



Oral Hygiene for Osseointegrated Implants

Thomas J. Balshi

Successful prosthodontic rehabilitation of the edentulous or partially edentulous patient with osseointegrated implants has been well established. Scientific and clinical documentation have demonstrated well the effective results of the biomechanical union between the titanium oxide of load carrying implants. The literature has been replete with numerous articles on the surgical and prosthodontic techniques as well as the basic biologic and physiologic aspects of osseointegration.

Recently, however, there has been an increased interest in the post prosthodontic maintenance of patients with tissue integrated reconstruction. Because the attachment mechanism between the osseointegrated implant and living bone is distinctly different from that of the natural dentition, there is increasing interest in the response of the peri-implant mucosa with regard to oral hygiene and specifically plaque and calculus control.

Meffert has stated that "a prerequisite for successful dental implant procedures today is controlling plaque which can compromise the perimucosal seal of the soft tissue to an endosseous implant." Lang takes the position that the soft tissue surrounding implants is characterized by structures which are similar to those encountered around

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4th Annual Meeting — Academy of Osseointegration

Multiplaner Reformatted CT Images of the Jaw — Alternate Systems to the Dentascan GE-9800

Charles Berman

Precision is necessary in the alignment of the patient's head so that the resulting multiplaner images are parallel to the plane of the intended implant. If the reformatted angle is 90 degrees from the axial cuts, the vertical plane of the gantry should be parallel to the mean plane of the alveolar process that is being evaluated. If the reformatted angle is greater or less than 90 degrees, as it is with some scanners, the technician will have to make modifications in the vertical angle of the reformatted image as it differs from 90 degrees.

Cases were demonstrated where the vertical plane or vertical angle of the gantry was not consistent with the mean plane of the alveolar process and where the angle of the reformatted image was 90

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Abutment Design in Partial Edentulous Cases

Steve Lewis

The development and utilization of osseointegrated implants over the past two decades has led to remarkable results in the treatment of edentulous patients. Professor P.I. Branemark and his colleagues have demonstrated high levels of success over extended periods of time in the treatment of this patient group. However, long-term studies in the treatment of partially edentulous patients are not available although some of the initial reports look promising. Application of this new biotechnology for partially edentulous patients requires the consideration of many complex interrelated factors. The surgical placement of the implant fixtures as well as the prosthodontic treatment are especially more demanding. In addition, the "Branemark" system was designed to

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Treatment Modalities for Peri-Implantitis — A Preliminary Study

S.A. Jovanovic; E.J. Richter; H. Spiekermann

Long-term success of dental implants has stimulated multidisciplinary interest in identifying factors which are associated with peri-implant health and disease. A critical feature that is common to all oral implant designs and material is the status of the soft tissue implant interface. In spite of a biological seal, crestal bone loss next to osseointegrated dental implants can occur. The etiology of this bone loss has varied, but falls into two categories: One deals with the biomechanical factors associated with load concentrations and the other deals with bacterial proliferation.

The preliminary findings show that the topography of bone loss around osseointegrated dental implants can be divided in five classes: 1) horizontal, 2) angular, 3) circumferential and angular, 4) horizontal and angular, and 5) circumferential, horizontal and angular.

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Insurance Reimbursement, Private and Medicare

Alan H. Kaye

"Dentistry" has been left out of the Medicare system since its inception and regardless of how you view it, thousands of seniors are unable to take advantage of dental care. This lack of dental treatment among the elderly is purely one of economics; the question is how to extend care to those who truly need it.

Approximately 15-25% of the estimated 45 million seniors in this country suffer from jaw atrophy and osteoporosis. In lay terms this means many people cannot chew and maintain an adequate diet. According to the Surgeon General's Report of July 1988, in 1979 1/6 of all accidental deaths in people over the age of 75 appeared to have been caused by poor or ill fitting replacement teeth.

