



A WORD OF CAUTION Osseointegration in Areas of Hydroxyapatite

By Thomas J. Balshi, D.D.S., F.A.C.P.

The occasional lengthy delay experienced in clinical data gathering, writing and publishing information in referred scientific journals can lead to outdated material at the time of printing. One such possibility is an article, authored by me entitled "Preventive Durapatite Ridge Augmentation for Esthetic Fixed Prosthodontics," *Journal of Prosthetic Dentistry*, September, 1987.

In an effort to establish the most ideal esthetics and improve function with prosthodontic treatment, and also provide patients with the most current scientific technology, the early 1980's led to the use of durapatite or hydroxyapatite as a form of pre-prosthetic and periodontal treatment. Many clinicians have used these materials for edentulous ridge augmentations, as well as treatment of infrabony pockets associated with periodontally compromised teeth.

The article reviews a very successful and practical use of the material and is illustrated with treatment that was typically performed for patients in the beginning years of this decade.

A WORD OF CAUTION!!! Most recently, however, the use of the Branemark method of osseointegration and the replacement of missing teeth with titanium submergible implants has proven extremely successful. The highly predictable prognosis is dependent on very specific surgical and prosthodontic requirements, in addition to an ideal biologic environment, the implant bed, in which the fixtures are placed.

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International College of Prosthodontics— Scientific Session—Interlaken.

► Clinical and Fundamental Analysis Of a Newly Developed Magnetic Attachment

Yoshinobu Tanaka, D.D.S., Ph.D. and
Kenji Hiranuma, D.D.S., Ph.D., Aichigakuin
University, School of Dentistry, Nagoya, Japan

Introduction

Soon after the intervention of the rare earth magnets, Sasaki and his colleagues introduced them into dentistry. These small but very powerful permanent magnets were used in some ordinary and maxillofacial prosthetics for more than 10 years. However, conventional magnets such as ferrite or alnico were too large to obtain the appropriate attractive or repulsive force.

The development of the cobalt and samarium magnetic alloy has greatly extended magnetic retention in prosthodontics. In 1983, another rare earth magnet using *neodymium* was developed in Japan. This has proven to be even more powerful than the cobalt-samarium magnet.

Magnets With Caps

Since the rare earth magnets are made as a cylinder from a samarium, cobalt and iron alloy, or neodymium, iron and boron alloy, any size or form is possible. The attractive forces measured by static loads correspond to the size of the magnets.

The common problem to both is corrosion in the oral cavity. They tend to absorb hydrogen and are broken down, losing most of their attractive force.

This problem was solved by introducing a nickel-chromium encapsulating cover, 0.2 mm in thickness; however, the attractive force decreased by more than 40 percent. Because of its smaller size several pairs can be used to attain adequate retention.

Magnetic Attachment

The magnets used with simple protecting caps are the "open field" systems. Although it has the disadvantage of using only one pole of the magnet, this simple system is sufficiently effective.

The use of these magnets on teeth poses another problem. Generally, stronger forces are necessary for retainers of removable partial dentures. Since space for the magnet is limited, introducing a large magnet to obtain the adequate retentive force is impossible.

The "closed field" system is a method that uses both poles of the magnet for retention, thus more than doubling the attractive force.

Cylindrical neodymium magnets are encapsulated within a magnetizable alloy; for the yoke and keeper, 26 chromium ferrite metal was factory milled, and had continued on page 6

► Design of the Superstructure In Edentulous Cases Treated with Endosseous Oral Implants

Jorg R. Strub and Ueli Grunder,
University of Zurich

Basically there are two different concepts of rehabilitation in edentulous patients treated with endosseous oral implants: The bone anchored fixed bridge (Branemark Method: T.I.P.), and the conventional designs were presented.

