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Every patient is different

The value of cone beam 3-D imaging

Our patients come to us for a variety of different needs, and as practising clinicians, it is our obligation to properly diagnose and recommend an appropriate plan of treatment. Until recently, 2-D periapical or panoramic imaging modalities were utilised to diagnose periapical pathology, tooth decay, periodontal disease and root morphology for endodontic treatment, restorative dentistry, and assessment of potential implant receptor sites. These concepts were accepted and widely taught by radiology departments in dental schools worldwide as conventional diagnostic dentistry.

However, with the advent of CT, and now CBCT, it has become increasingly evident that 2-D imaging modalities may not provide the most accurate assessment of the region of interest. As an example, on a panoramic image of the mandibular symphysis, we may be able to determine the height of available bone, but we cannot ascertain the width, contour or quality of the bone for the potential placement of dental implants. The course of the mandibular canal is essential to avoid damage resulting in irreversible paraesthesia. In the posterior mandible, there is often a clearly defined lingual concavity that if not visualised could lead to potential complications.

A few more considerations to think about: How important is it to know the actual width from the lateral to the medial wall of the sinus to determine the volume needed to fill the sinus to create the foundation for implant placement? Intraosseous vessels often reside within the lateral walls of the maxillary sinus and these cannot be determined with 2-D imaging modalities. It is important that they be visualised when contemplating a sinus augmentation procedure. Can the contour of the floor of the sinus be properly appraised when evaluating the posterior maxilla for a transcrestal approach with simultaneous implant placement? What about the presence of septa in the maxillary sinus? Septa are often problematic when they hinder the proposed treatment. Their presence and location cannot be determined from any 2-D radiography and may play a significant role in the long-term success of treatment.

Readers of past issues of our cone beam international magazine of cone beam dentistry have been exposed to a variety of clinical examples of how 3-D imaging modalities have been utilised in daily practice. However, there is one aspect of CBCT that may represent the most important reason that clinicians need to move from 2-D to the world of 3-D imaging: the ability to visualise anatomy in 3-D provides clinicians with an unprecedented appreciation that each patient is different. Each patient’s anatomy is revealed to be individual and separate from another person’s mandible or maxilla, each tooth, each alveolus, each inferior alveolar nerve or maxillary sinus. That individuality is so very important for clinicians to understand prior to commencing treatment and should serve as ample justification to enhance our diagnostic acumen to improve clinical outcomes and reduce complications for our many patients.

Please enjoy our latest issue, with our compliments. It is our mission to continue to present valuable content regarding this wonderful imaging modality and ancillary procedures that benefit from 3-D imaging technology. If you pick up one pearl from the articles enclosed, spread the word, tell your friends and share with your colleagues. Thank you!

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**Current and related literature abstracts**

**Author** Dr Barry A. Kaplan, USA

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**Figs. 1a–f** Axial view of foramina (white arrows) between mandibular central and lateral incisors (a). Panoramic view showing nutrient canals (black arrows) (b). Various sagittal views of nutrient canals proceeding to the lingual plate of cortical bone (c–f).


Nutrient canals are small neurovascular bundles originating from the incisive branch of the inferior dental canal, in the mandibular anterior region. These canals travel upwards to the apices and interdental areas of the mandibular incisors. Identifying these canals is essential in obviating clinical morbidity, which may include a neurosensory disturbance and/or haemorrhage. Their prevalence on traditional periapical films has been reported in the literature as anywhere from 5 to 40%. This study used CT images to assess canal prevalence, location, number, size, shape and Hounsfield units (HU) of the nutrient canals themselves.

The study showed that the prevalence of nutrient canals in the mandible is 94.3%, with the majority of these in the anterior region (92.7%), premolar region to a lesser extent (42.2%) and rarely in the molar region (1%). As for the exact canal locations, the preponderance of these canals was found between mandibular central and lateral incisors, both left and right. This is true because these teeth are furthest from the inferior alveolar canal and therefore require alternate blood supply. While gender specific differences were not observed, the prevalence of nutrient canals in the mandibular premolar region for males was greater than for females—a clinically significant difference. Additionally, there were no gender differences when comparing the HU of males and females. Age did impact the foramina size. The shapes of the foramina were generally ovoid and did not change shape with age. Lastly, the size of these canals ranged from 0.4 to 2.0 mm in diameter. This paper underscores the diagnostic value of CT in visualising anatomy and reducing surgical morbidity.

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Proper diagnosis and treatment planning is critical when placing immediate implants in the maxillary anterior region. In order to achieve optimum aesthetic results detail must be paid to the soft tissues. The soft tissue around implants is affected by three major factors: the position of the implant within its receptor site, labial bone thickness and tissue biotype. Studies show that a minimum of 2 mm labial bone thickness is sufficient to provide adequate soft tissue thickness. Thicker soft tissue will result in less recession and more stable interdental papillae. Additionally, thicker tissue will sufficiently mask potential discoloration of the underlying abutment. CBCT provides a cost-effective, low dose method of assessing both cortical bone thickness as well as tissue thickness.

In this study, cross-sectional images of maxillary central incisors where measured for facial and palatal...
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cortic thickness, facial and palatal tissue thickness and alveolar crest width. The bone and tissue thickness were measured at three locations: cervical, middle and apical. In the cervical areas, strong correlations were found between the labial bone thickness and corresponding soft tissue, palatal bone thickness and corresponding soft thickness as well as a correlation between bone thickness and bucco-palatal socket dimensions (wider sockets may associate with thicker labial cortices). The authors found no correlation between the position of the maxillary central incisor (forwardly inclined, normal or backwardly inclined) in the socket to the thickness of cortical bone in the cervical area. The majority of teeth (64%) had proclined roots compared to 30% having normally positioned roots, with the proclined teeth having a lower thickness of bone on the palatal in the apical area. As for the facial bone, this study demonstrated that 36.7% had labial bone thickness greater or equal than 1 mm, whereas 63% had < 1 mm of bone.

While no correlation was found between the position of the tooth in the alveolus and the labial cortical bone thickness, the tooth position does have significant implications for implant placement and underscores the importance CBCT analysis prior to tooth extraction. The position of the tooth in the socket can dictate the implant trajectory and this will, in turn, be affected if grafting is needed, as well as if the implant will be cement vs screw retained.

Fig. 2. Sagittal slice of maxillary anterior tooth demonstrating sufficient palatal bone for fixation.


Fig. 3. Sagittal section of maxillary and mandibular incisors. The thin white line is the long axis of the tooth and the thick white line in the long axis of the alveolus.


When placing immediate implants in the maxillary anterior region the position of the tooth within the alveolus must be evaluated prior to implant placement. Sagittal slices from CBCT are a cost effective way to do this with low dose radiation. This study evaluated the angulations of upper and lower anterior teeth with respect to alveolar bone in a Chinese population.

