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Editor: John L. Reyher, DDS, Danville, IL, concentrated his career in clinical practice and clinical research in the Department of Veterans Affairs

## Current Overview

*Colnot C, Romero DM, Huang S, Rahman J, Currey JA, Nanci A, Brunski JB, Helms JA. Molecular analysis of healing at a bone-implant interface. J Dent Res 86:862-867, 2007.*

Dental implants are successful, but most of the small failure rate can be attributed to factors including wear debris, excessive micromotion or excessive loading. In order to prevent or to remediate these failing implants, it is important to understand the biologic mechanisms behind implant success or failure. Bone healing clearly occurs around implants; however, the extent to which this differs from healing at sites without implants remains unknown. The current study, done in a mouse model, tested the hypothesis that an implant surface may affect the early stages of healing. The study compared healing around implants to healing of empty implant sites, to assess whether the presence of an implant accelerated the initiation of bone healing.

Implants examined included Ti-6Al-4V, poly (L-lactide-co-D,L-lactide), and 303 stainless steel implants with surface characteristics comparable to those of commercial implants. The mouse model used wild-type mice and placed the modified implants in the proximal tibia. For both the implant placement and the no-implant healing site, an 0.8-mm hole was drilled in the antero-proximal tibia and enlarged via a 1.0-

### Molecular analysis of bone healing

#### Clinical Practice Point

Implant surface microenvironment favors bone formation

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mm drill. Implants were press-fitted into slightly undersized holes, and wounds were closed. The surgery sites were examined at various timepoints from 3 to 28 days post-procedure. The implant surfaces were characterized after removal, and bone tissue was fixed and processed for histology.

Empty implant sites healed exclusively through intramembranous ossification, and no cartilage was detected during the 28-day period. Around the implant surfaces, lack of collagen type II expression indicated that intra-membranous ossification was the mechanism of new bone formation. The surface characterization (roughness) was assessed at 5–10 sites per implant, and the data showed comparable values of carbon on surfaces of all implants tested.

Overall, the qualitative cellular and molecular evaluations showed that osteoblast differentiation and new bone deposition began sooner around the implants. This suggests that the implant surface and corresponding microenvironment around the implants favored osteogenesis. The baseline assessment of the healing process around an implant in this new mouse model resembled the process reported for larger animal models and supported the use of this model as a model system for studying cellular and molecular responses to implants.

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***Alsaadi G, Quirynen M, Komárek A, van Steenberghe D. Impact of local and systemic factors on the incidence of oral implant failures, up to abutment connection. J Clin Periodontol 34:610–617, 2007.***

Dental endosseous implants may fail at 2 specific time points. Early failure is up to the time of abutment connection while late failure is when the abutments are exposed to the oral environment subjected to occlusal loading. Early failure is a result of inability to establish an intimate bone-to-implant contact. Late failure is associated with both peri-implantitis in connection with plaque-induced gingivitis and occlusal overloading.

An implant (TiUnite) with an increased oxide layer, created by anodic oxidation has been available for 5 years. Data from animal and human studies show a stronger bone reaction compared with turned implants. This study was designed to identify candidate factors: systemic, local bone and other intra-oral factors. The study enrolled 283 consecutive patients who received a total of 720 MkIII TiUnite implants. A minimum bone height of 7 mm was available at insertion, and a 2-stage surgical protocol with strict sterility measures was used for all implants.

The following factors were assessed with respect to early implant failure: hypertension, cardiac problems, gastric problems, osteoporosis, hypo- or hyperthyroid, hypercholesteremia, asthma, diabetes types I or II, Crohn’s disease, rheumatoid arthritis, chemotherapy, hysterectomy and medication (antidepressants, steroids, hormone replacement), radiotherapy of the implant area, breach of sterility during surgery, implant parameters, bone (quality, quantity, dehiscence or perforation), type of edentulous, antibiotics prescription, immediate implant placement, apical lesion detection and insertion torque.