In the past, Medicare always covered the "physicians" services when grafting the maxilla or mandible to help reverse atrophy. Recently, claims were being denied

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Paris World Congress on Implantology and Biomaterials

Results with the Branemark System

Magnus Jacobsson

The term osseointegration has been defined as living bone tissue in direct contact with a loaded implant surface at the light microscopic level. The following criteria have been put forward to define implant success: 1) when clinically tested every implant is immobile, 2) a radiograph must not show any signs of per-implant radiolucency, 3) the vertical bone loss should be less than 0.2 mm per year after the first postoperative year, 4) the function of the implant must be characterized neuropathies, paraesthesia or damage to the mandibular canal and 5) that in the context of the above mentioned criteria the implant survival rate should be no less than 85% over a five year period.

In an international multicenter study on the Branemark implants, the following results were obtained: Survival rate for mandibular implants: 5 full years-93% (195 implants), 3 full years-96% (1029 implants), 1 full year-97% (2520 implants). Survival rate for maxillary implants: 5 full years-100% (12 implants), 3 full years-89% (164 implants), 1 full year-91% (631 implants).

It is concluded that the Branemark implant system will function well over long periods of time as evidenced by several studies and that its use is a safe clinical procedure.

* Presented at the World Congress on Implantology and Biomaterials, Paris, France, March 1989.

Comparative Analysis of the Bone/Implant Interface by Microradiography and Polarized Light Microscopy

L.P. Garetto, W.E. Roberts

An index precisely defining mineralized tissue contact at the endosseous interface is important for accurate biomechanical evaluation of rigid osseous fixation ("osseointegration"). Branemark endosseous fixtures (13 x 3.75 mm) were implanted in mandibles of four adult dogs. After an 8 week unloaded healing phase, a 3 N continuous load was applied for 13 weeks. Implants with adjacent bone were fixed in 70% ethanol, embedded in plastic and cut into 100 um cross sections through the center of the implant. Central sections were microradiographed on Kodak High Resolution Spectroscopic Plates for 60 min. at 27 kvp. The interface adjacent to the lingual cortex was analyzed histomorphometrically at 100x by polarized light (P) and microradiographic (M) microscopic techniques. Using a linear

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Surgical Experiences with Branemark Implants in Partially Edentulous Cases—A Six Year Experience

Paul H.J. Krogh

The use of Branemark implants in fully edentulous jaws has been well established and documented. However, there is very little documented, written or published about the use of these implants in partially edentulous patients.

This report deals with over 400 consecutively placed fixtures in excess of 125 patients since October 1982. Over 150 prostheses have been in function on these implants from three months to five years. The success rate for individual implants is in excess of 90% and the bridge success rate is in excess of 97%. A statistical analysis of the experience was presented.

There was a discussion of the relationship of success rates to the position of implant placement in the jaws as well as surgical procedures to enhance the esthetics of the prosthesis. Esthetics are enhanced by: 1) proper fixture placement, 2) proper abutment length, 3) control of soft tissue, and 4) the use of porcelain. Experiences with connecting natural teeth and implants was discussed. Adjunctive surgical procedures which use implants in combination with orthognathic surgery and inferior alveolar nerve repositioning was also presented.

* Presented at the World Congress on Implantology and Biomaterials, Paris, France, March 1989.

Tissue Integrated Prostheses in Maxillofacial Rehabilitation

P-I Branemark

Prosthetic restoration of maxillofacial defects requires stable retention of the synthetic substitute for the original anatomy. Based on two decades of clinical experience of osseointegrated titanium anchorage elements in oral rehabilitation, components and procedures were developed for extraoral application.

Typical defect anatomy was identified, surgical and prosthetic procedures described and clinical cases reported in order to illustrate the structural and functional rehabilitation that can be achieved by providing mechanical stability for the maxillofacial prosthesis. Even cases with a combined intra and extraoral defect were included in the presentation.

Future trends in technical and methodological development were discussed as well as a rational clinical organization for tissue integrated prosthesis in craniofacial reconstruction.

* Presented at the World Congress on Implantology and Biomaterials, Paris, France, March 1989.

Biocompatibility Tests of Titanium Alloys in a Cell Culture System

K. Elagli, H.F. Hildebrand, J. Breme

Titanium and titanium alloys are more and more used for oral and orthopedic implants. Very little is known about toxic effects of titanium and its compounds in occupational medicine and alloys made on the basis of this metal are especially considered for their excellent performance in biocompatibility.