Sectional slices containing maxillary and mandibular central incisors, maxillary and mandibular lateral incisors and maxillary and mandibular canines were analysed to compare the angulation of the root relative to the bony housing itself (Fig. 3). The study found that maxillary anterior teeth were closer to the labial alveolar surface and therefore more divergent to the alveolus itself (17.65 degrees for the central incisor, 18.79 degrees for the lateral and 23.82 degrees for the canine). The mandibular incisors, however, were usually less than 8 degrees difference from the alveolus itself. Measurements of the maxillary alveolar bone were measured in three places: crestal, midroot and apical. What was noteworthy was that at the midroot level, the labial thickness was less than 1 mm in 77–90%; 42.4% of maxillary canine teeth were less than 5 mm and almost all maxillary anterior teeth had labial thicknesses less than 2 mm. The authors suggest these numbers as a plausible explanation to the higher frequency of perforation at the midroot level.

Given the greater incidence of the maxillary roots being closer to the labial plate the implant would be placed with a more labial inclination to access the available palatal bone necessitating the need of angulated abutment. Conversely, because the mandibular incisors are closer in angulation to the alveolar bone it is more likely a straight abutment can be used. CBCT is, therefore, instrumental in treatment planning immediate implants in the anterior region prior to tooth extraction._

Fig. 2


Fig. 3


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Dr Barry Kaplan, Prosthodontist, Bloomfield, NJ, USA. Past President of the NJ Section of the American College of Prosthodontists, Fellow of the International Congress of Oral Implantologists (ICOI).

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Having the ability to take a patient from point A to point Z in fewer appointments within one’s practice allows one to position oneself as a provider that can fulfill patient’s surgical and restorative needs. With the proper training, a dental provider may provide extraction, grafting and implant placement within one appointment at one location. Not only does this allow the reduction of the number of visits for the patient, but this type of service also helps the patient stay within his or her budget. Most importantly, this enables the dental provider full control of the surgical and prosthetic outcome.

Depending on the patient’s desires, the clinical conditions of the oral environment and the skills of the dentist, the dentist may choose to extract teeth, level bone, and graft with simultaneous dental implant placement. In this case, a patient in his mid-sixties presented to the office with discomfort owing to multiple rampant caries and generalized advanced periodontal disease (Figs. 1 & 2). Having already visited multiple providers for a consultation, he was very frustrated with the treatment options offered with varying treatment plans that were segmented into different disciplines. Since many of these options did not complement the other, the patient decided to come to us for full treatment after being referred by one of our patients who had undergone a Total Dental Solutions Reconstruction.

Before the surgical appointment, a CBCT scan was taken to accurately plan treatment for this case to make certain that no complications would arise from completing all of the procedures (extract, graft and implant placement) in the Total Dental Solutions Reconstruction protocol. coDiagnostiX software (Dental Wings) was used through 3D Diagnostix virtual assistance to precisely plan the placement of six Engage...
(OCO Biomedical) dental implants in the maxillary arch, as well as seven Engage dental implants in the mandibular arch using CT-based surgical pilot guides (3D Diagnostix; Figs. 3 & 4).

The final treatment plan was fixed bridges on implants in the maxillary and mandibular arches. Engage implants were selected (Fig. 5) because I have personally experienced their high implant stability at placement, which is a critical success factor during the early healing process of osseointegration with these types of cases. With the combination of its patent-pending Bull Nose Auger tip and Mini Cortic-O Thread, this implant system offers practitioners a bone-level implant with high initial stability for selective loading options. In fact, the Engage implant body creates a tapping pattern when threaded for an enhanced mechanical lock in the bone. Other dental implant systems with aggressive threading may include, but are not limited to, NobelActive (Nobel Biocare), SEVEN (MIS Implants Technologies), ET III (Hiossen), IS (AB Dental) and AnyRidge (Megagen).

For effectiveness and greater proficiency during the Total Dental Solutions Reconstruction procedures, intravenous sedation should be performed. Not only does it make the appointment easier, but patients also prefer to have the treatment completed in one visit. Since the patient is sedated, a mouth prop is needed to keep his or her mouth open. Because of this, teeth are extracted in quadrants, starting from the upper left to the upper right and then down to the lower right and lower left. This allows great time-savings, as it is easier to keep the patient’s mouth open and be able to proceed around the arches safely. Once the teeth have been extracted, the tissue has to be reflected in order to seat the bone-level surgical guides and fix them with their respective retention pins. Using these pilot surgical guides, the osteotomies for the implants were begun with a 1.95 mm pilot drill utilizing the Mont Blanc surgical handpiece (Anthogyr) and Aseptico surgical motor (AEU 7000) at a speed of 1,200 rpm with copious amounts of sterile saline (Figs. 6 & 7).

Paralleling pins were placed in the sites of the osteotomies to confirm the accuracy of the surgical guide and radiographs were taken to check the angulations of the pins within the maxilla and the mandible. Once the osteotomies were complete, an implant finger driver was used to place the dental implants until increased torque was necessary. The ratchet wrench was then connected to the adapter and the implants torqued to final depths, reaching a torque level of approximately 40–50 Ncm.

Adequate implant fixation was further verified using an Osstell ISQ (implant stability quotient) meter, which uses resonance frequency analysis as a method of measurement (Fig. 8). Several studies have been conducted based on resonance frequency analysis measurements and the ISQ scale. They provide valid indications that the acceptable stability range lies above 55 ISQ.
Extended healing caps were hand tightened to the implants. A postoperative radiograph was taken of the implants and the healing caps to ensure complete seating. The immediate dentures were soft relined with a silicone-based soft denture relining material (Ufi Gel SC, VOCO). Some of the advantages I have personally experienced with this material are that it is biocompatible, tasteless and odourless. By using the extended healing caps with the soft reline, the immediate dentures were much more retentive. The soft tissue and implants were evaluated clinically after one week. The patient stated that he had had very little postoperative discomfort or swelling.

Within ten days, the patient returned to the practice. The soft tissue around the extended healing caps had healed very nicely with a healthy pink colour. Using impression posts, full-arch impressions were taken with Instant Custom C&B Trays (Good Fit). These custom trays can be adapted and fitted in minutes, eliminating the need for models, light-cured materials, monomers and extra laboratory time for custom impression tray fabrication because they are made of a material (PMMA) that becomes mouldable when heated (Fig. 9) and maintains its shape while cooling.

Once the trays had been moulded for the patient, full-arch impressions were taken using a polyvinyl siloxane impression material (Take 1 Advanced, Kerr; Fig. 10). Bite relations, as well as instructions for size, shape and colour of the full-arch provisionals, were forwarded to the dental laboratory. With only a five-day turnaround, the custom abutments and provisionals were forwarded to the dental office and inserted. The patient was very pleased with the aesthetics and function of these provisional restorations. He was instructed about their care and use in eating, speaking and biting.

Approximately four months after the initial placement of the dental implants, the patient returned for the definitive porcelain-fused-to-metal restoration impressions. The provisional restorations were removed using the Easy Pneumatic Crown and Bridge Remover (Dent Corp). Any temporary cement was removed and the abutments inspected. If there was any settling or recession of the gingival tissue, the abutments were modified using a carbide bur with copious amounts of water not to overheat the abutments. This way, the margins could be brought right to or to slightly below the free gingival margin. A full-arch impression was taken in a similar fashion for the abutments and the provisionals. In addition, the relations between maxillary and mandibular arches were captured. Within three weeks, the porcelain-fused-to-metal restorations were inserted and a panoramic radiograph taken (Figs. 11 & 12).

