Weber HP, Kim DM, Ng MW, et al. Peri-implant soft-tissue health surrounding cement- and screw- retained implant restorations: a multi-center, 3-year prospective study. Clin. Oral Impl. Res. 2006;17:375-379. (33 refs.)

Purpose: To present in vivo findings from a 3-year prospective study on peri-implant soft tissue conditions and esthetic fulfillment of cement and screw-retained implant crowns.

Materials and Methods: One-hundred fifty-two ITI hollow, cylinder implants were placed in a total of 80 patients with single or multiple missing anterior maxillary teeth. Implants were inserted in a single stage surgical approach. Three to five months after implant placement, 93 screw-retained and 59 cement-retained porcelain-fused-to-metal crowns/bridges were placed according to restoring dentists' preference. The following clinical parameters were recorded at time of crown/bridge placement and 3, 6, 12, and 36 months post loading: modified plaque index (MPI), sulcus bleeding index (SBI), keratinized mucosa surrounding the implant (KM), gingival level width from the most coronal gingival margin to top of implant collar (GL), and esthetic fulfillment. Follow up appointments also included a dental prophylaxis. The MPI and SBI were measured at the mesial, distal, buccal and lingual surfaces of the implant. The Student's t-test, correlation analysis, multivariate linear regression, and ANOVA were used to analyze data.

Findings: No prosthetic complications were noted in any dental implant in the 3 year study, with a 100% implant survival rate also being noted. When comparing cement-retained vs. screw-retained, greater sulcus bleeding and plaque accumulation was noted in the cement-retained past the 6 month and 12 month loading periods respectively. While the increased plaque retention of the cement-retained restorations remained stable over time, a decrease in the amount of plaque over the 3 year study was noted for the screw-retained restorations. Also, the cement-retained restorations also demonstrated an increasing MPI and SBI scores over time while the screw-retained presented a decrease in scores over the same time period. It was also noted in the study that as the margin of the crown went from a sub-gingival to supra-gingival location, SBI scores decreased. For both types of restorations, both the KM and GL remained unchanged for the entire study period. In regards to esthetic fulfillment, patients showed no preference for either crown type while restoring dentists favored cement-retained over screw retained restorations.

Conclusion: In comparing cement-retained restorations to screw-retained restorations, cement-retained demonstrated an increased MPI and SBI scores over the period of the study. Although the cement-retained restorations did demonstrate an increase in scores, both restorations showed an overall low SBI score. For both types of restorations, the GL and KM measurements remained unchanged during the study period. Although dentists preferred to place cement-retained restorations, patients showed no preference to either type.

Barone A, Rispoli L, Vozza I, et al. Immediate restoration of single implants placed immediately after tooth extraction. J Periodontol 2006;77:1914-20. (26 refs.)

Purpose: To evaluate the 12-month clinical success and the esthetic outcome of 18 single-tooth implants placed in fresh extraction sites and immediately restored with a non-functional loading.

Materials and Methods: 18 patients (12 females, 6 males) ranging in age from 22-60 years who presented with a need for the replacement of a single compromised tooth were used for the study. Inclusion criteria included: monoradicular or biradicular teeth, adequate bone volume for placement of 3.75X13mm implant, bilateral occlusal stability, and patients ability to follow protocol and willingness to sign informed consent. Exclusion criteria included: compromised general health which would inhibit osseointegration, severe intermaxillary discrepancy, severe parafunctional habits, drug/alcohol abuse, poor oral hygiene, or absence of buccal wall of the extraction site. One hour prior to surgery patients received 2g amoxicillin along with another 1.5g dose after surgery. Teeth were extracted with the socket being debrided. Implants (titanium plasma sprayed surface) were then placed according to manufacturers instructions. No flap was raised in any case and all sites demonstrated no fenestrations or dehiscences of bone walls and the gap between implant and surrounding bone walls was <2mm. All implants had good clinical stability (ISQ>62 measured by Osstell measuring device). Following implant placement, a screw-retained transfer coping was connected to allow an impression to be taken. Temporary abutment crowns were placed with a non-functional occlusion. Final implant impressions were made after 6 months. Patents were placed on a strict follow up schedule until soft tissue healing was complete. Thereafter, patients were seen after 12 months with the following parameters being measured: modified plaque index, modified bleeding index, probing depths, distance between implant shoulder and the mucosal margin, attachment level, width of keratinized tissue, implant stability quotient, and bone level from implant shoulder to the first bone-implant contact via PA radiographs. At the 12 month recall, all patients were questioned about their satisfaction with esthetic outcome and changes in the gingival level around the implants.

