Prosthodontic treatment considerations and management of a frail 87-year old patient

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Introduction

World-wide populations are aging at a remarkable rate. The fastest growing segment of the population in the United States is 65 years and older, and the expected increase in the number of very old people (80 years and older) is increasing in most countries.[1]

The increase in the number of very old people, will translate into an increase in special care and attention to maintain a reasonable quality of life in the face of disability and growing frailty in this group. The net result is that demands for health and social services will increase substantially over the next quarter century.[2]

Tooth loss has a direct influence on reduced masticatory function and a shift towards a poorly balanced diet. This in turn will not only result in an increase in oral diseases, but also a deficiency in various micronutrients, leading to a compromised immune status. This may make patients more susceptible to various infections and even cancers.[3]

Ill-fitting dentures will worsen this situation, and patients may avoid certain social activities because they are embarrassed to speak, smile, or eat in the presence of others.

Geriatric patients who are medically stable may be suitable candidates for dental implant surgery. Dental implant treatment facilitates improved oral function, comfort, and quality of life. Studies have shown that dental implants can be successfully placed and restored in the frail elderly patient.[4] The lack of adequate denture stability and functional quality of conventional prostheses, is a clear indication for the fabrication of implant-retained overdentures for elderly patients.[4]

A two-implant overdenture is now regarded as the primary standard of care for edentulous people in developed countries.[5] Implants provide additional retention and stability to the implant-retained overdenture, apart from only being tissue supported as with conventional denture treatment, and creates a higher satisfaction in patients restored with this treatment modality.[4] These patients also report better masticatory function than with conventional dentures.[6]

A comment from a recent editorial by Morton L. Perel stated '... geriatric dentistry should begin with implant

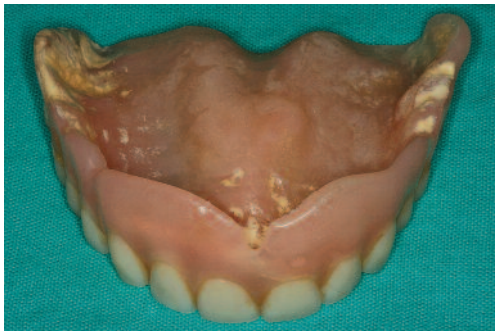

Figure 1: 20-year old maxillary denture.

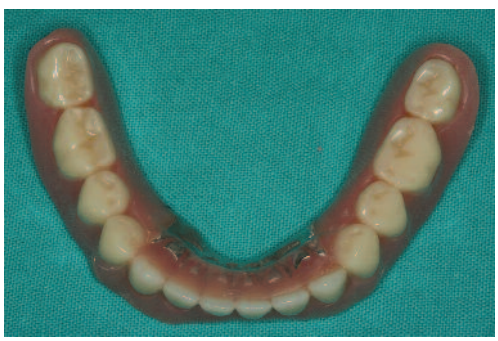

Figure 2: Modified partial mandibular denture.

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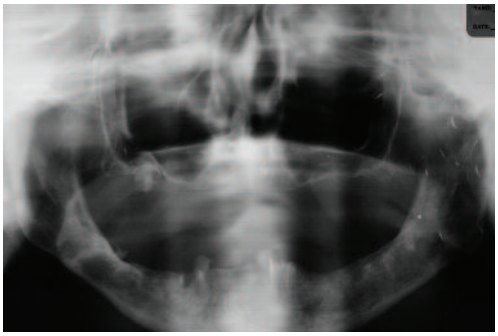

Figure 3: Pre-operative panoramic radiograph.

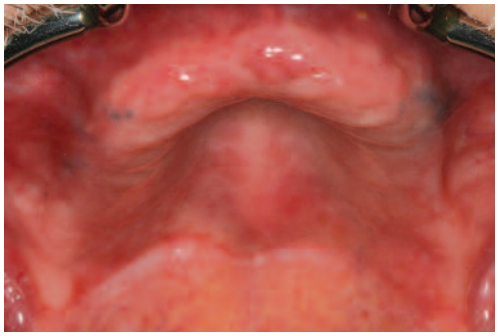

Figure 4: Clinical assessment of maxilla after extraction of residual roots.