If patients are offered a luxurious solution, they not only have the right to good functional comfort but also to excellent esthetic results. After the abutment connection a temporary bridge (Conversion prosthesis described by Balshi) made out of acrylic used as a diagnostic tool helps to determine the position and the design of the final superstructure. This can continued on page 6

► New All Ceramic Crown Systems—An In-Vitro and In-Vivo Evaluation

Dr. Susanne Scherrer, University of Geneva

The CERESTORE®, DICOR®, and VITA HI-CERAM® systems have been subjected to an "in-vitro" and "in-vivo" analysis at the Geneva University Dental School. This comparative study consisted of measuring the cement film thickness on bucco-lingual cross-sections, evaluating the clinical marginal adaptation using an S.E.M. and replica technique, as well as observing the soft tissue response (crevicular fluid flow rate and SBI) to the different types of restorations. Each clinical group comprised between 22 and 26 units. Observation time was 3 years for CERESTORE crowns, 2 years for DICOR crowns, and 3 months for VITA HI-CERAM crowns.

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Correlation of Dental Amalgam With Mercury in Brain Tissue

David W. Eggleston, D.D.S., and
Magnus Nylander, D.D.S.

The mercury content of dental amalgam (approximately 50%) has created controversy regarding its safety for patients and dental personnel. Organic mercury compounds and elemental mercury vapor can cause central nervous system damage, and long-term exposure to mercury vapor from dental amalgam may increase the brain tissue concentration of this neurotoxic metal.

Examination of the cadaver dentition and collection of brain tissue specimens from nonrandomized, sudden, unexpected death subjects was conducted as part of routine autopsy procedures at the Los Angeles County Coroner's Office.

Data from this project demonstrate a positive correlation between the number of occlusal surfaces of dental amalgam and mercury levels in the brain.

Data demonstrate a 35% higher level of total mercury mean value in the gray matter (cortex) than in the total mercury mean value in the white matter.

The exposure of a 7-month-old fetus to mercury was documented by the analysis of brain tissue from a gravid cadaver. The cadaver dentition contained 14 total surfaces of dental amalgam with nine occlusal surfaces. Analysis of the mother's brain tissue revealed 6.7 ng/gm in white matter and 9.9 ng/gm in gray matter (cortex); analysis of the fetal brain tissue revealed 2.8 ng/gm in white matter and 6.7 ng/gm in gray matter (cortex).

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A 53-year-old, well-nourished, slightly obese white woman suffered multiple blunt-force traumas from an automobile accident, including a maxillary fracture and laceration of the mouth. A total of 30 surfaces (12.5 occlusal surfaces) of dental amalgam were present in the teeth. The victim survived approximately 1 hour after the accident. Duplicate samples measured the level of mercury approximately 1000 times the mean level of subjects in the cadaver study. Had this person survived the automobile accident, the level of mercury in the brain probably would have contributed to symptoms of erethism.

Emergency room physicians should be advised to check the blood levels of mercury in survivors of major trauma to the oral cavity associated with the presence of dental amalgam.

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Vol. 58, No. 6, December, 1987.

Veterans Administration Cooperative Studies Project No. 147. Part IV: Biocompatibility of Base Metal Alloys

Participants of CSP No. 147
Harold F. Morris, D.D.S., M.S.

Restorative alloys with a high percentage of nickel are relatively new to the field of fixed prosthodontics. These alloys have gained favor because of their strength and low cost. Although the problems with base metal alloys seem minor, there are concerns that longitudinal and epidemiologic studies may show biocompatibility problems in patient sensitivity, and carcinogenicity in the laboratory technician and dentist.

Nickel and chromium are known allergens. Sensitivity to nickel has been reported to vary from 0.8% to 20.7% in men and from 9% to 31.9% in women.

Intraoral exposure to allergens can be manifested in locations remote from dental restorations. The symptoms of the sensitivity range from urticaria, pruritis, xerostomia, eczema, or vesicular eruptions. These symptoms may cause the patient to visit a dermatologist who would be unaware of an intraoral source of the problem. Because a sizable percent of the population is already sensitized, the placement of these restorations without informed consent could have an unfavorable medicolegal impact on the dental profession.

