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Digital precision for all indications

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Fig. 1

Fig. 2

Ten years since its launch, the NobelGuide guided surgery concept has evolved from an ambitious idea to become a solution many clinicians find indispensable. NobelGuide is a complete treatment concept for diagnostics, treatment planning and guided implant surgery—from a single missing tooth to an edentulous jaw. It helps to diagnose, plan the treatment and place implants based on restorative needs and surgical requirements.

Powerful diagnostics and treatment planning

Key to NobelGuide is the NobelClinician Software. It allows clinicians to plan dental implant treatment with precision and confidence by assessing detailed 3-D patient scans. Implant placement can be brought to life on screen and teeth can even be extracted virtually, meaning the surgeon can take into account important factors such as the availability of bone and prosthetic needs before actual tooth extraction. Precise measurements can be taken and the software even alerts the clinician when implants risk being placed too close to anatomical structures.

Right from the start

NobelGuide offers a predictable solution—from start to finish. Clinicians can choose to complete the whole surgery fully guided, or to use a surgical template just for pilot drilling.

With the latter option the easy-to-use surgical templates help to ensure correct angulation, direction and depth from the very first drill. The custom-manufactured surgical templates help ensure accuracy by guiding the initial drill according to the digital treatment plan created in the user-friendly NobelClinician Software. The software provides safety margins and a warning system to help the clinician avoid critical anatomical structures, meaning implants can be placed in narrow spaces with greater confidence—even NobelActive 3.0. The clinician will then continue with freehand surgery once the initial drill has been used.

The range of surgical pilot drill templates has been extended to cover both partially edentulous and edentulous cases, allowing more patients to

Digital precision for all indications
benefit from this predictable treatment option that helps to provide an optimised aesthetic and functional outcome. This means the templates can now be used for the All-on-4® treatment concept, helping the clinician to overcome challenges such as bone resorption, avoid critical anatomical structures and place implants deeper when treating edentulous patients.

This is made possible by the sleeve-offset function. It supports bone reduction and the deep placement of implants such as NobelParallel Conical Connection which are increasingly placed subcrestally. It also allows for the initial treatment plan to remain unchanged.

_A seamless workflow for every case

Every case is different. That is why NobelGuide offers a choice of treatment workflows—with and without the use of a radiographic guide.

Since partially edentulous patients do not need a radiographic guide, the clinician can save time with one less patient visit. They can also take advantage of the integrated treatment workflow. It connects Nobel Biocare’s digital treatment planning software, 2G NobelProcera scanner, high-end production, guided implant surgery, Communicator iPad® app and OsseoCare Pro iPad®-operated drill unit to enable the treatment team to communicate, collaborate and perform with ease.

Once the clinician has marked the critical anatomical structures using the NobelClinician Software they collaborate with the lab technician to develop a precise model scan. The clinician can then confidently develop a treatment plan thanks to NobelClinician’s SmartFusion technology, which provides the patient’s (CB)CT data together with the intra-oral situation, soft tissue information and diagnostic setup. At this point they can increase patient acceptance by using the Communicator iPad® app to explain the treatment plan to their patient. Finally, they have the freedom to choose between guided pilot drilling and fully guided implant insertion at any point during the workflow, using a custom-manufactured surgical template.

For edentulous patients the workflow includes the radiographic guide with a double-scan protocol. Once the clinician has made a clinical diagnosis, they fabricate and clinically validate the diagnostic tooth setup, transforming it into a radiographic guide—their prosthetic reference during treatment planning. After making a (CB)CT scan of the patient and the radiographic guide, they define the implant position, order a custom-manufactured surgical template and proceed with guided drilling and implant insertion.

_A clinician’s guide to success

From the initial diagnosis to the first guided drill, from partially edentulous to edentulous workflows, NobelGuide supports the clinician from beginning to end. It is no wonder that ten years since its launch NobelGuide has gone from strength to strength, improving treatment predictability and providing peace of mind to an ever-increasing number of clinicians.

Find out more at nobelbiocare.com/nobelguide
New X-ray imaging technique visualises teeth’s nanostructures

With the help of a new computed tomography (CT) method that is based on the scattering of X-rays, a team of international researchers has been able to visualise nanostructures in objects measuring just a few millimetres for the first time. To demonstrate the potential of the technique, the researchers reconstructed the precise 3-D orientation of collagen fibres in a piece of human tooth.

The new method, which was developed by a team of researchers from Technische Universität München (TUM), the Charité hospital in Berlin, Lund University and the Paul Scherrer Institute in Switzerland, utilises the scattering of X-rays rather than their absorption.