In this study, a failure rate of 1.9% was reported. No definitive conclusion concerning statistical significance could be achieved. A tendency for failure was noted with apical lesions, vicinity of natural dentition, smoking, hormone replacement, gastric problems, Crohn’s disease, diabetes type I and radical hysterectomy.

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***Goene RJ, Testori T, Trisi P. Influence of a nanometer-scale surface enhancement on de novo bone formation on titanium implants: a histomorphometric study in human maxillae. Int J Period Rest Dent 27:211–219, 2007.***

The objective of this research was to evaluate and compare a dual acid etched titanium surface implant treated with nano-scale calcium phosphate crystals to a non-treated dual acid-etched titanium control

**Implant failure**

Clinical Practice Point
Considerations and treatment of early and late implant failure

**Implant surface nano-scale consideration**

Clinical Practice Point
Bone development impact with titanium implant surface treatment

surface. This study was conducted on human posterior maxillas that were edentulous or partially edentulous and were scheduled for conventional implant placement.

The study design was a randomized, controlled, double-blinded clinical study on a total of 9 patients. A total of 18 implants were placed, 9 control and 9 study implants. The implants were 2 mm in diameter and 9.5 mm in length and were left submerged to heal for 4 or 8 weeks. Three pairs were retrieved at 4 weeks and 5 pairs were retrieved after 8 weeks. Each implant was retrieved using a 4 mm trephine bur.

Bone to implant contact for the test group was  $45\% \pm 18.1$  and for the control group was  $17.2\% \pm 10.6$ . The percent bone volume was  $28.7\% \pm 8.2$  for the test samples and  $21.5\% \pm 10.1$  for the controls with no significant difference. One control implant was found to be fibrous encapsulated but was included in the study. The authors conclude that this study demonstrates a significant impact on bone development when nano-scale calcium phosphate crystals are applied to a conventional dual acid-etched surface titanium implant.

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### **Implantitis**

**Heuer W, Elter C, Demling A, Neumann A, Suerbaum S, Hannig M, Heidenblut T, Bach FW, Stiesch-Scholz M. Analysis of early biofilm formation on oral implants in man. J Oral Rehabil 34:377–382, 2007.**

Clinical Practice Point
Implant biofilm formation linked to reduced anaerobic pockets and peri-implant tissue health

To increase the success of dental implants, it is important to gain a thorough understanding of why they fail. This includes peri-implantitis, which can start at the formation of biofilm(s) on the implant surface once it has been inserted into the oral cavity. Natural teeth and the surrounding gingiva have both the potential to prevent subgingival biofilm formation and to respond to early biofilm accumulation. Mechanisms to achieve this include structural components, including a well keratinized oral epithelium that terminates at the crest of the gingival margin where it is continuous with non-keratinized sulcular epithelium and circular collagen fibers.

Two predominant periodontal pathogens that are thought to be responsible for the pathogenic nature of the disease are *Hamophilus actinomycescomitans* and *Porphyromonas gingivalis*. This study investigated peri-implant biofilm accumulation atraumatically by use of implant abutments that were inserted temporarily and later removed for biofilm investigation.

In the first part of the study, a quantitative analysis in supra- and subgingival areas was performed. The second part of the study inves-

tigated whether known periodontal pathogens were present in the crevicular fluid around the implant abutments. Ten patients were enrolled in the study, with a total of 14 implants. Subjects had a history of periodontitis and probing depth of the remaining dentition greater than 3 mm. Healing abutments were inserted for 14 days. Sulcus fluid was sampled with paper points at 4 measurement points per abutment from 5 randomly selected patients of this group and assessed for the presence of *H. actinomycescomitans* and *P. gingivalis* DNA using the polymerase chain reaction detection method.

All subjects were partially edentulous and had at least 1 oral 2-piece implant made of titanium, which had been inserted 3 months before investigation in the lower jaw and 6 months before investigation in the upper jaw. Two weeks after abutment surgery, the previously existing abutments were removed, and the analyzed healing abutments were inserted. Biofilm formation on healing abutments was quantitatively assessed via standard scanning-electron microscopy procedures for topographical overview and for detection of biofilm-coated surfaces. The total extent of coverage of supra- and subgingival surfaces with biofilm was calculated.

