REPLACEMENT OF A MANDIBULAR SUBPERIOSTEAL IMPLANT

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KEY WORDS

Tripodal
Osseointegration
Multimodal
Hydroxyapatite coating
Atrophic

This case report describes the replacement of a failed subperiosteal implant with a tripodal design in a 60-year-old woman. The patient had been given the option of an augmentation using an autogenous iliac crest graft with subsequent insertion of endosteal implants or of replacing the failed implant with another of more sophisticated design. The latter, a more conservative approach, was selected for both economic and quality-of-life issues.

INTRODUCTION

Mandibular subperiosteal implants have been used successfully for many years.[1–4] Kay,[5] Kay *et al*,[6,7] James *et al*,[8] and Misch[9] have contributed to their continuing improvement. Nordquist and Naisbitt[10] described principles and techniques that have further enhanced the discipline. They emphasized the importance of accurate bone impression techniques to encourage optimal mating of implant surfaces to the underlying bone. They also discussed the role periosteum plays in the integration process of subperiosteal implants. An understanding of this role has led to a refinement of the periosteal flap–releasing technique that has resulted in improved healing. The case presented demonstrates the use of current knowledge in the design and replacement of a failing subperiosteal implant.

CASE REPORT

A 69-year-old woman presented with a failing tripodal mandibular subperiosteal implant that was supporting an over-denture prosthesis. Both the implant and prosthesis had been in successful service for approximately 15 years (Fig 1). The patient presented with pain, swelling, implant mobility, and draining purulence, particularly from the right side. Radiographic findings indicated some settling of the infrastructure into the mandibular canal (Figs 2, 3). The patient's history, confirmed by clinical examination, revealed a mild paresthesia of the right lower lip. The patient became aware of this condition approximately 3 weeks before this evaluation. Recommendations presented to this patient by other doctors included immediate hospitalization, implant removal and ileac crest grafting, and root form implant placement. After considering all options, the patient elected to proceed with removal and replacement of the subperiosteal implant.

TREATMENT

A full-thickness mucoperiosteal flap that included a midline and posterior retromolar releasing incisions was planned and executed. The framework

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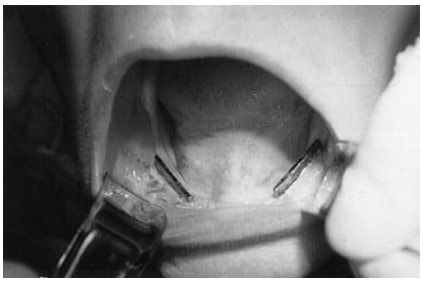

FIGURE 1. This failing subperiosteal implant served for approximately 15 years.

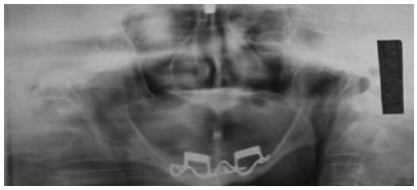

FIGURE 2. The panoramic X-ray of the old subperiosteal implant indicates some settling of the infrastructure into the mandibular canal.

FIGURE 4. Stage one surgery involved the removal of the relatively flat subperiosteal implant.

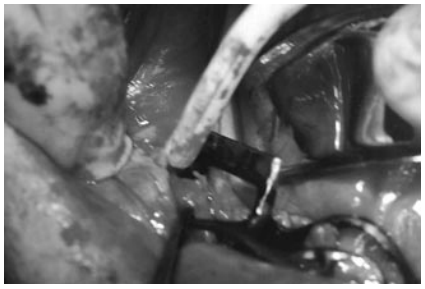

FIGURE 5. Stage one surgery involved the removal of the relatively flat subperiosteal implant.

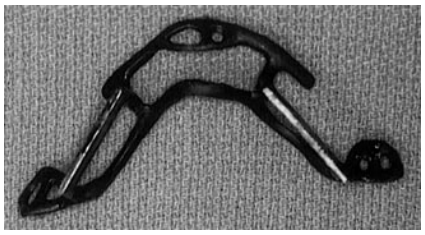

FIGURE 6. After removal, the framework showed visible surface tarnish and oxidation.

FIGURE 7. A second subperiosteal implant framework was designed as a result of a direct bone impression, shown here on a laboratory model (Root Dental Lab; Leawood, Kans).

FIGURE 8. Stage two surgery permitted the delivery of a subperiosteal implant of a more aggressive design, which utilized a single titanium fixation screw.

was visualized and released from the engulfing granulomatous and fibrous connective tissue using sharp dissection (Figs 4, 5). Following the removal of the failing implant framework, significant dark tarnish and surface oxidation were observed on the metal substructure that had approximated the gingival tissues (Fig 6). This appearance indicated widespread corrosive phenomena that affected the implant.

Upon removal of the framework, further reflection was necessary to expose all relevant landmarks needed for a new bone impression. This was then completed. Extreme care was taken in the right mental area to avoid further damage to the nerve. The tissue was then approximated and sutured. The patient was given appropriate postoperative instructions and dismissed.

