A simple surgical technique to maximise prosthetic results

Timothy Kosinski presents a technique to help minimise surgical risk, as well as helping the dentist to understand anatomy and proper implant placement

Replacement of missing teeth with dental implants is predictable and has become commonplace. Patients now present to our practices with information gathered from many sources, including the internet. They are educated about the benefits of implant dentistry and some of the surgical procedures. However, some cases are more difficult for the practising dentist than others. Any reluctance to consider dental implant surgical and prosthetic procedures by the general dentist may be a matter of not feeling confident or competent in the procedure in a particular area of the mouth.

Bone contour and vital anatomy need to be considered and evaluated carefully to ensure a high quality functional and aesthetic result. Risks need to be addressed with the patient prior to any surgical intervention.

A technique will be discussed here that will help minimise surgical risk as well as helping the dentist to understand anatomy and proper placement.

There needs to be a safe and effective mechanism for the placement of dental implants in the proper position – the step-by-step process of radiographic documentation ensures accurate surgical placement.

Aims and objectives

The aim of this article is to present two cases that demonstrate a simple surgical technique to maximise prosthetic results.

The reader will:

- Better understand anatomy and proper implant placement
- Learn about the concept of implant platform switching
- Appreciate the importance of design, stability and bone loss for a successful outcome.

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Design

There have been significant dental implant design improvements over the past few years, each creating better initial stability and less crestal bone loss over time, and improved retention, function and aesthetics of the final restoration. Preservation of soft tissue contours is achieved by maintaining crestal bone levels. The type and size of abutment placed within the implant has changed recently with the advent of the concept of implant platform switching. This proposed method of abutment placement has apparently shown a propensity to reduce circumferential bone loss around the dental implants (Zeineb K et al, 2008). The horizontal micro-gap is changed to be on the inside of the external diameter of the implant neck, and this process may result in decreased bone loss.

As design improvements are achieved in implant dentistry, the predictability and improved long term prognosis of the systems make implants a more popular restorative technique for dentists. Surface coatings and treatments, design characteristics for size and shape of the implants, and prosthetic parts all make the technique clinical success.

Stabilisation

Following surgical placement primary stability of a dental implant is an important aspect in creating a functional, osseointegrated fixture. There are several techniques that can be used to create initial stability including making the osteotomy site slightly smaller than the final implant to be placed and using a self-tapping implant design. The type of thread used in the body of the implant can affect initial stability; in addition, a combination of large threads for initial placement and smaller threads at the neck of the implant allow for condensing of crestal bone. A roughened surface allows for better anchorage in bone tissue compared to implants with smoother surfaces. Finally,

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apically tapered implants condense bone laterally and those with crestally widened necks allow for condensing of crestal bone as the implant is seated (Gittleman N, 2009).

Bone loss

The greatest bone stresses around dental implants have been reported to be concentrated at the cortical bone at the crest of the edentulous ridge. Bone loss therefore begins at the implant neck, so the implant neck should be smooth and polished and the crestal portion should not be designed as a load-bearing area. Initially following placement of a dental implant, there is bone remodelling and formation of a biological seal around the neck of the implant. A junctional epithelium is formed above the crest of bone. Crestal bone is not maintained above this junctional epithelium. It may be that when implant abutments are placed at the crest of the alveolar bone the cortical bone will adjust to the biological width and resorb.

Platform switching

Platform switching uses an abutment that is smaller in diameter than the external neck of the implant. The theoretical objective is to prevent the normal bone loss down to the first thread of the implant that often occurs, thus improving soft tissue aesthetics.

