PIELOTIC RICH FIBRIN:
OPTIMISATION AND APPLICATION
Johan Hartshorne and Howard Gluckman’s in-depth analysis of this innovative regeneration material continues inside

THE ROAD TO ENLIGHTENMENT
Viraj Patel shares his implant journey

FULL ARCH IMPLANT RESTORATION
By David Murnaghan

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THE ULTIMATE TEST
Dynamic navigation faces its toughest challenge yet
Putting dynamic navigation to the ultimate test

**David Burgess** describes how he used dynamic navigation with a fully digital workflow to accurately plan, place and immediately restore a dental implant to replace an upper central incisor

This procedure constituted an ‘ultimate test’ for dynamic navigation with Navident's computer-guided technology.

There was no margin for error at any stage in the planning, manufacture of abutment and crown, and placement of the implant. It was also a measure of the clinician's ability to follow a pre-determined path while preparing the implant site completely freehand, without the assistance of a static drilling guide.

**Diagnosis and treatment planning**

A 73-year-old female came to Carbis Bay Dental Care with a failing upper right central incisor (Figure 1).

The tooth had an associated symptomatic apical infection some years after root canal therapy and post crown placement. The patient had no significant medical history or contra-indications to implant therapy.

The patient was keen to replace the failing upper right central incisor with a fixed and permanent restoration. She expressed a preference for a dental implant rather than a fixed bridge. The tooth was extracted and a simple temporary immediate acrylic partial denture fitted (Figures 2 and 3).

Socket preservation was carried out through placement of a Bio-Oss collagen and bovine bone block, immediately after extraction. The socket was left to heal for three months and the denture used to shape the gingival tissue (Figure 4).

After three months, the site was reviewed. A customised support made from a unique thermoplastic material was moulded directly onto the patient's upper left teeth. As a result, stability of the stent was ensured even before the CBCT scan.

The support, or Navistent, provides attachment for a fiducial marker for the CBCT scan and later an optical tracking marker during treatment. It is cut away completely from the area to be prepared, facilitating a completely freehand approach.

Following a detailed CBCT scan using the Morita Veraviewepocs 3D R100 CBCT of the patient wearing the Navistent with the fiducial marker in place (Figure 5), the decision was made to proceed with restoration of the space with a dental implant.

In order to take advantage of the established gingival contour (Figure 6), and to enhance the healing potential that accompanies a one abutment – one time protocol, the capabilities of digital technology were employed to enable the design and manufacture of a custom-made titanium abutment, prior to implant placement.

**Design and production of abutment and restorations**

An intraoral scan, using a 3M True Definition scanner, was acquired with the partial denture
in place (Figure 7 and 8).

The STL file of the intraoral data was imported into the Navident planning software and merged with the DICOM file of the CBCT scan. This enabled the ideal size, shape and position of the proposed crown to be visualised.

The Navident planning software was then used to plot the desired, restoratively driven, final implant position (Figure 9).

Once the intended implant position and crown had been finalised, the relevant data was exported from Navident and sent to the dental laboratory. The final titanium abutment design was created with the laboratory’s 3shape Implant Studio planning software (Figure 10).

The manufacture of a Dentsply Sirona Atlantis custom-made titanium abutment was requested using this design.

Upon receipt of the abutment, the laboratory produced an ‘out-of-bite’ temporary crown to be fitted immediately after implant and abutment placement.

A zirconia permanent crown was also made, ready for fitting approximately three months later, once osseointegration occurs (Figure 11).

Minimally invasive, flapless surgery

A flapless procedure was carried out, using a minimally invasive surgical technique (Figures 12 to 14). Care was taken to ensure that the freehand implant site preparation followed the planned position as closely as possible (Figure 15). The aim was to place the implant to the same depth as planned, with minimal lateral position or angle deviation.

Precise placement of a 3.5mm x 14mm implant (Dentsply Sirona Ankylos CA) was achieved, with very good primary stability (Figure 16).

The custom-made Atlantis titanium
abutment was placed immediately (Figures 17 and 18), and the temporary crown secured with temporary cement (Figure 19).

**Predictable and accurate technique**

The patient was delighted with the outcome and reported very little postoperative discomfort, and no swelling or bruising as a result of the minimal flapless approach.

The end result demonstrated not only an excellent clinical outcome, but also that dynamic navigation is a predictable and accurate technique for precise implant placement. A definitive custom-made titanium abutment was fabricated with temporary and permanent crowns, from the 3D digital data supplied to the dental technician showing the planned final implant position. Dynamic navigation was then used to place the implant in the exact planned position. This allowed the abutment and crown to be fitted immediately after implant placement, without the need for adjustment.

The patient was reviewed after two weeks and tissue healing was observed to be progressing well (Figure 20). A further review is planned at three months with the intention of fitting the final crown, provided osseointegration of the implant is complete.

**Confidence of successful outcome**

Prior to electing to carry out this procedure, the potential sources of digital error had to be considered, including the accuracy of the CBCT scan and the reliability of the transfer of the CBCT data to the Navident software.

I also had to have complete confidence in the accuracy of all components of the Navident system, from the planning and guidance software to the tracking camera and the laptop image.

The possibility of operator error due to any instability of the thermoplastic stent, supporting the fiducial marker for CBCT acquisition and the jaw tag during surgery, had to be assessed. Another factor that might influence final implant position was the potential for the implant to deviate from the prepared site during implant placement. This could be affected by variations in bone density, increasing the possibility of the implant being ‘drawn into’ a different final position.

After careful consideration of all the above factors, and from extensive experience in the processes involved in dynamic navigation, I was confident of success with this case, remaining aware that, at any stage, I could revert to a multi-stage protocol. IDT
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.