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PROSTHODONTIC Insights

A Digest of Recent Trends, Techniques and Clinical Concepts of Dental and Facial Esthetics

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Debilitation to rehabilitation in 90 days with osseointegration

Patients with progressive oral debilitation frequently present with manifestations of advanced periodontal disease, malocclusion, skeletal discrepancies, multiple missing teeth, ill-fitting removable partial dentures due to the mobility of abutment teeth and a marked deterioration in their ability to function orally.

Rehabilitation of individuals presenting with total debilitation can be accomplished efficiently using osseointegrated implants and stabilized prostheses. Teeth can be extracted and implants placed immediately following their removal. Experience has proven that a three month healing time is adequate for implants placed in the mandibular anterior. Details of a new occlusal scheme can be refined during the time between implant placement and their use to support a fixed prosthesis. The new occlusion can then be duplicated in the final prosthesis.

As an example, a 62 year old patient (Figure 1) was referred for implant prosthodontic rehabilitation. His medical history was noncontributory. He did not smoke.

(Continued on Page 2.)

Debilitation to rehabilitation . . .

(Continued from Page 1.)

Figure 1:
Collapse of the perioral musculator due to loss of vertical dimension and skeletal deformities is evident in the profile view.

The patient presented with a skeletal Class III malocclusion (Figure 6), severe posterior bite collapse (Figure 2, 3, and 4), advanced periodontitis in both the maxilla and mandible, advanced mobility of the two remaining mandibular teeth, and moderate mobility of the maxillary dentition.

Figure 2:
Anterior view of "underbite" and severe loss of occlusal vertical dimension.

Figure 3:
The partially edentulous condition and loss of the majority of the mandibular dentition exacerbates the collapsed occlusal vertical dimension.

Articulating records and appropriate occlusal vertical dimension were required prior to the initiation of therapy. Diagnostic dentures were fabricated in preparation for first stage surgery. The teeth were set in wax to permit alterations prior to delivery.

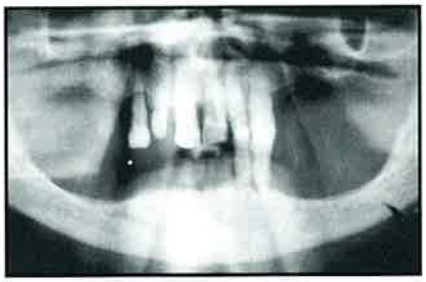

Figure 4:
Preoperative panradiograph shows advanced periodontal disease.

Figure 5:
Angulated abutments are placed 90 days after implant insertion.

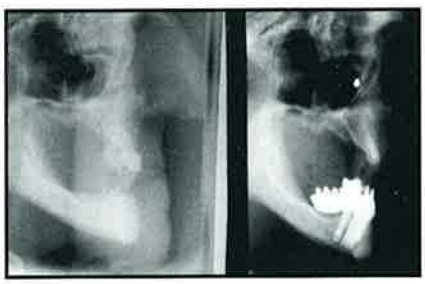

Figure 6:
Pre and postoperative lateral cephalometric films.

Stage I surgery:

All of the remaining teeth in the maxilla and mandible were removed and implants were placed in the mandibular anterior. Following surgery a wax try-in was used to confirm the position of the teeth and occlusal vertical dimension.

The patient remained edentulous following implant placement for two weeks permitting the primary closure of the surgical site to heal completely. At suture removal, temporary dentures were provided allowing the patient to accommodate to the new occlusal scheme. Ninety days following implant placement, stage II surgery was completed.

For this patient with a Class III skeletal deformity, angulated abutments were required for the mandibular anterior implants to permit the screw access holes to be oriented on the lingual of the prosthesis (Figure 5).

The change in the occlusal relationship created by the final restoration can be noted radiographically (Figure 6). The final complete rehabilitation is accomplished with a fixed tissue integrated prosthesis supported by five implants in the mandibular arch with a conventional complete removable denture replacing the maxillary dentition (Figure 7 and 8).