In conclusion, an increasing number of patients are presenting to dental practices who seem to require this type of reconstruction. By providing multiple services in a shorter number of visits with the use of CBCT and other technologies, the dental provider will find that more patients will accept treatment. In doing so, not only are you helping your patients regain proper form and function, but you are also helping them achieve a Total Dental Solutions Reconstruction in fewer appointments.
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CBCT and guided surgery

Introduction

Guided implant surgery entails using CT images of the patient to plan implant surgery through computer software. Conventional implant planning via panoramic radiographs has its limitations, as precise execution according to the surgical plan is often difficult. However, guided implant surgery can be executed accurately and precisely as planned. For guided implant surgery, a customised surgical template and a specialised surgical tool kit are needed (Figs. 1a & b).

Cone beam computed tomography

Cone beam computed tomography (CBCT) is a radiographic imaging technique used to scan the patient in 3-D. By using a CBCT device along with the requisite software, a precise and accurate examination of the patient, with realistic images, can be achieved.

Implant planning software

CBCT produces images in DICOM format, and implant planning software reads these DICOM files and reconstructs them into 2-D or 3-D images. This software provides various tools for implant planning, and as a result, the user can visualise the patient’s anatomical structures in order to plan a safe surgery.

Surgical template

A surgical template transfers the surgical planning to the patient’s mouth. In general, it is in the shape of an orthodontic splint and worn by the patient during surgery. On the surgical template, small metal sleeves are inserted in the place of the intended implant locations in order to guide drilling. It is essential for the surgical template to be fabricated to fit the patient perfectly. Several manufacturers provide surgical template fabrication services along with their implant planning software. Upon receiv-
ing the planning data obtained using the software from the clinic, the manufacturer will use the data to fabricate a customised surgical template and have it delivered to the clinic.

**Guided implant surgery kit**

In order to use a surgical template for guided surgery, a special drill kit must be used. Surgical templates and implants vary from one manufacturer to another, and various guided surgery kits are available on the market. Therefore, the manufacturer must advise which surgery kit is to be used with its surgical template.

**Case report**

A 56-year-old partly edentulous female patient presented to the clinic for evaluation of options for an implant-borne prosthetic reconstruction of the mandible. The general anamnesis did not find any noticeable problems, and the patient was not on any regular medication. The clinical examination found severe periodontal destruction around the remaining teeth in the mandible (probing depth of 6mm) and an adequately supplied maxilla.

In order to estimate the status of the alveolar bone and to evaluate implant surgery options, a 2-D radiographic examination was recommended and, consequently, carried out using the 2-D function of a CBCT device (SCANORA 3D, SÖRDEX). A panoramic radiograph was acquired to confirm the primary diagnosis of severe chronic periodontitis and to reassess the need for further radiographic procedures (Fig. 2). The patient was then informed about the diagnosis, therapeutic options and respective approximate costs.

**Implant planning procedure**

The patient elected for implant-borne prosthetic reconstruction of the mandible. A CBCT scan was consequently acquired (SCANORA 3D) to perform software-based implant planning for guided
Case report—guided implant surgery

Surgery using a surgical template. A radiographic guide was constructed by duplicating the denture and placing eight to ten gutta-percha markers throughout the oral cavity. Gutta-percha markers should be placed at 1–2 mm intervals for the best results (Fig. 3).

Two CBCT scans were acquired: firstly, a scan of the patient wearing the radiographic guide and a radiographic guide index (bite index) to ensure that the radiographic guide was securely placed in the patient’s mouth, and, secondly, a scan of the radiographic guide itself (double-scan method). The acquired data was imported into OnDemand3D software (Cybermed), and edited and merged by means of the In2Guide module (Fig. 4).

The implant planning was performed according to the nine-step procedure of the patient CT and radiographic guide option of the In2Guide module (Fig. 5). The final implant planning data was uploaded to the OnDemand3D server, and the surgical template was manufactured accordingly and delivered on time (Fig. 6).

Surgical procedure

The surgery was performed under local anaesthesia. The remaining teeth, except for one (vertical dimension placeholder), had been removed approximately six weeks earlier. The surgical protocol of a delayed implant placement was applied.

In order to fix the surgical template in place, three anchor pins were placed (Figs. 7 & 8). In accordance with the surgical template, four ICX implants (medentis medical) were inserted inter-foraminal, applying the one-stage protocol. After the implant surgery, the last remaining tooth was removed (Fig. 9) and a postoperative panoramic radiograph was acquired (Fig. 10; SCANORA 3D).

As the next step, a provisional implant-borne prosthesis was fabricated and seated (Fig. 11). The final restoration was performed approximately three to four months later.

Discussion and conclusion

The literature supports the use of CBCT in dental implant treatment planning, particularly with regard to linear measurements, 3-D evaluation of alveolar ridge topography, proximity to vital anatomical structures and fabrication of surgical guides. Areas such as CBCT-derived bone density measurements, CBCT-aided surgical navigation and post-implant CBCT artefacts need further research.
All CBCT examinations, like all other radiographic examinations, must be justified on an individualised need basis. The benefits to the patient for each CBCT scan must outweigh the potential risks. CBCT scans should not be taken without initially obtaining thorough medical and dental histories and without performing a comprehensive clinical examination. CBCT should be considered an imaging alternative in cases in which the projected implant receptor or bone augmentation site is suspect, and conventional radiography may not be able to assess the true regional 3-D anatomical presentation. The smallest possible field of view should be used, and the entire image volume should be interpreted.

Fig. 7_Surgical template and anchor pins in situ.
Fig. 8_Radiographic control of the anchor pins.
Fig. 9_Post-op situation.
Fig. 10_Post-op radiographic control.
Fig. 11_Provisional prosthesis.

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Immediate loading with dynamic navigation implant surgery

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Although osseointegration of dental implants is predictable, thorough preoperative planning is a prerequisite for a successful treatment outcome. Anatomical limitations and prosthetic considerations encourage the surgeon to obtain a very precise positioning of the implants. Historically, standard radiographic imaging techniques (intra-oral and panoramic) were available for investigation of potential implant sites.

Nowadays, it is well known that 3-D CT scans allow for more reliable treatment planning than when only 2-D data is available. Transforming the CT scan images into a 3-D virtual image can be achieved using computer software packages, allowing for a 3-D view using CAD technology. For years, stereolithographic guided surgery appeared to be the gold standard in computer-guided implant surgery. This technique has been well developed in recent years and several scientific reports have been published regarding accuracy, complications, survival and success. However, stereolithographic guided surgery has some major disadvantages compared with conventional implant surgery. The surgeon has to rely on a predesigned trajectory planned in the software, without being able to make intra-operative adjustments. In addition, the loss of tactile feeling during preparation and implant placement is a major drawback.