Case one

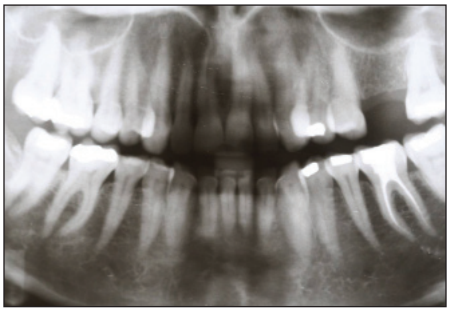
Figures 1 to 25

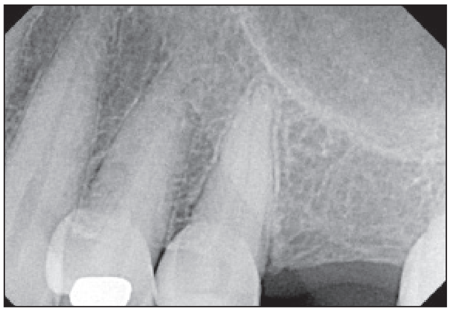
The patient was a 47-year-old female missing her maxillary left first molar. Discussions about how to restore this edentulous space included the option of a conventional fixed bridge. Her maxillary second molar had a relatively small amalgam restoration but the second bicuspid was healthy. Preparing two strong teeth to replace the missing tooth may have been considered conventional therapy in the past but dental implants are now more conservative and predictable. The issue to be considered prior to dental implant diagnosis was whether there was enough bone present to accept an implant, with the maxillary sinus position determined by a panoramic or periapical radiograph.

Objectives

To restore the maxillary left first molar our primary objectives were to establish a correct occlusal plane relationship, fill the edentulous space and improve aesthetics. Our choice of implant in this case was the SybronPro XRT dental implant, which incorporates innovative micro threads, a mount-free delivery system and self-tapping threads. An internal octa

Figures 1 and 2: Retracted facial and occlusal views of the UL6 area. It appears that there is adequate width of bone





Figures 3 and 4: Panoramic and digital periapical radiograph of edentulous space

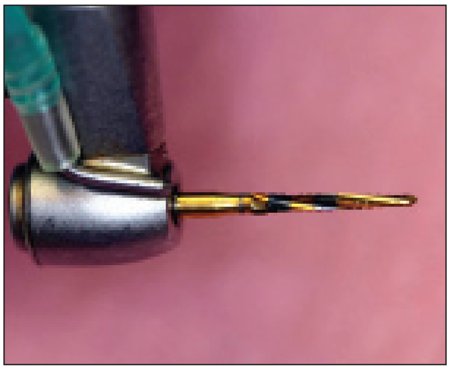


Figure 5: The first drill used to determine angulation is the Lindemann guide. This is a very sharp drill with a point. It also allows for lateral positioning as it cuts on its side

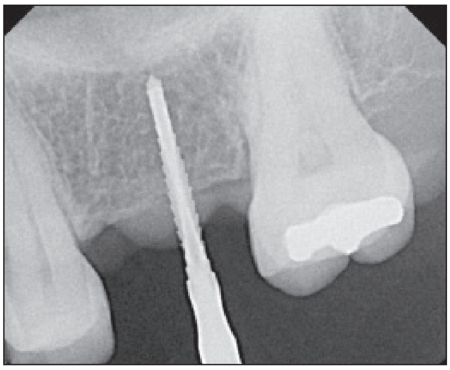


Figure 6: A digital radiograph is taken to determine proper angulation of the primary drill

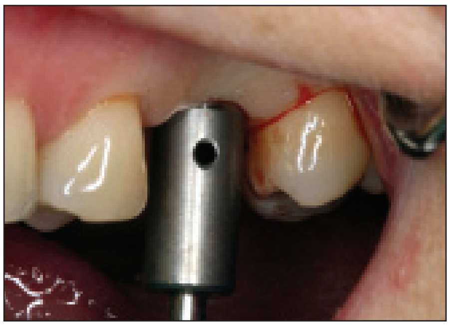


Figure 7: A sharp tissue punch blade removes soft tissue at the surgical site and eliminates the need for a full thickness flap. Sutures will not be required following implant placement

