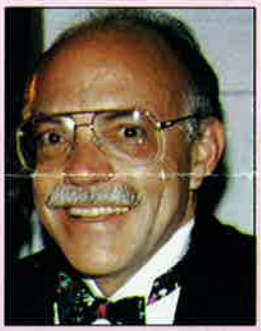
Vol 6., No. 1 March 1993

PROSTHODONTIC Insights

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



Multidisciplinary Approach to Implant Prosthodontic Rehabilitation

Thomas J. Balshi, DDS, FACP

Patients who suffer from skeletal abnormality and severe malocclusion often require a multidisciplinary approach to rehabilitation. This approach can be significantly complicated when advanced periodontal disease is present. The treatment planning sequence is critically essential to minimize the treatment time and obtain optimal results. Advanced periodontitis must be treated in the first stage of therapy. Once a level of periodontal stability is obtained, presurgical orthodontic treatment can be initiated.

Bone grafting in the maxilla can be accomplished simultaneously with orthognathic surgery, particularly if a LeForte osteotomy is performed. Titanium implants can be placed concurrent with autogenous grafting during these procedures.

Once osseointegration has been accomplished, the post surgical orthodontic refinement can take advantage of stable fixture retained provisional restorations. The final implant supported prosthesis will complete the occlusal scheme developed in the last stage of orthodontic treatment.

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A study of 589 consecutive implants supporting complete fixed prostheses. Part II: Prosthetic aspects

I.Naert, M.Quirynen, D. van Steenberghe, and P. Darius

From November 1982 to September 1989, 91 consecutive edentulous patients were treated with complete fixed prostheses supported by Branemark implants (n=589). Five hundred eighty-nine fixtures were inserted in 45 maxillae and 58 mandibles. The mean loading time (the time between abutment installation and the last follow-up visit) for the fixtures in the maxilla and mandible were 32 (range 6 to 80) and 38 months (range 5 to 83), respectively.

The absolute success rates of the prostheses were 96% and 100% for the maxilla and mandible respectively. The criteria for prosthesis failure used in this study was much more strict than those of other studies in which failure of an OIP was considered only when the patient had to revert to a complete denture.

After installation of the OIP, 3% and 1.3% of the fixtures were lost in the maxilla and mandibles, respectively. Fixture loss after installation of the OIP was concentrated during the first and second year of loading, which probably indicates overload during function or *parafunctional activity.* **Seven of the nine fixtures that failed after one year of loading were end abutments**

Marginal bone loss in OIP concentrates around medially located fixtures where tension forces exist, however, compression forces provoked on distal fixtures can also lead to overload and fixture failure. For two of the failing fixtures, no contact in maximal occlusion between the anterior region and the cantilever region was observed. For the other seven, overload resulting from parafunctional habits, such as clenching and bruxing, seemed the most probable explanation for loss. *Shorter cantilevers, optimal spreading of the fixtures along the arch, maximal fixture length, and a night-guard should be prerequisites to maintain optimal OIP stability in patients with parafunctional habits.*

Fractures of fixtures (0.5%) and abutment screws (0.8%) were few and were not due to inherent features of the fixtures or screws but to external factors, such as noncompliance with instructions. Also the percentage of gold screw fractures was low.

The following guidelines may be appropriate in order to limit implant component fractures and to load the fixtures within physiologic limits.

1. An optimal passive fit of the framework on top of the abutments and optimal occlusion and articulation design.
2. The gold screws should be tightened up to a calibrated maximal preload (10 N/cm) during installation of the OIP and at regular intervals.
3. Shorter cantilevers are advised to reduce lever forces when fixtures are installed in a straight line.
4. When posterior two unit cantilevers are included in the restoration, the second cantilever unit should be infraoccluded (0.1mm) to reduce strain and stress, and thus reduce the risks of fatigue and technical failure.
5. Regular examination, and detection and correction of changes in the

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An example of a treatment plan requiring such a multi-disciplinary approach follows.

