Case study: implant dentistry 'upside down'

Stephen E B Jones, Specialist in restorative dentistry and Ben Page, dental technician describe a case study where implants are placed directly to fit existing fixed restorations

Abstract

The importance of planning the precise shape and restoration of individual teeth before placing dental implants has been documented many times over the last two decades. However there is no mention in the dental literature of succeeding in doing just the opposite – trying to place implants directly to fit existing fixed restorations. This case study presents a situation where two mandibular three-unit bridges, both originally retained bilaterally by two implants, had to be removed after an implant under each had been lost due to an iatrogenic periimplantitis. Two new implants were precisely placed and new custom abutments were fabricated between the implants and the original bilateral bridgework. Both bridges were then recemented eight months after their original 'failure'.

Introduction

A 55-year-old healthy female patient was treated at her general practice and had several teeth removed and partial dentures made. However subsequently she expressed a wish to return to fixed teeth. In May 2002 eight dental implants (Nobel Biocare ReplaceSelect, Nobel Biocare UK Ltd), were placed as a single stage procedure, under intravenous sedation. Four hydroxyapatite coated implants were placed in the partially dentate maxilla and two each were placed bilaterally in the mandible, as single stage surgical procedures. Healing was totally uneventful.

Cemented porcelain fused to metal bridgework was subsequently made several months later in both arches using GoldAdapt (Nobel Biocare UK Ltd) cast-on abutments, also commonly known as UCLA abutments (Lewis et al, 1988). The bridges were fitted by the patient's general practitioner to restore the patient with a first molar to first molar slightly shortened dental arch arrangement. The patient went to live abroad and did not attend the one-year recall with either the implant surgeon or referring practitioner.

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The problems

On returning to the UK four years later she re-attended her original general dental practice complaining of a loose bridge. The dentist that had fitted the original abutments and bridgework had emigrated and the new associate was horrified to see a decemented very loose bridge on the lower left, still cemented to the loose distal implant. The bridge was simply removed from a mass of surrounding granulation tissue. He immediately referred the patient back to the original implant surgeon, the author, enclosing the bridge and implant.

Examination revealed a healing socket in the lower left second premolar position where the bridge had been present and radiographic examination showed a virtually identical problem on the lower right.

A computerised tomography (CT) scan was taken. This showed the presence of intact lingual and facial bony plates of good dimensions at both infected sites and the inferior dental nerve canals situated immediately beneath.

Fortunately both bridges had been cemented with a semi-permanent resin based cement (Improv – Nobel Biocare UK Ltd). Therefore it was possible to remove the remaining lower right bridge from the more mesial abutment with a Mead crown remover, albeit with the infected implant as well. In Figure 1 cement can be seen at the top of the thread on the implant '**in situ**'. In Figure 4 the cement fragments that were attached can be seen. The reason for the periimplantitis was because the bridge margins at the more distal implants had both been cemented subgingivally into a tight tissue cuff only previously occluded by relatively narrow healing abutments. In seating the bridges the cement had been extruded subgingivally, under pressure, and this cement had traversed the polished titanium collar to adhere to the roughened implant surface. This was the subject of an elegant laboratory study over 10 years ago (Agar et al, 1997) and is a well known hazard of cement-retained prosthodontic work on implants, especially in the aesthetic zone where it is often desirable to place crown or bridge margins subgingivally. This superfluous cement ridge acts as a ligature, of the type that has been seen to produce a rapid periimplantitis (Zitzmann et al, 2004) in animal experiments. Periimplantitis represents an inflammatory condition that is usually only associated with the presence of a submarginal biofilm and with advanced breakdown of soft and mineralised tissues surrounding dental implants. These rapidly progressive periodontal lesions have been observed many times anecdotally in the dental literature and many of these are probably associated with