Summary:

Patients who undergo this form of treatment rapidly accommodate the new and comfortable dentition. Efficient function begins immediately (Figure 9).

Osseointegrated implants can be used effectively to correct severe skeletal malocclusions, such as the Class III deformity presented. In addition, the implant prostheses provide stable function and drastically improved esthetics.

Figure 7:
Final mandibular fixed prosthesis supported by five Brånemark implants with newly designed maxillary complete removable denture.

Figure 8:
Occlusal view of the mandibular implant supported prosthesis showing the linqual screw access holes.

Figure 9:
Complete oral rehabilitation in 90 days with improved perioral support created by the new prostheses.

Restorations fabricated by Fort Washington Dental Lab, Inc., Fort Washington, Pennsylvania.

Wide Implants for Wide Teeth

D.Y. Sullivan

Implant fracture and abutment screw loosening are common problems associated with single tooth implant restorations. Clinical reports indicate that up to 14% of single tooth molar implants fracture. Improvements in implant and abutment design can be resolved by wide-diameter mechanical components (Editor's opinion: or the use of two implants).

By increasing the diameter of the implant, the force or tension of the abutment screw is reduced. A proportional decrease of the tension to the abutment screw results in decreased incidence of abutment screw loosening and prosthetic instability. Increasing the corresponding abutment diameter improves the coronal contours. Single tooth abutments engaging the entire shoulder diameter improves stabilization.

The emergence profile of molar restorations is also improved by the use of the larger diameter healing abutments. Since the large 7.5 mm diameter healing abutments are approximately the same diameter as molar teeth, the healed soft tissue creates a tissue well to receive a properly contoured implant crown. This information is then transferred to the dental technician using impression copings that mirror the diameter of the healing abutments. With 6.0 mm diameter implants and corresponding 6.0 mm single tooth replacement abutments, normal molar crown forms can then be created in the laboratory.

Clinical trials of these large diameter implant and abutment combinations demonstrate excellent short term results.

Advantages of a wide-diameter implant:

1. Improves stability for the prosthesis when the shoulder of the implant is enlarged to the outer diameter of three threads.
2. Provides greater surface area for bone contact.
3. Five and six mm-diameter implants are beneficial in premolar and molar regions where anatomic limits to length exist.
4. Increasing the internal wall strength by increasing the diameter demonstrates a 3-5 times increase in resistance to implant fracture.

In summary, wide diameter implants for wide diameter teeth mean decreased incidence of implant fracture, decreased incidence of abutment screw loosening and improved emergence profiles of the final implant restoration.

Dental Economics, March 1994

Hyperbaric Oxygen's Effect on Radiation Necrosis

EP Kindwall

The overall incidence of complications in radiation therapy for head and neck cancer is 65%. Radiation damage progresses throughout the patient's life, as cells that are not killed immediately may go on to die or fail to divide. Progressive loss of vascularity adds to the problem, affecting even cells that are otherwise normal in the irradiated field. Spontaneous breakdown is thought to occur at 3 mm Hg. A 7 to 10-fold increase in tissue O_2 tension results at 2.4 atmospheres absolute of hyperbaric oxygen (HBO), stimulating angiogenesis that persist with successive dives. When the tissue O_2 gradients, during HBO treatment, fall below a certain level, thought to be 20mm Hg), Neovascularizations ceases. HBO therapy is given five days per week. Surgery is performed after 20 dives, and is followed by ten additional treatments. The 20/10 protocol is useful in preventing osteoradionecrosis due to tooth extraction. HBO does not stimulate tumor growth.

Clin Plast Surg 20:473, 1993

Problems with Prostheses on Implants: A Retrospective Study

Walton & MacEntee

Evaluating the success of an implant supported prosthesis (ISP) includes assessing maintenance needs, specifically adjustments and repairs, and patient satisfaction. In light of the absence of substantive data on the maintenance of ISPs, a retrospective study of 156 patients with oral implants was conducted. The objectives were to compare the adjustments and repairs needed to both fixed and removable ISPs and to measure patient satisfaction with their prostheses.