The diagnosis was for an otherwise healthy 37 year old white female who was referred for the treatment of severe maxillary dysplasia and mandibular hyperplasia. Symptoms associated with this condition included impaired nasal airway flow, impaired mastication due to the severe malocclusion, and obvious clinical mid-facial deficiency. Clinical (figure 1A and 1B) and radiographic (figure 2A and 2B) examination confirmed a skeletal open bite deformity, maxillary and midfacial deficiency combined with transverse maxillary deficiency (figure 3). Advanced periodontitis was noted in the maxillary posterior with moderate periodontitis in other areas.

The following comprehensive treatment plan was developed and the therapy carried out over a two year period.

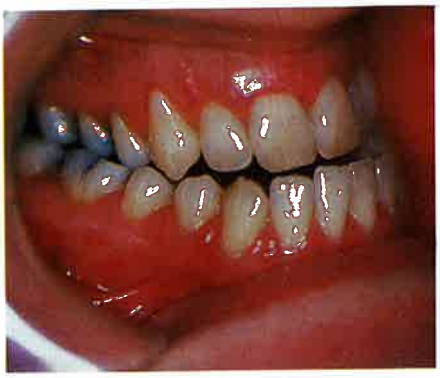

Figure 1A: Preoperative centric relation position, right side view.

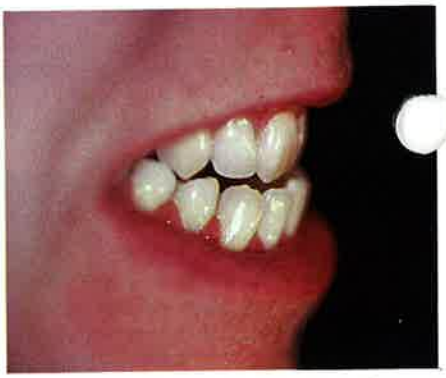

Figure 1B: Profile view showing prognathic position in centric relation.

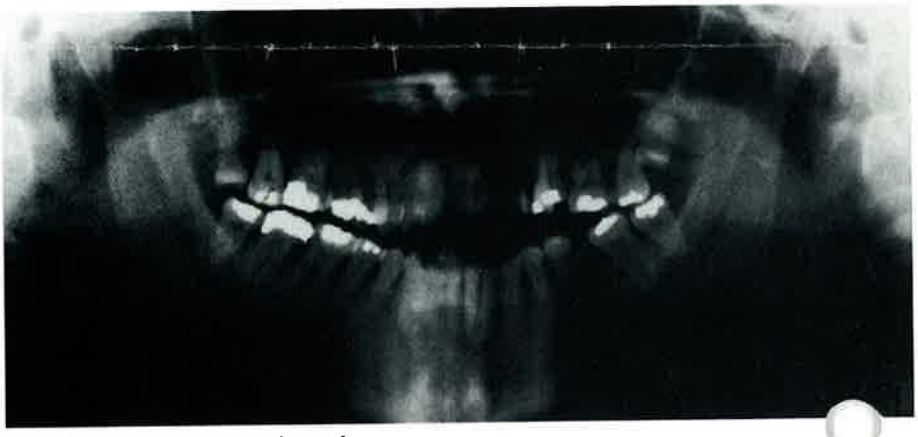

Figure 2A: Preoperative panradiograph

Multidisciplinary Treatment For Oral Facial Rehabilitation

Phase I

*Initial periodontal therapy.
*Removal of all periodontally hopeless teeth.
*Presurgical orthodontics.
*Surgical orthognathics and implant placement.