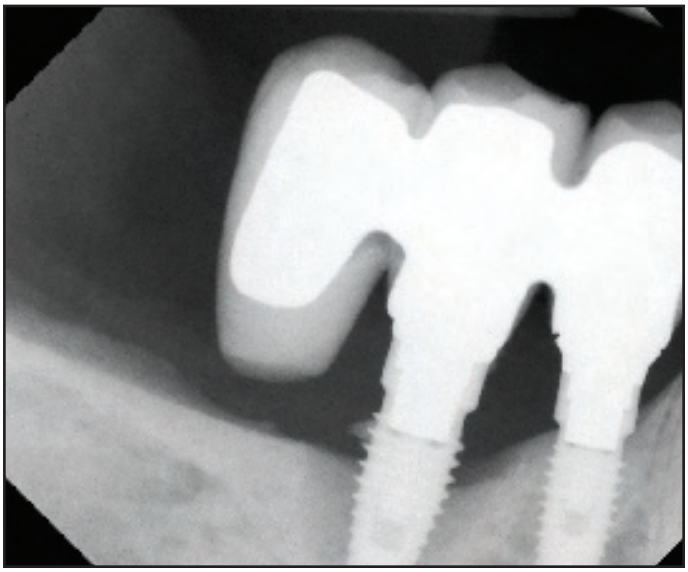


Figure 1: Periimplantitis present

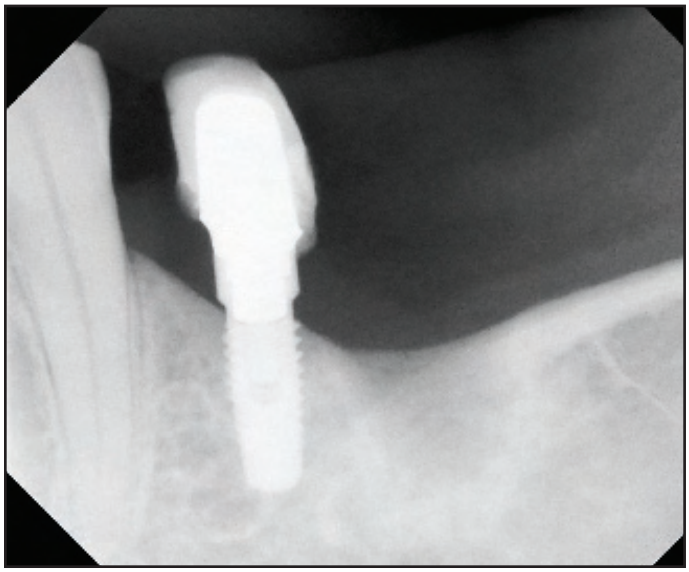
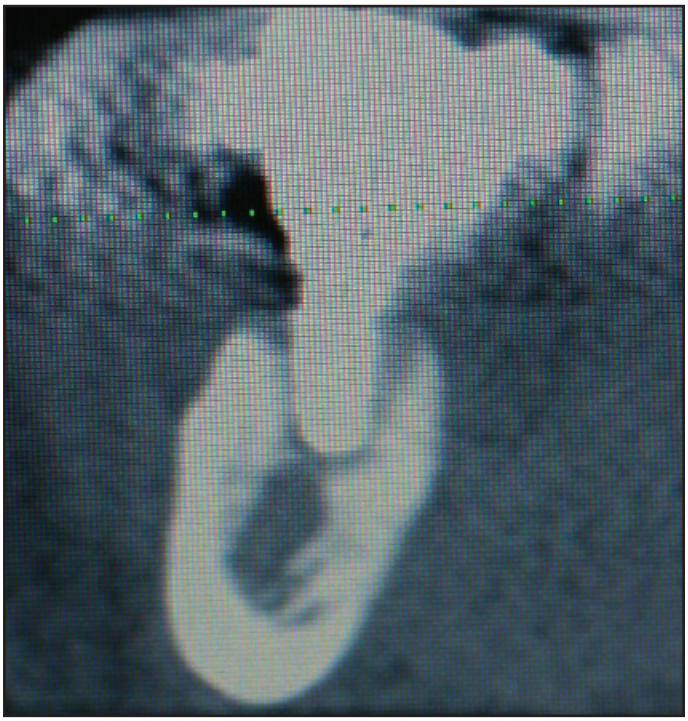