Conventional CT methods calculate exactly one value, known as a voxel, for each 3-D image point within an object. The advantage of the new technique is that it assigns multiple values to each voxel, as the scattered light arrives from various directions.

"Thanks to this additional information, we're able to learn a great deal more about the nanostructure of an object than with conventional CT methods. By indirectly measuring scattered X-rays, we can now visualise minute structures that are too small for direct spatial resolution," explained Prof. Franz Pfeiffer, head of the Institute of Biomedical Physics at TUM.

By combining 3-D information from scattered X-rays with CT, the researchers were able to view clearly the 3-D orientation of collagen fibres in a piece of human tooth measuring around 3 mm. In order to do so, 1.4 million scatter images were taken and then processed using a specially developed algorithm that builds up a complete reconstruction.

"A sophisticated CT method is still more suitable for examining large objects. However, our new method makes it possible to visualise structures in the nanometer range in millimeter-sized objects at this level of precision for the first time," said Florian Schaff, a PhD student at the institute and lead author of the paper.

The new imaging technique could be of interest for the characterisation of not only biomaterials such as bone and teeth, but also functional materials such as fuel cell and battery components, the researchers believe.

The results of the study were published online on 19 November in the Nature journal in an article titled "Six-dimensional real and reciprocal space small-angle X-ray scattering tomography."

_Contact_

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Functional hard and soft tissue preservation in the sloped alveolar ridge

**Author** | Dr Robert NöIken, Germany

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**Summary**

**Patient**

A 53-year-old woman presented with missing tooth 46. The alveolar ridge height at the site was uneven, sloping in a buccal direction by approximately 2 mm. The interdental papillae at tooth 45 and at tooth 47 were only marginally filled.

**Challenge**

To retain the hard and soft tissue structures around the implant to the greatest extent possible.

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**Fig. 1a** Not providing support to the lingual bone leads to its resorption.

**Fig. 1b** Risk of discolouration or necessitating augmentation.

**Figs. 2a-c** The height of the slope from the lingual to buccal side varies between 1.5 and 1.7 mm, depending on the design and diameter of the implant.

**Fig. 3** The CBCT images show the sloped atrophied alveolar ridge in region 46.
In order to reduce the risk of progressive vertical and horizontal alveolar ridge atrophy and subsequent loss of the papillae, an OsseoSpeed Profile (ASTRA TECH Implant System) was selected, with the expectation that its sloped implant design would optimally support the anatomical structures.

**Treatment**

Cone beam computed tomography (CBCT) was used for the planning of the case. After measuring the lingual and buccal preparation depth, an Osseo-Speed TX Profile was inserted. The final alignment of the sloped implant shoulder was carried out using the specially marked implant driver to ensure that the implant was placed flush to the bone. This allowed the marginal bone around the implant to be optimally supported. After approximately four months, the peri-implant mucosa was healed without irritation.

After making a final impression with a Profile Impression component, a TiDesign Profile Abutment (DENTSPLY Implants) was customised in the laboratory, and a metal ceramic crown was fabricated. About five months after implant placement, the ceramic veneered crown was cemented.

**Case study**

Adapting to the anatomical situation using a sloped implant design

Long-term clinical and aesthetic success of implant therapy can only be achieved if peri-implant hard and soft tissue structures are preserved to the greatest extent possible. Bone resorption after tooth loss in the posterior region can occur in an oro-vestibular as well as in a mesio-distal direction. In both cases the OsseoSpeed Profile implant (DENTSPLY Implants) is adapted to the anatomical situation because of its sloped implant design.

The primary objective of implant therapy is to achieve lasting functional and aesthetic success with minimal risk and without complications. As a result of tooth extraction or loss, however, horizonta

**Figs. 4a–b** Clinical images taken before implant placement show the pronounced buccal and slight lingual resorption of the alveolar ridge.

**Fig. 5** After crestal incision and elevation of a mucoperiosteal flap, the atrophied alveolar ridge is clearly visible.

**Fig. 6** The buccally insufficient ridge width caused a bone dehiscence.

**Figs. 7a–b** Nice transgingival healing of the OsseoSpeed Profile implant with support of the peri-implant hard and soft tissue structures caused by the anatomically natural contour of the implant neck.

**Fig. 7c** X-ray after 16 weeks at re-entry.
of the alveolar ridge can be followed and surgical adjustments to the ridge can be avoided (Fig. 2).

The importance of maintaining the marginal bone level was demonstrated by Tarnow \(^2\) who showed that the presence or absence of a papilla largely depends on the distance from the bone level to the proximal contact point of the crown. An increase of the distance from the contact point to the bone level from 5 mm to 6 mm reduces the probability of a papilla presence from nearly 100 % to 56 %. Bone resorption of only 1 mm can thus suppress the development of the papilla.