Significantly more extensive biofilm coverage was found on supragingival surfaces ( $17.5 \pm 18.3\%$ ) when compared with subgingival surfaces ( $0.8 \pm 1.0\%$ ). Although bacteria were detected in all the samples taken, *H. actinomycescomitans* and *P. gingivalis* were not found in any of the samples. Thus, despite massive supragingival biofilm formation, periodontal pathogens were absent from the sulcus fluid during initial bacterial colonization. It is possible that cellular adherence of peri-implant tissue via hemidesmosomes, actin filaments and microvilli reduces the risk of formation of anaerobic subgingival pockets.

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**de Jong LC, Opdam NJ, Bronkhorst EM, Roeters JJ, Wolke JG, Geitenbeek B. The effectiveness of different polymerization protocols for class II composite resin restorations. J Dent 35:513–520, 2007, Epub 2007 Mar 23.**

**Polymerizing composite resin**

<b>Clinical Practice Point</b>
Curing protocol affects restoration properties

A sufficient polymerization process is important to achieve good physical properties of a composite resin restoration. Light polymerization has been shown to be influenced by certain factors such as composition and shade of the composite resin, quality of light curing unit, exposure time, and composite layer thickness. Previously, it was recommended that increments of resin with a maximum thickness of 2 mm be exposed for 60 seconds when using a halogen-curing unit with a minimum light intensity of 400mW/cm<sup>2</sup>.

Currently, halogen curing units with outputs exceeding 800mW/cm<sup>2</sup> are available. Consequently, shorter exposure times of 10 seconds are recommended for curing resin composite. However, shorter exposure times may lead to reduced physical properties and poor biocompatibility, particularly at the bottom of the restoration. This study investigated the effect of reduced light exposure times on Vickers hardness (VH) of class II composite resin restorations.

A standardized *in vitro* set-up was developed for this study. A class II preparation was made in a freshly extracted third molar. It was then restored in three, 2 mm thick increments. Two composite resins (Clearfil AP-X; Esthet-X) were polymerized with 4 light-curing units (Halogen: Astralis 10; LED: The Cure, L.E.Demetron I, Smartlite) following 4 curing protocols. Three protocols had exposure times of 10s, 20s or 40s (control) per layer. In the fourth protocol, 10s irradiation per layer was combined with additional lateral curing for 10s from buccal and palatal sides after removal of the metal matrix. Immediately after light-curing and also after 7 days in storage, the hardness of the axial surface was directly determined at top and bottom layers.

The results indicate that directly after light-curing, VH of both composite resins was significantly influenced by curing protocols. After 7 days in storage, curing protocols had no significant effect on VH of Clearfil AP-X, except for the Smartlite. For Esthet-X, VH was still influenced by curing protocol, but differences were smaller than directly after light-curing. Depending on materials and curing protocols, exposure times of 10s/2 mm increment with high intensity light-curing units can be sufficient to obtain a high degree of conversion under *in vitro* conditions. A higher degree of cure can be obtained with shorter exposure times with additional lateral curing of a class II composite resin restoration.

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**Implant bone response experiment**

**Chikazu D, Tomizuka K, Ogasawara T, Saijo H, Koizumi T, Mori Y, Yonehara Y, Susami T, Takato T. Cyclooxygenase-2 activity is essential for the osseointegration of dental implants. *Int J Oral Maxillofac Surg* 36:441–446, 2007.**

<b>Clinical Practice Point</b>
NSAIDs affect bone healing

The aim of this study was to evaluate the effect that cyclooxygenase has on bone response when dental implants have been placed. This study used wild-type *COX-2*<sup>+/+</sup>, and knockout type *COX-2*<sup>-/-</sup> mice. Implants (1 mm × 2.5 mm) were placed into the left femur of each mouse. Four mice in each group were sacrificed at 0, 1, 2, 3, 4, 6, and 56 days after implant placement for RNA analysis. Six mice in each

group were sacrificed at 4 or 8 weeks post-implant placement for histological evaluation.