The American Dental Association (ADA) has requested manufacturers place the following warning on all packages of base metal alloys.

CAUTION: As with all nickel-containing alloys, the use of this alloy should be avoided by persons with known nickel sensitivity.

In addition, the ADA has advised against the routine use of patch-testing of patients. The probable reason for this advice is that the patch test may cause a sensitivity reaction, and most dentists are not trained in the use of patch tests or their interpretation. Without this procedure at their disposal, the ability of dentists to identify sensitive individuals is severely

limited. Moreover, the cost of referral to dermatologists would counterbalance the economy of base metal restorations.

Some investigators have recommended that the dentist patch-test all patients who are to receive a base metal alloy. *The ADA does recommend* that all patients suspected of having a metal sensitivity be referred to a dermatologist. A patient who develops dermal lesions after insertion of base metal restorations may have legal grounds for court action if the patient was not informed of the possible problems of metal sensitivity. Therefore, it is the dentist's responsibility to inform patients who are to receive a base metal restoration of the alternatives to the use of base metal restorations. Each patient should sign an informed consent such as the following sample. (Check with your legal counsel for more detailed information.)

Your doctor will be placing a crown that is made up of an alloy containing nickel and chrome. He is using this alloy because of its strength and economy. In some people, both nickel and chrome can cause allergic responses, which can appear as rashes and itching. These metals have also caused cancer in laboratory animals and have been implicated in the formation of lung cancer in humans.

If the dentist still wishes to use base-metal alloys the following precautions should be followed:

1. Document the alloy in the patient's chart.
2. Screen patients by history.
3. Refer those with suspected sensitivities to a dermatologist.
4. Obtain an informed consent.
5. Wear a mask when adjusting metals, use high-speed suction, and have adequate ventilation.

**Journal of Prosthetic Dentistry*, July, 1987,
Vol. 58, No. 1.

Two-Piece Cast Superstructure for Mandibular Osseointegrated Bridgework

Patrick J. Henry, B.D.Sc., M.S.D., F.R.A.C.D.S./
Lorenz Schibli, C.D.T.

Because of the morphology of the edentulous jaw, it is not always possible to place the implants in an ideal position for the prosthesis. Surgical templates have been suggested (Balshi—*Journal of Oral + MaxFac. Surg.*, May, '87) as an aid in the placement of the dental implants. While some compromise is acceptable, situations do arise in which the resultant placement of the dental implants makes their subsequent prosthodontic management difficult, and in some cases impossible. Traditionally, dental implants that are unusable for prosthodontic restorations were submerged or removed.

The surgical positioning of dental implants and the prosthetic design of the replacement dentition superstructure must be coordinated.

The design of this superstructure can be developed and finalized through the use of a temporary acrylic resin fixed prosthe-

have been used for the restoration of the partially edentulous dentition, as well as the use of the Branemark tissue integrated prosthesis to restore the hemidentate arch.

The use of the tissue integrated prosthesis supported by Branemark fixtures for the restoration of the partially edentulous periodontally compromised dentition has been demonstrated with a patient study. Clinical and laboratory aspects of treatment include the diagnosis and treatment planning required for the use of the tissue integrated prosthesis to stabilize adjacent mobile teeth.

Laboratory points important to note include: casting design and fabrication, porcelain application, and especially the avoidance of porcelain particles in the access screw holes. Clinical points important to note include: the master impression technique, modification of the provisional restoration, verification of fit, delivery of the final tissue integrated prosthesis, and oral hygiene maintenance.

In the author's experience, all patients who have received a sectional tissue integrated prosthesis to restore partial edentulism have responded favorably to treatment and identify comfort and function as the most important aspects. In addition, many of these patients felt that the elimination of a removable prosthesis and its replacement with the osseointegrated fixed prosthesis had positive psychological benefits and a definite improvement in the quality of their lives.