Figure 2: Healing socket where bridge removed related to cement



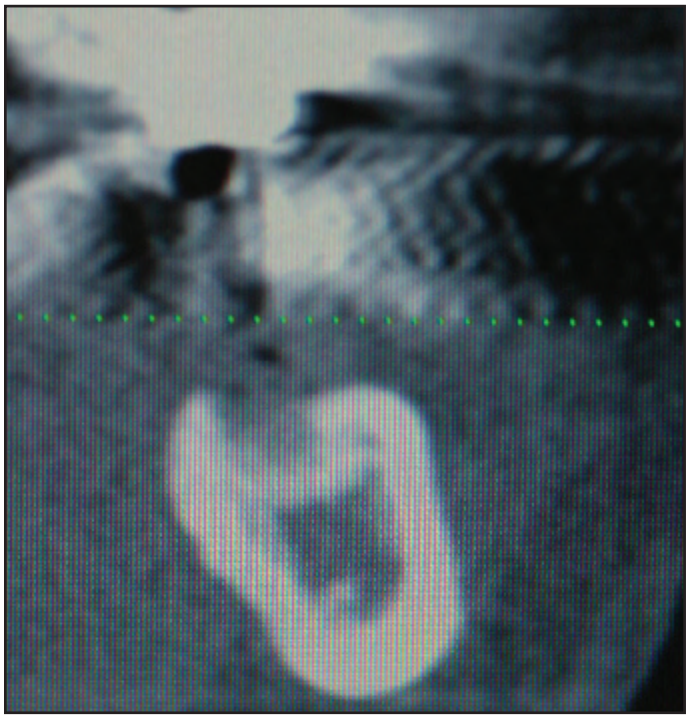


Figure 3: CT scans of sites

dental cement acting as a foreign body and implicated in the development of the lesion. In these situations a decision has to be made regarding management of the problem. The options are culture and antibiotic therapy, resective treatment, and removal of the implants (Esposito et al, 2004). Removal of the second bridge and immediate curettage of the chronically infected site was the only sensible solution in this case.

Surgical retreatment

The socket on the right was curetted thoroughly immediately after removing the implant and bridge but it was decided not to reopen the healing socket on the lower left for currettage. Both lower bridges, together with attached implants, were returned to the dental laboratory and heated slowly to break the cement seal between the exfoliated implant abutments and the bridges. The two implants and cast-on gold abutments were then returned to Nobel Biocare UK for replacement under their 10-year warranty agreement.

Five months later bony healing at the sites was complete and two replacement (10mm x 4.3mm Replace Select RP, TiUnite surfaces) implants were placed under infiltration local anaesthetic (Articaine 4% with 1:100000 adrenaline). Both bridges located well on the anterior undamaged abutments and so were able to be used as accurate positioning guides for the new implants. This was accomplished by establishing the correct position under the bridge with a 2mm twist-drill then verifying this using guide pins before completing the drilling sequence. The CT scan establishes the buccolingual dimensions with a degree of accuracy that allows only minimal flap

Figure 4: Bridge with cement fragments

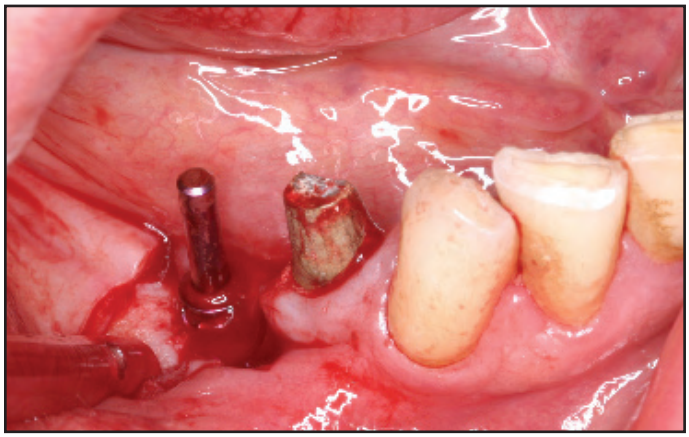
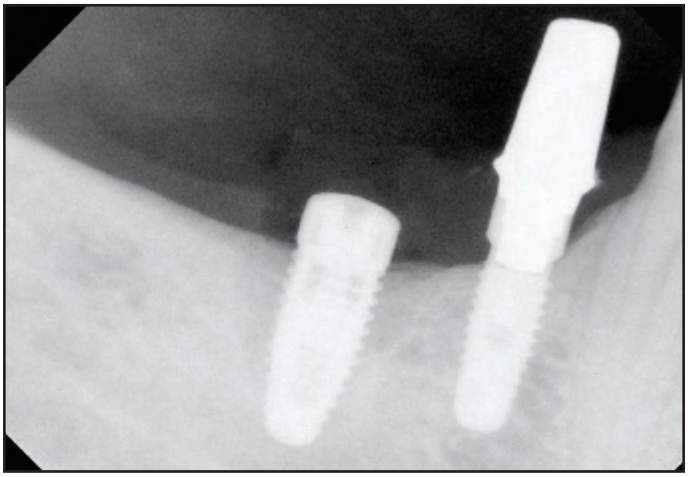
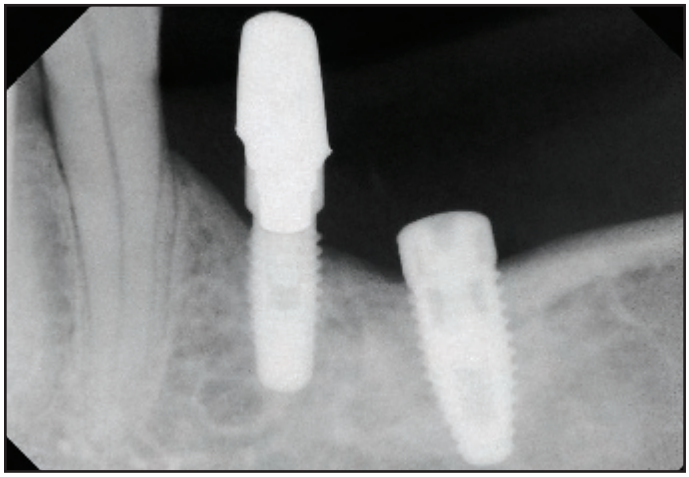