Expression of osteocalcin mRNA, which is an osteogenic marker, increased in the *COX-2<sup>+/+</sup>* group after 8 weeks but not in the *COX-2<sup>-/-</sup>* group. After 4 weeks, half of the implant was in direct contact with new bone in the *COX-2<sup>+/+</sup>* group, but there was no new bone contact along the implant surface in the *COX-2<sup>-/-</sup>* group. After 8 weeks the *COX-2<sup>+/+</sup>* group exhibited thick widely spread cortical bone, but in the *COX-2<sup>-/-</sup>* group, new bone was minimal. With the limitations of the study, it is suggested that the use of *COX-2* inhibitor NSAIDs may potentially inhibit bone healing.

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***Simion M, Rocchietta I, Dellavia C. Three-dimensional ridge augmentation with xenograft and recombinant human platelet-derived growth factor-BB in humans: report of two cases. Int J Period Rest Dent 27:109–115, 2007.***

### **Ridge augmentation**

Clinical Practice Point
Significant vertical bone height with use of growth factor

This is a report on 2 patients who received bony ridge augmentation for vertical and horizontal defects using a xenograft and a platelet derived growth factor (rhPDGF-BB). The first patient presented with a narrow 2 mm wide bony defect in the posterior mandible. The site was augmented with a deproteinized bovine bone block, soaked in rhPDGF-BB. The block graft was fixated using 2 screws.

The second patient presented with a primarily vertical defect of 11 mm in the posterior mandible due to previous implant failure. This site was grafted with deproteinized bovine bone particles embedded in a collagen matrix infused with rhPDGF-BB. This was retained with a fixation screw but was noted to slump under the weight of the soft tissue flap.

A bone biopsy using a trephine bur was done 5 months post-grafting along with the placement of 3 implants in each patient. The graft in patient 2 resulted in a vertical gain of approximately 8 mm. The histological examination showed new bone formation throughout both grafting types, with xenograft particles spread throughout, but surrounded by new bone.

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### **Edentulous patient with TMD**

Clinical Practice Point
Sliding plate technique benefits edentulous patients with TMD

**Zuccolotto MC, Vitti M, Nóbilo KA, Regalo SC, Siéssere S, Bataglion C. Electromyographic evaluation of masseter and anterior temporalis muscles in rest position of edentulous patients with temporomandibular disorders, before and after using complete dentures with sliding plates. Gerontol 24:105–110, 2007.**

This study evaluated EMG activity in edentulous patients with TMD before and after the placement of complete dentures fabricated with a sliding plate on the occlusal surface. Ten patients were selected for this study.

Electromyographic recordings were done over the anterior temporalis and masseter muscles at 0, 4, 9, and 12 months. The recordings were done at rest position with and without dentures, followed by rest position with and without dentures after a chewing exercise. New dentures were fabricated with sliding plates and balancing ramps on the occlusal surface, maintaining essential esthetics.

The study showed an increase in EMG activity over time, and a decrease in activity within the masseter muscles. All patients experienced a remission of muscular pain with the new dentures. The increase in temporalis activity was justified by the fact that the anterior portion is more active during mandibular rest. This study suggests that the use of complete dentures with sliding plates may promote neuromuscular reprogramming and muscular balance in patients with TMD.

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### **Atraumatic tooth removal**

Clinical Practice Point
Technique aids immediate implant success

**Babbush CA. A new atraumatic system for tooth removal and immediate implant restoration. Implant Dent 16:139–145, 2007.**

Easy X-Trac System is a new device for atraumatic extractions that incorporates 2 fundamental concepts. The first is that the device uses a screw to engage the tooth root as opposed to forceps. Second, it utilizes a mechanical means of extraction that distributes the forces over the surrounding dentition.

Indications for use of the device include all single or double rooted teeth, including ankylosed teeth and fractured teeth, and situations where implants will be immediately placed. It is contraindicated for molars and vertically fractured roots. The first step was to remove, if needed, the crown of the tooth. The center of the root was enlarged by using the color coded burs included with the device. One of 2 screws, which differed in height (28 mm or 33 mm), was then positioned by using a ratchet provided with the system.