The second-stage surgery was performed approximately 4 weeks later using the classical flap technique and a new hydroxyapatite-coated subperiosteal framework was placed (Fig 7). Difficulty with seating the infrastructure was experienced in the symphyseal area. Some surface remodeling had occurred at this site during the short period of time since the initial surgery. The unexpected change in bony anatomy required slight osteoplasty in the anterior symphysis to achieve the desired fit. One titanium screw was used to establish a firm initial fixation (Fig

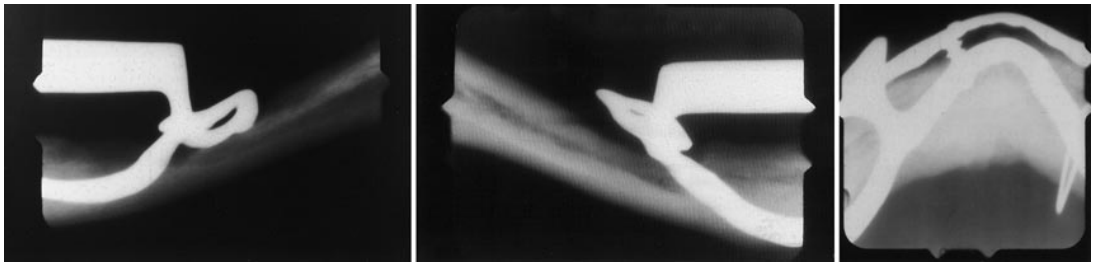

FIGURE 3. These films show the implant settling into the mandibular canal.

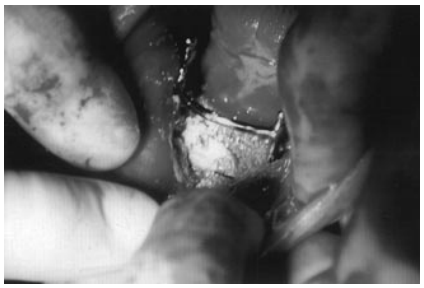

FIGURE 9. In order to improve peri-implant intimacy, nonrestorable hydroxyapatite granules were placed around the implant struts at the time of delivery.

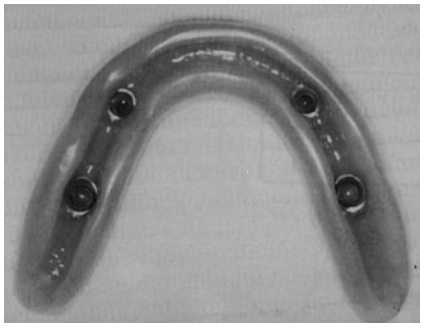

FIGURE 10. The implant supported this overdenture, which was delivered at the second-stage appointment.

8). Nonresorbable hydroxyapatite particles were placed in and around all of the struts prior to closure (Fig 9). A relieving incision was made through the periosteum at the base of the flap to allow a maximum amount of periosteum to be carried over the infrastructure during the suturing procedure. This provided an osteogenic tent over the implant struts, which is believed to be conducive for creating complete osseointegration of the implant. The tissue was approximated over the implant without tension. A continuous and interrupted 3-0 Vicryl suture was used to close the wound. A new overdenture was delivered to the patient at the same appointment (Fig 10). The patient was able to function with the prosthesis the following day and was able to eat soft foods. She graduated to full function within 1 week.

RESULTS

The goals in the treatment of this patient were to eliminate significant

FIGURE 11. The implant and its overdenture are shown after healing.

FIGURE 12. The implant and its overdenture are shown after healing.

FIGURE 13. A panoramic X-ray shows the replacement implant after 28 months of satisfactory function.

chronic infection while attempting to provide an implant-supported prosthesis in the most conservative manner possible. The results of these surgical and prosthetic efforts eliminated a potentially serious infection and provided a restoration that permitted normal function and comfort within a single month (Figs 11, 12).

SUMMARY AND CONCLUSIONS

Significant problematic situations, such as the case presented in this report, can be managed satisfactorily using several scenarios. Given the choice between harvesting from the iliac crest with the associated morbidity of such grafts,[7,9–11] along with the increased cost and time required by such an approach, the mandibular subperiosteal implant remained a more attractive treatment for this patient's severely atrophied mandible. The orthopedic splitting effect of this lower subperiosteal implant actually demonstrated a mild increase in the width of the midmandibular ridge within the first year. This benefit, in addition to the others cited, made the choice an acceptable one (Fig 13).

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DISCUSSION

''Replacement of a Mandibular Subperiosteal Implant'' stresses material and design considerations that have been instituted in order to encourage osseointegration of subperiosteal implants.

The essential step required is coating the infrastructure with hydroxyapatite. This is not a new concept; Lewis Benjamin described this fabrication at least a decade ago.

A coating designed to encourage osseointegration actually contradicts the original precepts of host site response found to be so successful for the past half century. The fibrous connective tissue bed in which such implants become cradled cushions the underlying bone from trauma, ameliorates the stresses of occlusion, accommodates its mass to local conditions, and serves as a protective envelope.

Were total osseointegration to be accomplished, the prognosis of a subperiosteal implant might be excellent, but it is difficult to visualize the mechanisms of infrastructural settling, the difficulties created by underlying resorptive patterns, hydroxyapatite's notoriety for delamination, and the formidable problem presented if corrective procedures or removal became necessary.

The essential stumbling block, however, is the situation that actually evolves: partial or localized osseointegration. In such a scenario, the worst combination of host site phenomena may occur. There will be areas of ''spot-welded'' metal-to-bone interfacing and other areas that will experience the more classical fibrous connective tissue support.

As function (and parafunction) exert their influences on the implant, the unpredictable responses of the underlying supporting tissues may lead to disaster. There will be settling in the classic manner beneath the nonintegrated components, while the integrated segments will settle by forcing their attached bony foundations more deeply into the underlying spongiosa, causing discontinuities and microfractures of the bone.

The very nature of the support system of subperiosteal implants as designed a half century ago, which was serendipitously discovered rather than planned, has been found to supply a nurturing, protective, and gently yielding anabolic environment.

As the old cliché has it, ''If it ain't broke, don't fix it!''

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