Aesthetic excellence

Thomas Sealey presents an award-winning case study of central incisor replacement in a challenging patient

Diagnostic challenges
By Virat Hansrani and Shashwat Bhakta

The next big thing?
Andrew Dawood sings the praises of the new Trefol system

Walk the line
David Burgess discusses Trace and Place, the latest update to dynamic navigation

The silver bullet
The real deal about record-keeping, from legal expert Stephen Hooper

PROMOTING THE DEVELOPMENT OF IMPLANTS IN GENERAL PRACTICE
Implant surgeons around the world have reacted with great interest to the recent launch of Navident 2.0. Incorporating the ‘Trace and Place’ feature, the latest version of the dynamic navigation system represents another big step forward in freehand computer-guided surgery. Implant dentists can now look forward to an even faster and more simplified workflow, from diagnosis through to precise placement.

Trace and Place is a significant enhancement to a system that facilitates the surgeon’s ability to place implants accurately, safely and with a reduced level of inconvenience and intrusion.

The new technology eliminates the need to include a radiographic marker on the CBCT scan. It removes the requirement to have a custom-made support, Navistent, placed over the patient’s teeth during implant site preparation.

The advantages are instantly apparent:
- Quicker planning and placement – no Navistent required
- A single recent CBCT scan can be used
- Unrestricted access to the patient’s mouth
- Unobstructed visibility
- Bite checks possible at any time – unhindered mouth closure during treatment.

**Safe and predictable**

Dynamic navigation has given the surgeon the unique ability to observe the pathway of the drill during implant site preparation in three dimensions (Figure 1).

Drilling is carried out freehand and the surgeon has the option to change the planned drill pathway at any time, whilst still following the passage of the drill on a computer screen as it progresses (Figure 2).

Operators are reassured that implants can be placed safely and with a predictable degree of precision (Figure 3).

Confidence in the system is enhanced by the ability to verify accuracy using a simple check, prior to site preparation.

Dynamic navigation is enabled by a stereoscopic camera known as a ‘Microntracker’ (Figure 4). It relays images of optical markers back to a laptop computer and, through the principle of triangulation, a graphical representation of the drill appears on the laptop monitor, showing every movement of the handpiece in real time.

Triangulation requires two fixed points in order to calculate the position of a moving point (Figure 5).

The arrangement of the detected markers is compared to known patterns to identify the Jawtag and Drilltag and compute their positions relative to the camera body.

With the earlier version of Navident, both the radiographic marker and the Jawtag were supported by the Navistent, which was moulded over existing teeth.

In cases where there are insufficient teeth to support a Navistent, for example edentulous ridges, the Jawtag is attached to a temporary small diameter implant (SDI) (Figures 6a and 6b).

**Trace and Place in practice**

The need for a Navistent as the fixed triangulation point supporting the radiographic marker and the Jawtag has been overcome by replacing it with a fixed optical marker attached to the patient’s forehead (Figure 7).

The optical marker, known as the Head Tracker, is supported by a frame which neatly fits behind the ears on both sides and rests on the bridge of the nose. Once in place, the Head Tracker becomes a rigid, constant reference to the teeth and jaw in the maxilla.

Another option in the upper jaw, and a requirement in the lower, is a smaller optical marker, known as the Jaw Tracker, supported on a wire that can be bonded to teeth using a light-cured composite resin (Figure 8).

**Figure 1:** Dynamic navigation has given the surgeon the unique ability to observe the pathway of the drill during implant site preparation in three dimensions.

**Figure 2:** Drilling is carried out freehand and the surgeon has the option to change the planned drill pathway at any time, whilst still following the passage of the drill on a computer screen as it progresses.

**Figure 3:** Operators are reassured that implants can be placed safely and with a predictable degree of precision.

Dr David Burgess BDS DPDS
MScConSed is principal of Carbis Bay Dental Care in Cornwall. He has placed over 2,500 implants, more than 350 of them while using dynamic navigation.

David is a willing pioneer of new technology, particularly in the field of digital dentistry. He was the first UK clinician to introduce the Navident dynamic navigation system into his implant treatment workflow.
The relationship between the optical marker and the teeth is fixed. If attached to mandibular teeth, the Jaw Tracker will move as the mandible moves, maintaining the constant relationship between the Jaw Tracker and teeth. In the maxilla, the operator has the option of either the Jaw Tracker attached to maxillary teeth or the Head Tracker attached to the forehead.

In order to establish the relationship between the CBCT image and the actual outline of the teeth, mapping of selected reference areas on existing teeth is carried out using a tracing tool (Figures 9a and 9b).

A minimum of three reference areas is required to correlate the CBCT scan image with the visible teeth in a chosen jaw.

Verification of the correlation between the tracer tip, placed against a reference point on a tooth, and the virtual location of the tracer tip visible on the CBCT scan, ensures accuracy before commencing treatment (Figure 10).

Further verification of the location of the drill tip in relation to a reference point gives the surgeon additional reassurance prior to implant site preparation (Figure 11).

Once the accuracy of registration has been verified, site preparation is carried out using dynamic navigation, with all the advantages of 3D visualisation of the drill as it progresses, and none of the disadvantages of having a tooth-supported stent or guide.

**Unrestricted access and visibility**

How does Navident 2.0 with Trace and Place change the face of computer-guided surgery?

Primarily, it provides a solution to some of the potential limitations afforded by the need for tooth-supported markers with the first version of Navident.

Dynamic navigation is now available to a wider audience of implant surgeons, who perhaps do not have easy access to a CBCT.
scanner for acquisition of a scan with stent and radiographic marker in place. There is no need to create any tooth-supported guide or stent – saving time and simplifying the process of case planning, prior to surgery.

Probably the greatest benefit is the lack of a physical guide, allowing the surgeon to work in a completely uncluttered mouth with no additional restriction of access or visibility.

As with all technology, there are limitations in particular cases. Accuracy will only be as good as the data used and the CBCT scan needs to provide a precise representation of the anatomy of the mouth. If there has been any movement of the teeth, or change to their shape through restorative procedures, it will not be possible to establish a correlation between the scan and the teeth. In order to use Trace and Place in this situation, a further representative CBCT scan would be required.

However, dynamic navigation has the distinct advantage of allowing surgeons to verify accuracy immediately prior to site preparation, so a decision to progress with freehand computer-guided surgery can be made with confidence.
Navident

Targeting Perfection

Dynamic navigation for freehand dental implant placement

See where the tip of the drill actually is, not where you think it is. Navident allows you to prepare the implant site completely freehand and with greater precision and confidence, using your CBCT data in real time as your virtual guide.

- Precision guidance for increased accuracy within 0.5mm of treatment plan*
- Easy to use, reducing time and expense with a simplified digital workflow
- Plans can be modified at any time, even during treatment
- Enables minimally invasive flapless drilling without a physical guide
- Provides even greater value from your CBCT data

“What makes Navident stand out is it precisely guides the surgeon to prepare and place the implant. The software shows the drill position on the scan in real time, as it enters the jaw.”

David Burgess BDS DPDS MScConSed
Carbis Bay Dental Care, St Ives, Cornwall

*Average error of 0.4mm in internal bench tests with a range of operating conditions.

Call 0845 602 4944 or email info@navident.co.uk

Hands-on dynamic navigation courses now available

Distributed in the UK and Ireland by The Dental Imaging Company Ltd

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