A protector plate resembling an impression tray with a large center hole was filled with an impression material and positioned over the tooth to be extracted, with the hole positioned over the screw. The extractor was attached to the screw and activated to vertically lift the tooth until extraction was successful. The major reported advantage was to provide for an atraumatic tooth extraction, which aids in the success of placing an immediate implant.

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**Weiss P, Layrolle P, Clergeau LP, Enckel B, Pilet P, Amouriq Y, Daculsi G, Giumelli B. The safety and efficacy of an injectable bone substitute in dental sockets demonstrated in a human clinical trial. *Biomaterials* 28:3295–3305, 2007.**

### **Injectable bone substitute**

Clinical Practice Point
Bone substitute safe and efficacious

This paper reports on 2 studies that evaluated the safety and efficacy of using an injectable calcium phosphate ceramic suspension (ICPCS). The first study enrolled 14 patients who needed a first molar extracted. The second study evaluated 3 of the original 14 patients 3 years later, with a biopsy to determine efficacy.

Full thickness flap was reflected, followed by extraction and socket preservation with the ICPCS material. Patients were evaluated at 0, 15, 90, and 120 days for signs of inflammation, infection, or graft rejection. Use of the material was reportedly simple, with little problem maintaining its position during the procedure. During the entire follow-up period, no infections or inflammation were noted.

Grafts were evaluated radiographically for the development of any radiolucency around the material. In some cases a radiolucent line was noted initially but gradually decreased with time. At 6 months, all grafts were determined viable. Radiodensity of the graft material increased from 0 to day 180. Only 3 patients were available for follow-up 3 years post-operative.

Evaluation using biopsy revealed that the ceramic material in general was still present but diminished in size. Not all of the graft was completely mineralized throughout the graft, especially in the gingival portion. In all 3 cases, the alveolar ridge height was maintained. This method proved to be safe and a viable option for preserving alveolar ridge height.

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**Implants and microflora**

**Fürst MM, Salvi GE, Lang NP, Persson GR. Bacterial colonization immediately after installation on oral titanium implants. Clin Oral Implants Res 18:501–508, 2007.**

<b>Clinical Practice Point</b>
Bacterial colonization with implant placement

This study’s objective is 2-fold: the first evaluates the bacterial colonization of implants immediately after placement and for the first 3 months, the second compares the microflora of adjacent teeth and implants. Fourteen individuals in need of a single implant with at least 1 adjacent tooth were used in the study. All were confirmed to have no active periodontal disease.

Subgingival plaque samples were collected before surgery, immediately after surgery and at 1, 2, 4, 8, and 12 weeks post-operative. Before surgery there was no difference between tooth surfaces adjacent to implant sites in probing depths or bleeding on probing sites. No differences were found in microbial patterns between tooth surfaces pre-operatively. No statistical difference was noted in the microflora on the adjacent teeth before and immediately after surgery.

At 4 and again at 8 weeks, higher levels of specific bacteria were noted on the tooth surfaces. A bacterial colonization was noted 30 minutes after placement, at week 1 only 1 species was higher. At week 8, higher loads were noted for 32/40 species and at week 12, a higher load was noted for 29/40 species evaluated. A difference was noted in colonization patterns between implants and adjacent teeth.

This study demonstrated that even with the use of chlorhexidine before and after surgery, a bacterial colonization was seen to develop around implants within 30 minutes of placement and re-colonization was seen around teeth.

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**Rotational path RPD**

**Byron R Jr, Frazer RQ, Herren MC. Rotational path removable partial denture: an esthetic alternative. Gen Dent 55: 245–250, 2007.**

<b>Clinical Practice Point</b>
Combined efforts with lab tech key to success with rotational path RPD

Although more than 70,000 dental implants are placed annually, this is not always the treatment of choice, nor is it always within the means of the patient. When removable prosthodontics are selected, the treatment of choice may be a rotation path removable partial denture (RPD).

