function of the mental nerve was completely recovered within 6-8 weeks. In one case, one patient still suffers from permanent paraesthesia, though it does not disturb much. However, even this patient would again decide upon the fixed implants instead of choosing a removable mandibular prosthesis as alternative solution. No case of implant loss can be reported. In all cases, the fixed implant supported prosthesis could be manufactured according to the previous planning.

Editorial note: The literature list can be requested from the author.

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* Excluding contract pricing and special price agreements.
From the patient’s perspective
Dr Götz Grebe and Dr Melanie Grebe discuss design, implementation and prosthetics

The cases presented in this article differ in level of difficulty in order to illustrate that navigated implant placement is the procedure of choice for many cases. We also wish to demonstrate that template-guided navigated implant placement is advisable not only in very complex cases. From the very first time the patient presents to the dental office, the focus of the entire team contributing to the treatment is on thinking and acting from the patient's perspective and his or her foremost wish to receive a treatment that is safe, not time-consuming, and associated with as little pain as possible.

The advantages of case planning with the NobelGuide software (Nobel Biocare) in combination with template-guided navigated implant placement include:
- backward planning
- pre-surgical planning in the dental laboratory
- maximal certainty of the diagnosis
- minimally invasive intervention
- evaluation of complications ahead of time, to the extent possible and
- optimal prosthetic preparation (Figs. 1–5)

Accordingly, the resulting case designs were developed on the basis of teamwork and are therefore supported by the entire team. The NobelGuide team always includes the dental technician, the prosthetic expert, the surgeon, the patient, and, if applicable, the radiologist recording the 3-D images. The advantages of integrating 3-D diagnostics, 5-D planning and 3-D templates outweigh the disadvantages, such as increased radiation exposure and associated costs, which are the ones most mentioned.

The definite advantages of this approach include certainty of diagnosis, precise surgical implementation, avoidance of angular deviations at depth during the surgery, expansion of the range of indications, and prevention of clinical and prosthetic complications to a large degree, especially in the application of NobelActive implants, as is described below.

As a concept, navigated implant placement can even be utilised for the purposes of patient marketing, mainly through word-of-mouth communication, as will become evident in case II.

**Teamwork**

The dental laboratory is an important partner in the team working with the NobelGuide software.

One of the earliest steps, the preparation of the X-ray templates defining the later prosthetic targets in detail, is carried out in the laboratory. During the planning phase, the results can be discussed by means of NobelConnect, an Internet-based network of all participating specialists, and the necessary decisions concerning the fine-tuning between surgery and later prosthetic requirements can be made.

Accordingly, the resulting

As a concept, navigated implant placement can even be utilised for the purposes of patient marketing, mainly through word-of-mouth communication, as will become evident in case II.

Two new tools – NobelClinician and Nobel Connect – enable even better networking between the participating team partners for collaborative purposes by giving each partner access to the current state of the case—from 3-D planning to the insertion of the implant restoration—through a dedicated software interface. This facilitates communication, especially if team members do not work in the same locale.

After taking the history and arriving at a clinical diagnosis, the 3-D analysis is performed and the results are discussed to determine the treatment plan. NobelGuide, being both a surgical and a prosthetic system, is advantageous in that it allows a temporary restoration to be fabricated by the dental laboratory prior to surgical intervention, provided this is needed and indicated. The laboratory can utilise the drilling template made in a centralised industrial production facility to transfer the planned implant positions to a model such that the temporary restoration can be fabricated without
the risk of transfer losses.

Case I: Lateral tooth restoration
The first case presented concerns a 75-year-old female patient and documents a situation that is commonly encountered. The plan was to treat tooth #14 with a single crown and place a bridge on two implants. Furthermore, teeth #23 and 24 were each to receive single crowns and, in addition, an implant bridge on three implants was planned (Figs 4a–f). In this case, what made the use of NobelGuide so attractive for patient, dental technician and surgeon?

Easier handling
Owing to the exact 3-D design with NobelGuide, the surgeon was able to proceed despite the reduced amount of available bone. A sinus lift was not necessary. It was possible to place all five implants without having to generate a flap, minimising the post-operative consequences such as pain, swelling and the formation of haematomas. Moreover, it allowed the impression for preparation of the master model over teeth and implants to be taken in the same surgical session (Fig 5). The dental laboratory contributed to the production of the X-ray templates early in the planning phase, was familiarised with the case and involved in the discussion about the desired implant positions. The benefits for the patient included a safe operation, since the surgeon planned the entire operation beforehand and thus expected a predictable result.