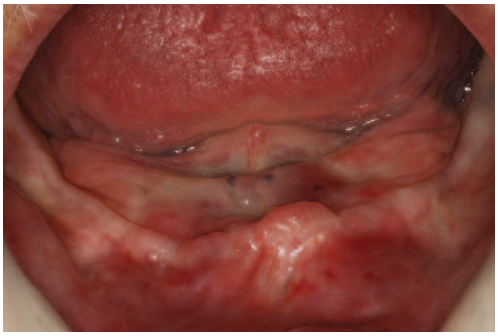

Figure 5: Clinical assessment of mandible after extraction of residual roots.

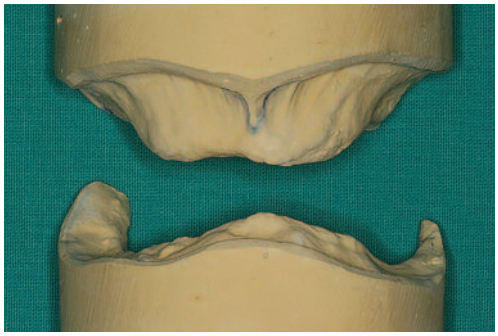

Figure 6: Study casts.

dentistry, so that implants are not used as merely a last resort. Before the elderly reach the assisted-living and basic needs facilities, they should at least have their teeth secured in their mouths rather than sitting in water cups. It is a matter of function. It is a matter of dignity...'.[7]

The number of people with implant-retained overdentures who are frail and dependent on others for daily care is growing. The prosthodontic maintenance associated with implant-retained overdentures can be complicated, time consuming, and expensive, and it is likely that this problem will add to the difficulties of managing oral health in the frail elderly patient.[8]

Case report

An 87-year old, healthy male presented with the main complaint of a poorly retained mandibular partial denture.

He had extensive caries on residual roots 17, 33, 32, 43, 44 and 47 with no apparent pain. His current prosthesis was a full maxillary denture (Figure 1) which was 20 years old, and a modified partial mandibular denture (Figure 2).

He did not wear the mandibular partial denture, due to loss of retention and stability. There was resorption of the mandibular alveolar process due to tooth loss, yielding an average height in the mandibular interforaminal area of 15mm.

Treatment planning

The patient was clinically assessed by a periodontist and prosthodontist. A pre-operative panoramic radiograph (Figure 3) was taken and evaluated. The decision was made to construct a new maxillary denture with an implant-retained overdenture in the mandible.

The initial surgical phase was to involve the removal of the residual roots, and after a healing period of 3 months, two interforaminal implants were to be placed. Construction of the final denture would then begin, to be delivered to the patient after an 8 weeks integration period of the implants.

The appointment schedule was as follows:

1. Examination and removal of residual roots (initial surgical phase).
2. Primary impressions and placement of implants (first phase implant surgery).
3. Final impression and occlusal registration.
4. Try-in of denture and uncovering of submerged implants (second phase implant surgery).
5. Delivery of denture and follow-up of implants.

First appointment (initial surgical phase)

The patient was anaesthetised with a local anaesthetic. Residual roots were removed with luxators and extraction

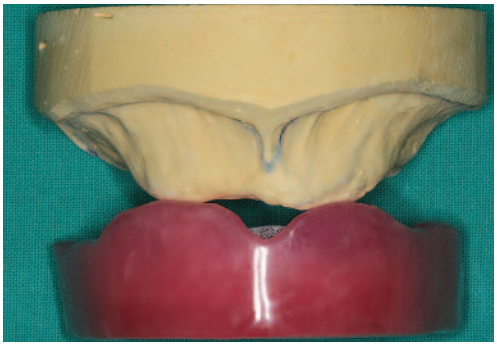

Figure 7: Maxillary occlusal rim incorporated into an individualized impression tray.