Prostheses: 2/3 fixed, 1/3 removable

A total of 781 implants were placed, 79% in the mandible and 21% in the maxilla, with most (64%) in the edentulous mandible. The implants supported 191 prostheses, mostly in the mandible, and nearly two thirds were of a fixed design. The prostheses had been in place for an average of 30 months, with a range of 2 months to $6^1/_2$ years.

Removable: More adjustments

An average of 0.8 adjustments were needed per fixed ISP compared with 2.1 adjustments per removable ISP. The types of adjustments were categorized as those needed (1) to correct contour for comfort, esthetics, or function, (2) to correct occlusion, (3) to tighten components (screws in fixed ISPs or attachments for removable ISPs), and (4) other.

Removable: More repairs

When repairs were considered, a similar tendency for removable prostheses to require more attention than fixed was found, with an average of 1.9 repairs per removable ISP as compared with 0.9 per fixed ISP. Thirty-four percent of the removable designs required repeat repairs as opposed to only 14% of the fixed. Almost all of the fixed repairs were related to fracture of some component, with fractured gold screws accounting for 27% of the needed fixed repairs. Removable prostheses repairs were related to lost, loose, or fractured retentive clips in 39% of incidents.

Previous studies suggest that an implant overdenture would likely be more cost effective than a fixed ISP and that, although the maintenance for overdentures is higher than that for conventional complete dentures, they are easier to manage and more cost effective than conventional full arch fixed prostheses. However, based on this study, although it may initially be less expensive to fabricate a removable ISP because of decreased treatment time and laboratory expenses, the need for repairs would no doubt increase the costs of treatment, costs that in many cases are absorbed by the dentist because they were not predicted at the outset.

One reason why removable ISPs required substantially more repairs than fixed ISPs may be the fact that fixed ISPs usually use a cast metal framework, but this is not always the case with removable ISPs. Loose, lost or broken retentive clips account for the most common repairs needed for removable prostheses. These components may also be inherently weaker than their fixed counterparts.

The high level of patient satisfaction, despite the numerous adjustment and repair problems observed, may reflect both limited patient expectations regarding the perceived nature of implants and the probable severe functional deficit many of these patients experience before implant treatment. Patients should be fully informed regarding not only the risks and benefits of implant restoration, but also about the need for ongoing maintenance of the prosthesis itself, including the higher risk of repairs to a removable ISP.

J. Prosthet Dent 1994; 71:283-8

Effects of early placement of a single tooth implant: A case report

Johansson et al

The age of the patient is not included in the principles for single tooth replacement given by the Branemark group (Lekholm & Jemt 1989). This article reports on a single implant placed in a young male aged 12 years and 3 months who lost his left upper central incisor due to trauma at the age of 9.5 years.

During the 4.5 year follow up period, the fixture did not move together with the adjacent teeth in the growing maxilla nor did it impeded the growth or marginal bone on the mesial side of the adjacent tooth #11. However, because the fixture had been placed too close to the tooth mesially, a marginal bone loss of 3.9 mm was noted on tooth #22 (figure 1).

This case emphasizes the importance of optimal fixture placement in all directions with expectation of further growth of the jaws in very young patients.

Clin Oral Impl Res 1994:5;48-51

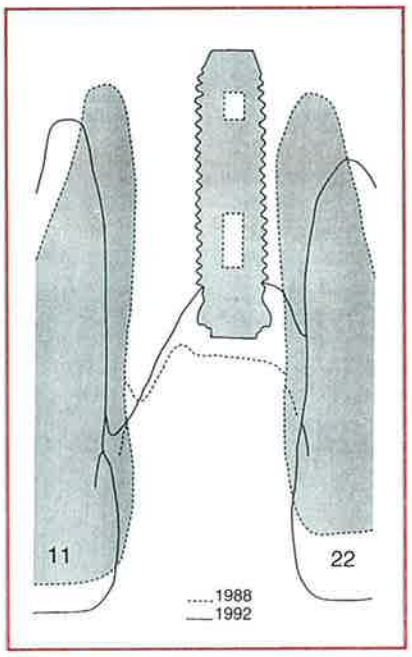

Figure 1.