This report discusses the principles, design, advantages and disadvantages of the rotational path RPD. An RPD with a curved path of placement was first described in 1935 by Hollenback, but did not enter into wider use until the late 1970s. The rest seats of a conventional RPD are mostly seated simultaneously. Comparatively, a rotational path RPD

is seated in 2 segments; the segment that contains the centers of rotation is seated first, before the RPD is rotated, positioning the second segment to the RPD's final seat. During the first part of placement, the RPD engages desirable proximal undercuts that are essential for retention. Then the RPD rotates, and conventional clasps are utilized for additional retention.

There are 3 basic categories of rotational path RPDs: anterior-posterior, posterior-anterior, and lateral. These may be condensed into 2 categories. Category I includes all designs that first seat the rest associated with the rigid retainer, and then the retention clasps, with the centers of rotation at the end of unusually long rests. Category II includes all lateral paths and anterior-posterior paths that replace anterior teeth; the centers of rotation are found at the gingival extensions of the minor connectors. A sliding method is used to establish initial contact with the abutment teeth.

Rotational path RPDs improve esthetics over conventional RPDs since they allow for the replacement of missing teeth without preparing a conventional clasp on every abutment tooth. This is especially useful when molars are mesially inclined. However, the rotational path RPD should not be used in distal extension situations, as functional movement will cause undesirable torque on the anterior abutment teeth because of the rigid retainers. With a firm ridge and modification in design, some exceptions can be made for specific distal extension situations. The key to successful rotational RPD fabrication is working closely with an experienced dental laboratory technician and meticulous attention to RPD design, cast survey and patient evaluation steps.

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***Jeong SM, Choi BH, Li J, Kim HS, Ko CY, Jung JH, Lee HJ, Lee SH, Engelke W. Flapless implant surgery: an experimental study. Oral Surg Oral Med Oral Path Oral Radiol Endod 104:24–28, 2207, Epub 2007 Mar 26.***

The use of a soft tissue flap during dental implant surgery almost always results in some degree of bone resorption in the crestal area of the alveolar bone. Flapless implant surgery has been described as predictable; however, there is a lack of clinical data to support this method. Therefore, the current study was initiated to examine the effect of flapless implant surgery on crestal bone loss and osseointegration in a canine mandible model.

Bilateral, edentulous flat alveolar ridges were created in the mandible of 6 female mongrel dogs. After 3 months of healing, 2 implants in each side were placed by either flap or flapless procedures. After a

### **Ridge surgery**

Clinical Practice Point
Flapless implant surgery benefits newly formed bone height

healing period of 8 weeks, bone blocks containing the implants were excised, and microcomputerized tomography was used to quantify the bone around the implants. Sections (35  $\mu$ m) were cut, and computerized 3-dimensional reconstruction was performed by accumulating traces of each implant. Osseointegration was calculated as percentage of implant surface in contact with bone. Bone height was also measured in the peri-implant bone.

All implant sites in all animals experienced uneventful healing. Average bone height was greater in the flapless group (10.1  $\pm$  0.5 mm) compared to the flap group (9.0  $\pm$  0.7 mm) ( $P < .05$ ). Average osseointegration was significantly greater in the flapless group (70.4  $\pm$  6.3%) compared with the flap group (59.5  $\pm$  6.3%) ( $P < .05$ ). Finally, the flapless group had significantly better vertical alveolar ridge height and more bone/implant contact than did the flap group.

According to the study authors, this is the first report to provide controlled experimental data concerning the influence of flapless implant surgery on osseointegration and the height of newly formed bone around implants. In a canine model, flapless implant surgery improved the osseointegration of dental implants and the bone height around implants after surgery.