A difficulty in the present case was the relatively soft quality of the bone. Under these circumstances, NobelActive is beneficial for the experienced surgeon since it rotates into the bone much like a compression screw, which allows good primary stability to be attained.

The NobelActive implant
The TiUnite surface of NobelActive implants affords osseointegration down to the level of the implant shoulder rather than to just below the implant shoulder owing to the biological width of at least 1mm as is customary for conventional implants. This is associated with significant advantages for the aesthetics of the red-white transition. The gingiva is more stable and resection is less pronounced, which leads to the volume being maintained. This effect is of crucial importance for the success of an implant treatment in the anterior region, where aesthetic appearance is extremely significant.

Ceramic-veneered and screw-retained implant bridges made of titanium

For dental management of the final restoration, CAD/CAM-fabricated Procera Implant Bridges with screw retention at implant level were produced.

The available framework materials for this purpose are zirconium-oxide ceramics and titanium. Titanium was selected in the present case (Figs 6 & 7).

Additional advantages of this technique are:
- screw-retained abutment and bridge (Fig 8)
- tension-free framework
- bridge construction and implant are made of the same material
- very high quality milled titanium material
- no problems with chipping
- bridges are aesthetically pleasing and easy to remove
- no gingival irritation is caused by a cement gap, since there is no such gap (Fig 9)

Screw-retained bridges and milled titanium are very popu-
lar forms of management today. Their production in the dental laboratory is no longer fraught with the earlier difficulties of cast titanium restorations, such as an alpha case layer. Accordingly, the veneering with titanium ceramic materials, made by VITA in the present case, has become much simpler. In a template-guided implant placement procedure, the axes are aligned such that the screw retentions can be implemented later exactly according to plan. This makes the work much easier and improves the quality of the restorations. Consequently, implant restorations can be achieved that are attractive to the patient owing to their reasonable pricing and high quality aesthetic appearance.

In this case, the master impression was taken during the surgical session. With respect to the skull, the models were mounted in an articulator by means of face-bow transfer via the impression posts. The natural teeth were treated with NobelProcera Crowns Alumina, which is another CAD/CAM-based method for fabricating allceramic dental restorations. For this purpose, a framework coping and the implant frameworks were tried-in at the subsequent session. At the third session already, the tooth-borne crowns were incorporated and the finished implant bridges were tried-in during the same session. The definitive incorporation of the final restoration was only effected after a healing time of three months though. Owing to this specific surgical and prosthetic protocol, no additional session for try-in was required, which the patient considered very convenient (Fig 10).

Case II: Management of upper and lower jaw
It was easy to conclude from the initial situation of this case that the patient, a 65-year-old male, had eschewed visiting a dentist for a long time. Accordingly, the teeth were in need of much dental work (Fig 11). Following a comprehensive diagnostic work-up, all teeth had to be removed, since they could not be conserved (Fig 12). The patient was phobic and well aware of the poor condition of his teeth but had not perceived an adequate treatment option for his needs in the past. Talking to an acquaintance, he had been made aware of the availability of surgery with a template without “cutting” and detailed pre-surgical planning on a PC in order to minimise the attendant risks. By his own account, he would not have made the decision to have classical surgery. For the surgeon, the outcome obtained in this case would not have been possible without this technique except with much difficulty and significantly more surgical effort and trauma.

Procedure according to treatment plan
It is very convenient for the treatment team to be able to proceed according to a detailed plan. Each member of the team is aware of all tasks and when they need to be addressed. In particular, the prosthetic pre-surgical planning, which is of great importance, attains a completely new function as it can be compared, in a quality management approach, to the final result obtained after the treatment is completed in order to determine the degree to which the plan was actually implemented. Following radiological digitalisation of the patient by means of a double-scanning procedure and conversion to virtual 3-D models, the surgeon can start to design the implants. In the present case, we planned to place six implants in the lower and eight in the upper jaw (Figs 13a–n).

The transitional dentures required after extraction of the residual teeth also served as...
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scanning templates (Fig. 14).

Surgery

In cases of a large number of implants to be placed, our team likes to implement a two-stage implant placement procedure. The lower jaw implants are inserted on the first and the upper jaw implants on the subsequent day. The patient was not subjected to general anaesthesia. It was possible to treat the phobic patient only with local anaesthesia without any problems. The surgical template used in combination with a specifically matched surgical kit allowed for exact transfer of the 3-D computer planning to the patient’s mouth (Figs 15 & 16). As in the first case, Nobel Active implants were inserted, which afforded good primary stability even under the strongly reduced bone conditions present in this case. This is owing to the special surface and the design of the implants. Following surgery, fixed temporary bridges, which had been fabricated ahead of time based on the existing planning, were inserted (Fig 17).