- Mandibular osteotomies
- Preparation of fixture sites in the maxillary posterior alveolar ridge
- Simultaneous harvesting of two unicortical grafts from left hip (20mm x 8mm x 10 mm)
- LeFort osteotomies with 5mm advancement of the maxilla
- Maxillary midline splint, posterior maxilla widened 5 mm with bone block placed.
- 6 Branemark fixtures (3 each side) to stabilize bone grafts in the sinuses.
- Cancellous bone used to fill voids.
- Occlusal splint to orient segments.
- 23 gauge stainless steel orbital suspension wires for anterior stabilization and 2 Titanium bone plates to maintain anterior maxilla vertical dimension.
- Iliac crest bone placed into lateral maxillary defects.
- Mandibular segments stabilized (fixations wires) against maxillary splint.
- Semi rigid titanium fixation plates with 12 screws to stabilize mandibular segments.
- Maxillary to mandibular fixation removed and occlusion verified.

Phase II

- Continued periodontal therapy.
- Stage II osseointegration - abutment connection.
- Conversion prosthesis.
- Continued orthodontic treatment using osseointegrated implants for anchorage.
- Evaluation of occlusion and adjustment following completion of orthodontics.
- Periodontal reevaluation. Removal of hopeless #20.
- 2 Branemark titanium fixtures placed in area of #'s 19 & 20.
- Stage II osseointegration in area of #'s 19 & 20 with conversion prosthesis.

Phase III - The Final Restoration

- Maxillary right and left posterior porcelain/gold TIP, screw retained.
- Mandibular left posterior porcelain/gold TIP, screw retained.
- Post-treatment radiographic evaluation

Phase IV - Maintenance & Disease Control

- Oral hygiene scheduled at 3 month intervals for 2 years, checking screw tightness.
- Maintenance treatment decreased to 4 month intervals at 3rd year.
- Annual radiographic reevaluation of implant prosthesis.

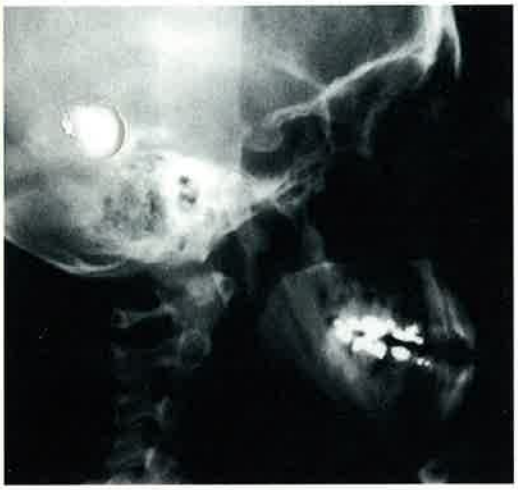

Figure 2B: Preoperative lateral cephalometric film illustrating the retrusion of the maxilla and prognathic position of the mandible.

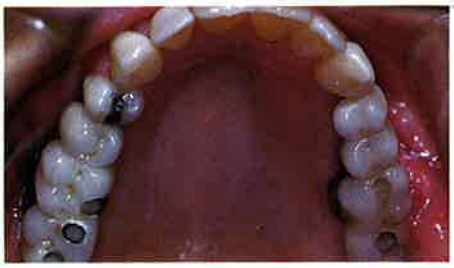

Figure 3: Postoperative occlusal view of the maxillary arch.

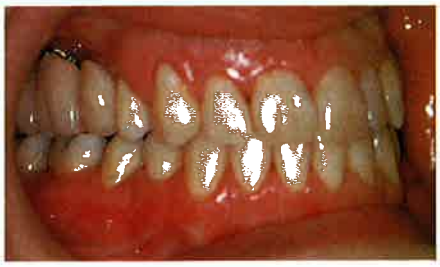

Figure 4: Postoperative centric relation following orthodontics, orthognathic surgery, and implant reconstruction of the posterior occlusion.