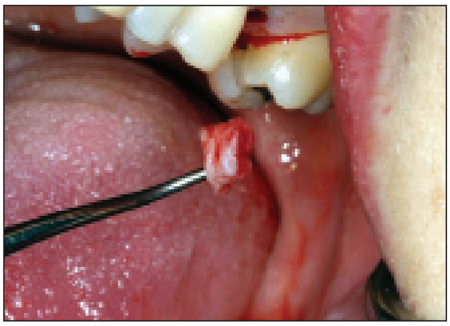


Figure 8: The soft tissue is simply removed with a curette. The tissue plug determines the depth of the soft tissue at the site

Figure 9: A 2.2mm diameter twist drill is used to establish depth. The black lines clearly delineate 7mm, 9mm, 11mm, 13mm and 15mm

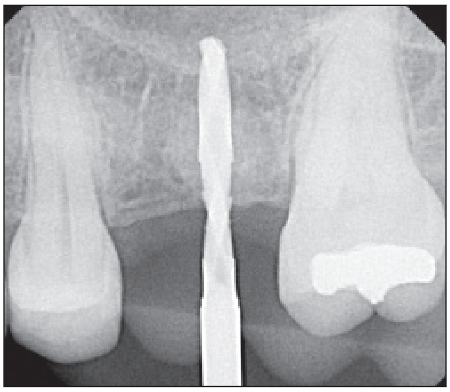


Figure 10: Radiograph illustrating the angulation at which the implant will be placed in the centre of the edentulous ridge. The small diameter twist drill radiograph shows that the floor of the maxillary sinus has been reached, with adequate bone for implant placement. Penetration into the sinus would require augmentation with a tenting procedure but this is not the case here

Figure 11: A 3.3mm twist drill (actual diameter of 2.8mm) is positioned so that an osteotomy 9mm into bone is made. Note that the soft tissue was approximately 3mm in height so, to determine the depth to which the implant should be placed in this flapless procedure, the 9mm of the implant to go into bone is added to the 3mm of tissue height. Therefore, the line markings on the twist drill are visualised to 12mm, between the second large black line

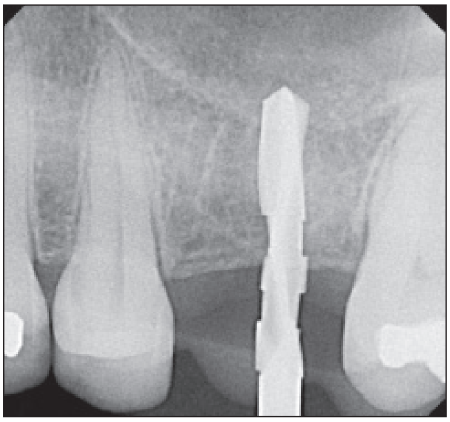


Figure 12: Radiograph of the 3.3mm twist drill in the site. Note the notches of the drill itself. The first break is at 7mm and the second at 9mm. This is intended to be our final depth, just at the floor of the sinus

Figure 13: A 4.1mm twist drill (actual diameter of 3.5mm) is positioned. The drilled was used at 1,200rpm

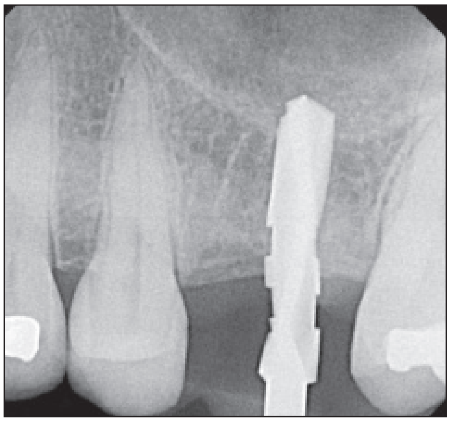
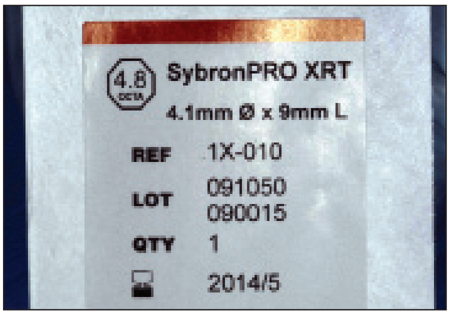
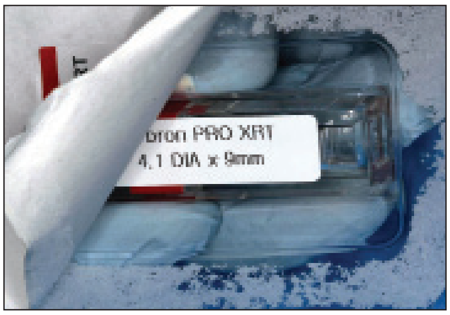