Real-time navigation appears to be a valuable alternative to stereolithographic (static) guided surgery, as it offers the clinician some advantages over the former technique. Using real-time (dynamic) navigation, one can avoid the fabrication of a stereolithographic template, resulting in a less expensive treatment. As navigation is considered a dynamic guided surgery system, changes to the treatment planning (location and size of implants, number of implants, flap or flapless, etc.) can easily be made intra-operatively. Also, the tactile feeling during the drilling procedure, as well as manual control over the implant stability, is still present when using navigation surgery.

Over the last decade, there has been a shift in surgical and prosthetic protocols, resulting in significant reduction in the integration time of a dental implant. This is a logical consequence of the constant improvement of implant characteristics and components simplifying dental implant treatment. Guided surgery using implant simulation software can contribute to better treatment planning, as it provides a preoperative view of the anatomical structures related to the future prosthodontics. This fact could make immediate loading procedures easier, and allows the clinician to know in advance the potential location and dimension of the future restoration(s). Many guided surgery procedures result in the absence of a flap design. Minimising the surgical flap can have advantages for soft-tissue healing and patient comfort. However, it has been shown that flapless free-hand surgery, regardless of surgical experience, leads to malpositioning of implants and consequently to bone perforations and dehiscences. This finding suggests that when using free-hand flapless surgery additional guidance during preparation of the implant bed and during implant placement is required. For this reason, navigation surgery can become an important tool in dental implantology, as it benefits from the advantages.
of using stereolithographic guided surgery and overcomes some important drawbacks of stereolithographic-involved procedures.

_Case presentation_

The patient treated was a 21-year-old female consulting the dental office for replacement of both second premolars in the maxilla, at regions #15 and 25. The patient was in good general condition and a non-smoker. She had been treated before at the orthodontic department at Ghent University Hospital because of multiple dental agenesis. Intra-oral examination revealed the absence of both lateral incisors and second premolars in the maxilla and both second premolars in the mandible. Periodontal screening showed no signs of pathology. The bone anchors used during the orthodontic treatment were still present in the second and fourth quadrants. Treatment involved placement of two dental implants in the edentulous regions of the maxilla. Both implants were to be restored with two provisional crowns within 12 hours of implant placement (immediate loading).

Preoperatively, an impression of the dental arch was taken using an irreversible hydrocolloid (Cavex CA37, fast set, Cavex Holland) to fabricate a diagnostic cast. This cast was used as a model for the moulding of the surgical stent; hereafter called NaviStent (Figs. 1a & b). The NaviStent served as a scanning template and was also worn by the patient during the surgery. Afterwards, the patient was sent for a CBCT scan with the NaviStent in place (Figs. 2, 3a & b, 4a & b).

_Planning procedure_

A standard CBCT scan was performed according to the procedure outlined in the NaviStent scanning protocol from ClaroNav. Cone beam images were taken with a Planmeca ProMax 3D Max (Planmeca) with a flat-panel detector and isotropic voxels. The field of view used for this case was 50mm x 100 mm and a voxel size of 200 µm. The exposition parameters were 96kV and 10 mA. Care was taken to align the field of view with the jaw and the radiographic tracker, which was situated anterior of the jaw.
All images were carefully reviewed and subsequently the CBCT images were converted into DICOM files and transformed into a 3-D virtual model using the Navident software system. The clinician who placed the virtual implants in the virtual 3-D model also performed the actual surgeries.

The potential locations for implant placement and corresponding implant lengths and widths were planned in a prosthetically driven manner. A distance of at least 3 mm from the neck of the implant to the gingival zenith was applied, allowing the biological width to create a connective tissue contour around the abutments (Figs. 5 & 6).

_Surgical procedure_

The surgery was performed under local and regional anaesthesia. Appropriate aseptic and sterile conditions were established to prevent postoperative infections. Before the start of the intervention, the NaviStent was placed over the remaining teeth. It was primarily fixated using the undercuts of the remaining teeth and additionally by application of a denture adhesive (Corega, GlaxoSmithKline Consumer Healthcare).

Before starting the osteotomies, the drilling axis of the handpiece used during the surgical procedure was calibrated. The osteotomies were prepared at a maximum of 500 rpm using the Navident naviga-
tion system to guide the drilling procedure in real time by indicating the desired drilling pathway on the computer screen. Prior to the use of each new drill, a calibration process was performed (Figs. 7–9) in order to determine the exact location of the drilling tip. No punching of the gingival tissue was performed prior to the preparation of the implant sites. Before placement of each implant, an extra calibration procedure was performed in order to be able to track the implant itself also in real time during insertion. This means that both the osteotomy preparation and the implant placement process are tracked in real time. The Navident tracking system uses an on-screen visual representation of the surgical area and auditory cues to aid the clinician (Figs. 10a & b). Two XPEED AnyRidge implants (Megagen) were installed. At region #15, an implant of 4 mm in length and 13 mm in diameter was placed, whereas at region #25 an implant of 10 mm in length and 3.5 mm in diameter was placed (Figs. 11a & b, 12). After completion of the dental implant placement, a crown-lengthening procedure was performed in the anterior maxillary region in order to ameliorate the aesthetic outcome. It is beyond the purpose of this report to provide any detail regarding this procedure.
**Prosthetic procedure**

Immediately after implant placement, impression copings (Megagen) for an open-tray impression were screwed on to the implants and hand torqued (Fig. 13). An impression was taken at implant level using a silicone material (Permadyne Penta H, 3M ESPE Dental) in a plastic Position Tray (3M ESPE Dental). Within 8 hours, two temporary screw-retained acrylic teeth were delivered to the patient and connected to each of the implants. The acrylic teeth were designed based on temporary titanium abutments. Occlusion and articulation were checked and corrected wherever necessary. All superstructures were hand torqued to a maximum of 15 Ncm. No cantilevers were allowed on the provisional structures in order to avoid extensive non-axial forces. Postoperatively, the patient received a prescription for antibiotics (amoxicillin 1,000mg, b.i.d., four days), non-steroidal anti-inflammatory drugs (ibuprofen 600mg, t.i.d.) and a mouthwash (chlorhexidine 0.12%, b.i.d.). After one week, a post-operative visit was scheduled. No signs of infection or inflammation were present and healing was uneventful (Figs. 14 & 15).

**Conclusion**

With a two-week postoperative follow-up, this was the first immediate loading procedure based on the Navident navigation surgery system. The patient reported no pain or swelling associated with the dental implant procedure. Further post-operative results are being tracked and reported as part of a pilot study being conducted at Ghent University (Figs. 16a & b).

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**Editorial note:** A list of references is available from the publisher.
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Eagle’s syndrome

Author_ Dr Enrique González Garcia, Mexico

Abstract

Eagle’s syndrome is characterised by an elongated styloid process and/or calcification of the stylohyoid ligament, which interferes with adjacent anatomical structures, giving rise to pain especially in the neck and throat area, as well as facial pain, otalgia and other symptoms that might not be associated with the oral and maxillofacial complex. These symptoms complicate the diagnosis, since it can be confused with other conditions; therefore, the differential diagnosis is vital. The following article presents a case of a patient with several signs and symptoms of Eagle’s syndrome for which CBCT images were essential in the differential diagnosis.

