Aesthetic correction of a post-orthodontic solution to missing lateral incisors

In this clinical case study, Dr Philip Bennett explains the procedures he undertook when performing this correction.

Miss S referred herself to the author's clinic as she was unhappy with the final result following a long period of orthodontic and restorative treatment with her current GDP. She was a fit, young, and bright 23-year-old, with unremarkable medical history, who also suffered from congenitally missing upper lateral incisors. Miss S had been referred by her previous GDP to a consultant orthodontist, who had decided to approximate her canines to her centrals, at the same time correcting the crowding in the lower arch (Figure 1). Having achieved the movement of canines he did not close the resulting space distally but asked her general dental practitioner to prosthetically close the space.

Sadly, at the same time as approximating her canines, he also took her out of canine-guided occlusion, which led to the formation of non-functional contacts on the second molars in both right and left lateral excursions (Figure 2). On referral back to her GDP following the closure of her gaps, he modified the shape of her canines to make them look more like lateral incisors, and consequently ground the tips from the canines. He then proceeded to manufacture two Maryland bridges, with bi-lateral wings, and one of her major complaints was the frequent debonding of these bridges (Figures 3 and 4). The reason for the debond undoubtedly would have been the technician re-building the canine to the correct length to attempt at an aesthetic finish, she then resumed canine guidance, which the Maryland bridges were not able to withstand.

The result was that the GDP then shortened the Maryland bridges and restored the lack of guidance, which was possibly the reason for Miss S's other complaint of pain, aching and discomfort from left and right temporomandibular joints. It is also true that she was less than happy with the aesthetic result that had been achieved, as it appeared as if the canines were not the correct shape to give her the correct smile line, and also, now too short. Given the history, the patient desired that any treatment carried out would not only be aesthetic, but also permanent in nature.

Proposed treatment plan
It was proposed that we would place two implants into the gaps in the anterior segment. It was also proposed that due to the orthodontic treatment and the movement of the canines mesially that we would need an increase in bone volume buccally, in order to place in optimal position. Sadly, the patient refused a block bone graft. It was therefore decided that with careful bone expansion, coupled with particulate bone grafting, and connective tissue grafting as required, we would be able to sufficiently bulk the buccal bone position to allow us to place implants aesthetically on both sides. A further problem as you can see from the radiograph, the roots of the upper canines and upper first molars were approximated, and to increase the level of difficulty, the gingival phenotype was thin and scalloped, making for less than ideal placement of implants. She further declined to have any further orthodontics to tip the roots mesially and distally in order to make the placement more predictable. Following her previous experience, the author was not surprised at her decision, and decided after careful analysis that it would be quite possible to place 11mm implants with a 3.5mm width into the gaps (Ankylos, Dentsply Friadent), followed, after suitable healing, by appropriate abutments and bonded crown restorations.

Pre-operative planning
The patient underwent standard pre-operative
planning, consisting of mounted study models on a semi adjustable articulator using pre-contact bite analysis of the occlusion, and also on a duplicate model a full pre-treatment prosthetic wax-up and construction of a suitable stent. My technician requested the approximate width and depth for buccal expansion to gain an optimum position, to this extent a blow-down was constructed to give an idea whilst working clinically at surgical stage, as to how much expansion is required for the best possible placement. As the patient had already declined block grafts, the patient was cautioned that it may require more than one surgical procedure in order to achieve a result. On analysis of her smile as you might have expected, she has a high smile line. It was decided, in consultation with the patient, that we would not alter the approximated canines at all, as again she declined orthodontics, but leave them in their present position even though this made a difference to the colour spectrum of the smile. The patient was also keen to keep her present Maryland bridges as temporaries.