Early Histologic Response to Titanium Implants Complexed With Bovine Bone Morphogenetic Protein

Yan et al

Titanium is biocompatible, strong, and corrosion resistant. Numerous tests in animals and humans have demonstrated the potential of this implant material. Unfortunately no evidence exists that titanium itself has the ability to induce bone formation more than other biomaterials. Urist demonstrated that an uncalcified bone matrix could induce new bone information. He and his coworkers were successful in isolating bone morphogenic protein (BMP) from bone and dentin matrix. Numerous studies have shown that BMP may induce differentiation of mesenchymal cells into cartilage and bone cells.

The purpose of this study was to (1) establish a method of using BMP with a titanium implant and (2) identify early bone formation induced by the titanium/BMP complex in the interface zone between implant and host bed.

Results of the study indicate that rapid formation of new bone around implants might be attributed to (1) new bone growing from the margins of the host bony bed; (2) new bone formed by the bone-inducing effect of BMP released from the margins of the host bone matrix; and (3) the bone formed by bone-induction of implanted BMP, which encouraged the rapid formation of bone by direct apposition.

It appears that osseointegration of implants can be enhanced by BMP-bone induction. In addition, an apical opening in a titanium implant provides an appropriate site in which to combine BMP with titanium and also provides a site in which osteogenesis can occur in an environment that might be relatively protected from implant movement before and after loading.

Further study should focus on quantitative measurements of morphometry and biomechanics to compare the difference in osseointegration with and without the presence of BMP, and long term observation of the implants after loading.

J Prosthet Dent 1994;71:289-94

The Mandibular Subperiosteal Implant Denture: A prospective survival study

Yanase et al

Eighty-one patients who received mandibular subperiosteal implant therapy at the USC School of Dentistry Advanced Prosthodontic Clinic were prospectively evaluated from 1971 to 1984. Because the study was initiated in 1971, before modern definitions of success, only implant survival was investigated. There were 63 women and 18 men with a mean age at implant placement of 53 years (range 39 to 77 years). Except for one patient who still retained the six maxillary anterior teeth, all patients were edentulous. The patients were referred to the clinic because of inability to function with conventional mandibular dentures.

Treatment was administered by dentists who had received instruction in advanced education programs in prosthodontics and oral and maxillofacial surgery at USC. Patients were examined 6 months after placement of the mandibular subperiosteal implants. Thereafter patients were recalled annually to the Advanced Prosthodontic Clinic. Telephone interviews were conducted 6 months after clinical examinations, and thus contact with patients was maintained twice a year. Patients who had relocated and could not be followed up clinically, were asked to fill out annual questionnaires in addition to the annual telephone calls.

Because the study was carried out in a large metropolitan area, the number of patients lost to follow up was remarkably low. Deceased patients and those lost to follow-up were removed from the analysis after their last follow-up examination.

In 1992, when the study was terminated, 42% (34 of 81) of the patients were known to have surviving subperiosteal implants. Thirty-two percent were known to have had their subperiosteal implants removed. Nineteen percent had died with the implants in place, and only 6% had been lost to follow up. Despite careful treatment planning, attention to detail, frequent follow-up, and subjective expressions of success from patients, this study showed that subperiosteal implants have a low long-term survival rate, and the rate of loss increases over time without reaching a steady state.

The 10-year survival rate of 79% indicates that the 80% total success criterion established by Albrektsson et al in 1986 could not have been met. Therefore on the basis of survival rate alone, subperiosteal implant therapy should not be considered as a current treatment option. Inasmuch as successful alternatives, now exist one can only speculate as to the benefits of subperiosteal implant therapy. However, subperiosteal implant therapy did provide function for patients who otherwise could not use dentures.