Introduction

The diagnosis of oropharyngeal pain is very complex owing to the great variety of anatomical structures found in that area. Eagle’s syndrome is named after Watt W. Eagle, who first described it in 1937 in patients with oropharyngeal and cervical pain after a tonsillectomy and with an elongated styloid process visible in radiographs.1

The size considered normal varies according to several studies (Table 1). The majority of studies agree on an estimated measure of between 2.5 and 3.0 cm.2-5 Around 4% of the population have an elongated...
styloid process, yet only 10.3% of them exhibit symptoms. It is more common in women (1:3 ratio) and occurrence increases after the age of 40.3–7

_Aetiology_

Aetiologically, patients are classified into those who have undergone tonsillectomy and those who have not had their tonsils surgically removed but with the same symptoms. Other theories exist, but the following are the most significant:1,4,7–12

1. **Congenital origin**: due to the persistence of a cartilaginous element connected to the temporal bone
2. **Meta- or post-traumatic origin**: originates from partial or total calcification of the stylohyoid ligament
3. **Anatomical origin**: where the theory of ossification is related to mandibular growth, due primarily to the proximity between the first and second pharyngeal arches and second due to the functional stimulation of the stylohyoid ligament derived from poor mandibular positioning, which generates ossification of this structure.

_Pathophysiology_

As previously mentioned, the majority of patients are asymptomatic, and there is no relation between the size of the styloid process and the symptoms. The symptoms can vary from mild to severe, depending on the degree of adaptation and proximity to the surrounding structures.

The most important surrounding structures are as follows:4

1. **Medially**: internal carotid artery, internal jugular vein, glossopharyngeal nerve, hypoglossal nerve and vagus nerve
2. **Laterally**: external carotid artery
3. **Posteriorly**: facial nerve and glossopharyngeal nerve.

<table>
<thead>
<tr>
<th>Study</th>
<th>Measurement</th>
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<tbody>
<tr>
<td>Moffat</td>
<td>1.52–4.77 cm</td>
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<tr>
<td>Kaufman</td>
<td>&lt; 3 cm</td>
</tr>
<tr>
<td>Correl et al.</td>
<td>&lt; 2.5 cm</td>
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<tr>
<td>Linderman</td>
<td>2–3 cm</td>
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<tr>
<td>Langlais et al.</td>
<td>&lt; 2.5 cm</td>
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<tr>
<td>Monsour &amp; Young</td>
<td>&lt; 4 cm</td>
</tr>
<tr>
<td>Montalbetti et al.</td>
<td>&lt; 2.5 cm</td>
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Table 1. The size considered normal varies according to several studies.
The symptoms will depend on the area of contact with the styloid process.\textsuperscript{3,4,12–14} In general, symptoms have been described as pain and feeling of a foreign object on the neck, pharyngeal pain, dysphagia, otalgia, temporomandibular joint pain and pain irradiated to the superior structures. Also, paraesthesia of the hand, pain in the temporal area with photopsia and hypacusis, vertigo, carotidynia, tinnitus, dysphonia, limited mouth opening, taste alteration and ptyalism have been reported.\textsuperscript{5} The majority of the symptoms are present during normal physiological movements, such as chewing, biting, speaking, opening the mouth, yawning, coughing and turning the head.

\_Diagnosis

The diagnosis is based primarily on clinical signs and symptoms and an immunological analysis. Owing to the great variety of symptoms, it is necessary to have a differential diagnosis, which could include the following:\textsuperscript{2,4}

- Temporomandibular dysfunction
- Laryngo-pharyngeal dysaesthesia
- Chronic tonsillo-pharyngitis
- Hyoid bursitis
- Sluder syndrome
- Ernest syndrome
- Pseudo-stylohyoid syndrome
- Glossopharyngeal neuralgia

\_Trigeminal neuralgia
- Migraine
- Sphenopalatine neuralgia
- Cervical arthritis
- Temporal arthritis
- Impacted molars
- Otitis
- Salivary gland disorders
- Tumours.

\_Imaging diagnosis

The evolution of techniques used for the diagnosis has been rapid and ongoing. In many of the previous studies, transcranial and lateral radiographs were used at 20–30 degree angles extending to the neck and even a panoramic radiograph as the method of choice to evaluate the styloid process.\textsuperscript{3,4,14–16} However, all of these techniques produce a magnified image and/or distortion and for this reason cannot be considered 100\% accurate when measuring structures. Because of this, the method chosen for the present study was CBCT, given its characteristics of less radiation and high accuracy, and the excellence and precision of the associated software.

\_Treatment

The initial treatment is infiltration of analgesics and local corticosteroids, with favourable and significant results in decreasing pain. If this treatment fails, surgical resection is indicated.\textsuperscript{2,3,6}

\_Clinical case

A 50-year-old female patient attended for a consultation after having seen several specialists. Several radiographic examinations had been performed, the most important of which were a lateral cranial radiograph, an anteroposterior radiograph and a head CT scan, in search of vascular problems, tumours, haem-
orrhaes or anatomical variance. The doctors who had been consulted before included a general medical practitioner, otolaryngologist, maxillofacial surgeon and neurosurgeon.

The patient’s symptoms included pain in the neck, cheeks, temporomandibular joint and upper back, as well as tinnitus and hearing loss, and constant vertigo, worsened with changing posture, while walking or with head movement. Another symptom reported was sporadic nausea. She had been treated with analgesics, anti-inflammatories, muscle relaxants and ear irrigation. Unfortunately, there was no favourable progress.

Taking into consideration the symptoms described, we obtained a CBCT scan, as well as CT images and 3-D reconstructions. The length of the structures was evident even without measuring. In order to determine the exact size, we took measurements of both styloid processes, and found a length of 51.32 mm for the right styloid process and 48.35 mm for the left.

Once the exact size of the structures had been established, based on the severity of the symptoms and consultation with the maxillofacial surgeon, we decided to proceed to surgical resection. For this, we produced stereolithographic models to verify not only the size, but also the shape and direction of both styloid processes. Owing to the size and location of the styloid processes and taking into consideration the surrounding structures at risk, the group of surgeons decided to perform the surgery extra- orally. A second CT was taken to evaluate the results.

After having part of the styloid process removed, the patient began a favourable recovery. A month after the surgery, the symptoms had resolved almost completely.

Editorial note: A list of references is available from the publisher.
Managing complex anatomy and correcting arch asymmetry

In the following case presentation, I take the reader step by step through the treatment of a challenging case, including a mandible treated according to the All-on-4 treatment concept.

Case presentation

A 64-year-old female patient presented for treatment with an asymmetric arch due to progressive tooth loss. She had controlled hypertension, but no other significant medical history. She had been wearing maxillary and mandibular partial cobalt–chromium–molybdenum dentures for many years, with individual teeth added when crowns or bridges failed. The patient presented with a severely atrophic maxilla and mandible, with a mandibular immediate prosthesis on a shortened dental arch.

As a result of the patient’s progressive tooth loss, I approached this case with the All-on-4 treatment concept (Nobel Biocare) in mind. For both 3-D diagnostics and treatment planning, we used NobelClinician Software (Nobel Biocare). The case, which presented with some significant arch asymmetry, required a staged approach to ensure that the complexity of the planned treatment could be managed successfully.