This investigation presented the effect of different titanium alloys on cell growth in a culture system using human epithelial lung cells (L132) because of their sensitivity to cytotoxic tests. Pure titanium seems to induce the best biological response in maintaining the highest survival rate. A difference of cell viability is noted depending on the thermal treatment of TiAl₆V₄.

Cells exposed to titanium powder are not affected after 48 hour incubation. The authors could not observe any modification of cell morphology and B-glucuronidase activity. Titanium particles are not phagocytized in contrast to other metals if they are industrial pure metal compounds.

* Presented at the World Congress on Implantology and Biomaterials, Paris, France, March 1989.

Diagnosis, Planning and Treatment Complications for Facial Esthetics and Osseointegrated Prosthesis

Thomas J. Balshi
Prosthodontics Intermedica, Institute for Facial Esthetics, USA

Diagnosis and treatment planning for potential osseointegration candidates must be based on a comprehensive understanding of the biomechanics of osseointegration. The formula for this success is based on the "team approach" of both medical and dental specialists. Non-clinical care in the area of cosmetology and hair styling are often considered a vital part of the facial esthetics team. Both intraoral and extraoral examinations are conducted. Audio and video tape recordings play an increasingly important role in phonetic evaluation. The psychological and social factors are studied in light of the patient's general psycho-social predisposition. Radiographic history plays an additionally important role in the comprehensive assessment of candidates for osseointegration. Computerized imaging can be used for patients requiring improved oral facial esthetics. Images can be altered to create projections showing the possible result of oral and facial treatment.

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Osseointegration Tidbit — Peridex — A Useful Agent in Therapy

Jack T. Krauser, D.M.D.
Palm Beach, Florida

Periodontal disease has long been associated with deposits of plaque on the teeth and for centuries oral hygiene procedures that remove plaque deposits have been recommended to keep the teeth and periodontium in good health. By definition osseointegrated implants do not have a soft tissue bone-implant interface or periodontal ligament. Nevertheless, inflammation and periodontal disease can compromise or even defeat implants. Consequently, prudent post-treatment care for osseointegrated cases should include aggressive plaque control, as well as mechanical, occlusal and technical check-ups for ideal case survival.

The use of chlorhexidine has been well studied in the periodontal literature and has been shown to be an extremely effective agent against inflammatory gingivitis and the retardation of supragingival plaque formation. Consequently, it has been widely utilized to help prevent gingival inflammation and bleeding which may progress to periodontitis. Chlorhexidine gluconate 0.12% (Peridex Oral Rinse) is considered to be a second generation antimicrobial by virtue of its anti-plaque effect and substantivity, which is long-term bacterial control by molecular binding to the oral surfaces in an ongoing manner.

Peridex has been shown to kill bacteria associated with gingival inflammation and bleeding after a 30-second rinse, with up to 100% reduction in aerobes, anaerobes, Streptococci and Actinomyces in vitro. In addition, the clinical use of Peridex has an excellent safety profile, and we have not seen any systemic adverse reactions or bacterial resistance or fungal

overgrowth. One potential negative aspect of the product is temporarily tooth discoloration. In some of our osseointegrated implant cases, we have seen golden-brown stain occurring on titanium abutments; however, this stain has been easily removed with routine prophylaxis measures.

Due to its excellent antimicrobial and disinfectant properties, we have incorporated Peridex use with our osseointegrated cases as follows: For a typical totally edentulous patient we use a regimen of: (1) one week prior to Stage I surgery, rinse one capful b.i.d. for 30 seconds (preferred time of rinsing includes after breakfast and before bedtime); (2) post-operative Stage I, one capful b.i.d. 30 seconds for 2-3 weeks; (3) stop use after tissues have healed while patient is in integration phase waiting for a Stage II uncovering; (4) pre-op Stage II, one week

prior to the second stage surgery follow regimen number one (#1); (5) post-operative Stage II, 2-4 weeks adjusted as per tissue healing around abutments; and (6) maintenance care—every third day rinse or apply Peridex to implant abutments with the use of a rotary brush.