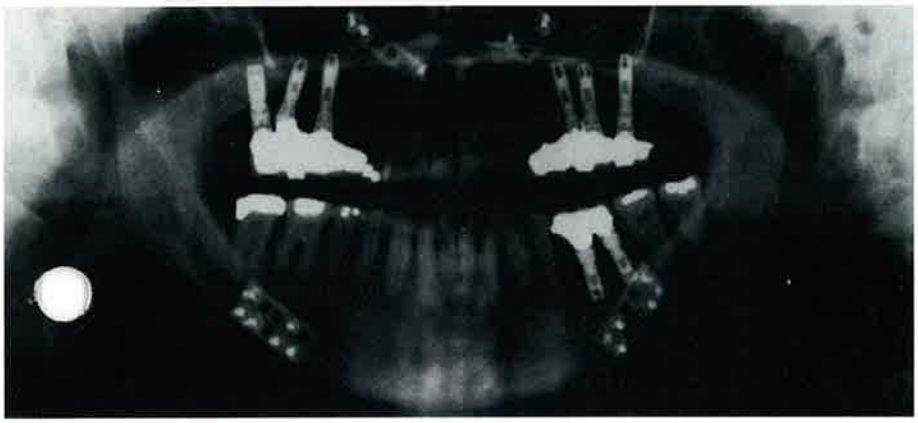

Figure 5A: Postoperative panradiograph following maxillary posterior osseointegration reconstruction and maxillary and mandibular orthognathic surgery.

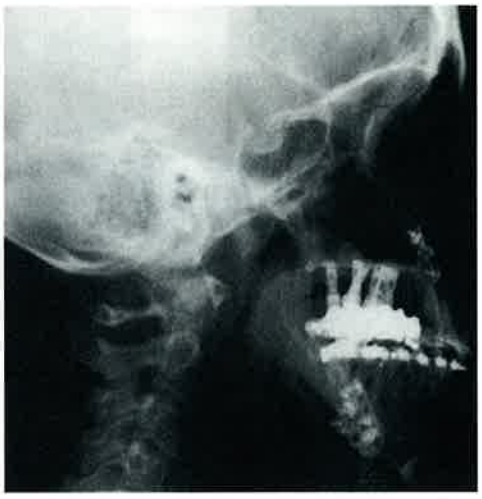

Figure 5B: Postoperative lateral Cephalometric radiograph following orthognathic repositioning of the maxilla and mandible.

Summary: The results of a multidisciplinary approach to oral facial rehabilitation, including orthodontics, periodontics, orthognathics, and implant prosthodontics (figure 4), can provide patients with significant improvement in oral function and facial esthetics, and substantially enhance their self esteem. The use of Branemark implants, even with bone grafts, are extremely effective as orthodontic anchorage units (figure 5A and 5B) and can serve well as segmental nonremovable tooth replacements.

Burning Mouth Syndrome: A possible etiologic role for local contact hypersensitivity

R.O.G.M. Dutree-Meulenberg et al

Complaints of a burning sensation and/or pain in the oral mucosa and/or the tongue in the absence of any evidence of any other specific disease is known as the burning mouth syndrome (BMS). The pathogenesis of the burning mouth syndrome is not yet understood. Apart from psychologic factors, several etiologic "somatic" factors have been reported. Frequently, the symptoms arise after dental intervention and the majority of patients wear dental prostheses. The disease occurs most commonly in perimenopausal or postmenopausal women. A mild erythema of the oral mucosae is sometimes observed, but no characteristic histo-pathologic features are present. Twenty-two patients were studied to determine the relevance of suspected etiologic factors with particular emphasis on hypersensitivity to dental prostheses and certain spices.

Nineteen women and three men with a mean age of 56.3 years were investigated. Besides clinical and laboratory investigations, patch testing was performed with a standard routine series and a standardized denture-dental (acry

(Continued on page 6.)

"Losses of Osseointegrated implants, an analysis of causes"

Mats Hallman

This retrospective study shows a fixture loss of 10 % in the maxilla and 1 % in the mandible. The study was short (1-5 years), but results correspond well with another study performed at a university clinic (Gunne J, Kahnberg KE and Åstrand P. "Loss of Osseointegrated Implants, Tandlakartidningen 1988; 429-36.)

