

# Implant retained restorations: a clinical case report

Dr Andrew Chandrapal BDS MFGDP(UK) DPDS MClintDent(Pros)

## Introduction

Implant dentistry, much like other disciplines in today's clinical environment, is heavily reliant on empirical evidence and subsequent guidance that the profession obtains from these findings. Implantology as a discipline relies on anecdotal evidence to a large degree as well as the academic findings to continue improving techniques and success rates.<sup>1</sup> Basic treatment planning factors will always apply and it is the implementation of these metrics that make such cases flow to a level where clinical decisions are both efficient and science-based. Prospective dentistry is essentially looking at risk factors, in other words, 'what is the risk of an undesirable event occurring?' While the clinician does not have a crystal

ball, we can look at markers to empower our decisions to result in the best outcome for our patients with the greatest level of longevity and predictability of treatment outcome.

The following case highlights the combination of two clinicians' work in a situation where difficult decisions needed to be made, and the resultant outcome.

Mr H attended the clinic for a consultation into management of his current dental issues. Whilst he was in no acute pain, the main issues were based around the current restorative status given he had been involved in a road traffic accident some eight years previously that had left him partially dentate (in his early twenties) as well as recurrent

infective episodes on localised front teeth. Mr H also stated his unhappiness with the current appearance of his teeth and smile and dissatisfaction in wearing removable dentures. The patient's complaints and aims were recorded as being the following;

1. Substitute the undesirable removable dentures for a fixed solution
2. Improve the appearance of the smile
3. Improve the ability to chew food without pain from ill-fitting dentures.

A full comprehensive examination was carried out and a number of findings were made at this time (*Figures 1-10*). Within this, discussions were had in regards to



Figure 1



Figure 2

Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9



Figure 10



fixed and removable options and what these solutions meant in the short and long term. It was clear the current state was not one with which the patient wished to continue and so special investigations were carried out. The findings were as follows:

- Moderate levels of oral hygiene
- Partially dentate dentition
- Caries in teeth 25 (UL5) and 26 (UL6)
- Chronic marginal gingivitis with mild attachment loss attributable to recession rather than periodontal disease
- Non-vital 23 (UL3) with associated periapical radiolucency
- Postured mandibular protrusion or extensive bony resorption to both upper and lower anterior ridges following trauma and associated tooth loss
- Buccally placed 33 (LL3) in cross-bite with 23 (UL3)
- Ill-fitting upper and lower removable acrylic dentures that were suboptimal both in terms of function and aesthetics.

Risk Factors were classified as follows:<sup>2</sup>

- Periodontal considerations
  - Moderate risk – given the localised recession and chronic marginal gingivitis
- Biomechanical considerations
  - High Risk – Given the erosion, periapical infection to 23 and caries evident
- Functional considerations
  - Moderate risk – given the missing teeth
- Dento-facial considerations
  - High Risk – given the postured centric occlusion position with the current dentures and the

positional issue with the lower left quadrant.

In view of the patient's wishes, an in-depth discussion took place regarding viability and longevity of updated removable and fixed options. The options of implant based solutions were given initially as well as options of better fitting removable dentures and fixed bridgework (which, was not advised). Relative merits and disadvantages of each option were provided. The fact that the left canines were in cross-bite was also discussed in terms of occlusal stability and aesthetic outcome. Mr. H commented on the frequent acute episodes he would get from 23 and the unhappiness he had regarding its colour and position. In terms of these teeth the suggested options consisted of:

Option 1:

- 1: Endodontic therapy 23
- 2: Internal bleaching 23
- 3: Orthodontic intervention 33 and 23 to reverse the cross-bite.

Option 2:

- 1: Endodontic therapy 23
- 2: Indirect treatment to 33 to mask the discolouration
- 3: Orthodontic intervention 33 and 23 to reverse the cross-bite.

Option 3:

- 1: Extract 23
- 2: Orthodontic intervention to 33 only.

Option 4:

- 1: Extract both 23 & 33 in order to provide clear bounded saddles with no modifications to provide fixed prostheses.

Careful consideration was given to these options as it was noted that 33 had also migrated and was rotated which meant orthodontic treatment had to be applied in order to attain a result of correction tooth proportions. It was felt that without this, extraction was the only plausible route given the high expectations of the patient's perceived end result. As a result, the decision was taken to remove 23 given its compromised condition and sacrifice 33 given its current position. It must be noted that by the time this decision was made, the referring implant surgeon had also taken a CT scan and found a very thin bone ridge locating to the anterior mandible. As such, removal of the 33 also allowed planning of potential implant sites that were then both restoratively led by placing the teeth in the correct position as well as having greater bone mass. It was clear that the current position of 33 was far too buccal in relation to the residual ridge, which would have experienced a large degree of resorption following the trauma. Mr H agreed with the treatment option and consented to extraction of both 23 and 33 as a consequence of becoming fully informed.