Findings: Healing was uneventful with 1 fixture being removed 4 weeks after placement due to an abscess. This results in an implant survival rate of 94.5%. ISQ values were 68.1±6.7 at baseline and 74±6 at the 12 month recall. Mean width of keratinized tissue at baseline and 12 months were3.7±0.4mm and 3.3±0.5mm respectively. PA radiographs demonstrated a 0.4mm gain in bone level. Plaque was observed in 44 of the 72 sites examined at the 12 month visit. Bleeding was also noted on 48 sites examined. All patients reported that the temporary restoration was esthetically acceptable.

Conclusions: Implants placed in fresh extraction sockets and immediately restored can provide satisfactory success rates in selected cases.

Sevimay, M., et al. Three-dimensional finite element analysis of the effect of different bone quality on stress distribution in an implant supported crown. J Prosthet Dent 2005; 93: 227-34.

Purpose: The purpose of this study was to investigate the effect of 4 different bone qualities on stress distribution in an implant-supported mandibular crown.

Materials and Methods: A 3-DFE model of a mandibular section of bone with a missing second premolar and an implant to receive a crown structure was used in this study. The 3-D tetrahedral structural solid FEs were used to model the bone, implant, framework, and occlusal surface material. The simulated crown consisted of framework material and porcelain. The length and diameter of the crown were 8 mm and 6 mm, respectively. A bone block, 24.2 mm in height and 16.3 mm wide, representing the section of the mandible in the second premolar region, was modeled. Four distinctly different bone qualities (D1,D2, D3, and D4) were used in this model. A solid 4.1 3 10-mm screw-type dental implant system (ITI) was selected for this study. The implant had a threaded helix, Cobalt-chromium was used as the crown framework material and feldspathic porcelain (Ceramco II) was used for the occlusal surface. The implant, its superstructure, and supporting bone were simulated using finite element software. The porcelain thickness used in this study was 2 mm, and the metal thickness used was 0.8 mm. the model consisted of 32,083 nodes and 180,884 elements. Vertical force of 300 N was applied from the buccal cusp (150 N) and distal fossa (150 N) in centric occlusion and the applied forces were static. Stress levels were calculated using von Misses stress values.

Findings and Conclusions: Stresses were located on the distal fossa and buccal cusp, and the maximum stress value was 532 Mpa at the distal fossa for all bone qualities. Stresses in cortical bone were almost uniform on the buccal and lingual surfaces of the bone for all bone qualities. For D1, D2, or D3 bone quality, von Mises stresses were concentrated at the neck of implant. Maximum stresses were: 150 Mpa for D1 bone quality, 152 Mpa for D2 bone quality, and 163 Mpa for D3 bone quality at the neck of the implant. For D4 bone quality, von Mises stresses were concentrated at the neck of the implant and in the middle of the implant body. Maximum stress was 180 Mpa for D4 bone quality. Maximum stresses were located within the cortical bone surrounding the implant and within the lingual contour of the mandible. There was no stress within the spongy bone. Maximum stress values within the cortical bone surrounding the implant were 87 Mpa for D1, 90 Mpa for D2, 113 Mpa for D3, and 146 Mpa for D4. The results of the current study, using 4 different bone qualities, showed maximum stresses in bone quality D4 at the neck of the implant and on the middle of the implant body. For bone qualities D1, D2, and D3, maximum stress was concentrated at the neck of the implant. A key determinant for clinical success is the diagnosis of bone density around an endosteal implant. Factors such as the amount of bone contact, the modulus of elasticity, and axial stress contours around an implant are all affected by the density of bone. As a consequence, this may influence the maintenance of osseointegration and long-term survival of implants. Simulating different bone qualities for an implant supported crown affected stress distribution and stress values. Stresses in D3 and D4 bone qualities reached the highest values at the neck of the implant and were distributed locally. A more homogenous stress distribution was seen in the entire bone for bone groups D1 and D2, and a similar stress distribution was observed.