The radiological quality and quantity of the bone was of some importance for the fixture losses experienced in this study. However, more losses would have been expected in cases with the poorest bone quantity/quality. The 7 mm fixtures were lost more frequently than other fixture lengths (15 of all inserted 7 mm implants were lost).

Patients who lost fixtures in the maxilla were interviewed about their smoking habits. **It was found that 50 % of the heavy smokers** (more than 15 cigarettes/day) **had lost fixtures**. Among the nonsmokers, only 20 % lost fixtures in the maxilla.

Only in 2 of the patients that had fixtures installed was it nesessary to go back to conventional prosthetic therapy due to fixture loss(es). One of the 2 was a bruxist and the other was a heavy smoker, which is considered to be a contributing factor to the loss of fixtures.

Table:

Loss of osseointegration as related to patient's smoking habits.

(+) = smokers who have lost fixtures
(-) = smokers who have had no fixture loss.
\+ = non-smokers who have lost fixtures
\- = non-smokers who have had no fixture loss.
(-)* = smokers who have had no fixture loss but other complications.

Non-Smokers	Smokers		
n=20	n=14 (3-14/day)	n=8 (15-24/day)	n=6 (25-34)
+	(+)	(+)	(+)
+	(+)	(+)	(+)
+	(-)	(-)	(-)
+	(-)	(-)	(+)
-	(-)	(-)	(-)*
-	(-)	(-)	(-)*
-	(-)	(-)	
-	(-)		
-	(-)		
-	(-)		
-	(-)		
-	(-)		
-	(-)		
-			

Tandlakartidiningen #5 1990

A study of...

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occlusal pattern caused by wear, especially at the cantilever parts, is essential.

Because the stress concentrations provoked by a misfit of a framework or due to parafunctional activity may be responsible for overload and subsequent bone loss, every preventive measure should be taken to minimize those stress concentrations.

Patients with fixture supported fixed prostheses in both jaws showed significantly more marginal bone loss than those with only one fixed prosthesis opposed by either natural dentition (50%) or a complete denture (50%). Neither the fixture location nor the cantilever length revealed a significant difference in marginal bone loss around the supporting fixtures. Component complications were limited to fixture fracture (3/564), abutment screw fracture (5/564), and gold screw fracture (7/564).

The results of this study confirm the predictability of Branemark implants in the treatment of complete edentulism. Fixture location, occlusal design, and fixed prostheses in both jaws influence prosthetic and implant complications. Care should be taken to design the superstructures so that loaded fixtures are within physiologic limits.

J Prosthet Dent 1992;68:949-56

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Training of the Oral and Maxillofacial Surgeon in Implantology

D.M. Laskin

The purpose of this study is to evaluate the didactic and clinical training provided to residents in oral and maxillofacial surgery programs and to compare these data with that reported for postgraduate trainees in other dental specialties involved in implantology.

Residents in 97% of the responding programs had experience in the placement of implants, each having placed an average of 26 implants (SD, +/-20.7; range, 5-100). The Branemark system (Nobelpharma USA, Chicago, IL) was the most commonly used (80%), followed by IMZ (Interpore International, Irvine, CA)(41%), Integral (Calcitek, Carlsbad, CA)(38%), and CoreVent (Dentsply, Encino, CA)(36%). Fifty-nine percent of the programs placed transosseous implants, but only 14% used subperiosteal implants. Restoration of the implants was done by prosthodontists in 66% of the oral and maxillofacial surgery programs, by staff dentists in 22%, by the general practice residents in 17%, and by private dentists in 8%.

A recent survey in predoctoral programs indicated that implantology was being taught in only 65% of the responding schools. At the post-doctoral level, implant dentistry was being taught in 85% of the specialty programs in prosthodontics, in 53% of those in periodontics, and in 68% of those in oral and maxillofacial surgery. Only 24% of the school based postdoctoral programs surveyed provided between 13 and 18 lecture hours in implantology, and only 15% offered greater than 18 hours. An average of 23 hours of lectures and/or seminars was reported by the school- and hospital-based oral and maxillofacial surgery programs.