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### **Smoking risk**

Clinical Practice Point
Implant failure risk for smokers upheld in studies

**Strietzel FP, Reichart PA, Kale A, Kulkarni M, Wegner B, Kuchler I. Smoking interferes with the prognosis of dental implant treatment: a systematic review and meta-analysis. J Clin Periodontol 34:523–544, 2007.**

Smokers face an increased risk of wound healing complications, peri-implant bone loss and increased implant failure rates. This is due in part to reduced peripheral blood circulation, attenuated collagen production, and reduced function of polymorphonuclear leucocytes and macrophages. Recently published literature reviews implicated smoking as a significant subject-based risk factor for periodontitis. In light of this information, it is important to form a complete picture of the impact of smoking on the success of dental implant therapy.

This meta-analysis and systematic review focuses on the question: Is there is a significantly enhanced risk of implant failures in smokers compared to non-smokers? The influence of smoking on implants inserted with accompanying augmentation procedures was also investigated.

Electronic databases were used to perform a literature search and printed versions of 3 German-language journals were searched manually

for relevant articles and well-defined inclusion and exclusion criteria were used.

The meta-analysis revealed a significantly enhanced risk for implant failure among smokers compared with non-smokers, and similarly for smokers receiving implants with accompanying augmentation procedures. The systematic review indicated significantly enhanced risks of biologic complications among smokers. Five studies revealed no significant impact of smoking on prognosis of 2-stage implants with particle-blasted, acid-etched or anodic oxidized surfaces. Seven studies revealed an enhanced risk for smokers to develop peri-implant soft tissue complications. Eleven studies found significantly enhanced marginal bone loss in smokers, compared with non-smokers, even after undergoing treatment for periodontitis or peri-implantitis. In general, smoking is a significant risk factor for dental implant therapy and for augmentation procedures accompanying implantations.

In this systematic review, the risk of implant failure for smokers ranged from 2.8 after implant placement and up to 1 year, decreasing to about 2.3 up to 5 years after implant placement, indicating a higher risk of early implant failure. The risk for later failure, at 5 years, remained elevated when compared to non-smokers. The authors recommend that the risks and implications of smoking should be included in the informed consent process for dental implant therapy.

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***Maeda Y and Imaishi K. Impact of osseointegrated implants on the selection of treatment options in relation to tooth extraction: comparison between 1995 and 2005. Int J Prosthodont 20:402–404, 2007.***

Tooth extraction is not a reversible process, and the decision to extract remains one of the most critical in the prosthodontic treatment planning process. Although many decision-making processes in dentistry may be described using a tree format, the decision to extract a tooth involves multiple overlapping factors, including level of periodontal bone support, remaining dentition, and position of the tooth in question. These factors are often ambiguous, which makes the construction of a decision tree even more challenging. Therefore, this report describes efforts to introduce a fuzzy concept model that will express each category as a membership function and allow definitions to overlap. These membership functions were then used to describe the impact of osseointegrated dental implants on decision-making for prosthodontic treatment by comparing the responses of dental clinicians to a questionnaire administered in 1995 and 2005.

### **Treatment planning and implants**

Clinical Practice Point
Implant treatment option impacts decision process and extraction choices

For each survey, 25 clinicians were randomly selected from a group of 60 general dentists at a Japanese dental school with 5–20 years of clinical experience. The survey consisted of a written scenario describing a patient’s remaining mandibular teeth (complete from left to right premolars) and the opposing maxillary natural dentition. All teeth were healthy, with the exception of a mandibular right second premolar. First, the clinician was asked to match the remaining bone level percent to the terms: poor, fair, good, and excellent. Then, clinicians were asked to choose a treatment option for the second premolar when each of the 4 bone support levels was present. Options in 1995 included extraction and fabrication of a removable partial denture (RPD), a cast-metal coping for an overdenture, an abutment splinted to the adjacent canine as a fixed partial denture (FPD), or a free-standing abutment as an RPD.

For the 2005 survey, the following options were added: extraction and implant placement, an abutment as an FPD, plus a molar implant, and implant placement in the molar site. From 1995 to 2005, there was a large increase in the range of definition of “poor” bone quality, extending to 60% in 2005. An accompanying shift in the definition of the low range of the “fair” bone quality was also seen. The ratio for each extraction-related treatment option became lower from 1995 to 2005 with the increase in implants after extraction. The overall ratios for treatment options were similar from 1995 to 2005; however, there was a decrease in splinted treatment. The increased range of definitions of poor bone quality may be the result of increased awareness of bone quality because of the availability of computerized tomography scans for prosthodontic treatment.

