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PROSTHODONTIC

Insights



World Congress on Prosthodontics, Hiroshima, '91

Thomas J. Balshi

This past September I had the honor of being one of four international specialists invited to present a keynote lecture on esthetics with dental implants at the 4th meeting of the *International Congress of Prosthodontists* in Hiroshima, Japan. This World Congress, the largest gathering of prosthodontists ever, was a joint meeting of the ICP and the Japan Prosthodontic Society. Other members of the keynote panel included Dr. George Zarb, from Toronto, Canada; Dr. Alfred Geering from Switzerland; and Dr. Israel Finger from Louisiana.

The President of the International College of Prosthodontists, Harold Preiskel, London, paid tribute to the spirit of international cooperation that pervades the specialty. President Preiskel presided as president from the first informal meeting of the International College of Prosthodontists in London in 1982, to the founding session of the College in Seattle in 1985, through the highly successful meetings in Interlaken 1987, Toronto 1989 and Hiroshima 1991.

Professor Hiromichi Tsuru, President of the World Congress on Prosthodontics opened the congress by stating that the congress would highlight advanced knowledge and arts in the field of prosthodontics, provide opportunities to further international understanding, and improve communications between col-

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WORLD CONGRESS ON PROSTHODONTICS, HIROSHIMA '91

KEYNOTE SYMPOSIUM

The Integral Implant and Its Use in Maxillofacial Prosthetics

I. M. Finger

Great strides have been made in developing new techniques and materials to meet the needs of patients suffering from acquired and congenital defects. As the predictability of implant therapy improved, this modality of treatment found favor in the field of maxillofacial prosthetics.

The Integral Implant system, which utilizes a hydroxylapatite coating, has been successfully used to aid in the rehabilitation of patients with both intra and extraloral defects and has also been placed into radiated sites and autogenous bone grafts. The Integral Implant used in patients with intraoral defects is the same as those commercially available for conventional implant prosthodontic techniques. The implants used for facial prosthetic restorations are custom fabricated. These implants are 4 mm. in diameter and 4 mm. in length with no vents at the distal end of the implant. The implants

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Esthetics and Implant Prosthodontics

G.A. Zarb

Esthetic and functional effectiveness of the many different methods of prosthodontic therapy has largely depended on educated anecdotes and asseveration. This approach has to a very large extent enabled dentists to enrich the quality of their patients' lives. However the trade-off between the need for prosthetic intervention per se, and the biologic price inherent in certain therapeutic endeavors, has demanded strict concerns regarding treatment effectiveness. The technique of implant prosthodontics is certainly one that has focused such concerns, particularly since the concept of osseointegration was introduced to North American dentists in 1982.

Consequently clinical research and opinion in this area have elicited both clinical euphoria and polarization vis-a-vis newer possibilities for resolving the twin objectives of esthetic and functional success. While these objectives may be regarded

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Overdentures Supported by Osseointegrated Implants

A.H. Geering

Treating edentulous patients and wearing dentures are both difficult tasks. The main problem seems to originate in the atrophic edentulous mandible. Therefore, the efforts of the profession focuses on improving the residual ridge by vestibuloplasty, bone surgery, or implants. However, preprosthetic surgery should not be viewed as an alternative to poor prosthodontic treatment. Patients who complain about functional problems may only need new dentures which are properly designed for function and esthetics. In the presented method, classic Swiss removable prosthodontic treatment precedes implant surgery. After a period of adaptation of six months at least, during which the patient has acclimated to the new dentures, his or her attitude towards implant surgery is discussed. About 90% of the patients concerned are no longer interested in treatment

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Esthetic Prosthodontic Rehabilitation With Osseointegrated Implants

T. J. Balshi

The subject of dental implants adds a new and challenging dimension to dental esthetics. An esthetic dental restoration requires an appreciation for artistic perception and scientifically based biologic response. The prosthetic replacement supported by bone anchored implants must be in harmony with the intraoral anatomy and dentition. It must provide appropriate lip support and complement facial balance. Special esthetic considerations for implant prostheses include the selection of restorative materials for single tooth replacement as well as multiple tooth partially edentulous rehabilitations.

Some of the most challenging esthetic rehabilitations are fully edentulous patients who have not only lost dental function and form but have also experienced the "aging" process which accompanies the loss of occlusal vertical dimension and diminished elasticity of the perioral and facial muscula-

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4th Meeting of the International College of Prosthodontists September 21-23, 1991 Hiroshima, Japan

A Consideration on Load Supporting Mechanisms of the Osseointegrated Implant

H. Sekine *et al*

Eighteen fixtures were installed in the tibiae of two adult dogs to clarify the occlusal load supporting mechanism of the fixture and its surrounding bone. After three months of healing, the metal block which had one loading point and two measuring points on its surface, was fixed to each fixture via an abutment. Up to 2000 gs loads were applied to the loading point in horizontal and axial direction of the fixtures and the displacement by each load was measured on the measuring points.