For the partially edentulous patient, we are more concerned with the periodontal pathogens that may be associated with the teeth. These microbes could shed to the surgical sites and possibly cause adverse effect to our implantation. We therefore modified therapy by rinsing two weeks before the Stage I surgery, with the rest of the regimen remaining the same. This regimen has been extremely helpful in tissue health, wound healing and maintenance of our osseointegrated implant cases. We enthusiastically suggest ongoing study of chlorhexidine and its use in this manner.

The Microbiota Associated with Successful or Failing Osseointegrated Titanium Implants

A. Mombelli, M.A.C. Van Oosten,
E. Schurch, Jr., N.P. Lang

In this study the microbiota associated with oral endosteal titanium hollow cylinder implants (ITI) was studied using microscopic, immunochemical and cultural methods. Samples from 5 edentulous patients with successfully incorporated implants serving as abutments for overdentures for more than one year were compared with samples from 7 patients with clinically failing implants. Unsuccessful sites were characterized by pocket probing depths of 6 mm or more, suppuration and visible loss of alveolar bone around the implant as visualized on radiographs. These sites harbored a complex

microbiota with a large proportion of Gram-negative anaerobic rods. Black-pigmented Bacteroides and Fusobacterium spp. were regularly found. Spirochetes, fusiform bacteria as well as motile and curved rods were a common feature in the darkfield microscopic specimens of these sites. Control sites in the same patients harbored small amounts of bacteria. The predominant morphotype was coccoid cells. Spirochetes were not present, fusiform bacteria, motile and curved rods were found infrequently and in low numbers. The microbiota in control sites in unsuccessful patients and in sites in successful patients were very similar. On the basis of these results, it is suggested that "periimplantitis" be regarded as a site specific infection which yields many features in common with chronic adult periodontitis.

* *Oral Microbiol Immunol* 1987;2:145-151.

Case Study: Implant Supporting Fixed Appliance

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State University School of Dentistry

A prerequisite for success in dental implant procedures today is controlling plaque, which can compromise the perimucosal seal of the soft tissue to an endosseous dental implant. Many implantologists use the ADA-accepted chlorhexidine gluconate 0.12% rinse (Peridex Oral Rinse) to control plaque and maintain oral hygiene in the post-restorative phases of endosseous implants. Use of a chlorhexidine rinse by implant patients in their home hygiene regimens has resulted in more than a 90% reduction of the oral bacteria and has retained anti-plaque activity even after five hours from administration via a 30 second rinse.

This study illustrates the use of chlorhexidine gluconate for plaque control therapy in an endosseous implant patient. Initially, the patient had less than a 50% modified O'Leary index (more than 50% of tooth surfaces had plaque upon staining with disclosing agents). This clinician's protocol is that all endosseous implant surgery candidates must demonstrate a 90% modified O'Leary index, or more than 90% of the surfaces free of plaque.

In this case study, a 47 year old patient with co-existing gingivitis and moderate periodontitis required a functional and more aesthetic appliance to replace missing teeth in the mandibular arch, #23-28 inclusive, and treatment of moderate periodontal disease in molar segments. The treatment modality included: (1) periodontal surgical procedures; (2) oral hygiene counseling on brushing; (3) rinsing with chlorhexidine twice daily; and (4) reflection of the full mucoperiosteal flap in the continued on page 4

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mandibular interior segment, followed by placement of endosteal implants. Restorative procedures were performed three months post-implant placement, and continued use of chlorhexidine for plaque control was prescribed. The patient followed a two-step regimen for two years of: chlorhexidine rinsing and brushing with motorized brushes, and brushing with a tartar control dentifrice (Tartar Control Crest). This new focus on brushing to maintain the implants, reinforced by three month recalls, has significantly enhanced at-home oral hygiene motivation and effectiveness, reversing previously poor plaque control and resulting in excellent tissue health and maintenance of

implants and natural dentition. Since superstructures placed on endosseous implants are less than normal in terms of relationship to the soft tissues, keep in mind that any hygiene technique or armamentarium must be modified and demonstrated once the prosthesis is in place.