In terms of clinical involvement, only 50% of the postgraduate programs provided experience in implant surgery, whereas, 97% of the oral and maxillofacial surgery programs provided such experience.

As implantology increasingly becomes an accepted part of routine dental treatment, extensive training in this area will have to become a standard part of all residency programs.

J Oral Maxillofacial Surgery, 50:601-602, 1992

Transmission of human immunodeficiency virus Type 1 from a seronegative organ and tissue donor

R.J. Simonds et al

Although rare, transmission of HIV-1 by seronegative organ and tissue donors can occur. In 1991, a woman whose only risk factor for HIV-1 infection was the receipt of a bone allograft in December 1985 was identified by the health department in her state as being infected. Subsequent investigation revealed that the donor was a 22 year old HIV-1 seronegative man who died after being shot in the head in October 1985. He had no known risk factors for HIV-1 infection. The donor probably had an early stage of HIV-1 infection, since no detectable HIV-1 antibody had developed by the time of his death.

Four solid organs and 54 other tissues had been distributed from the donor. Seven of the recipients were infected with HIV-1. This article describes the investigation, provides evidence of HIV-1 infection in the seronegative donor and the seven recipients of unprocessed organs or tissues, and documents the absence of transmission of HIV-1 to recipients of other tissues processed in various ways.

Of 58 tissues and organs obtained from the donor, 52 could be accounted for by the hospitals that received them. Of the 48 identified recipients, 41 were tested for HIV-1 antibody. All four recipients of organs and all three recipients of unprocessed fresh-frozen bone were infected with HIV-1. One died and three were alive at the most recent follow-up.

However, 34 recipients of other tissues - 2 receiving corneas, 3 receiving lyophilized soft tissue, 25 receiving ethanol-treated bone, 3 receiving dura mater treated with gamma radiation, and receiving marrow-evacuated, fresh-frozen bone tested negative for HIV-l antibody. Despite immunosuppressive chemotherapy, HIV-1 antibody appeared between 26 and 54 days after transplantation in the three organ recipients who survived more than 4 weeks.

The risk of HIV-1 transmission from a seronegative tissue donor may be reduced by quarantining tissue grafts until a subsequent negative HIV-1 antibody test confirms that the donor was not infected at the time of tissue removal. Such a quarantine is practical only for certain tissues from living donors that can be preserved for three to six months. The practice has been recommended for donors of bone and semen.

Improvements in the methods used to screen donors for HIV-1, advances in techniques of virus inactivation, prompt reporting of HIV infection in recipients, and accurate accounting of distributed allografts would help to reduce further this already exceedingly low risk. The Public Health Service is currently revising its guidelines for the prevention of HIV transmission by transplantation and is considering whether to expand federal regulation of organ and tissue transplantation.

New England J Medicine 1992;326:726-32

HA-Coated dental implants: Long-term consequences

BW Johnson

Hydroxylapatite (HA) coated root form endosseous dental implants were introduced in 1984. Early reports suggested an affinity of bone tissue for HA, resulting in the more rapid formation of a stronger bone-implant interface. This report explores the issues relevant to long-term maintenance of the HA-coated dental implant. A clinical hypothesis is developed that the HA coating is unstable and susceptible to bacterial infection.

Human bone bonds differently to different implant materials. The bond to titanium is a highly stable bioadhesive bond mediated by stable van der Waal's forces. Bone forms a bioreactive bond to HA. This bioreactive bond is mediated by a continuous ion exchange which is biologically unstable because of this continuous exchange. Two conditions are necessary for the coating to succeed: 1) it must adhere to the metal core; 2) it must not dissolve. A biochemical dilemma exists since the requirements of a strong bond to the core also increases exposure to dissolution.