After measurement, the tibiae were sectioned into blocks 6 mm thick, each containing a fixture. Standardized x-ray photographs of the blocks were taken in axial direction of the tibiae. The bone blocks were prepared for non-decalcified specimens for microscopic examination. Further, the displacements of abutments and gold cylinders themselves were also measured.

The results are summarized as follows.

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Mandibular Arch Width Change During Mandibular Movement

K. Hasegawa *et al*

The object of this study was to measure mandibular flexure in the horizontal plane during opening and protrusive jaw movement. Using the principle that any change in the arch width between the right and left lower first molar teeth reflected flexure of the mandible. Subjects with intact dental arches (excluding third molars) and no evidence of periodontitis were selected for the study. The measurement apparatus consisted of a linear variable differential transformer (LVDT), right and left side intraoral metal caps, and LVDT cap joints. Intraoral caps covered the lower first molars and LVDT cap joints were waxed on working casts for each subject. The waxed caps and LVDT cap joints were cast in a gold palladium silver alloy. The LVDT was placed between right and left side caps through the LVDT cap joints on the working casts. The metal caps were cemented into position in the mouth using polycarboxylate cement.

Mandibular arch width continued on page 6

Effect of Pulsed Electromagnetic Fields on the MC3T-E1 Osteogenic Cell Line—Part Four

Y. Hirose *et al*

The quantitative effect of pulsed electromagnetic fields (PEMF) on cell proliferation of the MC3T3 osteogenic cell line on implant materials was evaluated. The implant materials used were aluminum oxide (single crystal and polycrystal) and titanium. Disks were 10 mm. in diameter and 1 mm. thick. Disks of these materials were placed in 35 mm. diameter culture dishes. The cells were inoculated at 6×10^3 cells per disk on the implant materials, and cultured in 5ml of α -MEM supplemented with 10% fetal bovine serum. The medium was changed every 3 days. The cells were exposed to vertically directed PEMF (3 gauss, 25 μ sec, 100Hz) by placing the culture dishes between the ϕ 70 mm. diameter helmholtz coils. After experimental cultured samples were continuously exposed for 7 days, cell proliferation was measured by the fluorimetric method for DNA microassay. The result of this study was that DNA content in the stimulated group

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Mechanical Properties of Laser Welded Titanium Alloy Prosthesis

K. Kakimoto *et al*

A fundamental study was performed to investigate the applicability of laser welding to titanium alloy prostheses. This author describes the effect of joint geometry on mechanical properties of laser welds from a practical viewpoint. Pulsed Nd:YAG laser was used to weld pure Ti to pure Ti, or to Ti-6Al-4V as well as Ti-6Al-4V to Ti-6Al-4V. In the case of the similar welding of pure Ti and Ti-6Al-4V, strengths of laser welds were almost equal to those of their base metals. In the dissimilar welding of pure Ti to Ti-6Al-4V, a large part of the laser weld fusion zone exhibited acicular microstructure, and the hardness of the weld metal was higher than that of Ti base metal but lower than that of Ti-6Al-4V alloy. The strength of laser welds of pure Ti to Ti-6Al-4V was higher than that of pure Ti base metal. Tensile loads were dependent upon laser irradiation conditions and lap ratio (laser-welded area) of laser spot welds, and were satisfactorily high if proper welding conditions were selected. No cracks were present in any laser weld, and it was therefore

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EMG Activity of Masticatory Muscles Before and After Osseointegrated Implant Dentures

Y. Kobayashi *et al*

There are many reports on the residual rate, pressure sense of peripheral tissue, and occluding strength, in evaluating the treatment efficacy of osseointegrated implant dentures, but very few reports on masticatory movement. To evaluate the degree of recovery in masticatory function when osseointegrated implant dentures were used, the muscular activities of masticatory muscles were investigated.

Ten osseointegrated implant denture patients ages 58-74, 6 males, 4 females, were asked to chew boiled fishpaste on their habitual chewing side, and EMGs of temporal and masseter muscles were recorded. The integral values of muscular activities of masseter and temporal muscles for the 5th to the 14th stroke were calculated, and the results obtained before the implant dentures were compared with those obtained one month and one year after the implant dentures.

The amount of muscular activities in both masseter and temporal muscles in-

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Evaluation of Heat Injury of Peripheral Bone Tissue Caused by the Heat Generation During Bone Drilling By Microradiographic Technique

N. Minamidate *et al*

To clarify the effect of heat generated upon the peripheral bone tissue during bone drilling for dental implants, the relationship between bone heat injury and its healing mechanism was investigated in vivo on the premolar and molar region of the mongrel dog mandible by performing bone drilling with coolant (control group) and without coolant (test group). Following bone drilling, an implant was embedded into the prepared cavity. Observations were made on day 1, 7, 14, and 30 postoperatively and microradiographic studies were performed for each sequence to depict the changes in the healing phenomena.