Figure 14: Radiograph of the 4.1mm twist drill in ideal position at a depth of 9mm





Figures 15 and 16: External and internal packaging of the Sybron implant system XRT Octo implant

Figure 17: An implant driver is placed into the internal octagon of the implant, the motor turned down to 25Ncm and the implant driven into the osteotomy site. The driver stops when 25Ncm of torque is achieved

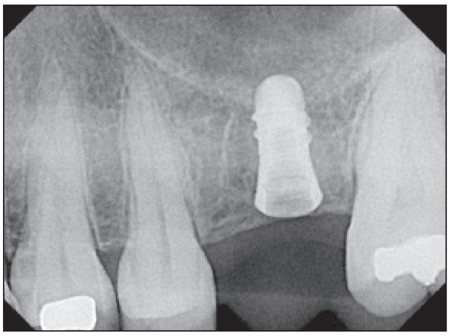


Figure 18: A radiograph of the implant in position. The tightness of the implant in bone is checked using a torque rachet. This records torques of 15Ncm, 25Ncm and 35Ncm. A torque of 25Ncm was achieved on this implant in the maxillary right first molar area. Once the required level of torque is achieved, either a cover screw or a taller healing abutment can be safely placed on the implant to allow for tissue and bone healing

Figure 19: Occlusal view of the cover screw in position. Note there is no bleeding and sutures are not required. Once the implant integrates, removal of the cover screw will allow direct access into the internal design of the implant

Figure 20: A direct impression is made using a two-piece impression post with an octagon base that engages the internal design of the Sybron implant and a screw that threads it into position

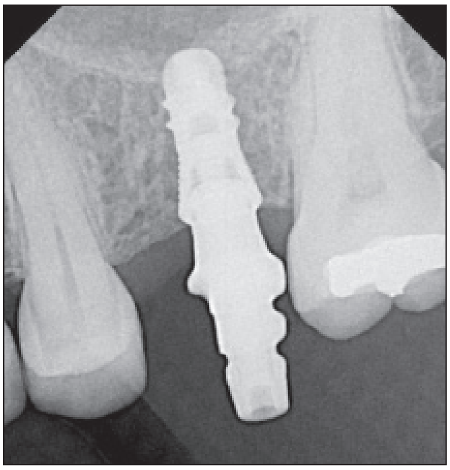


Figure 21: Radiograph of the impression post in position. This radiograph is taken to ensure that the impression coping engages the implant completely

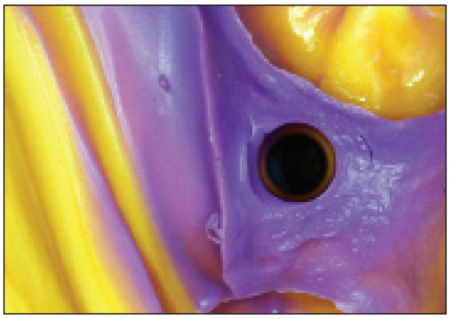


Figure 22: A polysiloxane impression is made with light and heavy body material. Note the clean contours of the impression. The impression coping must be retained properly in the direct impression to ensure a proper abutment and crown fabrication