Gottlander and Albrektsson compared bone to implant contact at six weeks and at 12 months with HA coated and commercially pure titanium implants showing a superior bone to HA contact at six weeks. At 12 months the percentage bone to implant contact was significantly higher in the titanium implant system (75% Ti to 53% HA). HA coated implants showed a marked decrease in bone contact. In a study by Krauser et al, HA was shown to have an affinity for the adherence of microorganisms. Rams suggested that rough HA surface may enhance plaque growth and predispose for periimplantitis. Therefore, the HA coated implants may be more prone to infection than titanium implants because of the risk of HA exposure. Evidence is mounting to support the hypothesis of microbial contamination of the HA coating yielding a biologically non-compatible interface and resultant infectious mode of failure.

The author's experience with HA coated implants occurred after two years of placing titanium implants. For nine months, HA coated implants were placed. This practice stopped for two reasons: 1) word of mouth in the implant community regarding problems with maintaining the coating, and 2) observation of bone loss around a substantial number of HA coated implants. While the coated implants rarely showed lack of integration in the early stages, significant bone loss was occurring later. Clinical reports demonstrated the occurrence of an aggressive, rapid and destructive pattern of bone loss associated with HA coated implants. The case report data indicated that the HA coated implant has the potential for a pattern of rapid destructive and dramatic failure. This was observed with alarming frequency.

A study to test the hypothesis regarding the long term consequences of the HA coated dental implant is underway. Preliminary data is now available on 40 HA coated implants in 14 patients who have been restored for more than three years. Twenty-five implants (75%) were persistently suppurative, although not mobile, and continued to exhibit suppuration after retreatment.

In the overview of the material presented in this report, it would seem prudent to use HA coated implants only in research endeavors or when titanium implants cannot be used. When a choice between coated and uncoated systems is available, the interest of patients is better served by choosing a titanium system which has long term data available instead of an HA coated system that demonstrate no life table advantag suspect in the longer term and has no long term data available.

Weinlander (Dental Clinics of North America '91) concludes that because of the biologically unstable ion bond and susceptibility to eventual dissolution, HA coated dental implants should not be used.

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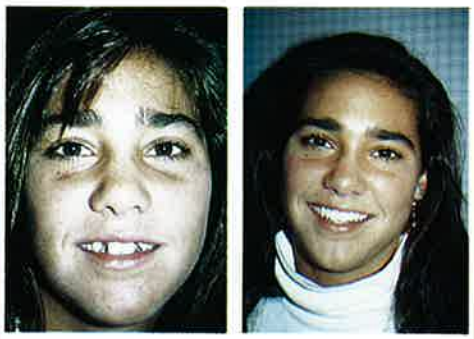
NEXT ISSUE



Orthodontics & Osseointegration
Replacing Congenitally missing teeth

Burning Mouth Syndrome:

(Continued from Page 3.)

late and metal) series. Folate, iron, pyridoxine deficiency, and Candida infections were found, but correction of the deficiency or treatment of the infection was of no benefit. Contact allergy to allergens used in the production of acrylate-based dentures was observed in six (27%) of the cases (all wore a denture); positive reactions were seen to N dimethyl-4-toluidine (3 cases), to tolyldiethanolamine (2 cases), to benzoylperoxide (2 cases), and to oligotriacrylate (1 case). In six cases (27%) a possible relevant sensitization was seen to dental metals and in particular to gold chloride (4 cases).

In all six patients with acrylate allergy the complaints decreased after removal of their dentures. No reactivity to methyl methacrylate was observed in any of the 22 patients. One patient had an allergy to mercury compounds contained in the amalgams used for dental fillings. Detailed data on patch testing with spices in BMS are lacking in the literature. In this study, seven patients probably had true delayed type allergic reactions to spices. Dietary restrictions in some patients partly improved the symptoms, but the relevance of these findings remains unclear.

The investigation concluded that the possible role of local hypersensitivty reactions to denture or dental components as etiolgoic factors in BMS must be considered.

J American Academy of Dermatol V26, #6, June 1992