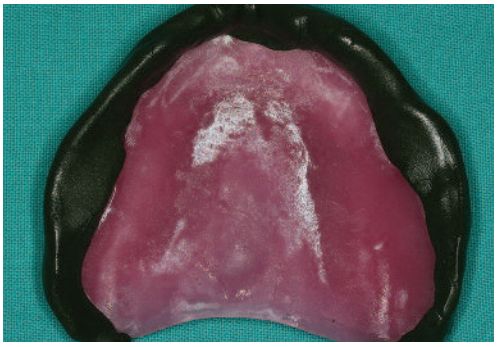

Figure 8: Border moulding incorporating the maxillary peripheral seal before final impression taking.

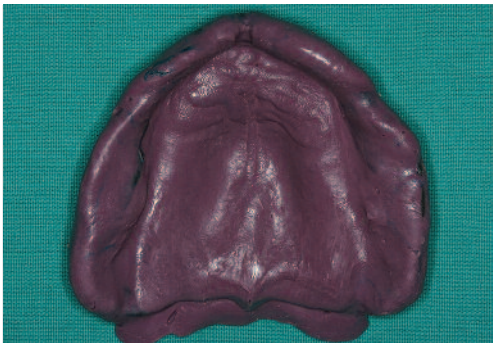

Figure 9: Final maxillary impression taken with polyether impression material.

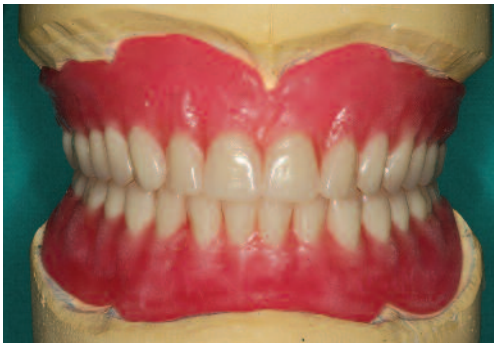

Figure 10: Wax try-in of denture.

forceps', utilizing a low trauma technique. Extraction sockets were thoroughly curetted to remove all residual infected tissue. Post-operative instructions were given to the patient.

Second appointment (primary impressions and first phase implant surgery)

The patient was followed up 3 months after removal of the residual roots and healing of the extraction sockets was assessed (Figures 4 and 5). The residual anterior mandibular alveolar crest was classified according to Cawood and Howell[9] as Class IV (knife-edge ridge form, adequate in height but inadequate in width). The restorative SAC classification[10] was a straight-forward prosthetic case. Primary impressions were taken with an alginate impression material utilizing stock trays to manufacture study casts (Figure 6). The incorporation of all relevant anatomical landmarks were verified on the impressions.

The surgical SAC classification[10] was a straight-forward surgical case. The decision was made to place two narrow Straumann Bone-level implants. The bone width allowed for the placement of two NC 3.3mm Ø, 10mm implants. It was decided to use SLActive surface implants, in order to maximize the healing response in the first two weeks.

A pulse oximeter was attached to the patient to monitor oxygen saturation and heart rate during the procedure. A local anaesthetic (with vaso-constrictor) was used to infiltrate the mandibular interforaminal area. Two minimally invasive mid-crestal incisions were made in the areas of the proposed implant sites. The standard Straumann drilling protocol for placement of Bone-level implants was followed.

Implants were placed after the preparation of the osteotomy sites in tooth positions 32 and 42. A 15 Ncm insertion torque was obtained in the 32 area, and 30 Ncm insertion torque in the 42 area. Cover screws were placed and the incisions were closed with Chromic 6/0 sutures.

During the operative procedure, oxygen saturation varied from 94-97% and the pulse rate increased from a baseline 65 to a maximum of 76. Postoperative care instructions were provided to the patient.

Third appointment (surgical follow-up, final impressions and occlusal registration)

Maxillary and mandibular individualized trays with incorporated occlusal wax rims, were manufactured on the primary impression casts before the appointment (Figure 7).

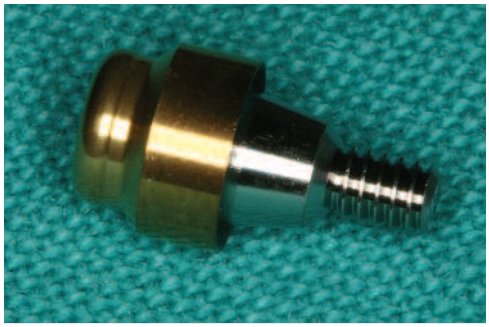

Figure 11: Locator abutment (2mm).