Figure 23: Following fabrication of a master cast using the impression coping placed into a laboratory analogue, an abutment is prepared and a crown fabricated. The prepared abutment is torqued into position intra-orally at 25Ncm

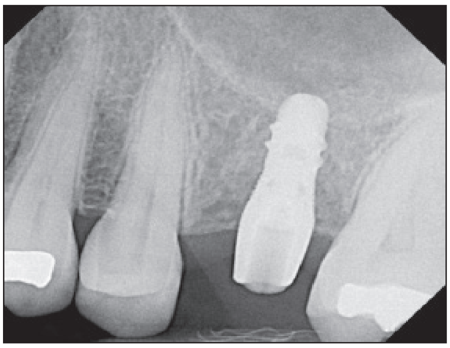


Figure 24: A radiograph is taken to ensure a complete seat of the abutment into the implant

Figure 25: A zirconia crown is cemented into place

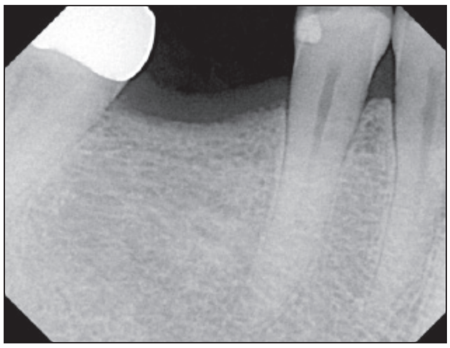


Figure 26: Digital radiograph of edentulous mandibular right first molar area

(used in this case) or hex pattern allows for great stability of the conventional or platform switching abutments. Here, an implant with a 4.8mm crestal width, 4.1mm body and 9mm length was used in the UL6. The determining factor in shape and size of the implant was based on the height and width of bone below the sinus area. If less bone had been available, a sinus lift or tenting may have been necessary.

Case 2

Figures 26 to 44

This case will demonstrate a simple surgical technique in placement of a single dental implant in the mandibular right first molar

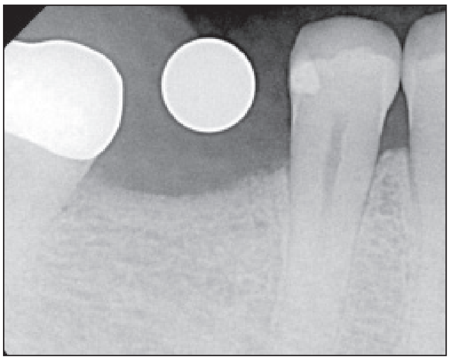


Figure 27: A 5mm ball-bearing is used to determine the precise height of bone from the crest to the mandibular canal

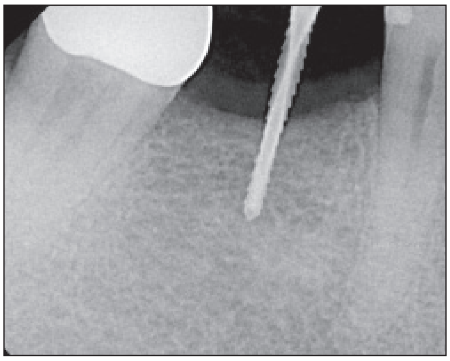


Figure 28: A Lindemann guide drill penetrates the soft tissue and bone by several millimetres. A radiograph is taken to determine the angulation for the dental implant

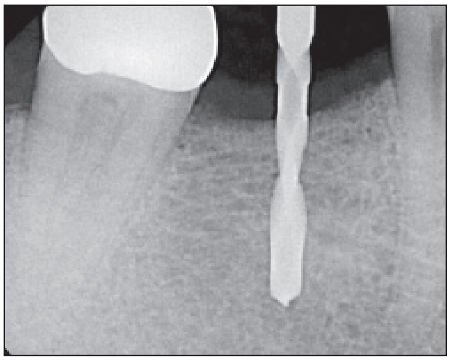


Figure 29: A 2.2mm diameter twist drill is used to establish depth. The intention is to determine a final depth no further than the apices of the adjacent root structures. The notches on the 2.2mm twist drill are marked 7mm, 9mm, 11mm, 13mm and 15mm. This digital radiograph indicates that the drill is 11mm at the crest of the ridge at the depth of the adjacent root apices

