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 hydroxyapatite coating, has been successfully used to aid in the rehabilitation of patients with both intra and extroral 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 currently available for conventional implant prosthetic 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

continued on page 6

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 on 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 critical euphoria and polarization vis-a-vis newer possibilities for resolving the twin objectives of esthetic and functional success. While these objectives may be regarded

continued on page 6

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 acclimatized 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

continued on page 6

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 compliment 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 restorations 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-
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 g loads were applied to the loading point in horizontal and axial direction of the fixture and the displacement by each load was measured on the measuring points.

After measurement, the tibias 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. continued on page 6

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 arc 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 poly-carboxylate cement. 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 6×10^5 cells per disk on the implant materials, and cultured in 5 ml 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, 25µsec, 100Hz) by placing the culture dishes between the 0.70 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 results of this study was that DNA content in the stimulated group continued on page 6

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 continued on page 6

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 Evaluation of Heat Injury of Peripheral Bone Tissue Caused by the Heat Generation During Bone Drilling By Microangiographic 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 process was investigated in vivo in 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 microangiographic 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 standardize 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, spattulation, 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 frameworks 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 concept for ideal fixture placement that has proven so valuable in creating both a functionally and esthetically uncompromised prosthesis supported by implants.


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

C. Dahlén et al

It is known that exposed threads of the implant may cause mucosal disorders that might lead to eventual 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 sealed 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.


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Endosseous Cylinder Implants in Severely Atrophic Mandibles

Tripllet et al

A retrospective study was undertaken to evaluate implants in patients with severely atrophic mandibles whose greatest anterior mandibular height was 10 mm or less as measured from standardized lateral cephalometric radiographs. To be included, patients had only implants that were located anteriorly between the mental foramina. Also, each patient had been wearing an implant supported prosthesis for a minimum of 1 year. Twenty-eight patients, 21 females and 7 males, met the criteria for this study. The patients ranged in age from 30 to 78 years (mean 59) and the follow-up ranged from 15 to 62 months (mean, 33).

In the 28 patients included, maximum anterior mandibular height ranged from 5–10 mm. A total of forty-six 7 mm implants and eighty-four 10 mm implants were used to restore the teeth of these patients. The prosthetic reconstruction consisted of 9 fixed prostheses and 19 overdentures. Supporting the fixed prostheses were eleven 7 mm implants and thirty-four 10 mm implants. No fixed prostheses was attached to 7 mm implants alone. Thirty-five 7 mm and fifty 10 mm implants were used to support the cast substructures for the overdentures. Success rates for the 7 mm and 10 mm implants were 96% and 93% respectively with an overall success rate of 94%.

One 10 mm implant was removed from a patient 5 months after placement because of a mandibular fracture. Radiographically, the fracture line travelled directly through the implant site. This patient had four remaining implants that were unaffected by the fracture. Following successful treatment of the fracture and an adequate healing period, a cast gold bar and an overdenture with clips was fabricated.

One of 9 fixed restorations failed, and the 19 overdentures was unsuccessful, yielding success rates of 90% and 95% respectively.

Major complications included a complete mandibular fracture in one patient with a mandible that measured 9 mm in height, and a partial mandibular fracture in a second patient whose mandible was 6 mm in height. A third patient had a transient bilateral mental nerve hypomania.

The patient who had the complete mandibular fracture that required removal of an involved implant had advanced osteoporosis and had suffered other bone fractures previously. This mandibular fracture was treated with open reduction via an extraradial approach and application of a compression bone plate. Masticatory function was restored using the four remaining successful implants and an overdenture. While osteoporosis is not a contraindication to dental implant therapy, poor bone quality may have led to the development of these fractures.

Minor complications were noted in five patients. Gingival hyperplasia developed around abutments in three patients, prolonged pain and edema occurred in one patient in whom the inferior border of the mandible was completely penetrated by implants and formation of a hematoma under the mucoperiosteal flap was noted in one patient. The hyperplastic inflammatory tissue observed was related to poor oral hygiene. Following a local gingivectomy, the hyperplastic tissue was removed.

When the implants were placed in mandibles of 7 mm height or less, an attempt was made to engage or even slightly penetrate the cortical bone of the mandibular inferior border. After the healing period, radiographs commonly showed bone covering the inferior portion of the implants that penetrated the inferior border. Since the tensile, compressive, and bending strength of cortical bone are seven or more times greater than that of cancellous bone, the stability afforded by engaging the extra layer of cortical bone probably contributed to the success of these implants.

The Effect of Piozelectric Film on the Bone Repair in Rats

S. Chiba et al

The effect of the electrical stimulation on bone repair by using Piezoelectric film was investigated. The film was Vinyldiene Fluoride-Trifluoroethylen copolymers (VDF/TFE), and generated piezoelectricity when stretched, bent and compressed. A drilled bone hole (0.2 mm) was prepared in 40 Wistar strain male rats in the right femoral diaphysis. VDF/TFE Film (10mm, X 5 mm.) was implanted around the bone over the drilled hole. Subjects without films were used as controls.

