What's New in Dentistry

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Implant surfaces accelerate bone deposition. It has been well established in previous studies that bone forms around endosseous root form implants that are used to replace missing teeth. In addition, it is also known that simply creating a hole in the alveolar bone will also heal and fill in with bone. Is there any difference in the rate at which bone repair occurs in an empty hole compared with the rate of bone deposition around a titanium implant? This interesting question was addressed in a study that was published in the *Journal of Dental Research* (2007;86:862–867). The experimental research project was conducted in mice. Holes were created in the alveolar bone, the soft tissue was replaced over the site, and the hole was allowed to fill in with bone. Histologic sections were made of the healing bony margin at various times during the healing process. A similar hole was then made in the alveolar bone of adult mice, and a titanium implant was placed in the hole. A similar histologic assessment of the healing at the bone-implant interface was matched with the same time observations of the animals with the empty holes. The results of this study showed that when the implant was present, the sites showed accelerated differentiation of peri-implant cells into osteoblasts and accelerated remodeling of new bone matrix compared with the sites with the empty holes. In addition, these researchers found that although the cortical edges of the bone did not always come uniformly into contact with the implant surface, the time course of repair was equivalent whether or not a small gap existed. In conclusion, this study showed that osteoblast differentiation and new bone deposition begins sooner around implants, which suggests that the implant surface and the microenvironment around implants favors osteogenesis.

Platelet-rich plasma accelerates early bone regeneration. Bone grafting is a common surgical procedure in patients who will receive implants to replace missing teeth. The grafting materials can be autogenous (native bone) or alloplastic (human cadaver bone or bovine bone). After adequate healing, an implant can be placed into the remodeled bone-graft site. In an attempt to accelerate the healing of the graft site, clinicians have proposed adding platelet-rich plasma (from the patient) to the bone graft material. In theory, local application of platelet-rich plasma should induce bone regeneration and increase the healing of the graft site. This hypothesis was tested in an experimental study in rabbits published in the *International Journal of Oral and Maxillofacial Implants* (2007;22:563–568). The sample for this study consisted of 12 New Zealand rabbits. Two identical cranial defects, 10 mm in diameter, were created in each rabbit. One of the defects was grafted with platelet-rich plasma, but the contralateral defect was left unfilled and served as a negative control. The healing of the defects was evaluated histologically at two, four, six, and eight weeks after surgery. At two weeks, histologic samples showed poor bone formation in both experimental and control defects. At week 4, new bone was slightly formed in the control defects, whereas in the defects grafted with platelet-rich plasma, a complete bone bridge linking both sides of the defect could be seen. At eight weeks, the amount of newly formed bone was similar in both defects. In conclusion, local administration of platelet-rich plasma in cranial defects in rabbit calvaria stimulates the first phases of bone regeneration. However, over the long term, there are no differences in the quality or quantity of bone in the experimental or control sites.

Altering the risk-benefit ratio of fluoride among young children. The use of fluoride for promoting oral health has always involved a balance between the protective benefit against caries and the risk of developing fluorosis. Monitoring fluoride exposure in childhood continues to be important in preserving the effectiveness of fluorides in caries prevention, while limiting the risk of fluorosis. Early fluoride exposure protects newly erupting deciduous teeth, creating a healthier oral environment. However, the current generation of children is exposed to numerous fluoride sources, each of which has an unknown balance of benefit and risk. A study published in the *Journal of Dental Research* (2007;86:723–728) evaluated the balance of benefit and risk of several fluoride exposures among a large group of children. More than 650 children participated in the study. Fluoride exposure history for these randomly selected children was collected to calculate exposure to fluoridated water, fluoridated toothpaste, and other fluoride sources. Caries experience, recorded when a child was six years old, and fluorosis prevalence, recorded at examination were compared between and among groups with different levels of fluoride exposure. Fluorosis prevalence was found to be 11.3%, whereas caries prevalence was 32.3%. Exposure to fluoridated water was positively associated with fluorosis but negatively associated with caries. Using 1000-ppm-fluoride toothpaste or eating, licking, or swallowing toothpaste was associated with a higher risk of fluorosis without additional benefit in caries protection. The authors suggest beginning toothpaste use at 19 to 30 months old, using toothpaste fluoridated at 400 to 550 ppm (rather than 1000 ppm), encouraging spitting after brushing, and discouraging eating/licking toothpaste habits in young children.

Immediate loading of splinted implants has high success rates. Immediate implant placement (placed into the socket at the time of tooth extraction) offers several advantages: shorter healing time, reduced resorption of the alveolar process, and fewer surgical visits. However, over the long term what happens to the bone level around implants that are placed into extraction sockets. That question was answered in a study published in the *International Journal of Maxillofacial Implants* (2007;22:187–194). The sample for this study consisted of 17 patients between the ages of 57 and 82 years. All patients had a hopeless maxillary and/or mandibular dentition. As a result, their remaining teeth were extracted and six to eight implants were placed at the time of extraction and restored within 72 hours. Some of the implants were placed in native bone ($n = 97$) and some were placed into the extraction sockets ($n = 42$), for a total of 139 implants. Radiographs were taken of these implants at the time of placement, then at three months, six months, and annually for five years. The radiographs were digitized, and the bone level changes were measured using a computer-assisted method. The overall results indicated that for all implants, about 0.6 mm of bone was lost after the first six months. When stratifying for native bone implants versus extraction socket implants, it was found that less bone was lost around those implants placed in extraction sockets after six months. However after the first year, native bone implants and extraction socket implants underwent similar rates of adjacent bone loss with no statistically significant differences between the two groups. The authors conclude that a combination of immediate implants placed in extraction sockets and implants placed in native bone can be immediately loaded with a fixed full-arch prosthesis and remain stable for longer than five years. The bone loss adjacent to these implants is similar to that seen surrounding those implants placed and restored using traditional protocols.

Chlorhexidine provides antibacterial protection to specific implant surfaces. Chlorhexidine has been shown to be an effective antibacterial agent for patients who are susceptible to periodontal pathogens. The bactericidal effect of chlorhexidine can enhance the healing of periodontal defects around teeth when used in conjunction with other therapeutic methods of combating periodontal disease. Does chlorhexidine have a similar beneficial antibacterial effect around implants? This important clinical question was addressed in a study that was published in the *Journal of Periodontology* (2006;77:1194–1200). This laboratory study used titanium disks that could be immersed in chlorhexidine and then subjected to bacteria. Half of the titanium disks had a smooth surface, and the other half were sand-blasted/acid-etched to produce a rough surface. The disks were soaked in 0.1% or 0.2% chlorhexidine digluconate for 24 hours. After that time, the authors determined how much chlorhexidine had been adsorbed by the two titanium surfaces and determined the antibacterial potential of the disks after exposure to *Streptococcus mutans*. The results of this study showed that chlorhexidine adsorption rates were significantly higher when using the 0.2% concentration of chlorhexidine. In addition, the adsorption was twofold higher on the rough titanium disks compared with the smooth surface. Finally, larger bacterial inhibition was obtained with the 0.2% chlorhexidine concentration and the rough surface titanium disks. In conclusion, the authors have shown that chlorhexidine is adsorbed by titanium, a higher concentration is more effective, and a rough titanium surface produces higher adsorption. Based on this research, it is suggested that chlorhexidine can provide an antibacterial effect around dental implants.