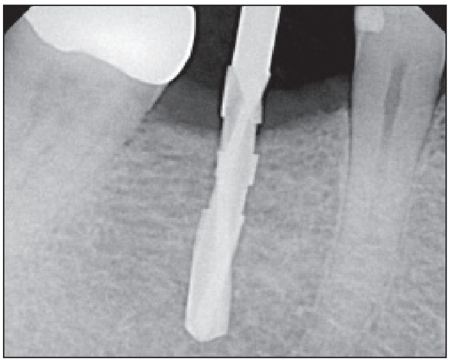


Figure 30: A 3.3mm twist drill (actual diameter of 2.8mm) is used to depth

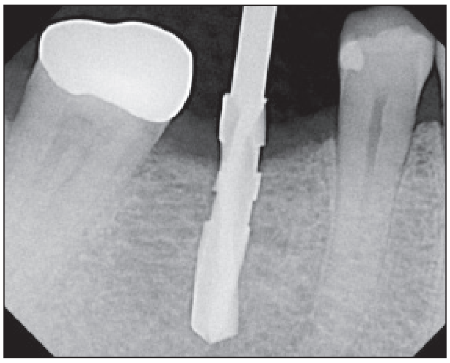


Figure 31: Radiograph of a 4.1mm twist drill (actual diameter is 3.5mm) to a depth of 11mm

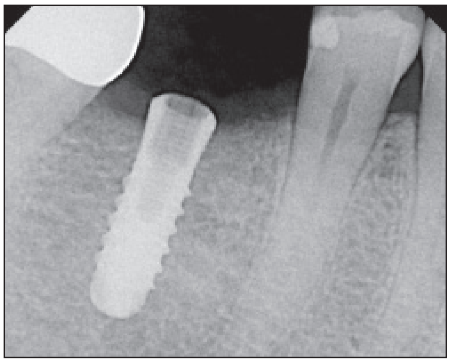


Figure 32: A 4.1mm x 11mm Sybron XRT-PRO implant placed into the bone

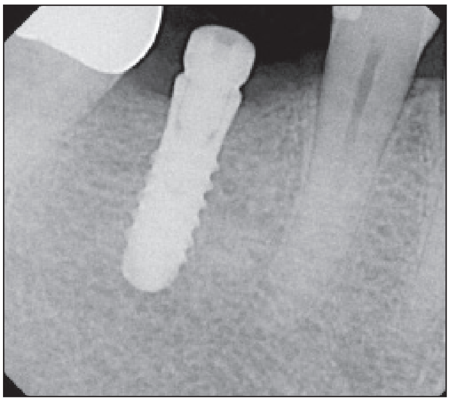


Figure 33: A 2mm-high platform switching healing abutment is torqued into place. Note that the healing abutment fits inside the body of the implant, creating a notch at the crest of bone

Figures 34 and 35: Facial and occlusal view of the healing abutment in place following healing

area and the use of platform switching restorative techniques.

A 4.1mm wide by 11mm high implant was used in the area of the LR6. The determining factor in shape and size of the implant was based on the height and width of bone above the mandibular canal. The final restoration was a full gold crown, as the patient had a history of breaking porcelain on posterior crowns.

