Single anterior tooth replacement: clinical approaches

Paul Swanson examines the role of implant design in approaching a range of treatment protocols for replacing a single tooth.

Placement protocols

The clinician works to three anterior implant protocols.

- Immediate
- ‘Delayed immediate’ at six to eight weeks post extraction, with guided bone regeneration utilising xenograft material
- Delayed placement at six or more months post extraction, with or without an autogenous block graft.

All three of these protocols are routinely used by implantologists and have recently been subject to a Cochrane Review, which made a suggestion that ‘immediate and delayed-immediate implants may be at a higher risk of
implant failure and complications than delayed implants, on the other hand the aesthetic outcome might be better when placing implants just after tooth extraction’ (Esposito et al, 2010).

The author makes a decision on the timing of placement and choice of augmentation based on his own experiences and the advice and teaching he has received in his implantology career to date.

Case one: immediate extraction, implantation and provisionalisation

A female patient presented with retained root maxillary left central incisor (Figure 1). The root was deemed unrestorable with root canal therapy, cast post and crown.

The patient had a particularly ‘gummy smile’ and so maintaining the gingival architecture was critical.

Radiographic examination indicated significant bone apical to the UL1 root and no crestal bone loss at UL1. There was no pocketing or inflammation of the periodontal tissues involving the retained root. The patient had a small anterior open bite.

Consent was gained for immediate extraction and implant placement provided all four bony walls of the socket were intact.

Consent was also gained for an immediate provisional crown provided adequate primary stability was achieved.

Treatment:
The root was carefully elevated. Careful examination revealed that all four walls of the bony socket were intact (Figure 2).

Once the osteotomy was created, a Biohorizons tapered internal implant (4.6x12mm) was placed with good primary fixation in excess of 40Nm and a 1mm gap between the buccal thread of the implant and the buccal bony plate (Figure 3).

A 3inone abutment was used to create a screw-retained composite/acrylic crown to support but not overly compress tissues (Figure 4).

Postoperative instructions were given, and the patient returned four months after placement.

The provisional crown was removed and integration confirmed (Figure 5).

Fixture head impressions were then taken, and a custom abutment and cement-retained porcelain bonded crown were manufactured to complete the case (Figure 6).

A 3inone abutment on this case would have had too subgingival a margin, leading to concerns about excess cement.

The patient and clinician were happy with the end result and this case has been stable for two years clinically and radiographically.

In this case the aggressive thread of the Biohorizons tapered implant helped achieve good primary fixation and the 3inone abutment allowed the provision of a chairside constructed crown with no added cost to the clinician.

Paul Swanson BDS, MF GDP (UK), Dip ImpDent RCS (Eng), MSc (Impl)
obtained his diploma in implantology and advanced certificate in bone grafting from the Royal College of Surgeons of England in 2009. He also completed an MSc in implantology from the Queen Mary University of London in 2011. He runs a busy referral practice in Liverpool with three similarly skilled colleagues who treat periodontic, endodontic and restorative cases, and who work together to tackle a number of multidisciplinary cases. For more information visit the practice websites at www.liverpooldentalimplantscentre.co.uk and www.roselanedentalpractice.co.uk or email referralcoordinator@roselanedentalpractice.co.uk.
Case 2: ‘delayed immediate’ implant placement with augmentation

A male patient presented with a retained root maxillary right central incisor (Figure 8). The root was deemed unrestorable with root canal therapy, cast post and crown.

In this case, periodontal investigation revealed some deeper pocketing buccally and a small amount of suppuration. There was also a loss of papilla between the upper right central and lateral incisor, again suggestive of an element of loss of bony attachment on both teeth in the area. Radiographic examination confirmed the clinical findings.

Consent was gained for extraction and ‘delayed immediate’ implant placement, with guided bone regeneration at six weeks post extraction as described by Buser et al (2008).

This treatment plan was subject to ‘socket mapping’ at the time of extraction and the appearance of soft tissues at four weeks post extraction.

The patient was warned that due to periodontal breakdown he could have an uneven gingival height between the two upper central incisors. He was also warned that it might be difficult to achieve complete downgrowth of the lost interdental papilla.

The patient understood the pre-operative warnings and had a favourable smile line in any case.

Treatment:

The root was carefully elevated (Figure 9). Careful examination revealed that all four walls of the bony socket were intact with a small ‘V-shaped’ defect buccally maximum of 2mm. A review at four weeks showed favourable healing (Figure 10).

At six weeks post extraction, a remote palatal flap was raised with mesial and distal relief one tooth either side of the implant site. The remote palatal flap with relief distant to the osteotomy site ensures that any augmentation materials are not close to the wound edges in case of any wound dehiscence.

On reflection, a 2mm buccal defect was noted. The osteotomy was created, and a Biohorizons tapered internal implant (3.8mmx12mm) was placed with good primary fixation in excess of 40Ncm (Figures 11 and 12). Care was taken to place the implant with its buccal surface at 2mm from the buccal surface of neighbouring teeth.

The relatively narrow implant was placed slightly ‘deeper’ in order to allow a gradual emergence profile (Figure 13).

The buccal defect was augmented with a mixture of whole blood, bone scrapings, and Ladecc (Figure 14). This was then covered with a Mem-Lok membrane (Figure 15).