In the clinician's opinion, the use of Peridex during the post-surgical and post-restoration phases reduced the risk of gingival inflammation and infection around the neck of the implant. Further, chlorhexidine use promoted the successful outcome of the therapy, treatment, restoration and maintenance of the endosseous implants, despite the patient's history of periodontal disease.

Chlorhexidine in the Maintenance of Dental Implants

Niklaus P. Lang

In evaluating the healing processes during the tissue integration of dental implants three different levels may be of interest:

- 1) Osseointegration or functional ankylosis predictably occurs with several implant systems (Branemark, ITI Bonafit, IMZ, etc.). This is characterized by a close adaptation of bone cells on biologically inert materials such as titanium or titanium plasma.
- 2) The supracrestal fibers "adhere to" or run parallel to the long axis of the implant. This densely packed connective tissue collar forms a seal around the implant similar to that of a natural tooth.
- 3) An epithelial attachment of junctional epithelium mediated by hemidesmosomes and a basement membrane has also been suggested for implant abutments (Gould et al. 1984).

Obviously, the soft tissue integration around dental implants is characterized by structures which are quite similar to those encountered around natural teeth. Experimental studies (Brandes et al. 1988) have established that the pathogenesis of "periimplantitis" is also similar to that of periodontitis. Hence, most of the implant failures must be bacterial in nature. Cross-sectional studies on the subgingival microbiota of clinically successful or failing implants have demonstrated that "periimplantitis" has to be regarded as a site specific infection which is characterized by a Gram-negative anaerobic microbiota commonly seen in chronic adult periodontitis (Mombelli et al. 1987). Furthermore, the colonization of newly integrated implants with microorganisms from the surrounding oral environment appears to follow a sequence similar to

that demonstrated on teeth (Mombelli et al. 1988). Potentially pathogenic microorganisms may also be found in low percentages in the subgingival area around dental implants. The fact that periodontopathogenic microorganisms may be recovered from healthy sites around dental implants supports the concept of an opportunistic infection of the development of "periimplantitis."

From a preventive point of view, optimal and regular plaque control is a prerequisite for the long-term success of dental implants. Only with meticulous plaque control can late failures ("periimplantitis") of osseointegrated implants be prevented. In order to keep the integrity of the periimplant soft tissue collar in a healthy state, chemical plaque control is an ideal adjunct for maintenance care. Since it has recently been shown that the use of 0.12% chlorhexidine rinses was clinically as well as histologically efficient in maintaining healthy gingival tissues (Brex et al. 1989), this antimicrobial agent should be used on a regular basis in patients with dental implants. Other antiseptics have been shown to be significantly less effective than 0.12% chlorhexidine in controlling gingival inflammation and bleeding (Lang & Brex 1986) and hence, cannot be expected to result in optimal maintenance care of dental implants.

A Multicenter Report on Oral Implants

T. Albrektsson

The results of 3,683 consecutively placed Nobelpharma dental implants at 11 treatment centers in Europe, North America, and Australia were compared with the results of 317 implants placed at the University of Gothenburg in Sweden. The 11 centers reported success rates of 97.38% for mandibular implants over 3 years and 92.82% over 5 years. Maxillary implant success rates were reported as 90.97% for 1 year, 89.02% for 3 years and

Histological and Clinical Parameters of Human Gingiva Following 3 Weeks of Chemical (Chlorhexidine) or Mechanical Plaque Control

M.C. Brex, T. Liechtl, J. Widmer, P. Gehr, N.P. Lang

The aim of the present study was to compare steriologically the histopathologic variations following 3 weeks of chemical (chlorhexidine) or mechanical plaque control. Eighteen students and dental hygienists volunteered for this investigation. After prophylaxis, they performed optimal oral hygiene to reach mean plaque and gingival indices approaching 0. Six of them then performed mechanical plaque control of 3 weeks (control), while the other 12 rinsed 3 times daily with a 0.12% chlorhexidine solution (test).

At days 0 and 21, the plaque index (PII), the gingival index (GI) and the gingival exudate flow rate (GEFR) were assessed and biopsies were obtained from buccal sites. Point-counting procedures were performed at 2 different levels of magnification on light microscopic sections to estimate the volume fractions of epithelium, infiltrated and non-infiltrated connective tissue, and collagen. The relative numbers of fibroblasts, polymorphonuclear neutrophils, lymphocytes, plasma cells, macrophages and mast cells were estimated by counting the number of nuclear profiles of these cells in a specific connective tissue area adjacent to the apical termination of the junctional epithelium.