Adjacent teeth stabilized with osseointegrated implants.

* *Int. J. of Pros.* V1, #1; 1988:51-58.

N.I.H. Consensus Development Conference

Dental Implants—June, 1988

The use of dental implants to provide support for replacement of missing teeth is becoming an important component of modern dentistry. It has been estimated that the overall number of dental implants inserted in the United States increased fourfold from 1983 to 1987, and during that same period, the number of practitioners who perform implant therapy increased tenfold.

According to the 1985-1986 National Institute of Dental Research's (NIDR) national survey of oral health, approximately 42 percent of those 35 to 64 years of age are totally edentulous.

Traditional removable dentures or fixed bridges are not satisfactory for a significant number of individuals who have lost the tooth-bearing portions of the bone and simply cannot manage removable appliances. Moreover, there is a strong suggestion that a substantial number of patients prefer implant-supported prostheses over soft tissue supported prostheses.

The NIDR in conjunction with the National Institutes of Health (NIH) Office of Medical Applications of Research and the Food and Drug Administration convened a consensus development conference on June 13-15, 1988. They reported:

There is evidence from a number of case series studies that a large proportion of specific types of dental implants remain in place for periods of 10 years or more when inserted by clinicians experienced with the respective techniques. Additional knowledge about the biology of hard and soft tissues, coupled with technological advances in the construction and insertion of various implants, will likely result in a trend toward improved long-term success rates. The best reported long-term survival rates have been achieved with systems that have bone at the interface (such as the Branemark system of osseointegration*).

With regard to indications for a specific implant type, the bone available to support the implant is the primary factor after prosthodontic diagnosis and treatment plan. Other factors affecting indications for implant type are the degree and location of the edentulism of the patient.

The panel recommends that the individual who assumes the surgical treatment phase be well prepared in accepted surgical methodologies. The panel also recommends advanced instruction in the prosthodontic phase of implantology.

This program also should include expertise in short and long-term tissue maintenance addressing gingival status as well as radiographic evaluation of tissue support.

Patient selection should be restricted to those patients who show a need and motivation for the implant procedures.

The panel supports the need for a multidisciplinary approach and recommended a pre-implant consultation involving professional participants with the patient. Post-implant procedures should include communication, monitoring, and collection of recorded data by the professional team. The panel recommended that the patient be thoroughly instructed in maintenance therapy with the understanding that the patient do oral self care.

Before surgery, a medical history should be taken to evaluate the history of the presenting problem and chief complaints. A review of the current status of the organ systems should be made. Factors related to prediction of health risks need to be continuously assessed before the surgical decision, after implantation, and at 6-month intervals throughout the followup period.

The release of constituent material from the implant may influence biocompatibility. To achieve a more complete understanding of tissue response to the implant, basic experiments in host implant physiology must be continued.

Among the factors involved in the design of an implant are the force components produced during loading, the dynamic nature of loading, and the mechanical and structural properties of the prosthesis. Such information is essential for appropriate design of implants.

The panel feels that one important method of accumulating accurate data on implant performance is to establish a National Dental Implant Registry, which will standardize reporting forms to collect information on this activity in the United States. Consideration also should be given to the establishment of centers for training, treatment, and research in dental implantology.

The public is entitled to educational materials that enable informed participation in implant treatment decisions.

The panel concluded that the indications and contraindications of various types of dental implants have been described. The complexity of the surgical, prosthodontic, and periodontal procedures used to successfully insert and maintain dental implants demonstrate the need for a multidisciplinary approach in this field. Long-term studies that concurrently compare various types of implants are needed to provide information beyond mere survival rates. Functional success of various implants should include such criteria as ability to support fixed or removable prostheses in the absence of discomfort, the presence of satisfactory esthetics, and clinical and radiographic evidence of tissue health.

* Editor's comment.

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