Figure 5: 2mm Guide pin

Figure 6: Bridge over guide pin

Figure 7: Implant placed





Figures 8 and 9: New implants immediately post-placement

elevation to be undertaken. The procedure on the right side is shown in Figures 5-7. The surgical procedure was exactly the same on the left side.

Healing abutments were placed on both the new implants, right and left, in a single-stage surgery. Temporary crowns were made (Prevision, Heraeus Kulzer Ltd) and cemented over the undamaged cast-on abutments mesially (Temp Bond, Kerr UK Ltd). Monofilament sutures were placed to secure the minimal soft tissue flaps and were removed one week later. Healing was uneventful.

Eight weeks later bony healing was complete and impressions were taken using an open tray technique. A master impression was made of the lower arch in polyvinylsiloxane impression material (Flexitime, Hereaus Kulzer Ltd). A model was produced using 4.3mm implant replicas (ReplaceSelect, Nobel Biocare UK Ltd).Two new engaging cast-on GolAdapt abutments (Nobel Biocare UK Ltd) were cut down as required to engage the old bilateral bridgework using a rigid bite registration

Figure 10: Cast-on gold abutment as supplied

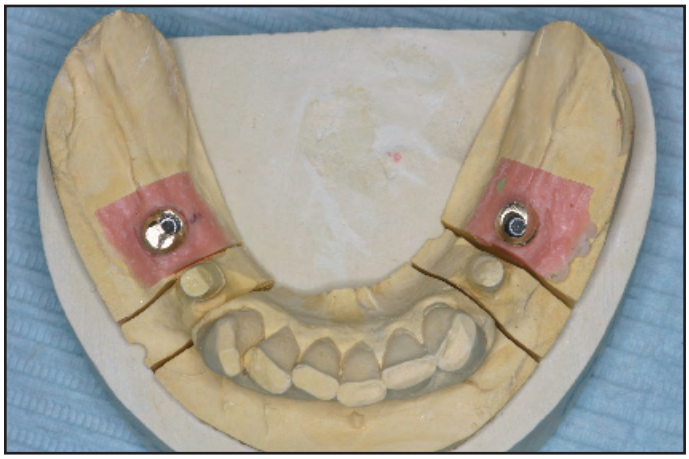


Figure 11: New cast gold abutments on model (GoldAdapt, Nobel Biocare UK Ltd)

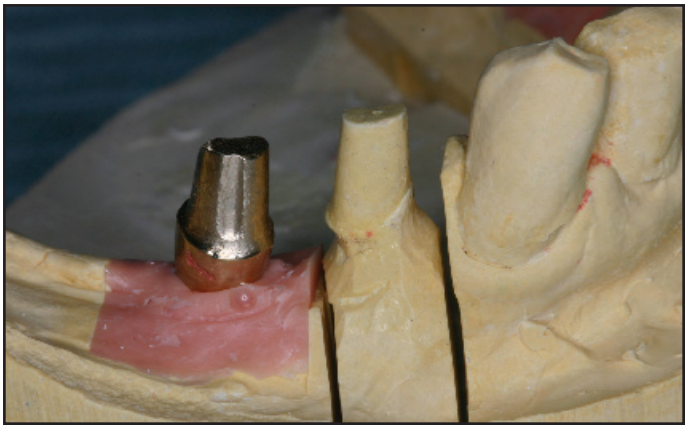


Figure 12: Right abutment

Figure 13: Refitted bridge

material (Stonebite, Kerr Ltd). Care was taken to make sure that the bridges were in occlusion with the upper jaw opposing dentition when the registrations were taken.