My colleagues at the Queensway Dental Clinic (consultant oral and maxillofacial surgeon Dr Rob Banks, Queensway Laboratory managing partner Richard Elliot, and prosthodontic manager John Blenkey) and I carried out the prosthetic planning, the All-on-4 surgery, immediate provisionalisation and the laboratory work.
As demonstration of the importance of careful planning, the successful outcome of this case was accomplished through the use of NobelClinician, 3-D prosthetic-driven treatment planning software. The full 3-D case planning approach was streamlined using the online collaboration tool NobelConnect. It involved the surgeons, prosthodontist and prosthetic technicians, who used NobelProcera to make this graftless solution (which could be delivered to the patient in a primary care environment) possible.

Dr Banks carried out the All-on-4 treatment surgery in the mandibular arch with a fixed temporary acrylic prosthesis and provided the patient with immediate function on the day of the surgery at the clinic in Billingham in the UK. The maxillary arch treatment was then carried out over a period of six months to allow implant placement and healing in a severely atrophic alveolar ridge.

During this six-month period, we took a staged implant placement approach. Owing to the 3-D diagnostic features, the placement of the implants into the available bone in this manner avoided sinus grafting or extensive block grafting. Both pterygoid and anterior implant placement took place prior to delivery of the immediate temporary prosthesis. This cautious approach was adopted owing to the poor bone quality.

The final prostheses were carefully designed after a phase of temporisation to correct the arch asymmetry. This was made possible by using some of the techniques we had learnt for managing complex occlusal schemes and facial symmetry from Dr John Kois, a prominent prosthodontist and educator.

Editorial note: For more information on the All-on-4 treatment concept, visit www.nobelbiocare.com/all-on-4. The All-on-4 treatment concept is a registered trademark of Nobel Biocare.

Dr Ian Lane is a managing partner at Queensway Dental Clinic in the UK.
At the heart of the relationship between a dentist and a patient lies trust and respect. Recent events, such as the Sony or, more currently, the Ashley Madison breach, have brought to public awareness the importance of securing one’s data. Data security and governance is a very tricky area. I must make it clear I am not a lawyer, but I am a highly experienced information technology professional with a good understanding of data protection and other relevant legislation. All interpretations provided here are my own.

Even if a dental practice has not embraced the digital age and all records and correspondence are ink and paper based, the practice still has a number of responsibilities regarding data security. As dental practices collect patient details, they must register with the Information Commissioner’s Office (ICO) here in the UK. Dental records must be stored safely and securely for a number of years (up to six years for the National Health Service; NHS) and kept for a maximum of 30 years (Department of Health). Records must also be disposed of in a policed manner to avoid fines.

What about dental practices who have embraced digital? Data is accessed in two situations, storage and movement, the same as physical records are. This also means that there are the two situations in which data can be compromised in the digital world. Dental practices have an obligation to ensure patient data is backed up, recoverable (in case of disasters), secure and protected. This applies during both storage and movement. If you are using one of the popular industry patient management systems, such as EXACT (Software of Excellence), it should have features to support this in place; liaise with your account manager to verify this.

The next area of concern then is movement of data. This can be via e-mail, online referral tools or portals, feedback platforms or devices, and your website. E-mail is not a secure medium, and communication with patients about their medical history or medical circumstances using this platform raises potential issues. The service provider you use for your e-mail could also be inadvertently making you breach data security rules. For example, if you are using one of the popular US-based organisations for e-mail, such as AOL, Hotmail and Gmail, and liaise with your patients via this e-mail platform, you have to consider where the e-mails are being stored; most likely on servers outside your own country.

The UK’s Data Protection Act states that “personal data shall not be transferred to a country or territory outside the EEA (European Economic Area) unless that country or territory ensures an
adequate level of protection for the rights and freedoms of data subjects in relation to the processing of personal data.” As a dental practice, you should reconsider if you are using a commercial e-mail provider to liaise with your patients, and determine whether your website communication tools and feedback portals are compliant and if not ensure your designated data policy controller addresses this as a priority. Here in the UK, the ICO can issue monetary penalty notices, requiring organisations to pay up to £500,000 for serious breaches of the DPA occurring on or after 6 April 2010. Clients at Dental Focus expect us to take care of online compliance and provide guidance on keeping up to date and resolving these issues. Make sure your data is secured and protected before it is too late.

Naz Haque, aka „The Scientist“, is Operations Manager at Dental Focus. He has a background in mobile and network computing, and has experience supporting a wide range of blue-chip brands, from Apple to Xerox. As an expert in search engine optimisation, Naz is passionate about helping clients develop strategies to enhance their brand and increase the return on investment from their dental practice websites. He can be contacted at naz@dentalfocus.com.
Tekscan launches new digital occlusal analysis system

Tekscan has announced the launch of T-Scan Novus, the next generation of its digital occlusal analysis system. T-Scan is used by clinicians and researchers who perform or study occlusal analysis in order to effectively measure the timing and force of teeth coming together in the mouth. A frame-by-frame movie of occluding teeth allows clinicians to identify problematic contacts that could damage dental work or contribute to pain, sensitivity, and periodontal issues or temporomandibular joint dysfunction. The new system features an ergonomically designed handpiece, sensors and sensor supports—bringing an all-new look and feel to digital occlusal analysis. A software update (Version 9.1) has been released in tandem with the new system.

T-Scan is the only technology that shows the measured force and the timing of occlusal surfaces coming together. With T-Scan’s digital bite force data, clinicians can pinpoint occlusal interferences, quickly remove them, and treat patients with greater accuracy. T-Scan is also a great visual aid that helps patients better understand their occlusion and the treatments that may be necessary to balance bite forces.

The Novus Handpiece has upgrades to improve efficiency in a clinical setting, such as a handle that is easier to hold, chairside adjustment buttons, handle latch redesign, wall attachment and user-replaceable cord. The accompanying software comes with user-inspired improvements, such as HIPAA-compliance improvements to the patient list, sensitivity adjustment wizard, option to disregard artefacts from overjet/overbite from Class II malocclusions, auto-typing (categorisation) of multi-bite scans, more accurate ABCD (closure timing) lines, and improved implant loading alerts.

Dentists who want a modern digital occlusal analysis system will find the hardware and software ideal for comprehensive examinations, patient education, and case finishing in any dental application.

A sleeker, faster and more convenient way to measure occlusion

T-Scan Novus can be used in virtually every application in dental medicine requiring occlusal analysis. Dentists specialising in prosthetics may use T-Scan to help them preserve crowns and bridges, identify the cause of rocking in dentures, and ensure implant longevity. Cosmetic applications include comprehensive bite analysis for full-mouth reconstruction, identification of contact points with veneers, and maintaining a healthy occlusion throughout orthodontic treatment. Temporomandibular joint dysfunction specialists may use T-Scan to adjust orthotic appliances or identify occlusal imbalances that could be contributing to symptoms.