After 21 days, the PII's of the test subjects were significantly higher than the PII's of the controls, but their GI were similar. At the end of the experimental period, the various volume fractions and %'s of cell profiles remained stable with the exception of an increase in the %'s of lymphocytes in the test group. This study has shown that clinically as well as histologically, the daily use of chlorhexidine for a 3 week period is equally efficient as optimal mechanical tooth cleaning in maintaining a healthy gingiva in the buccal sites investigated.

* *J. Clin. Periodontol* 1989;16:150-155.

100% for 5 years (12 implants only). It was further reported that 99.7% of the patients had stable mandibular implant prostheses over 1 to 8 years and 96.1% had stable maxillary prostheses over 1 to 6 years. Implants placed in grafted or irradiated bone were comparably successful, except for implants placed in grafted maxillary bone, which were only 66% successful. These results were similar to the results obtained at the University of Gothenburg and further validate the results reported by Branemark (GERROW).

* *J. Prosthetic Dentistry* 1988;60:75-84.

Dr. Gerald J. O'Keefe Joins Prosthodontics Intermedica

Thomas J. Balshi, D.D.S., F.A.C.P., Charles F. Hertzog, D.M.D., and the staff of Prosthodontics Intermedica are pleased to announce that Gerald J. O'Keefe, D.M.D. has joined their practice in Fort Washington, Pennsylvania for the treatment of patients requiring maxillo-facial prostheses as well as general prosthodontics.

Dr. O'Keefe is a 1972 graduate of Temple University School of Dentistry and in 1974 completed his postgraduate training in Maxillofacial Prosthetics at Temple University. Dr. O'Keefe served in the army from 1974 to 1976 as a prosthodontist and as a consultant to the Cleft Palate Rehabilitation Center at the Walter Reed Army Medical Center. In addition to his private specialty practice in Fort Washington, he will maintain an affiliation with both Pennsylvania Hospital and Hahnemann Medical College and Hospital. As part of Dr. O'Keefe's continuing community service, he treats bed-confined patients living within the Delaware Valley.

Dr. O'Keefe's contribution to the staff will provide restoration of facial aesthetics for our patients. We are honored to have Dr. O'Keefe join the Prosthodontics Intermedica team.

Diagnosis

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It is the *combined* analysis of all information that leads to the development of a comprehensive tentative sequential treatment plan and minimizes complications for facial esthetics and osseointegrated prosthesis. In addition, a classification for potential treatment complications has been established.

* Presented at the World Congress on Implantology and Biomaterials, Paris, France, March 1989.

Insurance

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simply because the surgery was performed by a dentist, not because the reconstructive procedure was inappropriate. Upon appeal, hearing officers overturned the denial in favor of the medical necessity of the reconstruction but after a few months, the same hearing officers reversed their opinion and upheld the Medicare denial. Suggestions were made to appeal to Washington.

After four years, Senate Bill 2924 was introduced into the United States Senate. This bill is designed to limit the broad application of the "dental exclusionary act" so jawbone reconstruction, when atrophy and medical needs exist, would be covered under Medicare. The exclusionary act is the portion of Medicare law that states: "work upon the gingiva, teeth, periodontal ligament or alveolar

Oral Hygiene

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natural teeth. The term peri-implantitis has been coined to describe the inflammatory process produced by pathogens effecting the mucosal tissues surrounding implants. In studies conducted by Mombelli, bacterial colonization on osseointegrated implants appeared to be similar to that found on the natural dentition.

Recognizing peri-implantitis as a defined disease entity, Jonacovic identifies the etiologic factors which fall into two categories; the biomechanical factors relative to load concentrations and other factors related to bacteria proliferation. With a focus on peri-implantitis, clinicians throughout the world now recognize the importance of oral hygiene maintenance. These maintenance procedures will range from simple plaque control procedures and home physiotherapy by the patient to surgical intervention in an effort to correct chronic problems. In that regard, the experience of our Fort Washington team has demonstrated very little need for post treatment surgical intervention. A strong oral hygiene maintenance program, however, is mandatory. This includes a predetermined schedule of hygiene visits with greater frequency during the first two years following prosthesis completion in order to establish patient hygiene habit patterns.