The femur of the rat which was given an injection of calcine and oxytetracycl cin double labeling, was examined histologically by Villanueva bone staining on the 7th, 14th, 21st and 28th day after the operation.

The results were as follows. 1) The surface of VDF/TFE Film was surrounded with connective tissue. A little inflammatory infiltration was found in the edge of the film. 2) In the experimental group the hole drilled in the femur was filled with incompletely mineralized bone formed about the 7th to 14th day. On the other hand, the holes in the control group filled with osteoid and low density bone. 3) VDF/TFE Film accelerated new bone formation in the drilled holes.

World Congress on Prosthodontics, Hiroshima, 91

The Comparative Accuracy of Implant Impression Procedures

A.H. Fenton et al

Several dental implant impression procedures have been advocated. This study compared the accuracy of implant casts produced by four different impression techniques. A standard mandibular metal implant framework was made. A metal model of a mandibular arch with five Nobelpharma implants was then constructed to fit it. Fifteen casts of the metal model were made with each of the four different impression techniques. The fit of the standard implant framework to each cast was assessed manually. The difference between passive seating and "screw-tight" fit was measured at 30x with a travelling stage microscope. Results:

<table>
<thead>
<tr>
<th>Method</th>
<th>(n=15)</th>
<th>Bad Fit Gap</th>
<th>(Gap x + SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Acrylic splint and alginate</td>
<td>0</td>
<td>4.17 ± 1.76</td>
<td></td>
</tr>
<tr>
<td>b. Acrylic splint and polyethylene</td>
<td>0</td>
<td>4.17 ± 1.83</td>
<td></td>
</tr>
<tr>
<td>c. Polyether only</td>
<td>4</td>
<td>11.0 ± 4.41</td>
<td></td>
</tr>
<tr>
<td>d. Replaceable copings in polyvinylsiloxane</td>
<td>8</td>
<td>21.6 ± 18.57</td>
<td></td>
</tr>
</tbody>
</table>

The manual assessments of passive fit correlated with the gap measurements. When acrylic was used to splint-transfer copings in an impression, all casts were acceptable and more accurate than the best of the other procedures.

Continued on page 6

Going West... for the Academy Meeting in Vancouver?

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Early Failures in 4,641 Consecutively Placed Brånemark Dental Implants: A Study From Stage I Surgery to the Connection of Completed Prostheses

Friberg et al

This study comprised 4,641 Brånemark dental implants which were retrospectively followed from stage 1 surgery to completion of the prosthetic restorations. The implants were placed during a 3 year period (1986-1988) in 943 jaws, representing 889 patients with complete and partial edentulism. The jaw and sex distribution revealed a predominance of mandibles (564/943) and females (534/943). The mean age of the patients was 57.5 years (range 13 to 88 years) at implant placement. Only 69 (1.5%) fixtures failed to integrate, and most losses were seen in completely edentulous maxillae (46/943) in which the jaw bone exhibited soft quality and severe resorption. A preponderance of failures could also be seen among the shorter fixtures (7 mm). A majority of the mobile implants were recorded at the abutment connection (stage 2) operation (48/69).

Jaw shape and bone quality seemed to be the two most important factors for early fixture failure in this study. While the same factors may be significant in the maintenance of osseointegration during functional periods, this was not revealed by the present results. This observation will be the focus of other investigations.


The Prosthodontics Intermedica Philosophy of Professional Collaboration

As you know all too well, few medical conditions are as insidiously disabling as full or partial endentulism. Though not life-threatening, edentulism exacts a toll—in loss of function, loss of self-image, and indeed loss of maxillofacial bone—that can be incalculable.

Conventional dentures are, at best, a poor substitute for natural teeth—one which many patients never learn to tolerate. Even conventional bridgework can compromise the viability of healthy teeth, leading to further tooth loss.

This is why, when the opportunity to pursue postgraduate training with Dr. P-I Brånemark in his system of osseointegrated implants was first presented to me nearly a decade ago, I eagerly pursued it. Since then, I have had the privilege of treating thousands of patients, with a remarkable success rate of over 95%.

This dramatic success—and the equally dramatic improvement in the quality of life I have seen the Brånemark System® make for patients—was the impetus behind the founding of Prosthodontics Intermedica as a resource for dental practitioners throughout the northeastern United States.

If you are unfamiliar with Prosthodontics Intermedica, please take a moment to read why many of your colleagues have used this resource to make their own practices more successful.

Dentists who do not already perform implant procedures find that PI enables them to expand the range of solutions they can offer their patients, and patients appreciate this knowledgeable recommendation.