“If practising quality dentistry and occlusion is important to the dentist, T-Scan is an invaluable tool,” said dentist Dr Donn Metten. “It is absolutely key for the longevity of crowns, restoration, and rehabilitation cases—but most spectacularly for the symptomatic patients. I’m just sorry I didn’t get it sooner. Because of the quality of dentistry we practise, we have so many grateful and appreciative patients. I would never give up T-Scan.”

While the clinical value of digital occlusal analysis benefits dentists and their staff in a variety of applications, integrating T-Scan technology is different for every practice. Some larger practices use T-Scan on every new patient for a baseline occlusal record, or in the hygiene re-care department. Others may choose...
to use it on specific cases, such as implant restoration or full-mouth rehabilitation. The recent improvements to the system with the launch of T-Scan Novus make integrating the technology to evaluate occlusion easier for practising clinicians. The handpiece can be hung in any operatory and moved between multiple operatories for easy access.

T-Scan Novus is not only a convenient tool to help in diagnosis and treatment, it is also a patient education and case finishing tool. “I am 82 years old and have suffered malocclusion most of my life,” said patient Charles McPartland from Philadelphia in the US. “I have lost several teeth due to this. In Florida, I had a T-Scan bite analysis and adjustment. I never felt so good afterward. I’m going to find a T-Scan dentist in Philadelphia, because I’m tired of losing good teeth due to traditional occlusal indicators.” Patients can visualise their occlusal disorders on-screen to help them understand the need for treatment. Dentists use the data to pinpoint bite issues and non-visible indicators that could be contributing to symptoms.

T-Scan Novus has been under development for some time and over 17 clinicians were part of the initial beta test. The new system was released in September, sparking interest among existing users and prospective customers alike.

“T-Scan Novus is the biggest release this product has seen in over a decade,” said Sarah Hutchinson, Project Manager for the Tekscan Dental Division. “The recent software upgrades bridge the gap between digital renderings and measured occlusal force, while the hardware has been redesigned to reflect the style and functionality of modern dental hardware you’d see in labs or operatories. T-Scan Novus looks as well as it performs and we couldn’t be more excited about this launch.”

_Tekscan, Inc._
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Stratasys 3-D printer now available for larger dental laboratories

Stratasys, a 3-D printing and additive manufacturing solutions company, has introduced a new 3-D printer for larger dental and orthodontic laboratories. The Objet500 Dental Selection offers increased throughput and productivity, with triple-jetting capability to enable life-like color models and multiple applications to be printed in a single run.

The Objet500 Dental Selection 3-D printer’s large build area allows a dental laboratory to increase throughput, and its triple-jetting technology can create a variety of dental-specific palettes, allowing multiple applications to be combined.

The multicolor, multimaterial 3-D printing solution produces dental models with gingiva-like softness and color, a range of natural tooth shades, and nerve canals or other anatomy in contrasting materials. This is accomplished by combining Stratasys’s flexible and rigid PolyJet dental materials, such as VeroDent, VeroDentPlus, VeroGlaze and Clear Bio-Compatible.

The printer can be used for a variety of applications, such as implant testing on stone models, models requiring gingiva-like materials, and jaw models printed directly from CBCT scans.

In particular, the Objet500 Dental Selection is an attractive solution for larger dental restorative and orthodontic laboratories that are interested in implementing digital dentistry, from intra-oral scans to realistic models, and that serve a wide range of dental applications in larger production volumes. Since multiple applications can be produced in a single print run, the Objet500 Dental Selection requires fewer interventions.

A generous build volume of 490 × 390 × 200 mm (19.3 × 15.4 × 7.9 inch) accommodates demanding workflows. It can produce horizontal build layers as fine as 16 µ (0.0006 inch). The resolution is 600 dpi in the x-axis, 600 dpi in the y-axis and 1,600 dpi in the z-axis. The system has accuracy levels of 20–85 µm for features below 50 mm and accuracy levels of up to 200 µm for full model size. It offers two build modes: high-quality (16 µ) resolution and high-speed (28 µ) resolution. The cabinet dimensions are 1,400 × 1,260 × 1,100 mm (55.1 × 49.6 × 43.3 inch). Additional supported materials include VeroWhite, VeroMagenta, TangoPlus, TangoBlackPlus, as well as a range of gingiva-like and natural tooth shade digital materials.

The Objet500 Dental Selection system is compatible with all open-format color intra-oral scanners.

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20 years of digital panoramic imaging: Seeing better with modern technology

The first digital panoramic X-ray machine that Sirona put on the market 20 years ago made perceptible changes in radiological imaging in dentistry—away from films that had to be developed with chemicals and then physically stored, to a fast, more precise method with easy storage function.

Digital X-rays, first patented in 1988, became a marketable commodity in 1995. Sirona presented the first panoramic X-ray machine with a digital sensor, the ORTHOPHOS Plus DS, 20 years ago. The ultimate goal: top image quality for an even more reliable diagnosis with lower radiation exposure for patients. The workflow within the practice was simultaneously improved. It was no longer necessary to develop films with chemicals.

Since then, digital imaging has become a fixed component of a dental practice and has many advantages over conventional imaging with X-ray films: time is saved because the images are available immediately, the images can be processed on a computer and the image quality is higher with reduced radiation exposure. Today, sensor or scanner systems are usually used for intraoral images instead of conventional films. Three-dimensional imaging has become standard, especially for implantology.

Digital imaging constantly improving

The latest innovations by Sirona in imaging techniques have taken digital imaging to a whole new level. The Direct Conversion Sensor (DCS) is new and absolutely unique in this form. It generates electrical signals directly from X-rays without the previously required intermediate stage of first converting them to light. The image data this yields is significantly better in relation to the exposure to radiation. The Direct Conversion Sensor generates extremely sharp X-ray images very efficiently.

For one panoramic image the Sharp Layer technology, which is also new, uses several thousand individual projections that are taken very rapidly from several angles in one rotation and reproduce the individual morphological situation very precisely. The advantages are excellent panoramic images and the possibility of compensating for positioning errors retroactively.

The future means integration

With respect to the many possibilities for digital imaging diagnostics, there is a clear trend: More and more processes in dental practices are digital. The next step here is integration. “Our products can be easily integrated with one another,” says Jörg Haist, Head of Product Management Imaging Systems at Sirona. “Our SIDEXIS 4 imaging software ensures that panoramic and other X-ray data can not only be processed, but also accessed in the treatment centre, documented in the practice administration, and used with CERE.” Thanks to interfaces that have been implemented, Sirona products will remain open for integration of different imaging systems in the future.
Exhibition    Live Product Presentations    Hands-on Workshops
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The Nordic Institute of Dental Education

Sharing CBCT expertise with dental professionals from around the world

The Nordic Institute of Dental Education (NIDE) is a joint venture founded by Planmeca and the University of Turku. It has been a logical next step in Planmeca’s close and decades-long collaboration with the university world. Utilising the dental company’s technological innovations, as well as the University of Turku’s strong academic pedigree, NIDE offers continued education courses to international dental professionals looking to strengthen their expertise.

Planmeca expanded its operations in the field of dental education last year by founding the Nordic Institute of Dental Education together with the University of Turku. NIDE has started off strong by already organising five courses in 2015—with several more lined up for 2016.