## Proposed treatment plan

- 1: Oral hygiene instruction and hygiene treatment
- 2: Caries control 25 & 26
- 3: Construction of immediate replacement dentures to be fabricated in light of the perceived end result
- 4: Extraction of 23 & 33 and insertion of transitional dentures

Figure 11



Figure 12



- 5: Review and preparation for implant surgery
- 6: Implant surgery to upper and lower anterior sites
- 7: Insertion of implant retained temporary bridgework
- 8: Construction of definitive bridgework
- 9: Maintenance and follow-up.

Mr H underwent extensive oral hygiene instruction given the level of commitment involved with fixed implant retained prostheses and was assured that the treatment plan may be subject to change if oral hygiene standards were not consistently higher.<sup>3,4</sup> At the same time, caries control took place to 25 & 26 by means of direct composite restorations. Caries was removed under rubber dam isolation leaving a remaining undercut of unsupported enamel. It was decided that this should remain so as to improve the bond strength of the resultant composite restoration so long as it could be assured that all carious material had been removed. A sectional matrix system was placed with a correctly fitting matrix band (V3). The system was wedged using the appropriate size wedge being careful not to distort the band. Once secured, the teeth were then etched using 36% phosphoric acid gel (Kerr). This was left on the enamel for 20s and then introduced to the dentine for a further 10s. After a thorough wash with water, separate primer and bonding agent was applied according to manufacturer's

instructions (Optibond 1,2 FL, Kerr). This was then light cured for the full duration of 40s.

Once the hybrid layer had been constructed on both teeth, proximal walls were built in two increments using enamel composite resin (Venus Pearl AM, Kulzer) in order to account for polymerisation shrinkage causing cuspal flexure and thus sensitivity, delamination of hybrid layer and restoration breakdown. Once constructed a dentine mass was applied in layered sequence (Venus Pearl OMC, Kulzer) with the same enamel shade being placed on the occlusal surface to then conclude the two restorations. Light discing was carried out to open the interproximal embrasures (Cosmedics, Cosmedent) as well as light polishing of the occlusal surface to eliminate the weak and reactive oxygen inhibition layer (Optibrush, Ivoclar).

Once complete, impressions and occlusal registrations were taken for transitional dentures. At this stage communication and discussion were essential in designing the dentures according to that which the patient felt he needed alongside what was actually possible. By carrying this out, patient expectations can be gauged and measured. It was clear that the expectations of this patient could be met to an acceptable standard by use of these prototypes and effective clinical photography.<sup>5</sup> At the final point of construction, the dentures were delivered shortly after

extraction of the left side canines. Both canines were extracted carefully so as not to have any residual bone attached. The resultant dentures were pleasing to the patient in terms of aesthetics and phonetics. *Figure 11* shows the transitional dentures *in situ*. Note the elimination of cross-bite and improvement in spatial positioning of anterior teeth.

At this point, the patient was able to comment and pass judgement on the aesthetic results of the transitional dentures. In terms of final restorations it also aided the cause of minor modifications to the perceived end result. Given the degree of facial acrylic flange required, it was also clear that fixed options would need to include the same feature for correct proportioning of teeth - as such, oral hygiene maintenance would need to be excellent in order to cope with this design. At this stage, it was possible to gain such information to begin advising and instructing the patient for the choices and responsibilities to come within the definitive restorations.

Week 6 after extraction, the patient was then assessed by the implant surgeon. It was decided that three implants were to be placed in the upper saddle area and three to the lower. Implants were then placed under IV sedation as well as a connective tissue graft to the area of the lower central implant in order to

Figure 13



Figure 14



modify tissue biotype in this area.<sup>6</sup> Multi-unit abutments were immediately placed alongside pre-fabricated provisional implant retained bridgework. These were designed to simulate the end result, as well as having open gingival embrasures

Figure 12 illustrates the positioning of the implants (Nobel Biocare) and the subsequent multi-unit abutments with provisional bridgework *in situ*. The patient was then left to allow for integration, phonetics and oral hygiene consistency. The hyper-cementosis relating to the apices of 45 & 46 maintained to be under observation.

The provisional bridgework allowed for adequate oral hygiene measures to be applied but also highlighted the hard and soft tissue defects present due to the trauma that resulted in initial tooth loss (Figures 13-14). The patient was also

instructed in using automated water jet systems to clean, as well as superfloss. It must be noted that interdental brushes and sticks were not suggested due to the risk of further soft tissue depression.

Once week 12 had elapsed after implant surgery and a connective tissue graft, the process began for construction of the final restorations. At this point, the patient had shown a very good level of commitment for optimal oral hygiene and so it was agreed that fixed bridgework would indeed be in the patient's best interests as well as being maintained to a required standard.

Open tray impressions were taken using polyether material (Impregum, 3M) and then verified using an acrylic jig as shown in (Figures 15, 16). This confirmed the position of the implants and the degree of rigidity so that any framework

constructed would be of a passive and accurate fit.