The presented case shows that the vertical and horizontal atrophy of the jaw and the disappearance of the papillae could be countered successfully by using the OsseoSpeed TX Profile.

Clinical and radiographic examination

CBCT was used for the planning of the case. The CBCT image showed that region 46 had a bone level difference of about 2 mm and sufficient bone height above the inferior alveolar nerve. The ridge width and height were sufficient to place an implant with a 4.5 mm diameter and a 13 mm length. The interproximal papillae distal to tooth 45 and mesial to tooth 47 were reduced in height. Tooth 47 was clinically healthy. The endodontically treated tooth 45 had enamel defects, and improvement of its aesthetics with composite was planned for (Figs. 3 & 4).

Surgical workflow

After a crestal and intrasulcular incision, a mucoperiosteal flap was elevated, revealing the sloped ridge. After marking the implant position about 2 mm buccally to the highest lingual jaw ridge, the initial preparation of the implant site was done using a surgical template, in accordance with the manufacturer’s protocol. During the pilot drilling, the implant axial alignment was monitored with paralleling tools. The correct drilling depth was measured with an implant depth gauge at the bone walls. Initial insertion of the OsseoSpeed Profile was performed using the contra angle.

However, the final alignment of the sloped implant shoulder must be performed manually using a specially marked implant driver. It enables the sloped implant shoulder to be aligned with the bone within a fraction of a millimetre. The marginal bone around the implant can thus be optimally

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Figs. 8a–b. Re-entry after 16 weeks. The buccal dehiscence defect regenerated without augmentation.

Figs. 9a–b. Healthy and stable peri-implant conditions provide an optimal foundation for the prosthetic crown.

Fig. 10. Individualized titanium abutment TiDesign Profile.

Fig. 11. The ceramic veneered crown in region 46 immediately after cementation (about 5 months after implant placement).
supported. Following placement of the implant-specific Healing Abutment Uni (DENTSPLY Implants), the soft tissue was sutured (Figs. 5 & 6).

The patient was recommended soft and liquid foods and to avoid chewing on the implant. After approximately 4 months, the peri-implant mucosa had healed without complications. During the healing phase, the defects of tooth 45 were aesthetically corrected with dental composite in order to facilitate the future provision of a crown (Figs. 7a–c). For the purposes of this case presentation, re-entry was carried out to inspect the marginal bone. Even without an augmentation of the dehiscence defect, bone regeneration had developed to the level of the buccal implant neck. After the re-entry procedure, the Healing Abutment Uni was re-inserted, and the soft tissue was sutured (Figs. 8a & b).

Fabrication of the crown

Two weeks later, the process of fabricating the implant restoration began (Figs. 9a & b). When using the OsseoSpeed TX Profile implant, specific prosthetic components must be used. The use of a titanium abutment is recommended in the posterior region with heavy occlusal load and little aesthetic requirements. It provides stability, while having no limiting effects aesthetically. For best results, the prefabricated TiDesign Profile titanium abutment was individualised in the laboratory to optimise the emergence profile and the progression of the marginal gingiva. When cementing porcelain-fused metal crown (PFM), care was taken to ensure that all cement residues were thoroughly removed (Figs. 10–12).

Follow-up

Clinical and radiological images were taken one, two and three years after implant placement and demonstrated the good clinical results of using the OsseoSpeed TX Profile implant. The interdependent features of the Astra Tech Implant System Biomanagement Complex together with the sloped implant neck worked to preserve the peri-implant tissues. No bone remodelling was observed, with the buccal and interproximal bone levels remaining stable at the level of the implant shoulder. Furthermore, the mesial and distal interdental papillae regenerated, and an inflammation-free, keratinised peri-implant mucosa developed around the implant crown (Figs. 13–15c).

Discussion

The criterion for successful implant therapy is the preservation of the peri-implant bone-level. It is of significant prognostic importance.

Conclusion

The OsseoSpeed TX Profile implant, can enable favourable aesthetic and functional results, not only in the aesthetic zone but also in the atrophied alveolar ridge and even without augmentation procedures.

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Editorial note:
A complete list of references is available from the publisher.
Planmeca ProMax 3D units
Ideal for imaging patients with braces

Planmeca ProMax 3D is a CBCT product family consisting of exceptional all-in-one imaging units. The intelligent units support several different imaging modalities and provide all needed specialist tools. As a reflection of their suitability for orthodontics, three of the Planmeca ProMax 3D units—Classic, Mid and Max—have now been certified for use with the suresmile treatment management system.