Procera Implant Bridge

As before, the definitive form of management selected in this case was a NobelProcera CAD/CAM restoration. There were some particularities to take into account in the management of both the lower and the upper jaw. The true quality of the teamwork of dental office and laboratory becomes evident in the smooth production of very sophisticated rehabilitation restorations that can be fabricated without complication and incorporated into the stomatognathic system of the patient without any difficulties.

As part of the production of the restorations for the lower jaw, the terminal molars (teeth #56 and 46) were fabricated as titanium single tooth crowns and screw-retained at implant level (Figs 18 a & b). It was thus possible to take into account the 3-D twist of the arching lower jaw bone such that tensions at the level of the terminal implants were prevented, which might otherwise have caused bone loss or even implant loss. We only splinted interanatomically in the lower jaw, between teeth #55 to 45 (Fig 19). A distal cantilevered pontic substituting for teeth #56 and 46 was not used in this case, as implants #45 and 55 were only NobelActive implants with a diameter of 5.5mm. The Procera Implant Bridge Titanium on multi-unit abutments from teeth #55 to 45 was veneered completely, including gingival regions, using Vita titanium ceramic (Fig 20). As before, it was feasible to implement the screw retentions exactly according to plan such that no adverse aesthetic effects arose. The far-reaching bridge was fabricated at the Nobel Biocare milling centre and was prepared for the veneering steps with only little time required for minor details of post-production processing.

Thanks to CAD/CAM technology, it is possible to generate frameworks that are truly free of tension. In this context, Nobel Biocare guarantees a precision of fit of less than 25µm.

For aesthetic reasons, an elaborate form of re-storation was selected for the upper jaw. A Procera Implant Bridge Titanium on multi-unit abutments was produced. The bridge was designed to allow all-ceramic NobelProcera Crowns Alumina to be cemented to them. For this purpose, the framework was veneered with a gingiva-coloured ceramic material and opaquer was attached in the region of the stumps by firing (Figs 21 & 22). In the next step, the single crowns were prepared (Fig 23). After completion of the entire restoration, the basic framework was screw-retained in the mouth (Fig 24) and the aesthetic Procera alumina crowns were cemented in the mouth using conventional cement (Durelon, 5M ESPE, Fig 25).

Accordingly, the patient’s restoration was still conditionally removable in the dental office, since the crowns covering the screw channels remained removable. This is advantageous for the patient in that the aesthetic appearance of the upper jaw can be improved even further, while no screw channels are visible. This resulted in an excellent aesthetic appearance at the red-white transition (Figs 26 & 27).

Conclusion

In this article we have demonstrated a dental team being able to offer treatment based on a one provider concept that starts with a 3-D diagnostic work-up, allows for template-guided navigated implant placement, keeps in stock all implant and prosthetic components (as typifies the concept of Nobel Biocare), and offers numerous advantages, including:

- application of a broad range of different techniques from a single supplier
- only a single supplier needs to be contacted
- implant and prosthetic components match
- interfaces match
- materials match
- final result has a high preciseness
- generous solutions if difficulties are encountered
- custom-made designs for special needs

Approaching the planning and implementation of an implant restoration from the patient’s perspective and his or her needs will always cause the treatment team to place safety very high up on the list of its priorities. Based on the reliable NobelGuide concept, the success of the team becomes a matter of planning. To have

“To have but a single supplier to contact for all necessary components saves time and the attending team can rely on the perfect match of all components!"
3-D alveolar ridge reconstruction

Prof Dr Marcel Arthur Wainwright discusses a case with severe bone loss

A high clinical evidence of grafting procedures from extraoral autologous donor sites like from the iliac crest in difficult bone loss sites is still the practice in oral or oral-maxillofacial surgery. However, the invasive surgery combined with a prevalence of patients morbidity and suffer is an issue to discuss the persisting legimitation of this procedure. Since the appearance of reliable bone substitute materials with or without any autologous bone added, the positive results concerning longterm stability of regenerated bone even in difficult cases have become very predictable.

This article will point out in a case report the reliability of alternative and less invasive techniques for 3-D bone reconstruction in the mandible and question the necessity of iliac hip grafts for intraoral bone augmentation.

Materials and methods

A female patient aged 48 years old with a severe and advanced periodontitis in the maxilla and the mandible came into our clinic with the desire of a complex treatment plan with an implant retained denture in both jaws. This case report will pinpoint the treatment of the mandible. A CBVT was revealing massive bone loss in height and width in the mandible arch from canine to canine and api-cy cyst at tooth 23, 26 and 28 (Figs 1 & 2). According to our protocol we started with an initial scaling and HILIBO®-Laser decontamination prior to the surgery to decrease the number of pathologic germs and post op infections. Tooth 18 and 19 in the left mandible were intended to maintain until the finalisation of the prosthetics to give some comfort during temporisation with an immediate denture that was placed post op. Preoperative the patient received 1,200mg of Clindamycin. The patient desired the surgery of tooth removal and ridge augmentation pursued under general sedation.

