Replacement of maxillary central incisor teeth with implant retained restorations

Case study of implants which have been present for nine years.

Introduction

O

ver the last twenty years implant dentistry has progressed rapidly which has lead to implants becoming well established as a good treatment option to replace failing teeth.

Osseointegration is now almost taken for granted and implants are expected to function in a stable manner for many years. However, predictable treatment outcomes can only be achieved through high levels of training, experience and thorough preoperative assessment and treatment planning.

Case Study

In 2001 Mr J.A was a 48-year-old self-employed carpenter who was referred to be seen to assess his maxillary central incisor teeth.

The patient was complaining of “missing a right front tooth and wearing a denture which feels loose, uncomfortable and is moving when trying to eat”. Historically the central maxillary incisor teeth were fractured in a swimming accident when the patient was 15 years old. He had hit the bottom of the pool when diving and fractured the incisal edges.

The teeth were endodontically treated and restored with post crowns. These had been initially successful for many years with no symptoms. Unfortunately over time sinus formation had occurred labially and apicetomies with amalgam retrograde material were undertaken but discomfort and infection persisted.

The right central maxillary incisor was extracted approximately three years ago and a mucosal borne partial acrylic denture fitted. The left maxillary central tooth was extracted when he was seen and a new denture constructed. A careful extraction of the tooth was made with no reflection of the flap and a through debridement of the socket to remove granulation tissue. A defect of the labial plate was noted by direct visualisation up the socket site.

Medically the patient was fit and well he smokes 8-10 cigarettes a day with 2 units of alcohol daily. Although smoking cessation was recommended this was not followed and the patient continues to be a moderate smoker (Bain CA, 1996).

Tobacco smoking has been demonstrated in dental and medical surgical literature to be a factor leading to higher risk of poor wound healing and infections. There has been an association shown with an increased risk of implant failure in smokers (Bain CA, Moy PK, 1993).

On examination the patient had a well cared for minimally restored dentition with low caries and periodontal susceptibility. There was no bleeding on probing with no pocket depths exceeding 3 mm.

The patient was wearing a mucosal borne acrylic partial denture with no clasp retention.

The patient was assessed with the denture inserted and removed to check the lip support and amount of prosthesis shown in function (Figure 1).

The teeth are set up ridge lapped, considered aesthetically acceptable suitable and to use this set up as a diagnostic for the planned final restoration. The lip line was fairly low and in discussion with the patient the likely final aesthetic outcome was further discussed. He was happy to accept a result
similar in appearance to the current denture and have a realistic expectation of what would be achieved.

The occlusion was assessed and there was evidence of incisal wear. There was group function on lateral excursions and parafunctional wear facets noted (Figure 2), (Figure 3).

The ridge in the region on the missing teeth demonstrated a well formed ridge with adequate height and width (Cawood and Howell, 1988). However due to the previous history and more recent extraction it was known that there would be defects in the labial plate due to infection and the previous apical surgery which may have compromised the bone.

There was 19mm of space at crest of the ridge between the maxillary lateral incisor teeth. This would enable a good volume of bone to be maintained between the implants themselves and the adjacent lateral teeth.

The interocclusal space was 7mm, which meant there was adequate space for the restoration to be placed in the correct planned position (Figure 4).

The aesthetics showed a low smile line; the cervical margins of the maxillary teeth were not shown. This of course makes the final aesthetic outcome less challenging than on a higher smile line case.

The papillae were luckily maintained mesially to the maxillary lateral incisor teeth, with no evidence of recession labially or proximally.

The soft tissues had healed well in the region of tooth extraction. There was no evidence of sinus formation labially and the patient reported no symptoms of further discomfort (Figure 5).

A radiograph was taken prior to the extraction of the left maxillary central tooth. The film shows a shortened root of the maxillary central incisor and the use of a diagnostic stainless steel ball (5mm in diameter) was used to check for any distortion in the film.

Image quality is very important with allowances for any distortion of the image made. It can be difficult to obtain an accurate image as the arch curves and it may not be possible to get the film parallel to the area of interest. Measuring the distances clinically and using the diagnostic ball will help verify that correct measurements have been made (Figure 6).

After the extraction of the left maxillary central tooth and a further 3 month healing period a further periapical view was taken which showed evidence of trabecular bone formation in the region of the extracted teeth and the presence of some remaining amalgam scatter.

A panoral view was also taken to enable an assessment to be made on the restorative and periodontal status of the remaining teeth.

Treatment options were discussed with the patient of a new partial denture in acrylic or cobalt chrome.

However due to the previous problems of retention, stability and the removable nature of the denture this was not considered the treatment of choice.

An adhesive bridge was discounted on the basis on his parafunctional habit. This type or restoration was considered to have a high risk of cementation failure in this patient’s case.

The fixed bridge would be considered to have the disadvantage of preparation of the unrestored lateral teeth. This conventional approach would be likely to have a good long-term outcome as the abutment teeth had good root morphology and bone support. However the patient did not wish the teeth to be prepared and declined this as an option.

An implant retained restoration, which has been documented to be a successful treatment option in the anterior maxilla was discussed further with the patient. The advantages and disadvantages were explained and documented in the notes. The patient had time to consider the information given to him and allowed to come to his own conclusion on the treatment he felt was most appropriate for his case.

This was supported by a letter to the patient, which again went through the verbal discussion of the case.

**Treatment phase**

An alginate maxillary impression was taken with the denture inserted to construct a surgical stent in cold cure acrylic resin with the labial face and gingival contour duplicated from the denture set up. The surgical stent was made to help allow placement of the implants in an optimal position.