Planmeca ProMax 3D units have been designed to meet the strictest of requirements in maxillofacial imaging. They support three different types of 3-D imaging (CBCT, 3-D face photo and 3-D model scan), and also extraoral bitewing, cephalometric and digital panoramic imaging. This flexibility between 2-D and 3-D allows clinics to optimise their imaging procedures, and select the techniques that work best with each case—at an optimal patient dose.

The Braces imaging protocol of Planmeca ProMax 3D units is tailor-made for orthodontics, as it allows users to acquire a low dose CBCT image, which accurately shows the metal brackets on braces. With powerful artefact removal algorithms used in image reconstruction, the units produce images that reveal the exact position of roots in relation to bone.

The CBCT units’ stable support system helps patients remain completely still during imaging. This is especially important when acquiring high contrast images as part of orthodontic treatments.

Certified for use with suresmile

The Planmeca ProMax 3D Classic, Mid, and Max CBCT units are now certified for use with the suresmile treatment management system by OraMetrix. The suresmile system has been designed to enable orthodontists to visualise and simulate multiple diagnostic set-ups and design customised archwires for every patient.

The accuracy of patient scans plays a critical role in maximising the effectiveness of the suresmile system. Combining the system with a CBCT unit allows the efficient visualisation and virtual manipulation of teeth and their roots. The orthodontic braces protocol of Planmeca ProMax 3D units has been optimised for use with the suresmile treatment management system.

See more at a lower dose

The effective patient dose of CBCT imaging is closely related to the protocol used for scanning. Planmeca has established itself as the industry leader in pioneering ultra low dose imaging. The innovative Planmeca Ultra Low Dose protocol available in all Planmeca ProMax 3D X-ray units reduces the effective patient dose in CBCT imaging significantly—without a statistical reduction in diagnostic image quality. At best, this means lowering patient doses to levels below even that of traditional 2-D panoramic imaging.

With suresmile-certified Planmeca ProMax 3D units and the Planmeca Ultra Low Dose protocol, patients can benefit from CBCT imaging and three-dimensional diagnostic accuracy in orthodontic treatments with significantly lower patient doses than in traditional imaging.

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Where innovation comes to life

_A world-class speakers, hands-on instruction, master classes, forums and social networking opportunities, all in the heart of one of the greatest cities in the world. Between June 23 and 26 next year, the fabled Waldorf Astoria in Manhattan will be hosting the Nobel Biocare Global Symposium under the banner “Where innovation comes to life.”

_Four days of learning

The symposium’s four-day program will be based on three main themes: refining and enhancing treatment, digital dentistry and achieving clinical excellence in challenging situations. Each theme has a complete schedule of its own, including lectures, master classes and practical sessions. Should attendees choose to follow only one theme, the symposium schedule allows them to be a part of every related session.

If, on the other hand, delegates would like to pick and choose between the different themes and attend individual sessions of special interest in several (or all) of the themes, Nobel Biocare gives them the opportunity to design their own learning program.

In addition to a theme-related agenda intertwined with independent study opportunities, the company is arranging a compelling array of forums, including an innovation assembly and a full-day compromised patient forum. Other forums will cover the company’s Partnering for Life program, through which Nobel Biocare helps dental professionals achieve their goals, the All-on-4 treatment concept and the dental laboratory workflow. A new generation of dental professionals will also have their own platform at the event’s NEXT GEN forum.

_Getting to know each other

After a busy first day of lectures, master classes and hands-on sessions, a welcome cocktail on June 23 will provide the perfect opportunity to unwind and network with colleagues from around the world. Attendees will be able to raise a glass, enjoy some food and see a display of innovative Nobel Biocare products in the beautiful, historical setting of the Waldorf Astoria.

On the evening of June 24, Nobel Biocare will be hosting the symposium’s reception off-site at an exciting venue, yet to be revealed. It is set to be an evening to remember with an inspiring blend of diversion and education.

_By popular demand

The Scientific Chairmen for the Nobel Biocare Global Symposium are Drs Peter Wöhrle (USA) and Bertil Friberg (Sweden). They recently announced that—for the first time at a Nobel Biocare dental event—registered attendees will be able to have a direct impact on the program by voting for various topics and speakers on the event’s website. The results will be revealed a few weeks before the symposium.

With world-class lecturers and thousands of dental professionals from around the world exploring the future of dental implants together, the 2016 Nobel Biocare Global Symposium promises to be an incomparable experience for everyone involved.

Registration for the symposium is open at: www.nobelbiocare.com/global-symposium-2016_

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