

What's New in Dentistry

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Stem cells used to create teeth in adult jaws. Missing teeth in adults may require restoration of the space with removable or fixed bridges or the placement of intraosseous implants. Although both means of space restoration are acceptable, they are costly and may require replacement depending upon the initial age of the patient. However, new information published in the *Journal of Dental Research* (2004;83:518–522) confirms that tooth structures can now be created in the jaws of adult animals by introducing stem cells at the appropriate time. These researchers isolated neural stem cells, embryonic stem cells, and bone marrow-derived cells from a mouse model. To determine whether a mouse embryonic primordium could develop into a tooth when transplanted into the adult mouth, the authors surgically implanted molar tooth rudiments into the soft tissue of the maxilla of adult mice. The transplanted explants were left for 26 days. When these explants were removed and evaluated histologically, the authors found a clearly identifiable ectopic tooth had formed at the site of the transplantation. The ectopic tooth was of a size similar to that of the first molar and was histologically normal, with dentin and enamel. The tooth was connected to ectopic bone by an organized soft connective tissue. This is the first study to show that transfer of embryonic tooth primordia into the adult jaw resulted in complete tooth development, showing that an embryonic primordium can develop in its adult environment. Although many important questions remain to be answered, this research provides the real possibility that teeth could be produced “to order,” by use of stem cells to create tooth primordia in vitro for transplantation and replacement of missing teeth in humans.

Platelet-rich plasma enhances alveolar cleft repair. Alveolar bone grafting is an essential procedure in the treatment of cleft lip and palate. Autologous iliac bone marrow is used because of its sufficient quantity and the high osteoinductive potential of this bone. However, even with iliac bone, the regeneration of the alveolar cleft may be insufficient because of the patient's age and the width of the cleft. However, a recent study published in the *Journal of Oral and Maxillofacial Surgery* (2004;62:555–558) used platelet-rich plasma to enhance the response during autologous bone grafting. Platelet-rich plasma (PRP) extracted from autologous whole blood is known to have a number of different growth factors in high concentration. Successful results in the treatment of periodontal disease with the in-

corporation of PRP have been reported. In this study, the authors performed tertiary bone grafting (after completion of the second stage of dentition) in a series of seven adult patients with alveolar clefts using autologous iliac cancellous bone with PRP. A control sample had bone grafts without PRP. The PRP was extracted during the cleft repair operation. Cancellous iliac bone was harvested, and the PRP was mixed with it. Human fibrin glue was added to pack the PRP into the bone marrow. Evaluation was performed with three-dimensional computed tomography before and at five to six months after the operation. The authors analyzed the volume of regenerated bone to the alveolar cleft using a computer. All patients had an uneventful course postoperatively. In the experimental group, the average percentage of bone regeneration was 80%. In the control group, the average amount of ridge regeneration was 63%. The difference was statistically significant. The authors believe that PRP is a safe and cost-effective source of growth factors and could enhance osteogenesis of alveolar bone grafting in cleft lip and palate patients.

Implant surface treatment influences osseointegration. Today, implants have revolutionized restorative dentistry. Millions of implants are placed every year throughout the world. However, for implants to be successful and support a restoration (denture, bridge, or crown), the titanium surface of the implant must integrate with the bone to provide maximum support. A study published in the *Journal of Periodontology* (2004;75:273–282) evaluated the effect of different surface treatments of the implant. This was an in vitro experiment. Six titanium disks with different surface treatments were compared. These ranged from a completely smooth surface to a surface that was sandblasted (with either aluminum oxide or zirconium oxide), acid etched, or a combination of both techniques. Then, these prepared disks were seeded with human osteoblasts and fibroblasts and cultured on a Petri dish. The degree of osseointegration was assessed using scanning electron microscopy after 24 hours, six and 12 days. The scanning electron microscopic observation revealed drastic differences in surface microtopography, with a higher cell density on sandblasted and acid-etched samples than on the smooth surface and plasma sprayed surfaces. The titanium surface that was the most favorable for inducing a more pronounced proliferation of cells was the surface that was sand blasted by zirconium oxide and then acid etched. The

authors concluded that surface treatment of titanium will influence the growth and metabolic activity of cultured osteoblasts and fibroblasts.

Researchers identify predictors for poor outcomes in patients with orofacial pain. Temporomandibular dysfunction (TMD) is a relatively common problem among adult subjects. This disorder can manifest itself in different ways. One type of manifestation is orofacial pain. When treating TMD, especially the orofacial pain component, it is important to be able to predict whether or not the treatment will be successful in the future. A study published in the *Journal of Dental Research* (2004;83:712–717) reported on the results of a large population-based study designed to describe the outcome of orofacial pain after a period of four years and to identify baseline factors that would predict a poor outcome in those with orofacial pain. The sample consisted of 2504 participants, of whom 646 (26%) reported orofacial pain at the outset. The sample ranged in age from 18 to 65 years. Overall, 424 (79%) of these individuals participated in the four-year follow-up. At that time, 229 (54%) reported orofacial pain and 195 (46%) did not report such pain. Then, the authors performed an analysis to determine which factors or variables at the outset of the experiment in the persistent pain group were similar and could provide predictors of continuing orofacial pain. On the basis of their data, the authors associated persistent orofacial pain with females, older age, psychological distress, widespread body pain, and taking medication for orofacial pain at baseline. The authors conclude that of those persons selected from the community with self-reported orofacial pain, just under half will have symptoms that will resolve after four years. Persons with pain that requires medication, other body pain, and psychological distress are more likely to have symptoms that persist.

Patient compliance with TMD treatment recommendations. TMD treatment generally focuses on relieving symptoms rather than curing the underlying problem. Occlusal splints are commonly used by clinicians to reduce TMD pain, and these devices are successful in between 70% and 90% of affected patients. But there are other techniques for alleviating TMD pain. For example, muscle-stretching exercises can also be effective, if the patient routinely practices the techniques. In addition, electromyographic biofeedback has been applied to the treatment of pain on the premise that reducing masticatory muscle tension will decrease dysfunction and pain. Thermal therapy, both alone and in combination with stretching has also been shown to relieve muscle pain and inflammation. However, subjects need to practice each of these techniques, or they obviously would be ineffective. That issue was the topic of a study that was published in the *Journal of Orofacial Pain* (2004;18:203–213). The purpose of this investigation was to evaluate the short-term patient compliance with five conservative TMD treatments (jaw relaxation, jaw stretching, heat application, cold application, and occlusal splint use). A population of 81 TMD patients was given from one to five treatment recommendations as part of usual care in a TMD specialty clinic. Compliance with each recommendation and pain, pain-related activity interference, and jaw use limitation measures were calculated from electronic interviews conducted three times daily for two weeks. The results of this study showed that the median compliance with individual treatment modalities ranged from 7.7% for heat application to 92.7% for jaw relaxation. The median overall compliance was 54.8%. In conclusion, participants with higher initial pain intensity and jaw use limitations were significantly more compliant with their recommended treatment regimen.