J. Prosthetic Dentistry 1994;71:369-74

Characteristics Associated with the Loss and Peri-Implant Tissue Health of Endosseous Dental Implants

R.J. Weyant

The object of this study was to identify from registry data variables that were correlated with implant failure and with problems in peri-implant soft tissue health. The principle data source for this study was the United States Department of Veterans Affairs (VA) Dental Implant Registry. Data was examined to determine if variables contained in the registry or other VA data bases could be related to implant removal or problems with peri-implant soft tissue healing after implant surgery. All registry cases that met the following conditions were used in the analysis (1) the patient received cylinder (root-form) implants, and (2) the patient had at least one postsurgical evaluation of the implant(s).

Independent variables were created from registry data that characterized the implant, provider, patient, and treatment facility. Implant variables included: implant manufacturer, date of implant placement, intraoral site of implant, and type of implant surface coating. Patient variables included: demographics, medical/pharmacologic history, and oral health status. Provider and facility variables included: implant surgeon's "experience" with implants, size of treatment facility, and the treatment facility's patient flow characteristics.

Data from 598 patients fit the selection criteria and were used in this study. These patients received a total of 2,098 implants. The 60-69-year-old age strata composed the largest single group to receive implant treatment. Reports of systemic disease and medication usage were widespread.

Most implant restorations involved multiple implants. Only 61 cases (10.2%) that involved a single implant were reported.

Although 15 different types of implants were contained in the registry data, there was sufficient data on only the top six brands of implants to mount a meaningful statistical analysis. All other implants were placed into an "all others" category.

Implant failures and subsequent removals were rare. Overall, 81 implants in 45 subjects failed and were removed. This results in a crude rate for implant survival of 96.1%.

Implant descriptor variables revealed that coated implants, surgical complications with bone, and implants with peri-implant soft tissue health complications were at higher risk of loss. The association of loss with peri-implant soft tissue health status suggests that the decline of an implant's health is part of a clinical continuum in which each failing implant processes from minimal pathosis to implant removal. There was nearly a three times greater crude failure rate when a provider reported a surgical complication associated with alveolar bone for that implant.

Three variables associated with systemic medical conditions were associated with implant failure: surgical risk, medical history and medication history. Taken together, these variables suggest that systemic health factors contribute to implant survival. One systemic variable, a history of smoking, was shown to be associated with peri-implant soft tissue health.

One variable related to the nature of the treatment facility. The model indicates that as the number of outpatients treated within a dental service increases, the likelihood of implant success also increases.

The only characteristic associated with both implant failure and poor peri-implant soft tissue health status was the presence of a surface coating.

Results showed that implant survival is associated with (1) the medical status of the patient, (2) the surface coating of material of the implant, and (3) implant surgical and healing complications. Peri-implant soft tissues health was associated with (1) patient's use of tobacco, (2) surface coating of implants, and (3) implant providers experience.

(Int) J Oral Maxillofac Implants 1994;9:95-102

Editor's note: Although the author disclaims endorsement of implant manufacturer, valuable information regarding the complication and failure rate related to various manufacturing processes could be beneficial to the profession and our patients. T.J.B.

"Bottom Line", Patients Love Their Permanent Teeth

Patient attitudes prior to and following dental implant rehabilitation

Balshi, Hernandez & Wolfinger

A retrospective survey was conducted to determine the subjective feelings of patients concerning their present implant-supported prostheses compared to previous worn removable prostheses. Of the 137 respondents, 70 had previously worn a removable prosthesis. Patients answered questions concerning esthetics, function, self-esteem, and overall dental condition.

A dramatic improvement was noted by patients with respect to increased function and esthetics with their implant-supported prostheses when compared to their previous removable prostheses. A majority of patients also noted a rise in self-esteem, which may be attributed to not having to worry about a removable prosthesis that could dislodge during function, speech, laughter, or yawning. The upswing reported in general dental health is most likely due to the perceived combination of improved esthetics, increased self-esteem, and better function.

Of the 70 applicable patients responding to a survey comparing implant-supported prostheses with previous removable prostheses, the overwhelming majority indicated that they were very satisfied with their new restorations. Although a few patients commented about the cost not covered by insurance for their implant-supported prostheses, all of the patients surveyed preferred their new restorations over the previously worn removable dentures.

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