NIDE’s courses are an intriguing blend of theoretical and practical perspectives, complemented by fun activities outside the classroom. Most of the courses are held in Finland’s beautiful capital, Helsinki, with some of them also taking place in the coastal city of Turku. All courses are taught in English by leading experts in their fields.

_3-D courses for users of different levels_

The Nordic Institute of Dental Education offers a wide range of academically accredited courses. In particular, NIDE specialises in 3-D and CAD/CAM education, but its courses also cover several other essential topics, such as aesthetic, restorative and adhesive dentistry.

The most popular NIDE course so far has been ‘3-D imaging and diagnostics’—an entry-level course, which continues to raise interest among dentists from all around the world. The two-day course offers detailed information on CBCT usage in digital dentistry and deals with a wide range of questions, such as effective patient doses, image analyses, and anatomic considerations. The course also incorporates a hands-on approach to learning, featuring example cases that have been handpicked by lecturers.

The course’s Belgian lecturers, Dr Bart Vandenberghhe and Dr Livia Corpas, are both known for their...
publications and work at the forefront of applying digital imaging in dentistry. Specialists from Planmeca are also readily available to teach correct techniques and answer questions on the equipment used. This helps participants gain practical insights on digital technology, which support the academic aspects of the course.

In 2016, the Nordic Institute of Dental Education will also offer a CBCT course for more seasoned users. The ‘Advanced 3-D diagnostics’ course has been designed to provide a deeper understanding of 3-D imaging.

In addition to its standard CBCT courses, NIDE offers tailor-made study tours for groups from clinics, distributors, or dental associations.

Fun in and out of the classroom

The Nordic Institute of Dental Education’s courses bring together participants from diverse clinical and cultural backgrounds. Throughout 2015, NIDE has hosted dental professionals from countries as varied as Belgium, Bulgaria, Croatia, Egypt, Finland, Lithuania, Norway, Portugal, Sweden, and Zimbabwe. This broad range of nationalities creates a truly international atmosphere in which participants can exchange experiences and ideas.

In addition to the cutting-edge academic and clinical contents featured in its courses, NIDE also wants visiting dental professionals to experience Finland in more leisurely ways. This is achieved through offering an interesting side programme as part of its courses, highlighting the beauty of Helsinki and its surrounding archipelago. A complimentary Nordic dinner is also included, as well as the possibility to try a traditional Finnish sauna. The side programme has received a great deal of positive feedback from participants, who have valued the authentic Nordic experience alongside the course’s high-quality content.

NIDE is offering a particularly special combination of learning and leisure in January of 2016. Titled ‘3-D winter school’, the unique package consists of NIDE’s ‘3-D imaging and diagnostics course’ and a trip to magical Finnish Lapland. After two intensive days of learning, ‘3-D winter school’ participants get to head up north for a relaxing weekend in the arctic tranquility.

With a rare blend of scientifically proven concepts, academic backgrounds, technological expertise, and beautiful Nordic surroundings, NIDE’s continued education courses are truly one of a kind.

The Nordic Institute of Dental Education is a Finnish joint venture company founded by Planmeca Oy and the University of Turku. The NIDE offers high-quality continuing education courses to international dental professionals, who wish to strengthen their expertise in the latest topics in the field of dentistry. The NIDE’s courses utilise the strong academic pedigree of the University of Turku, the best lecturers in the field, as well as Planmeca’s world-leading technology.

All NIDE courses are taught in English at the University of Turku or at Planmeca’s headquarters in Helsinki. The University of Turku provides ECTS credits and course certificates to students.

NIDE’s expertise covers a wide range of topics, such as 3-D imaging, CAD/CAM technologies, aesthetic dentistry, biomaterial sciences, prosthodontics, endodontics, and orthodontics.

contact

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Asentajankatu 6
00880 Helsinki
Finland

www.planmeca.com
www.nordicdented.com

NIDE 3-D courses

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The Nordic Institute of Dental Education’s upcoming courses.
International Events

2015

ADF
24–28 November 2015
Paris, France
www.adf.asso.fr

Greater New York Dental Meeting
27 November–2 December 2015
New York, USA
www.gnydm.com

CAD/CAM International Conference 2015
4–5 December 2015
Suntec, Singapore
www.capp-asia.com

3rd EADMFR Junior Meeting
7–10 February 2016
Lublin, Poland
www.eadmfr.eu

ICOI Winter Symposia
12–14 February 2016
Miami, USA
www.icoi.org

Academy of Osseointegration Annual Meeting
17–20 February 2016
San Diego, USA
www.meetings.osseo.org

151st MIDWINTER MEETING
25–27 February 2016
Chicago, USA
www.cds.org

2016

20th UAE International Dental Conference & Arab Dental Exhibition—AEEDC
2–4 February 2016
Dubai, UAE
www.aeedc.com

ECR – European Congress of Radiology
2–6 March 2016
Vienna, Austria
www.myesr.org

AADR/CADR Annual Meeting & Exhibition
16–19 March 2016
Los Angeles, USA
www.iadr.org

IMAGINA Dental
5th Digital Technologies & Aesthetic Dentistry Congress
7–9 April 2016
Monaco
www.imaginadental.org

International Osteology Symposium
21–23 April 2016
Monaco
www.osteology.org

Dental Digital Marketing Conference
29–30 April 2016
Dallas, USA
www.dentalmarketingconference.com
submission guidelines:

Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

_ the complete article;
_ all the image (tables, charts, photographs, etc.) captions;
_ the complete list of sources consulted; and
_ the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must not be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

Text length
Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

Text formatting
We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasise certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

Any formatting contrary to stated above will require us to remove such formatting before layout, which is very time-consuming. Please consider this when formatting your document.

Image requirements
Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

Please place image references in your article wherever they are appropriate, whether in the middle or at the end of a sentence. If you do not directly refer to the image, place the reference at the end of the sentence to which it relates enclosed within brackets and before the period.

In addition, please note:
_ We require images in TIF or JPEG format.
_ These images must be no smaller than 6 x 6 cm in size at 300 DPI.
_ These image files must be no smaller than 80 KB in size (or they will print the size of a postage stamp!).

Larger image files are always better, and those approximately the size of 1 MB are best. Thus, do not size large image files down to meet our requirements but send us the largest files available. (The larger the starting image is in terms of bytes, the more leeway the designer has for resizing the image in order to fill up more space should there be room available.)

Also, please remember that images must not be embedded into the body of the article submitted. Images must be submitted separately to the textual submission.

You may submit images via e-mail, via our FTP server or post a CD containing your images directly to us (please contact us for the mailing address, as this will depend upon the country from which you will be mailing).

Please also send us a head shot of yourself that is in accordance with the requirements stated above so that it can be printed with your article.

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An abstract of your article is not required.

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The author’s contact information and a head shot of the author are included at the end of every article. Please note the exact information you would like to appear in this section and format it according to the requirements stated above. A short biographical sketch may precede the contact information if you provide us with the necessary information (60 words or less).

Questions?
Magda Wojtkiewicz (Managing Editor)
m.wojtkiewicz@dental-tribune.com
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