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“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.”

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A 67-year-old female patient presented with a horizontal fracture at the gingival level of a root-treated upper left lateral incisor. The prognosis of the tooth was poor, and restoration with a post crown was unlikely to provide anything more than a temporary solution.

The patient was keen to avoid a denture at any time. The author had provided her with seven other dental implant restorations over the preceding ten years, so she expressed a preference to have the upper lateral incisor replaced with an implant.

Clinical examination and planning
Clinical examination showed the upper left lateral incisor to be periodontally sound, asymptomatic and endodontically treated, with no obvious pathology. The bonded crown had been re-cemented and was slightly out of the ideal position, compromising the aesthetics (Figure 1).

Radiographic examination suggested a satisfactory root filling and sufficient bone to allow implant placement.

Computer-guided dynamic navigation with Navident was used in the preparation and treatment of this case.

Scanning and planning took place during an assessment visit about two weeks before implant surgery. A customised Navistent support, made from a unique thermoplastic material, was moulded directly onto the patient’s upper right teeth. As a result, stability of the support was ensured, even before the CBCT scan.

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

A Morita Veraviewepocs 3D was used to take a detailed scan of the patient wearing the Navistent with the radiographic marker in place.

The CBCT examination revealed adequate apical and interproximal bone, with an intact covering of labial bone on the tooth root.

The patient was made aware of the likelihood that the labial bone would resorb following extraction of the tooth.

The likely consequences of resorption, such as compromise to implant success and gingival height loss, are well documented. It is therefore commonplace to carry out augmentation procedures following extractions in the aesthetic zone, in order to attempt to preserve the contour of the labial bone, and the thickness and height of the gingival tissue.

While immediate placement of an implant into the socket of an extracted tooth was seen as a minimally traumatic approach in the past, the consequences of bone loss following extraction...
have necessitated a more invasive approach by including augmentation procedures.

**The 'socket shield' technique**

In recent years, an experimental approach has been proposed to prevent labial bone loss following tooth extraction.

The ‘socket shield’ technique was born out of a suggestion that if a portion of the labial aspect of the root was left in the socket, while the rest of the root was removed, the periodontal interface between the root surface and the overlying bone would ensure the resorptive process was not triggered.

As a relatively new technique, there is no long-term data to back up this hypothesis. However, many reviews have suggested that a socket shield may have a place in some cases, where preservation of the labial bone and minimal surgical trauma are of high importance.

In this case, the patient understood the potential benefits and pitfalls of this approach, and was willing to have a socket shield to avoid augmentation and reduce trauma.

The plan was not only to use dynamic navigation to guide the freehand preparation and placement of a dental implant into the optimum position, but also to accurately section the root and prepare a socket shield.

The patient felt reassured by the care being taken to achieve optimum implant positioning, with minimal trauma and risk of potential complications, and was extremely impressed with the technology.

The Navident planning software allowed the placement of the implant to be restoratively driven. The size, shape and position of the intended crown were planned prior to treatment and the consequent position of the implant determined, so that the optimum restoration could be achieved (Figure 2).

**Extraction and socket shield preparation**

Treatment was carried out under local anaesthesia.

The crown was removed from the upper left lateral incisor (Figure 3). The NaviStent was attached to the jaw tag and positioned on the upper right teeth, leaving access to the treatment site clear (Figure 4).

The optical marker, known as the drill tag, was attached to the high-speed turbine. Accuracy was verified by using reference points on adjacent teeth, touching them with the tip of the drill and checking the contact as it complied with the representative points on the CBCT scan image.

The root of the lateral incisor was carefully sectioned to the apex with the high-speed drill, using dynamic navigation to enhance visualisation (Figures 5 and 6). The clearly visible drill position was monitored on the Navident screen throughout socket shield preparation (Figure 7).

The palatal section of the root was then extracted from the socket using periotomes and gentle pressure. Preparation of the labial section of the retained root continued until a crescent-shaped socket shield remained, with the coronal border at the edge of the socket and 2mm sub gingival (Figure 8).

Dynamic navigation facilitated the creation of the socket shield and virtual visualisation of the process, even deep in to the socket where...
a true visual examination was not possible.

It is this author's opinion that the use of dynamic navigation in this instance ensured the socket shield was prepared in a more ideal and predictable manner than could have been achieved using eyesight alone.

A digital radiograph was taken to confirm the coronal and apical extent of the socket shield (Figure 9). Although a two-dimensional radiograph could not have confirmed the three-dimensional shape of the retained root section, the Navident system provided an accurate virtual picture, so that a further CBCT scan was unnecessary.

**Implant site preparation and placement**

Following the standard Navident protocol, a 3.5x14mm Dentsply Sirona Ankylos C/X implant was placed in the optimum pre-planned position into bone palatal to the socket.

Dynamic navigation was then used for preparation of the osteotomy using the surgical handpiece (Figure 10). Care was taken not to disturb the socket shield during site preparation, firstly with a 2mm twist drill, and finally with the 3.5mm Ankylos drill (Figure 11).

Dynamic navigation enabled the preparation of the implant site to be within 0.1mm of the planned position and not exceeding 0.5º deviation, according to the Navident data.

The implant path was also monitored by calibrating the apex of the implant, in the same way as drill tips are calibrated before each use, and tracking its movement into the osteotomy during placement with the handpiece.

Again, dynamic navigation gave reassurance that the final three-dimensional position of the implant was as planned.

In this case, the feedback was of greater significance, as it was important that the optimum relationship between the implant and the socket shield was achieved (Figures 12 and 13).

No augmentation or additional socket fill with heterogenous bone substitute was required, no flap reflected and no disturbance of the gingival connection to the underlying labial bone. Figure 14 shows the implant in its final position and demonstrates a high degree of precision in relation to the pre-treatment plan.

**Screw-retained temporary abutment and temporary crown**

A titanium Ankylos stock abutment was selected and a screw-retained acrylic temporary crown constructed (Figure 15).

Access to the abutment screw was achieved through the palatal aspect of the temporary crown, which was attached to the abutment with composite luting cement.

The contour of the temporary crown was fashioned to conform to the gingival margin, to be out of occlusion and cover the socket shield (Figure 16).

The postoperative radiograph confirmed the implant position was as planned (Figure 17). The implant will be restored with a custom-made titanium abutment and a zirconia crown, once adequate osseointegration has occurred.