Splinting teeth was relatively common in Japan in 1995; however, the decrease in the selection of this option in 2005 could reflect growing recognition of side effects of splinted teeth. When the ratios for all extraction options in the 1995 survey were compared to those from the 2005 survey, the ratios were similar; however, in actual dental practice, extraction of teeth is increasing.

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***Peri-implant bone*** ***Hermann F, Lerner H, Palti A. Factors influencing the preservation of the periimplant marginal bone. Implant Dent 16:165–175, 2007.***

<b>Clinical Practice Point</b>
Factors affecting implant bone levels

This article reviews the factors that influence the peri-implant bone levels for successful outcomes of esthetic implant dentistry. A stable bone level is critical for the long-term maintenance of esthetics around implants. The ideas and concepts of biologic width, platform switching, implant design along the cervical region, and abutment design are reviewed.

The finding of Gargiulo and Cohen, defining biologic width as 2.04 mm, not including the sulcus depth, is reviewed. Bone remodeling along the implant will continue vertically and horizontally until the biological width has stabilized. The horizontal component is the justification for platform switching and a maintenance of 3 mm between implants.

Platform switching was inadvertently discovered in the 1980's. It is used now to move the micro-gap between the implant and the abutment further from the bone to prevent continued bony resorption. The application of a roughened surface to the coronal portion has aided in the prevention of apical migration of bone. If the implant surface has a roughened coronal surface made of fine threads, it aids in the primary stability of a newly placed implant, helping with bone level maintenance.

Cochran has shown the ability of epithelial cells and fibroblasts to adhere to the rough and smooth surfaces of abutments. It has also been shown that the continued disruption of such adhesions, which can occur with the removal of healing caps and impression posts, may impact further apical migration of the bony/soft-tissue complex.

In conclusion, critical aspects for excellent esthetic outcomes include the position of implants that maintain recommended space between adjacent implants as well as to adjacent to teeth. In addition, roughened coronal surfaces have aided in maintaining bone levels. Platform switching, with final abutment selection and placement at the time of surgery, should aid in the prevention of continued recession.

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***Awliya WY. The influence of temperature on the efficacy of polymerization of composite resin. J Contemp Dent Pract 8:9–16, 2007.***

Light curing techniques have improved significantly over the years to overcome the drawbacks of quartz-tungsten halogen lights. Light emitting diodes (LEDs) emit a narrow spectrum of light (450 nm–500 nm), with a peak close to the peak absorption of camphoroquinone, which is the most common photo inhibitor used in dental composites.

Studies have shown that although high intensity light sources improve immediate depth of cure, this intensity of light results in high polymerization shrinkage stresses. To reduce shrinkage, a “soft-start polymerization” protocol has been suggested. This protocol uses an initial low-power intensity light. This technique is said to relieve shrinkage stress and achieve an improved integrity of the composite/tooth interface without compromising the final double-bond conversion or mechanical properties of the cured composite.

### **Composite curing with LED**

Clinical Practice Point
Light, temperature and integrity of the composite restoration

The insertion temperature of composite at 40° C was found to influence the hardness of composite more favorably than composite inserted at room temperature. In addition to increased hardness, pre-warmed composite resulted in higher immediate and final conversion values, as well as an increase in fracture resistance.

This study investigated the effect of temperature on the integrity of polymerization during the insertion of composite resin using different light-curing units. Forty-five disc-shaped specimens of composite resin were prepared with 15 each prepared at different temperatures (5° C, room temp. 25° C and 37° C). Each of these 3 groups of 15 was then subdivided into 3 groups of 5 specimens, according to the type of curing light used.

The results of this study suggest that the integrity of composite polymerization is improved by: pre-heating composite to 37° C, using a soft start curing and using an LED light, which produces significantly better hardness.

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