Taylor TD, Wiens J, Carr A. Evidence-based considerations for removable prosthodontic and dental implant occlusion: A literature review. J Prosthet Dent 2005; 94:555-60.

Purpose: To review and discuss some of the classic removable prosthodontic literature and the currently available scientific literature involving removable prosthodontic occlusion and dental implant occlusion.

Materials and Methods: A review of the dental literature concerning occlusion was undertaken. Material appearing in the literature prior to 1996 was reviewed in as comprehensive manner as possible and material after 1996 was reviewed electronically. Electronic searches of the literature were performed in MEDLINE using key words in different combinations to obtain potential references valuable to this review. Manual hand searching of the MEDLINE reference list was performed to identify any articles missed in the original research. As the vast majority of the articles reviewed were descriptive in nature, and because of the very limited number of human clinical trials found, it was decided to report findings in a descriptive manner rather than as a systematic review of the available clinical trials identified.

Findings and Conclusions: Removable prosthodontic occlusion: Modern theories and concepts of occlusion for implants and natural teeth have originated in complete denture construction. The early gnathological approach to occlusal rehabilitation evolved from the concept of balanced articulation, which can be defined as bilateral, simultaneous, anterior and posterior occlusal contact of the teeth in centric and eccentric positions. As a result, numerous articulators were developed to mechanically record and replicate maxillomandibular relationships, along with a variety of tooth forms to correspond to the balanced occlusal scheme theory and their prescribed formulation. These principles of balanced occlusion required the recording of the patient's condylar guidance and the establishment of the incisal guidance as predicated by esthetic and phonetic, determinants, skeletal relationships, and acceptable vertical dimension of occlusion. It was evident from the search that there are multiple pathways to clinical success when considering occlusal concepts for removable prosthodontics. Although these concepts remain scientifically unproven they are still being used in clinical practice as accepted parameters of care.

The effect of non axial load on implant function and survival: Relative to implant supported prostheses numerous authors have stated the need to avoid the application of nonaxial forces to dental implants whenever possible. Such forces may result in areas of high stress concentration instead of uniform compression along the implant to bone interface. Evidence is lacking, however, regarding the effect of nonaxial load on the integrity of the osseointegrated interface between bone and implant. Two studies specifically examined the effect of nonaxial loading on osseointegrated implants. Both studies failed to demonstrate a negative effect on bone-to-implant anchorage after extended period of nonaxial loading.

Progressive loading and occlusal overload of dental implants: Gradually increasing the load applied to implants in poor quality bone, thereby allowing that bone to increase in mass and density through gradually increasing function seems logical. However, the evidence available does not support the need for progressive loading. It may also be argued that the concept of progressive loading is, in fact unlikely to be attained. When coupled with evidence suggesting that full occlusal loading does not damage the osseointegrated interface, the value of progressive occlusal loading must be questioned.

Proprioception and dental implants: Loss of periodontal ligament proprioception that occurs when the natural teeth are lost has been described as an important consideration in the replacement of natural teeth with dental implants. The presence of proprioceptive nerve endings in the periosteum, TMJ and muscles of mastication may compensate partially for those lost from the missing periodontal ligament.

Lindeboom J, Frenken J, Dubois L et al. Immediate loading versus immediate provisionalization of maxilllary single tooth replacements: A prospective randomized study with BioComp Implants. J Oral Maxillofac Surg 2006;64:936-942. (23 refs.)

Purpose: To Evaluate the Clinical out come of Immediate Loading of tooth versus Immediate Non Loading Provisionalized Implant in the Anterior and Premolar regions of Maxilla.