Surgical procedure
Following pre-surgical consent, the patient was prepared for surgery. A standard sterile procedure was carried out within the operating area. Crestal incisions were carried out over the surgical sites, and as the author was acutely aware of the need to expand and make space for particulate grafting, a relieving incision was carried out distal to the upper first pre-molars. It is often better to release the flaps at this stage for the final suturing, rather than do this at the very end of the procedure. In this way, final minor adjustments of the flaps can be made at the end of the procedure, and the surgical site can be immediately covered. Expansion of the bone between the canine and the pre-molars were carried out using half round osteotomes (Bone expanders, Dentsply Friadent). This procedure is started using a number 15 blade, and precisely scoring the crest of the bone, exactly where you want to start your expansion. Starting with the small half round with the curve buccal, you move using a mallet and a very gently easing and rocking technique you create what could be called a bony ‘pocket’. It is very important to be able to feel the bone expansion happening during this period. Without care it is possible to crack the buccal surface. If that happens, especially following the removal of the periosteum, it would make implant placement extremely difficult, if not impossible. Having created sufficient expansion, which you are able to check using the blow-down mentioned earlier, it is now possible to use site formers to increase the expansion even further and mould the shape into the round required for implant placement. In this case we have used 11mm implants. These implants were placed 1.5mm to 2mm sub-crestal (Figures 5, 6, 7, 8) and in this particular case following placement of the implant, an anorganic porous bovine-derived bone material (Bio-Oss, Geistlich) was placed to further enhance, and try and restore the bony eminence normally associated with canines in the root region (Figures 9a, 9b and 10). It is relatively simple to create this using this product even as a particulate. The graft site was then covered with a resorbable collagen membrane (Bio-Guide, Geistlich) in this particular case the ‘bandage’ technique as advocated by Dr Buser was used and then closed after checking that the flaps were tension-free, and the author could easily approximate the margins.

The patient was given detailed post-operative instructions and the Maryland bridges were recemented (and at the time I remember having to discourage her from going off to play a game of hockey that evening!)

Uncovering
The implants were left to heal for three months,
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whereupon we went for a relatively small crestal incision both sides (Figures 11 and 12). The right side was still somewhat deficient in tissue, so a small connective tissue graft was performed, the donor site being the palatal side of the access flap and, it was held in place with resorbable sutures (Vicryl Ethicon – Johnson & Johnson International). After healing, the implants were uncovered. In this system the cover screws are integral with the implants, at placement, the carrier fits over the top of the cover-screw. I removed the cover screw at this stage, using a reverse self-cutting thread which locks into the screw, and removes it. Then impression copings were placed in order to take an open-tray impression that will allow an index to be made by the technician, to select and trim abutments and construct early temporary crowns for me at the next visit (Figure 13). Following removal of the tray and copings, sulcas formers were placed and then the flap was reconstructed into place using 6/0 Prolene sutures (Figure 14) (Prolene Ethicon – Johnson & Johnson International).

Provisional reconstruction

The author has found it advantageous to place the abutments and the temporary crowns earlier rather than later. The author prefers to allow maturation of the tissues with my abutments and temporary crowns, rather than with sulcas formers, which are never as accurate as abutments and temporary crowns. Therefore, the technician selected two standard abutments and trimmed them in the laboratory, and constructed for me composite temporary crowns (Figures 15a and 15b). These were placed some two weeks after uncovering and placing the sulcas formers (Figures 18 and 19). At that stage we could then remove the patients Maryland bridges. The author allowed the patient to return to canine guidance with the implants and allowed some two-to-three-month maturation of the soft tissues, before going to the final restorations.

Final restorations

At the same time as having the abutments and temporary crowns made in the laboratory, I also
asked the laboratory to construct gold copings, which intimately and perfectly fit the abutments that they have prepared in the laboratory (Figure 16). It is these gold copings that form the centre of the bonded crowns to be constructed (Figure 20). It is therefore a relatively simple exercise following good soft tissue management, to remove the temporary crowns, place the gold copings and do a simple pick-up impression. It is of course essential that the gold copings fit well, and do not ‘rise up’, while the impression is being taken. Mostly the fit is so good that it does not require any sort of cementation prior to impression taking. The final impressions and acrylic occlusal record are taken; also the essential photographic record and colour choice are made (Figures 21 and 22). That is sent to the laboratory, who cast the impression and construct their simple bonded crowns on the copings. The patient then returned, the temporary crowns were removed and the final bonded crowns were fitted. However, as always, a careful analysis of the occlusion must be carried out. The crowns were cemented with temporary cement and the patient discharged for a week, before returning one week later for final occlusal adjustment, and photographs and then discharged to normal review (Figures 23 and 24).

Conclusion
Sadly, it is obvious to the author that treatment planning of congenitally missing teeth is one of the more demanding aesthetic requirements. It has also been the author’s experience that not all orthodontic movement is desirable or carried out in the patients best interest, as this case demonstrates. It would of course, have been a much better decision either to approximate the canines to their original position, and then reconstruct the laterals with implants, or close all gaps and use veneers or crowns to manage the aesthetics and function. The patient was encouraged to go for that option at early treatment planning stage. However, she was not prepared to undergo any further orthodontics. This case highlights the requirements for good treatment planning, even when an interdisciplinary approach is contemplated. While the result is not perfect, this treatment has undoubtedly improved her smile and her confidence, and as she is a solicitor, the author is more than delighted that she is happy!

References