Practitioners whose practices focus on other areas of dentistry find they are able to better concentrate on their specialties while still providing their patients a full range of services and advice. Even those who are already performing implants may turn to PI for patients who present special challenges.

When patients come to PI for Brånemark System® osseointegrated implants, you can be assured that they will be treated by experienced specialists—including doctors, surgical assistants, hygienists, and technicians—thoroughly trained in all aspects of this procedure, to assure the highest degree of success.

Patients can also be confident that the full spectrum of their ancillary needs—from specialized oral hygiene to speech therapy—will be met by a multidisciplinary treatment team.

Most importantly, we respect the role of the patient’s primary dental care provider as a full member of the treatment team—receiving full communication from PI specialists and assisting in the procedure to the extent they wish. Many collaborating practitioners have remarked on the positive effect PI has had on patient relationships.

Prosthodontics Intermedica offers a wide range of educational services to the dental community—including seminars, preceptorships, and access to an extensive international database of information on osseointegrated implants. I hope you will take the opportunity to visit Prosthodontics Intermedica personally.

To request more information, call 215-646-6334.
World Congress (continued)

leagues who share a special scientific interest.

Over 2,300 prosthodontists from 35
countries attested to the international flavor. The
numbers were further swollen by those
involved in a large Trade Show and those
accompanying the delegates.

Presentations were arranged into four
main symposia and two separate lectures.
There were in excess of one hundred oral
and poster presentations, and despite the
number of parallel programs, all were well
attended.

The social program included the
Presidential Reception with its lavish display of
exquisite Japanese foods and an elegant
black tie dinner dance. A three hour boat
trip around the Inland Sea culminated the
meeting. The calm sea, island and capes
were an ideal setting for affirming new
friendships and saying good-byes with
promises to meet again.

World Congress on Prosthodontics was
the first of its kind in Asia and was con-
sidered by all to be an overwhelming suc-
cess in scope and scale. The next meeting of
the International College of Prosthodontists
will be held in Venice, September 24-26,
1993.

Overdentures (continued)

with osseointegrated implants. Generally,
two implants are placed in an optimal rela-
tion to the denture base and the morpholo-
gical aspects of the residual ridge in the an-
terior region between the mental foramina.
For denture retention, spherical anchors or a
clip bar are mounted on the implants.

Between 1981 and 1986, a total of 256
implants have been placed in 108 mainly
elderly patients (average age 65 years). Six
implants failed (2.3%).

Esthetic Prosthodontics (continued)

ture. The correction of skeletal deficiencies
and treatment of facial tissues in conjunc-
tion with implant rehabilitation is a multi-
disciplinary approach to improved dental
and facial esthetics. The stability of the
osseointegrated implant provides excellent
support for maximum esthetic opportunity
resulting in both physical beauty and inner
peace for the patient.

Consideration (continued)

When horizontal loads were applied to the
fixtures, small amounts of linear rotations
corresponded to the loads. The amount of
rotation varied greatly according to the situa-
tion of fixtures to supporting bone. When
axial loads were applied however, all fix-
tures barely indicated displacement.

Mandibular Arch (continued)

was found to decrease during opening and
protrusive jaw movements. Comparison of
arch width change with millimeters of jaw
opening showed marked acceleration of
change as position approached maximal
opening. Mandibular arch width decrease
plotted against protrusion showed an im-
mediate change in arch width at the begin-
ning of protrusion.

Effect of Pulsed (continued)

had a significant increase of 30-40%
(P<0.001, t-test). PEMF stimulation pro-
moted osteogenic cell proliferation on the
implant materials,

EMG Activity (continued)

creased significantly both after one month,
and after one year of implant denture use.
However, between one month and one year
the difference was insignificant. From these
results it was clear that the amount of mus-
cular activities varied conspicuously and
increased significantly after wearing osseoi-
integrated implant prostheses.

Endosseous Cylinder (continued)

to the high success rate in these severely
resorbed jaws.

The majority of patients in this study
were limited to the use of a removable prosthesis. Most of these patients selected a
removable prosthesis because of financial
constraints. Only one removable prosthesis
failed thus far. The patient was a 52 year old
white female with Crohn’s disease. The
patient functioned well for over 4 years
with a cast gold bar and an overdenture with
clips.

The preliminary results of this study
indicate that endosseous cylinder implants
are useful and effective for the rehabili-
tation of mandibles that are 10 mm or less in
maximum anterior height. These implants
may also be used in selected patients whose
mandibles are less than 7 mm in maximum
anterior height, even without bone aug-
mentation procedures. However, additional
long term studies are needed to evaluate
these implants when used for the rehabilita-
tion of extremely resorbed jaws.

Int J Oral Maxillofac Implants 1991,
6:264-269

Integral Implant (continued)

have been used to provide the retention and
stability required to provide an esthetic and
functional restoration.

Mechanical Properties (continued)

found that laser welding would be a useful
technique for prostheses framework con-
struction.