The selection of length and diameter of the implants was made after information from the full clinical and radiographic examination, try in of the ridge lapped denture and a review of the diagnostic casts.

Under local anaesthetic a midcrestal incision was made with relieving incisions from the line angles of the adjacent teeth mesially. The site was found to still have two areas of persistent chronic infection with the loss of the overlying labial plates, both defects were fully explored and the granulation tissue carefully removed.
The implant placement was undertaken with the stent and diagnostic guide pins used to confirm that the planned position was obtained in all dimensions with the long axis of the implants passing through the incisal tips of the planned final position of the maxillary central incisor teeth.

The bone was classified as type 2/3 in region of site preparation (Lekholm and Zarb, 1984), with the ridge morphology type 111 with adequate height and width (Cawood and Howell, 1988).

Two 4.5mm diameter on 15 mm length implants were placed according to standard protocol. Both fixtures exhibited good primary stability with measured torque values of 40 Ncm.

The buccal fenestrations were filled with osseous coagulum collected in a single use bone trap and covered by a resorbable membrane and the site coagulum collected in a single use bone trap and the site coagulum collected in a single use bone trap and the site coagulum collected in a single use bone trap and the site coagulum collected in a single use bone trap and the site coagulum collected in a single use bone trap.

The acrylic partial denture was adjusted and relined with tissue conditioner. On review one week later the patient reported little pain or swelling post operatively. The sutures were removed and excellent healing was noted. The patient had maintained good oral hygiene around the surgical site. He had used chlorohexidine mouth rinses on a daily basis and had left the denture out for most of the immediate post operative period.

The implants were left for a four-month healing period with a further soft reline made to the acrylic denture to maintain good stability and retention. Careful efforts had been made to prevent any direct or indirect pressure from the denture base onto the healing ridge.

After four months under local anaesthetic a midcrestal incision was made following the original incision line with crevicular incisions made around the adjacent teeth to allow full visualisation of the short cover screws. Bone was found to have encroached upon both the cover screws and was carefully removed using hand instruments only (Figure 7).

The selection of 4.5mm height healing abutments was made to enable these to emerge level with the attached keratinised mucosa. The abutments were bevelled labially to allow good mucosal adaptation. There was a wide zone of attached keratinised mucosa buccally which is considered to be a better peri implant tissue rather than non keratinised mobile mucosa which can make maintenance of an integral seal more difficult (Wennstrom J, Bengtson F, Lekholm U, 1994).

Incising the excess palatal tissue and retaining a connection distally used a Palacci style flap to close the tissue between the fixtures (Palacci P, Ericsson I, 2000). The denture was eased and relined with a tissue conditioner to aid the healing process.

The patient was reviewed one-week post operatively to allow the sutures to be removed and check the denture fit again (Figure 8).

**Restorative phase**

An impregum impression of the implant heads was taken using impression copings secured with guide pins. A good quality rigid stock tray was eased so that it did not contact the impression copings.

A full arch impression is recorded with a careful check that the impression copings are firmly held by the fully set impression material.

Laboratory analogues are placed and a master cast constructed using the implant analogues and a soft tissue replica (Figure 9).

A good quality opposing impression was recorded in alginate, with a wax occlusal record. Bonded crowns were made to fit over the abutments that had been selected.

The abutments were fully torqued in before the crowns were cemented using zinc oxide and eugenol. The technique was to use minimal cement and carefully clean any excess from the soft tissue margin. This implant design allows a space between the abutment and the crown for cement release.

The occlusion was carefully verified to be in light contact on the implant retained crowns at maximum intercuspation. There were no interferences on protrusive or excursive movements (Chapman RJ, 1989). (Figure 10), (Figure 11).

A good quality periapical film was taken. This demonstrates a clear thread pattern.

The abutments were fully seated and no obvious cement lute could be seen on this film (Figure 12).
Maintenance and recall

The patient made aware of the long-term cooperation for maintenance with the need to maintain meticulous oral hygiene. He was advised to see the hygienist on a regular basis. This would enable any issues of infection or inflammation to be identified and treated early on (Mombelli A, Lang NP, 1998).

He failed to attend any review appointments made and was not seen for a further eight years.

On review eight years later the patient reported to be very happy with the implants. He has had the definitive crowns changed once in the intervening period as he simply wished a small diastema to be present. These had been cemented onto the previous abutments and were found to be fully seated.

On examination there was moderate oral hygiene being maintained. On probing around the implant crowns no pocket depth exceeded 3 mm. There was no exudate or bleeding detected. The occlusion was rechecked and found to be in light contact in centric occlusion with no interferences lateral or protrusive movements.

Radiographically the bone levels were stable. Although the film processing was too light a clear thread profile could be seen and the bone level measured from the shoulder of the implant to the marginal crestal bone did not appear to have changed over time (Figure 13).

There does not appear to be any detectable bone loss at the crestal bone area between the two radiographs.

There are several published versions of what constitutes a successful implant over time. Albrektsson et al. (1986) proposed several minimum criteria.
1. The individual implant should not demonstrate mobility when tested clinically.
2. Radiographic examination does not demonstrate any periapical radiolucency.
3. After the first year in function radiographic bone loss is less than 0.2 mm per annum.
4. An individual implant should not demonstrate any signs or symptoms of pain or infection.

The patients implants appear to meet these criteria for success in the medium term (Figure 14), (Figure 15).

Conclusion

Implants have shown to be in this patients case a predictable way to replace the failed maxillary central teeth with a fixed option.

Despite the patients failure to have regular dental care and no professional hygiene maintenance the outcome has been good with stability of the bone levels and good coronal seal around the implants.

References