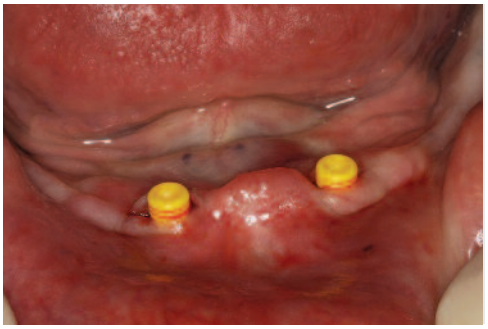

Figure 12: Try-in of Locator trial abutments.

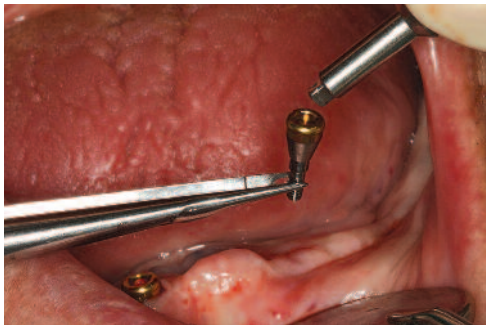

Figure 13: Insertion of Locator abutments onto implants.

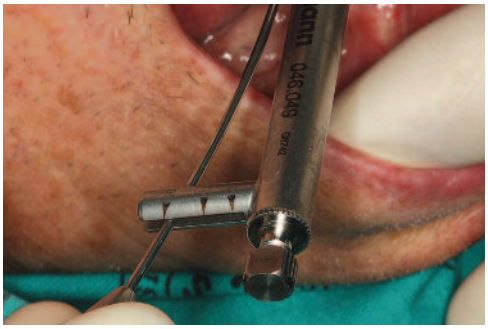

Figure 14: 35 Ncm torque applied to Locator abutments.

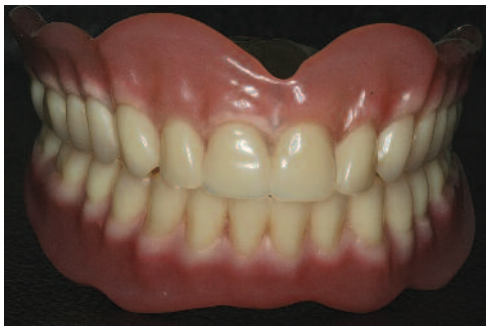

Figure 15: Denture finished in acrylic resin.

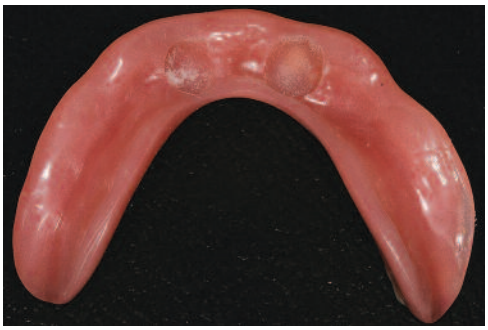

Figure 16: Recesses drilled in impression surface of mandibular denture for denture caps.

Surgical follow-up of the incision areas was done 10 days after implant insertion. The soft tissue had healed uneventfully. Sutures were removed at this time.

Wax rims were adjusted to record correct occlusal vertical dimension (OVD), lip support, smile line and midline. The idea was to duplicate the current functional maxillary denture as far possible, so that the patient would adapt easier to the new denture. Border moulding of the individualized trays were done using compound Green stick (Figure 8).

Closed-mouth impressions were taken with polyether impression material (Figure 9), while the patient made normal oral movements, to ensure adequate incorporation of muscle movements into the denture bases. The correct OVD was checked and verified after impression-taking.

Fourth appointment (try-in of denture, second-phase implant surgery)

The patient was followed-up 8 weeks after implant insertion. A wax try-in of the denture was done, and all occlusal, functional and aesthetic parameters were evaluated (Figure 10). The border seal was verified to obtain adequate retention and stability. The denture was sent to the dental laboratory for finishing into acrylic resin.