Postoperative instructions were given to the patient. After a period of four months the implant was exposed with an ‘H-shaped’ incision and a 3mmone abutment was used to create a screw-retained composite/acrylic crown to create favourable soft tissue profile.
Case 2 continued

(Figure 16).

The patient was reviewed on two occasions and modifications made to the contour of the screw-retained crown in order to create the most favourable soft tissue profile.

Fixture head impressions were taken (Figure 17). A 3inone abutment and cement-retained porcelain bonded crown were manufactured to complete the case (Figure 18).

The patient and clinician were happy with the end result and the case has been stable for two years clinically and radiographically (Figure 19).

In this case the aggressive thread of Biohorizons aided achievement of good primary fixation. The use of Laddec and
Poor design meant that the denture tooth was slightly buccal to the natural teeth. As well as increasing the prominence of this tooth, mesial drift had also led to a loss of symmetry in respect to the midline (Figure 20).

Careful use of waxed up study models showed that with interdental stripping of UR1 and UL2 it would be possible to place the UL1 in the correct alignment, with good centrelines, and that the two upper central incisors would be of even width.

Clinical examination clearly showed significant width buccolingually for implant placement.

Mem-Lok helped achieve a favourable result with guided bone regeneration.

A 3inone abutment allowed the provision of the chairside-constructed crown with no added cost to the clinician. In this case a 3inone abutment was also utilised for the definitive crown.

**Case three: autogenous ramus block graft**

A male patient presented with a missing maxillary right central incisor that had been replaced with a removable acrylic partial denture.

The patient’s religious beliefs prohibited the use of allograft or xenograft materials. Radiographic examination indicated sufficient bone height for implant placement. Consent was gained for a ramus block graft as described by Misch (1996).

Implant placement was planned for three months post graft. The restorative phase would begin four months after implant placement.

**Treatment:**
A remote palatal flap was raised, with...
Case 3 continued

Figure 27: Three months post graft

Figures 28a, 28b, and 28c: Vitality of the graft was confirmed, the graft screw removed, and a Biohorizons tapered internal implant (4.6mmx12mm) placed.

Figure 29: After four months the implant was exposed and a screw-retained composite/acrylic crown used to create a favourable soft tissue profile.

Figure 30: The contour of the screw-retained crown was modified at review to create the most favourable soft tissue.

Figure 31a, 31b, and 31c: Fixture head impressions were taken and a cement-retained zirconia crown manufactured to complete the case.

Figure 32: Radiograph taken two years after restoration.
mesial and distal relief one tooth either side of the implant site (Figure 21). As described by Misch (1996), the remote palatal flap with relief distant to the osteotomy site ensures that the autograft is not in close proximity to the wound edges in case of any wound dehiscence.

On reflection, the buccal defect was noted and measured (Figure 22). A two-sided flap was raised 5mm remote of the gingival margin of the mandibular teeth (Figure 23). The autograft was harvested and the donor wound closed with a continuous suture (Figure 24).

The graft was adapted to closely fit the recipient shape and fixed with a graft screw (Figure 25).

Tension-free closure was achieved with interrupted sutures (Figure 26).

The patient returned three months later (Figure 27). A crestal flap with distal relief was created. Vitality of the graft was confirmed and the graft screw removed.

An osteotomy was created, and a Biohorizons tapered internal implant (4.6mmx12mm) was placed with good primary fixation (Figure 28).

After a period of four months the implant was exposed with an ‘H-shaped’ incision and a 3inone abutment was used to create a screw-retained composite/acrylic crown to create favourable soft tissue profile (Figure 29).

The patient was reviewed on two occasions and modifications were made to the contour of the screw-retained crown in order to create the most favourable soft tissue (Figure 30).

Fixture head impressions were taken. A 3inone abutment and cement-retained zirconia crown were manufactured to complete the case (Figure 31).

The patient and clinician were happy with the end result and the case has been stable for two years clinically and radiographically (Figure 32).

In this case, the aggressive thread of the Biohorizons tapered implant helped achieve good primary fixation and the 3inone abutment allowed the provision of a chairside-constructed crown with no added cost to the clinician.

In this case a 3inone abutment was also utilised for the definitive crown.

Discussion
These three cases demonstrate three well-recognised and utilised approaches for the replacement of a single tooth in the aesthetic region.

The reverse buttress thread lends itself to providing good primary stability - vital in the first case.

In two of the cases a 4.6mm width implant was used. However, in cases involving guided bone regeneration, or in patients with thin biotype, a 3.8mm width implant can be used provided the clinician ensures the depth of the head of the implant allows for a gradual emergence profile.

Laddec and Mem-Lok are used routinely for the augmentation of small areas of dehiscence such as in case two.

A 3inone abutment can provide the clinician with additional help in ensuring the three dimensional positioning of the implant.

This abutment also allows the cost-effective provision of chairside screw-retained composite or acrylic screw-retained crowns. In some cases the 3inone abutment can also be utilised for the definitive crown.

In the author’s practice a ‘stockpile’ of 3inone abutments are sterilised and used routinely. In some cases they are not suitable due to the depth or angulation of the implant.

The Laser-Lok zone and internal abutment connection have contributed to the maintenance of bone levels with all these cases by maintaining a connective tissue connection to the head of the implant, thereby preventing further bone loss (Nevins et al, 2008).

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REFERENCES