Materials and Methods: The study was conducted at the Oral and Maxillofacial Surgery department Maxilla of the Academic Medical Center of the University of Amsterdam. Forty-eight patients (31 females and 17 males) with age range from 19 to 78 yrs were selected from the inclusion criteria. A total of 50 threaded TPS BioComp implants were placed and provisionalized within 24 hours after surgery. The BioComp implant is a tapered screw-shaped titanium implant with 4 diameters (3.4, 4.0, 4.6, and 5.2mm) and length from 8 to 18mm. One hour before surgery, all patients received 600 mg of clindamycin and all procedures were performed under local anesthesia. Mucoperiosteal Flap was elevated. A small Lindemann drill was used for determination of the position of the implant followed by a 2.5 mm diameter twist drill. Depending on the size of the implant, the site was further prepared using the corresponding twist drill. Implants were placed using low rotation speed. Patients with bone defects had augmentation surgery with a bone block from the mandibular trigonum region. The patients were randomly assigned in 2 groups . In the Immediate Loaded (IL) group the Provisional was in normal contacts in centric relation and at lateral excursions. In the Immediate Non Loaded (IP) group the provisional was adjusted to clear all occlusal contacts or contacts at lateral excursions. In all, 30 implants were placed in the anterior maxillary region and 20 in the premolar region. Buccal bone grafting with mandibular ramus grafts was done 3 months before the implant prcedure in 32 of the implant sites, 16 sites in each group. The length of the implants ranged from 10-14 mm. Patients were placed on soft diet and were told to avoid placing food in the area of provisional for 6 weeks. The Implant Stability Quotient (ISQ) is measured by the Osstell Apparatus. Radiographs were taken after implant placement and 4, 12, and 24 weeks. Radiographs obtained after 12 months after implant placement were used to access the coronal bone defects and gingival esthetics between the 2 groups.

Patient inclusion criteria:

Maxillary anterior or premolar single tooth sites.
Height and volume of the alveolar bone for placement of implants without bony dehiscence.
Bilateral stable Class I Occlusion.
Nonsmokers .
Implant torque at insertion 30 N-cm.
Patient's availability to set the follow-up schedule.
Minimum age 18 years.
Healthy patients: ASA I.
Proper oral hygiene.
Adequate patient compliance.

Patient exclusion criteria:

Parafunctional Habits.
Lack of a stable occlusion.
Drug or alcohol abuse.
Serious cardiovascular disease.
Hematological disease.
Nonregulated diabetes.
Autoimmune disease.
Inadequate patient compliance.
Metabolic or systemic diseases that affect bone or wound healing.

Findings: Of the 50 implant placed, 25 in each group, 2 implants were lost in the IL group and 3 in the IP group. The failing implants showed increasing mobility within 2-3 weeks after insertion, and were removed. In the IP group, all the lost implants were located in the anterior maxilla, and in the IL group, 1 was lost in the anterior region and the other in the premolar region. The mean implant stability quotient (ISQ) was 63.7 $\pm$ 5.8 for the IL group versus 63.2 $\pm$ 4.3 for the IP group (P = .78). No statistically significant difference was found between anterior and premolar ISQ (62.6 $\pm$ 5.7 vs 64.6 $\pm$ 4.0, P=.18). The mean mesial marginal bone loss after 12 months in the high yield group was 0.27 $\pm$ 0.2 mm versus 0.28 $\pm$ 0.22 mm in the IP group (P = .9). The mean distal marginal bone loss after 12 months in the IL group was 0.19 $\pm$ 0.15 mm vs 0.2 $\pm$ 0.11 mm in the IP group (P = .87). No difference was seen in marginal bone loss in implants placed in the maxillary anterior and premolar region (P = .74). Gingival midbuccal esthetics were also similar in both groups. All implants in the IL group had an ideal gingival buccal margin vs 91% of the IP group. Full regeneration of the mesial interdental

papilla was observed in 70% of the IL group vs 91% of the IP group, While full regeneration of the distal papilla was observed in 91% of both IP and IL implants. No significant difference in mean ISQ value for implants placed in grafted sites was 63.2 $\pm$ 5.6 and 64 + 4.0 for non grafted sites (P= .63). The mean ISQ for smaller 3.4 implants was 61.6 $\pm$ 5.3 and 64.3 $\pm$ 4.8 for the larger diameter (4.0, 4.6, and 5.2) implants (P= .97).