Wax prototypes were then constructed once the occlusal registration had been verified, although this was confirmed at the point of provisional bridgework. Figures 17-20 illustrate the modification of soft tissue incorporated onto the try-in model to ensure proportioning of teeth remained satisfactory. The try-in phase required the subtle modification of a few teeth to ensure the result remained harmonious with the natural dentition.

At this stage, phonetics and aesthetics were evaluated. A total of two try-in visits were required to get to an acceptable point of setup. Following this the internal framework was then ordered to be milled (Createch, Guipúzcoa, Spain). Figures 21 and 22 illustrate the resultant framework that was



Figure 15

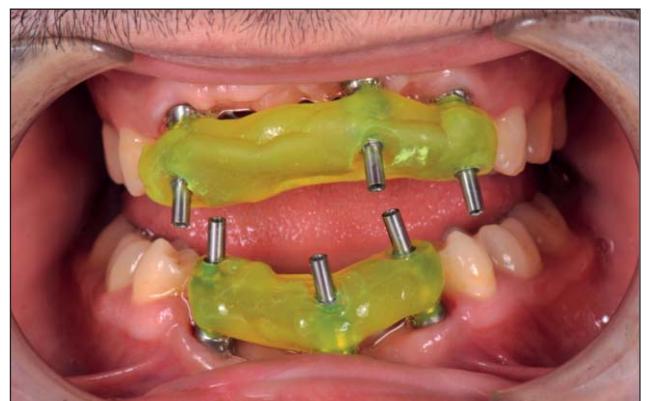


Figure 16

Figure 17



Figure 18



Figure 19



Figure 20



designed for an accurate and passive fit to the multi-unit abutments on which the accepted setup was to be applied.

The frameworks were subject to a try-in and bite registration to ensure the space for setup remained accurate as per plan. This also gave the clinician and technician a view of available space for soft tissue design.

Figures 23-25 illustrate the available inter-occlusal space and verifies this in line with the design of the framework as well as determining any resistance to passive fit. It was confirmed that there was none in this instance.

The final design was processed according to the prototype. Note that the restorative margins were not

kept totally flush with the underlying tissues. The design was also such that no concavities existed thereby eliminating the chance of food impaction adjacent to the natural soft tissues. It must also be noted that the patient wished to whiten his teeth but only decided after the installation despite being offered it at the beginning of treatment. Consequently, the shade was



Figure 21



Figure 22

Figure 23



Figure 24



constructed to be that of a higher value and reduced chroma than the natural dentition in view of this.

Occlusal integration appeared very satisfactory and the patient was thrilled with the end result. It was emphasised that the long term success was dependant on exquisite oral hygiene, diet control and regular follow up to ensure the parameters set and constructed for this treatment were maintained.

## Conclusion

This case highlighted the importance of effective assessment, treatment planning and communication. Especially where difficult decisions had to be made in order to create a result that did not compromise the wishes of the patient. It also highlighted the importance of patients taking ownership of their responsibilities as well as the clinician designing treatment plans around the patient's ability to

maintain the teeth. In this case, given the aesthetic demands of the patient as well as the degree of hard and soft tissue resorption, it was essential to create a life-like result that focused on function, aesthetics and biology to culminate in a result that was life-changing for the patient (Figures 26-32).

Thanks and acknowledgement must be given to Dr Andrew Dawood for his implant surgery execution as well as Phil Reddington and team at BDT Laboratory.

## References

1. Lekholm U, Grondhal K, Jemt T. Outcome of oral implant treatment in partially edentulous jaws followed 20 years in clinical function. *Clin Implant Dent Related Res* 2006; **8**: 178-186.
2. Bakeman BM, Kois JC. Maximising esthetics/mimising risk: the line of predictable success. *Inside Dent* 2005; **1**: 16-24.
3. Coulthard P, Esposito M, Slater M, Worthington HV, Kay EJ. Prevention. Part 5: Preventive strategies for patients requiring osseointegrated oral implant treatment. *Br Dent J* 2003; **195**: 187-194.
4. Roos-Jansåker AM, Renvert S, Egelberg J. Treatment of peri-implant infections: A literature review. *J Clin Periodontol* 2003 **30**: 467-85.
5. Steel C, Behle C, Bellerino M et al. A guide to accreditation photography, Madison, WI. *Am Acad Cosmetic Dent*, 2002
6. D'Elia C, Baldini N, Cagidiaco EF, Nofri G, Goracci C, de Sanctis M. Peri-implant soft tissue stability after single implant restorations using either guided bone regeneration or a connective tissue graft: a randomized clinical trial. *Int J Periodontics Restorative Dent* 2017 **37**: 413-421.



Figure 25

Figure 26



Figure 27



Figure 28



Figure 29



Figure 30



Figure 31



Figure 32