Maintenance therapy implements the use of specially designed polish bristle brushes, plastic scaling devices designed to fit the circumference of the titanium implant and avoid scratching the machined surfaces. Other mechanical methods such as interfxtural brushing and flossing techniques not only physically remove plaque but also aid in stimulating the mucosal tissues. In more recent years, the use of chemical plaque inhibitors, particularly chlorhexidine, has been widely prescribed for patients immediately following the abutment connection surgery and then continued after final prosthesis delivery.

bone is excluded from payment under the system, also the care, treatment, filling, removal, or replacement of teeth or structures directly supporting teeth are not covered."

The ADA has given its full support to Senate Bill 2924 as well as specialty organizations. Individual support from prosthodontists and surgeons is needed as well as petition from patients and their family physicians. This bill may be passed by the 101st Congress and all those who truly need our help will be able to avail themselves of it. When the bill is reintroduced into the 101st Congress, the number will change. The new number will be published as soon as it is available.

* Academy of Osseointegration 4th Annual Meeting, Dallas, Texas, February 1989.

Recognizing the effect of peri-implantitis and gingivitis on bone loss is a strong motivating factor for oral hygiene maintenance. A great majority of patients who suffered the loss of their dentition through periodontitis, if given a second chance with osseointegrated implants, become avid oral physiotherapists and follow closely the recommended plaque control procedures.

An overwhelming majority of patients have responded very favorably to this strong oral hygiene maintenance program. The end result has been favorable maintenance of bone level surrounding the osseointegrated implants and firm healthy mucosal tissues.

Educating patients to the relationship of perfect oral hygiene to implant success and longevity is a required part of the treatment plan and a serious responsibility of each practitioner participating in the process of osseointegrated implant reconstruction.

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Surgical-Prosthodontic Reconstruction of Oronasal Defects Utilizing the Tissue-Integrated Prosthesis

D.E. Tolman, R.P. Desjardins,
E.E. Keller (Mayo Clinic)

The closure of large congenital or postsurgical oronasal defects is a challenging problem for both the surgeon and the prosthodontist. Closure of the defect, whether it be by soft tissue or in combination with a bone graft, may reduce the potential for prosthesis extension and retention. This article describes the surgical-prosthodontic treatment for three patients utilizing the placement of titanium fixtures to support the prosthesis. Treatment sequence, surgical procedure and follow-up results are described.

Prostheses were first used to rehabilitate patients with palatal defects. Early literature implies that Ambroise Pare may have used artificial closure of palatal defects in the 1500's. Documented evidence of artificial soft palate closure was not reported until 1800, however, and Snell was credited with fabrication of the first speech-aid prosthesis.

Movable, fixed, and meatus obturators have historically been suggested for pharyngeal obturators. Palatal coverage alone without an obturator has often been sufficient in rehabilitating palatal and alveolar defects. Even though prostheses have been remarkably successful in restoring the physiology of the oronasopharyngeal complex, they create an environment that encourages problems with other oral structures.

CT Images

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degrees. Other cases were demonstrated where the angle of the reformatted image was significantly less than 90 degrees. In both cases, this resulted in elongated images which were distorted from the true length by 3 and 6 mm.

* Academy of Osseointegration 4th Annual Meeting, Dallas, Texas, February 1989.

Treatment Modalities

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Therapeutical intervention of the five different defects consisted of a surgical approach which depended on the bony defect. These interventions included flap management, granulation tissue removal, osseous and implant recontouring, implant cleaning by prophy-jet, application of detoxifying agent, suturing and periodontal dressing.

The preliminary results demonstrated a significant decrease in Gingivitis index, bleeding probing, crevicular fluid flow and probing depth.

* Academy of Osseointegration 4th Annual Meeting, Dallas, February 1989.