The results indicated a delay in healing at 7 and 14 days after implantation in the test group. After 30 days bone regeneration occurred in both test and control groups. These results suggest that lack of a coolant system in the test group caused delay in healing during the first two weeks.

Production of Accurately Fitting Full-arch Implant Frameworks: Part I - Clinical Procedures

G.E. Goll

Osseointegrated implant frameworks for full and partial fixed partial dentures should fit passively on the fixtures. The *author's experience* has shown that perhaps 25% of "his" metal frameworks for full arch restorations do not fit accurately. This article defines and discusses some of the parameters involved in obtaining a one-piece, full arch metal casting that accurately fits Branemark System osseointegrated implants, including impression techniques, verification of fit of plastic framework, alternatives if the plastic framework does not fit, casting procedures and metal selection.

Eden et al tried to standardized the mold conditions for producing single unit porcelain fused to metal crown and fixed partial denture castings. They addressed the following parameters: casting ring size, asbestos liner, position of pattern, investment type, powder-liquid ratio, spatulation, setting time before casting, burnout sequence, removal of casting ring from oven, casting machine, melt soak time, and melting temperature of the oven. Their findings showed Ni-Cr castings to be consistently undersized and precious metal castings to be oversized. Because of the complexity of the casting process it is not surprising that casting distortions may arise.

Each step in the fabrication of a one piece metal implant framework casting is of critical importance. The following suggestions will improve the accuracy of the casting

and reduce some of the possible errors:

1. Use machined parts because their intimate fit and contact is more predictable.
2. Check the fit of gold cylinders and transfer copings onto the abutment cylinders at the first clinical appointment following the second stage surgery to ensure that all of the components fit together properly.
3. Cover the abutments with cover caps to prevent debris from accumulating on the abutment surface.
4. Double check the accuracy of the master cast by using an acrylic resin fixed partial denture facsimile before proceeding to the casting of the framework. Construct the acrylic resin fixed partial denture the night before it is needed and leave it bolted down overnight.
5. Use new guide pins for the laboratory stages and when checking the fit of the cast metal framework intraorally. Test the fit of the casting by using only one screw at one end of the framework.
6. Clean the fitting surface of each gold cylinder with wax solvent before investing.
7. Cast the metal framework in one piece if possible.
8. Cover the cylinders with stainless steel protector caps or duplicate brass analogues to protect the surface when polishing the framework.
9. For full arch castings use 4 mm gold cylinders because the framework will have more bulk and sturdiness. The acrylic resin try-in framework will similarly be less likely to distort.

Prosthetic Dentistry 1991, 66:377-84

The Use and Fabrication of a Self-retaining Surgical Guide for Controlled Implant Placement: A Technical Note

S. Parel & J. Funk

The use of a surgical guide to control and predict final implant position can be critical in establishing both the functional and esthetic basis for a variety of fixed or removable restorations. This paper describes a technique which allows for the simple creation of a self-retaining facial veneer guide that eliminates the need to stabilize the prosthesis during the surgical procedure, results in a relatively clear and self-retentive guide which will limit the angulation of the implant in a facial and mesiodistal direction, and leaves surgical access and visibility unimpaired. This design is more convenient to use than previously described occlusal extension splints, and it maintains the concepts for ideal fixture placement that have proven so valuable in creating both a functionally and esthetically uncompromised prosthesis supported by implants. Int J Oral Maxillofac Implants 1991, 6:207-210.

Membrane-Induced Bone Augmentation at Titanium Implants. A Report on Ten Fixtures Followed From 1 to 3 Years After Loading

C. Dahlin et al

It is known that exposed threads of the implant may cause mucosal disorders that might lead to a total loss of the implant in some advanced cases. This study reports the clinical experience of the first ten consecutive implants combined with e-PTFE membranes (GTAM) at the Branemark Clinic.

Since connective tissue formation occurs at a rapid rate and often creates a hindrance to osteogenesis, a membrane was placed in such a way that a secluded space into which only the presumably slower migrating osteogenic cells could enter was created. The outcome of the treatment was found to be successful as new bone was created around all test fixtures. Complete bone coverage of exposed implants was obtained after a six week healing period. The controls showed considerably less bone regeneration even after 15 weeks. The bone gain, ranging between 0.5 and 3.0 mm, corresponded to approximately one to five threads of the fixture and was considered to be crucial to the long term prognosis of the fixtures.

No complications were observed after loading of the membrane treated implants with fixed prostheses. There were no exposed threads or mucogingival reactions. This finding indicates that the newly generated bone seemed able to bear the stress and tensile forces that were transferred to it via the loaded fixtures. This study gives evidence that the membrane technique is a useful tool for establishing new bone in conjunction with the placement of titanium implants in patients.

Int J Periodont Rest Dent 1991, 11:4



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