

What's New in Dentistry

Vincent Kokich, DDS, MSD

Bioengineering teeth in edentulous sites. Currently titanium implants are a popular method of replacing missing teeth in edentulous sites. However, implants are immobile, ankylosed objects, whereas adjacent teeth have a periodontal ligament and can move. This lack of implant mobility can be a problem, especially in young, growing patients. In the future we may be replacing missing teeth with bioengineered teeth grown in tissue culture. These experiments to grow teeth have been occurring for a few years, and today researchers are refining their methods and determining what specific ingredients are needed to successfully grow teeth in vitro and in vivo. A study published in the *Journal of Oral and Maxillofacial Surgery* (2007;65:501–507) evaluated the influence of bone morphogenetic protein on the development of tooth buds in mice. Mouse tooth buds were transplanted to an edentulous area of an embryonic mandible and placed in tissue culture. Either bone morphogenetic protein or its antagonist, Noggin, was administered near the tooth buds during the experimental period. After 3 weeks, the explanted tooth buds were removed and analyzed histologically. In the bone morphogenetic protein group, bioengineered teeth were produced that had maturation of cusps and enamel matrix. However, in the group treated with Noggin (the bone morphogenetic protein antagonist), the developing molar had a crater-like appearance with immature development of cusps and suppressed formation of the enamel matrix. In conclusion, the findings of this study confirm that tooth germ transplantation and culture with the administration of bone morphogenetic protein can lead to the mature development of dental structures. These results suggest the possibility of bioengineering tooth morphogenesis and differentiation even in edentulous areas.

Role of bacterial sequencing in noncontact plaque removal. The removal of plaque from the surfaces of teeth requires the use of a toothbrush. However, there are several areas that a toothbrush does not reach. In recent years, sonic and rotary toothbrushes have been developed. One of their benefits is that the bristles of the brush do not need to contact the tooth to dislodge dental plaque. The moving action of the bristles acting in the fluid surrounding the tooth surface can dislodge the plaque from the tooth without actually contacting the tooth surface (noncontact plaque removal). However, a recent study published

in the *Journal of Dental Research* (2007;86:421–425) has shown that the sequence in which specific bacteria attach to the tooth affects the ability of the toothbrush to remove the plaque. Two common bacterial components of dental plaque are streptococci and actinomyces. In this laboratory experiment, both types of bacteria were suspended in artificial saliva in different sequences (either streptococci first followed by actinomyces or in reverse order). After the bacterial plaque had formed on the enamel surface, either a sonic or rotary toothbrush was used to remove the plaque. The toothbrushes were either in contact with the enamel surface or at 2- or 4-mm distances from the surface of the enamel. The results showed that bacteria adhering to enamel in the sequence of streptococci followed by actinomyces appeared more difficult to remove than from the sequence actinomyces followed by streptococci. In addition, at contact, both rotary and sonic brushing performed equally well in bacterial removal, but at a 4-mm distance, both had lost some efficiency. In conclusion, this study has shown that both methods of brushing are capable of noncontact removal of co-adhering bacteria. The authors believe that this is clinically important because many caries-susceptible sites are inaccessible in a contact mode of brushing and are better cleaned by sonic or rotary brushing.

Dental pulp cells able to form cementum-like matrix. Dental pulp is involved in the formation of reparative dentin in response to a variety of external stimuli. However, in these situations, the dental pulp is being influenced by the adjacent dentin, which contains dentinal growth factors. What if dental pulp existed without the influence of the adjacent dentin? If stimulated, would the pulp produce dentin, bone, or cementum? That question was addressed in a study published in the *Journal of Dental Research* (2007;86:469–474). In this investigation, researchers evaluated the hard tissue induced by transplantation of the dental pulp, without adjacent tooth structure, into subcutaneous tissue in rats. Seven days after transplantation, initial hard tissue was formed at the inner periphery of the dental pulp. After 2 weeks, the hard tissue expanded inwardly. When the authors evaluated this mineralized matrix, they found no proteins that tested positive for dentin. On the other hand, they did find proteins that were immunopositive for bone and cementum. In conclusion, subcutaneously transplanted

rat dental pulp formed mineralized hard tissue possessing bone- or cementum-like characteristics. The authors believe that their findings indicate that pulp cells are able to form mineralized hard tissue in the absence of dentinal growth factors, but the morphology of the tissue formed does not resemble that of dentin.

Long-term results of open reduction and rigid fixation of condylar fractures. Fractures of the mandibular condyle represent 20% of all mandibular fractures. Nondislocated mandibular condylar fractures and condylar fractures in children are successfully treated conservatively. Dislocated condylar fractures have traditionally been managed with closed reduction using a period of maxillomandibular fixation succeeded by jaw exercises. However, some surgeons believe that open reduction and rigid internal fixation of dislocated condylar fractures provides the possibility of restoring the pretraumatic anatomic relationships and gives stability to the fracture. However, open reduction by an extraoral approach leaves a facial scar and has the potential to cause facial nerve injury. A study published in the *Journal of Oral and Maxillofacial Surgery* (2006;64:1771–1779), documents the clinical effects of an intraoral approach for open reduction of condylar fractures. The sample consisted of 15 patients with an average age of 42 years (range 18 to 85 years) who underwent intraoral open reduction of their condylar fractures. Six patients had unilateral fractures and nine patients sustained bilateral condylar fractures. Clinical and radiographic examinations were performed an average of 2 years after surgery. The authors found that two patients fulfilled the criteria for TMD, which included myofascial pain, arthralgia, and disc displacement with reduction. Satisfactory healing and lack of symptoms were found in 12 joints. The authors did point out that minor adjustment of the postoperative occlusion was necessary in six patients. Lastly, the authors found no significant difference between maximum vol-

untary isometric bite force measurements or maximum pressure pain threshold between the fracture side and the opposite side in unilateral cases or between the operated and nonoperated sides in bilateral cases. The authors conclude that their intraoral approach is technically demanding and associated with a high risk of complications.

Immediate loading of machined and titanium oxide implant surfaces equally successful for supporting fixed bridges. Recently, a titanium oxide surface treatment of implants has been demonstrated in animal and in vitro studies to reduce bone healing time and to increase the bone-implant contact compared to the traditional machined surface implants. But is there any difference between these surfaces when the implants are loaded immediately to support posterior fixed bridges? A study published in the *International Journal of Oral and Maxillofacial Implants* (2007;22:35–46) answered this question. The sample consisted of 10 patients with bilateral partial edentulism in the posterior mandible. This was a split-mouth–designed study, and 20 implants were placed on the test side (titanium oxide coated) and 22 implants were placed on the control side (machined surface). The implants were loaded with fixed bridges in light occlusal contact within 24 hours after surgery. Then implant stability was evaluated at baseline and at 1, 2, 3, 12, 24, and 52 weeks following implant placement. The radiographic bone level change was measured on periapical radiographs at baseline and after one year of loading. The results showed that the overall implant success rate was 95%. No implants were lost in the test group, but two failed in the control group. The difference in the radiographic bone level between the test and control implants was not statistically significant. The authors conclude that immediate loading of implants to support fixed bridges in the posterior mandible may be considered a viable treatment option using implants with either machined or titanium oxide surfaces.