In this case, the choice of dental implant was based on the necessity to reduce or eliminate functional load at the crest of bone and reduce bone loss. The theory of platform switching seems to support this choice and provide for a long-term positive prognosis on

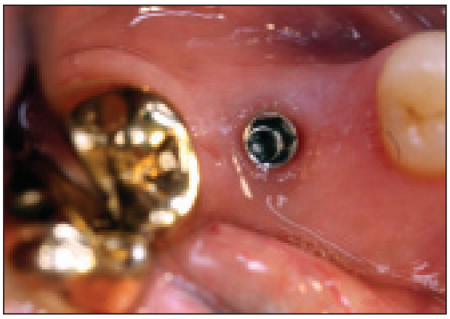


Figure 36: Occlusal view of the internal hex design of the Sybron dental implant prior to final impression

Figure 37: Two-piece impression coping used for a direct impression of the implant

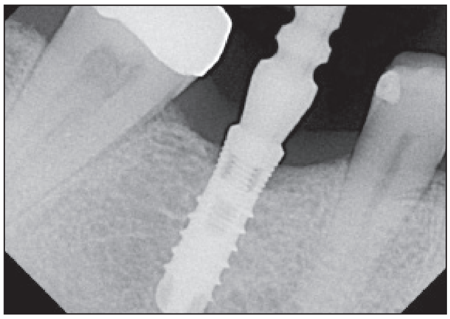
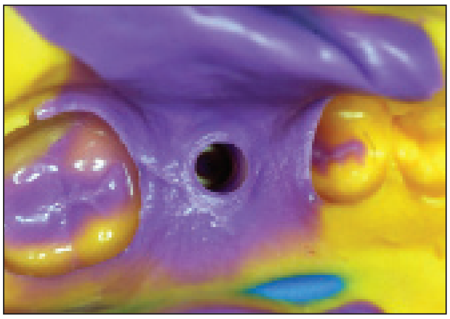
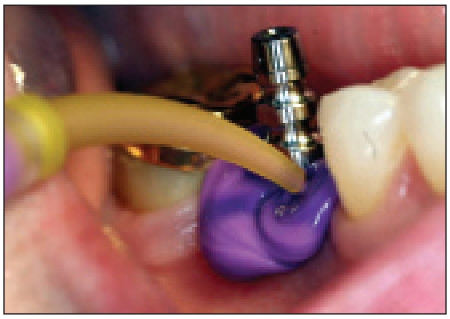


Figure 38: A radiograph is taken to ensure complete seating of the platform switching impression coping. Again, note that the coping fits inside the neck of the implant

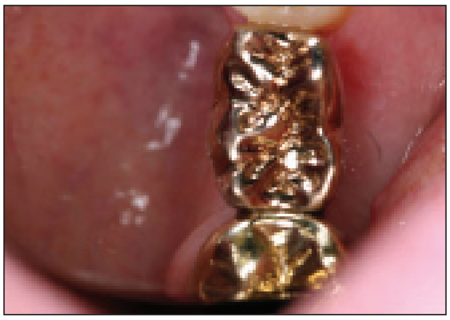


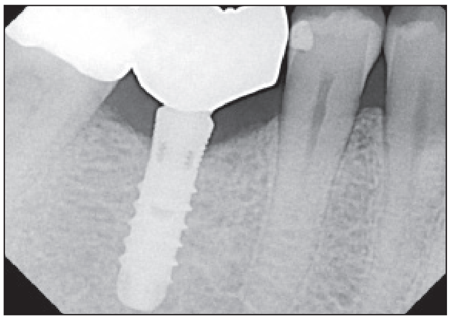


Figures 39 and 40: A polysiloxane impression is made with light and heavy body materials. Note the clean contours of the impression

Figure 41: The impression coping is placed into a lab analogue and inserted into the final impression. Stability is checked

Figure 42: Facial view of the titanium abutment prepared and torqued into position at 25Ncm





Figures 43 and 44: The final full gold crown (FGC) is cemented in place. An FGC was used due to the patient's severe bruxing and a history of breaking porcelain in the posterior

this chronic bruxer. The patient was provided with a new occlusal guard for night use.

Conclusion

The use of dental implants to support, retain and stabilise single crowns has greatly improved the quality of life in patients who may have previously been deemed bridge candidates. These implants provide an outstanding option for restoring single teeth. These cases highlight the technique to restore a missing maxillary/mandibular first molar using a minimally invasive surgical procedure leading to an aesthetic and functional prosthetic result. ■

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