Gold cast-on custom abutments still have a lot to offer in dentistry, despite the recent proliferation of titanium and zirconia abutments manufactured in many forms (Chee and Jivraj, 2006).

Although it is now routine to form the desired abutment shape in pattern resin or casting wax and then produce a replacement custom abutment in either zirconia or milled titanium by the Procera (Nobel Biocare UK Ltd) method we had received replacement GoldAdapt abutments under the manufacturer's warranty. In addition to being strong in thin section gold can be cast extremely accurately and has a long record in dentistry of excellent biocompatibility.

Laboratory procedures

In the dental laboratory the upper cast was articulated with the lower bridges using putty indices. A small amount of Vaseline (Elida Faberge Ltd) was used as a separator inside the bridges and the abutment shapes were formed with pattern resin (Duralay, GC Ltd) incrementally applied to the GoldAdapt (Nobel Biocare UK Ltd) abutments. The abutment screw access holes inevitably became occluded by pattern resin and so the set resin had to be cut away to gain access to each screw head. Each abutment was then invested using Moldavest Exact (Heraeus Kulzer Ltd) and placed in the furnace at room temperature, then held at 250 degrees centigrade for one hour to burn out the pattern resin. Then the temperature was raised to the final casting temperature of 700 degrees centigrade and both abutments were cast using 3 STAR alloy (Metalordental Ltd) and were left to cool on the bench. A small layer of red lipstick was painted inside the fit surface of each bridge to show high spots on each casting. These were adjusted and after finishing and sandblasting the work was returned to the surgeon for fitting.

There was some minor occlusal adjustment to the occlusal surface of the right bridge, but none to the left bridge. After tightening the abutment screws to 35Ncm the screwheads were covered with a soft wax plug. Both bridges were cemented with RelyX Unicem (3M/ESPE Ltd) and the occlusion rechecked. Because of the inevitable loss of alveolar ridge hard and soft tissue after the loss of the implants the new bridge margins were inevitably coronal to the gingival margins. This was not a problem aesthetically and safeguarded against leaving any excess cement second time around.A high level of oral hygiene can be easily achieved because of the necessarily wide residual embrasure spaces present.

Conclusion

Why carry out this form of prosthodontic gymnastics? Quite simply it comes down, like so much in prosthodontics, to cost/benefit. The impression and bite registration appointments were rolled into one and there were no intermediate 'try-ins' of either metal

Figure 14: Bilateral bridges on new abutments returned for fitting

Figures 15 and 16: Right and left bridges definitively recemented

work or porcelain. Therefore the prosthodontic appointments were essentially completed in only two long appointments and, with the additional saving of the dental laboratory fees in accepting the old bridges and the implant company honouring their 10-year warranty, this made this 'salvage' operation relatively inexpensive.

It is not advisable to heat porcelains that have been in and out of the oral environment for long periods of time, but if the bridges were to remain intact there was no option other than heating in order break the cement seal. The patient has been warned of the possibility of porcelain fracture in the future. Even if this occurred it is likely that a bridge could still remain functional.

The patient was very happy with the savage operation. It can always be argued, with the benefit of hindsight, that these problems could have been avoided if both brides had been screw-retained rather than cement-retained. Both bridges would have been easily retrievable and of course the displaced cement would not have been present in the first instance. The reality today is that the majority of fixed dental implant prostheses are cemented and there are many convincing reasons for using both protocols, sometimes within the same prosthesis. However this discussion is way beyond the scope of this case report and the reader is advised to read further on the matter (Michalakis et al, 2003).

The implants will be reviewed on the anniversary of their placement, which is always our preferred protocol. Regular dental hygiene appointments every six months have also been implemented. Of course if this had been possible one year after the initial implant placements it might have been possible to spot the problems at their inception using routine periodontal screening measures and standard radiographs. Then one or other of the periimplantitis lesions might have been averted.

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