After nasal intubation and local anaesthesia the bridge in the lower was removed and the remaining teeth despite from 18 and 19 as mentioned before (Figs 3 & 4). After full flap preparation with crestal incision, releasing incisions and exposure of the mental nerve exit, the volume of the severe bone loss was revealed as well as the minor soft 3-D alveolar ridge reconstruction in a case with severe bone loss tissue conditions due to inflammatory tissue proliferation (Figs 5 & 6). The success of 3-D bone augmentation is bonding to primary wound closure and tensionless flap adaptation. Thus, the periodontium is dissected with a scissor from the epithelial connective tissue before augmentation procedures to reduce bleeding and guarantee a flap flexibility without compromising soft tissue and nutritive blood vessels.

For bone augmentation a bone block was harvested via ultrasonic surgery from the retromolar region distal from 52 of the right mandible (Periozome II, Acteon France).

This bone block was divided into two halves. One was used for two “bone shields” to create a mold for the grafting mate-rial, one was particulated with a bone mill and mixed with defect blood and a beta-TCP (Nanohone®, Artoss GmbH, Rostock, Germany). The bone blocks were fixed with two os-teosynthesis screws (Fig 7) and a mold for the grafting mate-rial we started with an ini-terial, one was particulated with a bone mill and mixed with defect blood and a beta-TCP (Nanohone®, Artoss GmbH, Rostock, Germany). The bone blocks were fixed with two os-teosynthesis screws (Fig 7) and the mixture of autologous bone plus beta-TCP in mixing ratio 50:50 was used to fill the gaps and increase the ridge width and height. To increase the bone augmentation material volume an alolagraft block (Porous®, Zimmer Dental) was particulated and added to the mixture.

Before placing the material a non resorbable titanium-reinforced membrane (Cytotact® Ti-250, Sybron Implant Solutions) was adapted lingually and folded to shape the augmentation complex according to the new and desired crest volume (Fig 8). Upon the non resorbable membranes three xenogenous resorbable membranes (Tu-todent®, Zimmer Dental) were placed according to the sandwich membrane layer technique to create a better adaption to the flaps (Fig. 9) and enhance wound healing. Primary wound closure (Fig 10) was achieved with a 4-0 metric suture (Gore-Tex®, Gore). The patient carried a clamp retained provisional denture that was rebase with a soft material and was instructed to have no solid food for 10 days.
Postoperative the patient continued with 1,800 mg Clindamycin, Ibuprofen 600 mg and a decongestant enzyme based medicine (Bromelain-Pos®, Ursapharm, Germany).

The next day the patient had an expected cheek swelling but was not suffering from pain, after 10 days the sutures were removed. However, six weeks later a membrane exposure of the non resorbable membrane was evident, but due to the fact that this is tolerable when the patient is instructed to maintain oral hygiene and re-called once a week, the success of the outcome was not threatened (Fig 11a). The titanium pins and the titanium reinforced membranes were removed after four months.

Eight months after augmentation the 2-D aspect of the CBVT showed clear evidence for entire ridge reconstruction of the deficient sites (Fig 11b) with osseosynthesis screws in position. To emphasize the efficiency and predictability of this technique the pre-op scan of region 28 (Fig 12a) and the reconstructed bone eight months later (Fig 12b) show clear an increase of bone height and width. The well vascularized bone was used to insert four dental implants (4 x 3.75 x 13 BEGO Semados®, BEGO, Germany) for a later bar-retained denture, the healing time is estimated with eight weeks (Fig 13) and was not completed before publication, here my apologies to that.

Discussion
3-D bone augmentation in cases with severe bone loss can be accomplished also with a less invasive surgical protocol than the iliac hip graft. The morbidity can be dramatically reduced with the use of ultrasonic devices. Regarding the donor site, which may be favoured with the retromolar region, patients have close to zero complaints if a single incision procedure is performed. Allograft materials may enlarge the volume of the augmentation material and in addition to that the success of beta-TCP is not to be questioned. Regarding the long term stability the regenerated bone is superior to pure autologous bone from the iliac crest, which resorption rate is much higher compared to introral bone or beta-TCP. Reduced pain and postoperative complains should be reduced and enlarges the number of patients willing to undergo oral augmentative procedures.

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