

# ENDONEWS

ENDODONTICS, LLC / NEW HAVEN / HAMDEN / CONNECTICUT / SUMMER 2014

## New Frontier of Endodontics-----Regenerative Endodontic Procedure (REP)

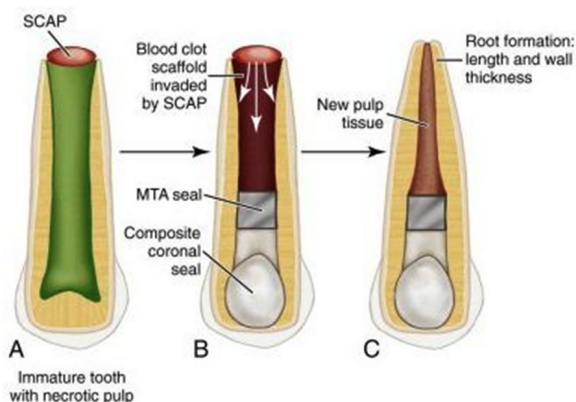
Endodontic management of immature permanent teeth with necrotic pulp is a challenge for dentist. Traditionally, the treatment option for immature non-vital teeth was thorough debridement of the root canal system followed by long-term  $\text{Ca(OH)}_2$  in order to induce an apical barrier formation---i.e. apexification. The downside to this treatment was length of treatment time and weak, short, thin roots with incompletely formed dentin wall. More recently, Mineral trioxide aggregate (MTA) apexification has become more common. This consists of debridement of the immature root and immediate obturation with MTA as apical barrier. This shortened the treatment time, but the problem of short thin roots still remained and these teeth are frequently susceptible to root fracture. Regenerative endodontic procedure (REPs) have emerged as a viable treatment alternative for these teeth. It is an exciting new concept that seeks to apply the advances in tissue engineering to the regeneration of the pulp-dentin complex. Previously necrotic, immature teeth is able to 'regenerate' pulp-like tissue allowing for continued development of the tooth. The dentinal walls thicken, the length of root increases, periapical lesions heal and the open apex closes.

The treatment protocol is still developing and based on the best level of available evidence from clinical or preclinical translational studies.

Regenerative endodontics often involves a two or multi-step procedure. The first appointment is centered on proper access and disinfection of the pulp space. After access and determination of working length, the root canal systems are slowly irrigated first with 1.5% NaOCL and then irrigated with saline, with irrigating needle positioned about 1 mm from root end. Canals are dried and intracanal medicaments (antibiotic paste or calcium hydroxide) is delivered to canal system. Access is temporarily restored. Those procedures include minimal-to-no mechanical debridement. Hence, they rely heavily on the chemical debridement step and on the use of intracanal medicaments to achieve disinfection and resolution of infection. An antibiotic mixture composed of ciprofloxacin, metronidazole, and minocycline, known as triple antibiotic paste have been the most widely used medicament.

Upon confirming the absence of clinical signs and symptoms, the second appointment is scheduled 2-4 weeks after the first visit. To better facilitate stimulation of apical bleeding, 3% Mepivacaine (no epinephrine) is recommended as local anesthetics. The antibiotic paste or  $\text{Ca(OH)}_2$  paste is removed by irrigating with EDTA to release growth factors from the dentin. The canals are dried. To deliver stem cells into the root canal and create a scaffold with blood clot, bleeding is induced by rotating a #25 K file past the apical foramen with the goal of having

the entire canal filled with blood to the level of the CEJ. Once a blood clot has formed, 3mm MTA is placed on the top of the blood clot to serve as an internal matrix. The tooth is then restored with glass ionomer and composite. The follow-up appointments are essential in order to evaluate the clinical outcomes.



SCAP: Stem cell from apical papilla  
*From Hargreaves: Pathway of the Pulp*

Here is an example of pulpal regeneration performed at our office. A 15-year-old girl presented with a diagnosis of pulp necrosis and acute apical abscess on tooth #20. The tooth was accessed and allowed to drain. The coronal portion of the root was irrigated with NaOCL. No instrumentation was performed. Antibiotic paste containing metronidazole, ciprofloxacin, and minocycline was placed inside the canal for disinfection and the tooth was temporized. The patient returned 14 days after the initial appointment without any symptom. After irrigation of the canal, bleeding was stimulated from apex with files and a blood clot was stopped below the level of the CEJ to provide a scaffold for the ingrowth of new tissue. An increment of mineral trioxide aggregate (MTA) and a bonded resin were placed coronally as final restoration. Radiographic healing was noted within 3 months. At 30 month recall, the root walls were thickened with closure of open apex.

Regenerative endodontics is currently in its infancy. However, the possibilities are exciting and research is ongoing. Regenerative dental therapies may one day lead to more effective vital pulp therapy, more effective treatment of immature teeth, traumatized teeth, and possibly the replace of missing teeth with bioengineered teeth.

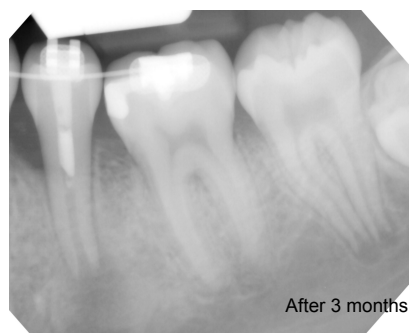
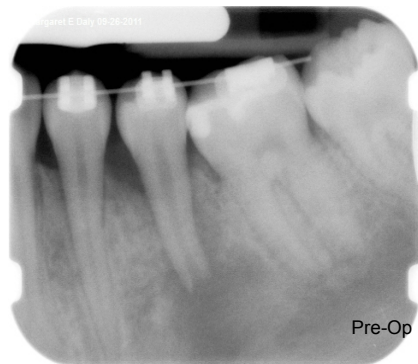
BRUCE Y. CHA, D.M.D., JIN JIANG, D.D.S. & JOSEPH T. SIRACUSE, D.M.D., Practice Limited to Endodontics

Lincoln Place, 406 Orange Street, New Haven, CT 06511 (203) 777-6461

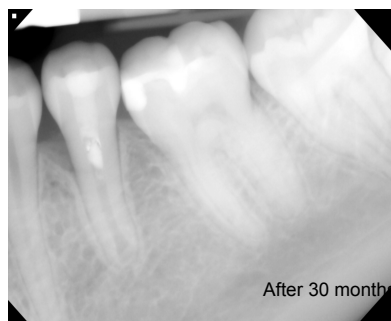
Washington Place, 60 Washington Avenue, Suite 202, Hamden, Connecticut 06518 (203) 281-6574

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