With the improvement in surgical and surgical-orthodontic techniques, the role of the prosthodontist has been reduced in recent years. Ideal cleft lip and palate management would eliminate the prosthodontist from patient needs. Nevertheless, there exist congenital and acquired palatal defects for which prosthodontic management is the treatment of choice. In addition, there are other defects for which a combined surgical-prosthodontic treatment approach will provide the optimal rehabilitative experience for the patient. It is with an awareness of these patients that this article is written.

In managing 209 patients with tissue-integrated prostheses at the Mayo Clinic, three in which a large oronasal defect was present were treated. All three had successful closure of the defect, one with bone graft.

The closure of large congenital or post-surgical oronasal defects is a challenging problem for both the surgeon and the prosthodontist. If the defect is obturated by utilizing a removable denture prosthesis, there is an opportunity to gain retention from engagement of the defect by the prosthesis. However, the additional bulk and weight of the prosthesis may be counterproductive and create additional problems. If a removable prosthesis is unstable, increased stress will be transmitted to the residual ridge and remaining natural teeth that may jeopardize the long-term prognosis for the patient.

When an alveolar defect is closed surgically, opportunities for removable prosthesis retention may be decreased.

Comparative Analysis

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intercept method, the results indicated: that polarized light and microradiographic analysis were equally capable of determining when bone was more than 50 μm from the implant surface ($P = 30.6 + 8.9$ vs. $M = 30.2 + 7.9$ percent; mean + SE). However, when bone was closer than 50 μm to the implant surface, polarized light microscopic analysis: 1. overestimated the proportion of bone in direct contact with the implant ($P = 55.6 + 7.0$ vs. $M = 32.8 + 3.5$ percent; $p < 0.05$) and 2. underestimated the amount of bone that was near ($< 50 \mu\text{m}$) but not in direct contact with the implant ($P = 13.8 + 3.61$ vs. $M = 37.0 + 4.90$ percent; $p < 0.05$). Direct osseous contact was defined as no resolvable radiolucency between the implant and adjacent bone at 100x magnification. These data suggest that high resolution microradiographic analysis is a more reliable index of osseous contact than polarized light microscopy.

* Presented at the World Congress on Implantology and Biomaterials, Paris, France, March 1989.

Surgical closure with a bone graft and soft tissue advancement may further reduce the potential for prosthesis extension and retention with obliteration of the sulcus.

Utilization of a tissue-integrated prosthesis following surgical bony or soft tissue closure of these defects has provided both an excellent functional and esthetic result. In addition, placement of titanium fixtures to secure bone grafts to the residual maxilla in patients with inadequate bone provides both fixation for the bone graft in the immediate postoperative period and later provides support for the definitive prosthesis.

* *International Journal of Oral and Maxillofacial Surgery* Volume 3, No. 1, 1988.

Abutment Design

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fabricate fixed restorations for edentulous patients. When using the components in the restoration of partially edentulous patients several problems arise. First, adequate interocclusal distance between the abutment cylinder and the opposing occlusion may be lacking. Also, the exposure of the abutment cylinder as it emerges above the gingival crest may be esthetically displeasing, and finally, it may be difficult to develop ideal contours in the definitive restoration with the conventional components.

A solution to these difficulties was to fabricate the restoration directly to the implant fixture, bypassing the transmucosal abutment cylinder. By incorporating a prefabricated plastic cylinder, the "UCLA" abutment, into the wax pattern, the final cast restoration connects to the implant fixture with the use of the titanium screw. Microscopic evaluation of this implant-restoration junction reveals marginal discrepancies of 4-8 microns, well within the limits of conventional implant components.

Advantages of eliminating the transmucosal abutment cylinder include additional interocclusal working space as well as the ability to create more gradual and natural appearing emergence profiles of the restoration. Additionally, porcelain can be brought subgingivally allowing for the fabrication of exceptionally esthetic anterior restorations.

By incorporating a hexagon at the base of the "UCLA" abutment which matches the hexagon on top of the implant fixture, single tooth restorations can also be fabricated directly to the implant fixture.

A consideration of this technique is that the master cast must contain an implant fixture analogue rather than a brass abutment cylinder analogue.

* Academy of Osseointegration 4th Annual Meeting, Dallas, Texas, February 1989