Conclusion: There was no significant difference in the ISQ mean values in radiographic bone loss and gingival esthetics found between the immediate loaded vs the immediate non loaded BioComp implants in the anterior and premolar maxilla. No difference was found in mean ISQ values between augmented and nonaugmented implant sites. Due to the small sample study , no definite conclusion on survival can be drawn. Follow- up studies are needed to determine the long term stability of clinical appearance of inter proximal papillae and osseous support of the immediate loading

Strassburger C, Kerschbaum T, Heydecke G. Influence of implant and conventional prostheses on satisfaction and quality of life: A literature review. Part 2: Qualitative analysis and evaluation of the studies. Int J Prosthodont 2006;19:339-348. 135 refs.

Purpose: To investgate the influence of prosthetic restorations on patients' OHQOL (oral health-related quality of life) and satisfaction on the basis of 114 clinical studies.

Materials and Methods: Review of literatures between 1960 and February 2003.

Findings:
Studies with low levels of evidence (AHCPR III: Agency for Health Care Policy and Research III) and the development of the instruments:

The most important study is by Carlsson et al. in 1967, who investigated the satisfaction of wearers of complete dentures. This study already included phychosocial aspects. Whereas approximately 90% of subjects reported satisfactory adaptation to their complete denture, 24% complained about insufficient retention of the mandibular prosthesis, and another 20% regarded their prosthesis as an "impediment". In 1979, Smith and Sheiham reported that a 25% of the interviewees reported pain when eating and 41% needed more time for chewing because of insufficient chewing ability. As a result, patients reported (psychologic) discomfort when eating in company.

Studies with High levels of evidence (AHCPR I and II):
17 of 38 studies presented in this section are with evidence level Ib (randomized controlled trials), there were 16 papers dealing with complete denture therapy. All 17 studies included implant therapy.

- Treatment options for the edentulous maxilla.-
  Compared to the pretreatment evaluation with conventional dentures, one study showed increased satisfaction after insertion of implant-supported removable overdentures; however, there was no difference between dentures with and without palatal coverage. The other study demonstrated a higher degree of general satisfaction, better speech quality, and more ease of cleaning with removable overdentures than with fixed implant-supported prostheses. There is general consensus that implants in the edentulous maxilla appear to be a recommendable option, especially for patients who show unfavorable anatomic conditions or fail to adapt to conventional treatment. In most cases, completely edentulous patients gave less favorable ratings to conventional mandibular prostheses because the anatomic condition of the maxilla often allowed acceptable results even with conventional removable prostheses.
- Treatment options for the edentulous mandible.-
  Implant-supported prosthetic devices were generally judged more favorably in patients' subjective ratings and created higher general satisfaction rates. Placement of more than 2 implant does not appear to further increase patient satisfaction. One RCT reported that about half of all patients preferred removable overdentures to fixed partial dentures: Those who judges stability and chewing ability as the more important factors chose fixed prostheses, while those who judges ability to clean and esthetics more important selected removable overdentures. It appears to be certain that OHQOL as measured by the OHIP (Oral Health Implant Profile in 1994) can be significantly improved by the use of mandibular prostheses stabilized by 2 implants in edentulous patients.
- Treatment options for the partially edentulous patient.-
  In spite of shortage of studies, 2 studies reported that implant-supported prostheses were more favorable then conventional dentures or no restoration, although implant constructions were more difficult for the patients to clean.

Recommendation for the clinical practice:
As a primary solution, 2 implants and an overdenture retained by ball or bar attachments can be suggested. With proper planing, this type of treatment can be upgraded to a fixed prosthesis at a later stage if additional implants are placed in the posterior area.