A pulse oximeter was attached to the patient to monitor oxygen saturation and heart rate during the surgical procedure. A local anaesthetic (with vaso-constrictor) was then used to infiltrate around the implants, and the

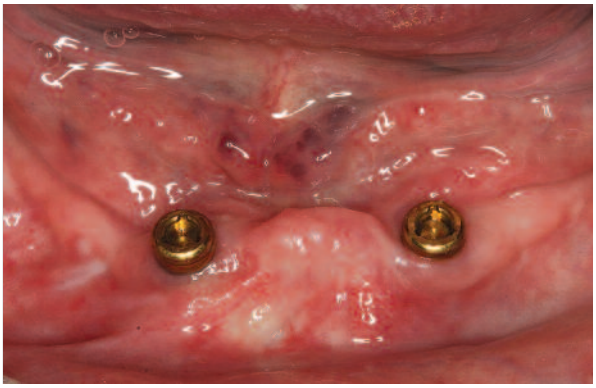

Figure 17: Intra-oral view of Locator attachments.

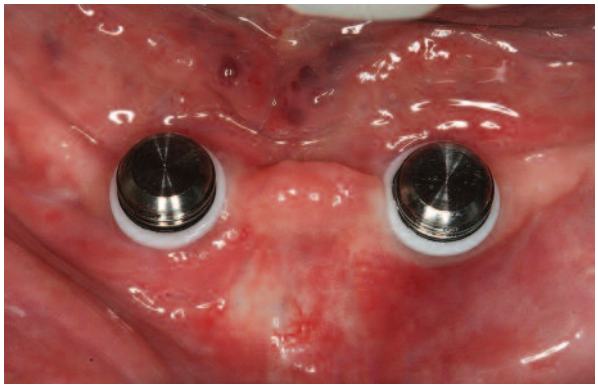

Figure 18: Block-out spacers to prevent inflow of reline material into undercuts.

positions of the implants were verified. Small incisions were made, splitting the keratinized tissues, to allow for the retention of sufficient keratinized mucosa on both the buccal and lingual aspects of the implants. Osseointegration of the implants was verified with a Radio Frequency Analysis instrument (Osstell AB, Gothenborg, Sweden), yielding an adequate Implant Stability Quotient (ISQ). Cover screws were removed, and Locator abutments, 2mm in length, were placed on the implants and torque was applied at 35Ncm (Figures 11-14).

During the operative procedure, oxygen saturation varied from 98-100% and the pulse rate increased from a baseline 68 to a maximum of 71. Postoperative instructions were given to the patient.

Final appointment (delivery of denture)

This was done 2 weeks after second-phase implant surgery. Soft tissue around the abutments had healed uneventfully. The maxillary denture was delivered, and all occlusal, functional and aesthetic parameters were evaluated (Figure 15).

The decision was made to process the Locator denture caps intra-orally with a reline procedure, to accommodate the visco-elastic properties of the denture-bearing mucosa. The occlusion of the denture was verified; where after the location of the abutments were marked on the impression surface of the mandibular denture.

Recesses were drilled (Figure 16) in these areas to accommodate the titanium denture caps of the Locator attachments (Figure 17) and an adequate space for the reline material.

Block-out spacers were placed over the abutments, to prevent inflow of the reline material into the undercuts (Figure 18). The denture caps were placed on the abutments and the fit of the denture was verified over the denture caps, to ensure that the abutments did not interfere with denture position. The reline material was mixed according to the manufacturers' instructions, and applied to the recesses in the denture. The denture was placed over the denture caps, and the patient was instructed to bite into centric occlusion. The denture was left in place for the reline material to set, where after it was removed from the mouth and placed in a polymerization kettle for final curing of the material. The excess acrylic was removed and the denture was polished and finished.

Black processing male components were replaced with blue (light retention-1.5lbs) male components (Figures 19-21), and the denture was delivered to the patient (Figure 22). Postoperative care instructions were provided with relation to removal and insertion of the denture, and denture hygiene.

Conclusions

This treatment protocol has shown to successfully provide a frail elderly patient with well integrated implants (Figure 23) an implant-retained overdenture, utilizing a minimally invasive protocol.

The implants increased the retention and stability of the mandibular denture. The patient has since the delivery of the prosthesis, reported an increase in masticatory function, weight gain and social acceptance. This treatment has also shown to provide a complete rehabilitation (Figure 24), utilizing a conventional protocol in the minimum amount of appointments.

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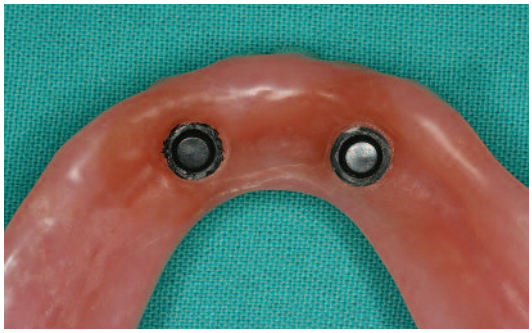

Figure 19: Black processing male components after reline pick-up of denture caps.

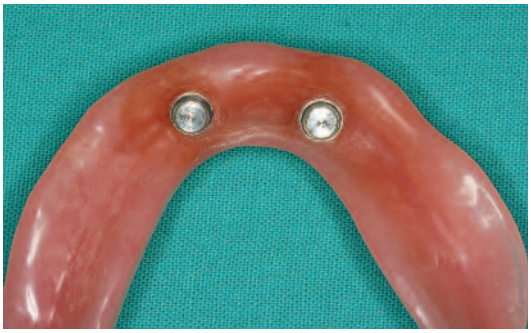

Figure 20: Denture caps without male retention components.

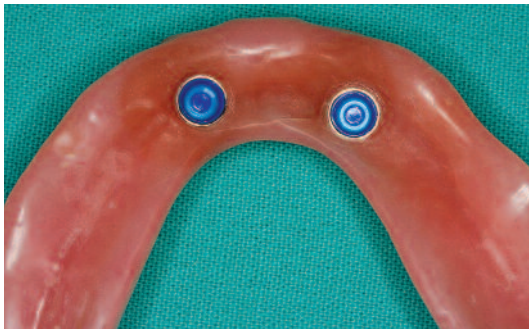

Figure 21: Finished mandibular denture with blue male components.

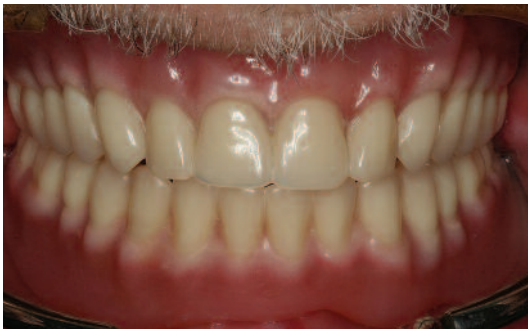

Figure 22: Delivery of finished denture to patient.

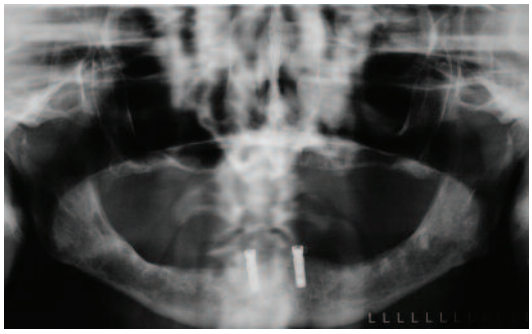

Figure 23: Postoperative panoramic radiograph demonstrating well integrated dental implants.

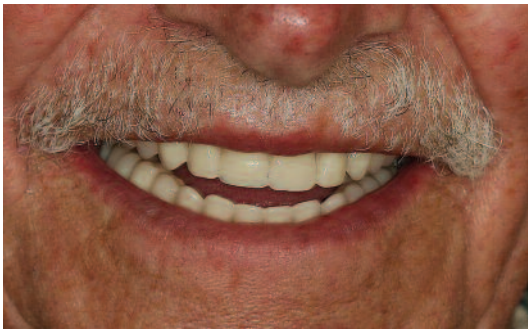

Figure 24: Smile photo demonstrating adequate aesthetics and lip support.

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