



# Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology

## EDITORIAL

### The Emperor's new cloth

Let me begin by narrating a famous fairy tale by Hans Christian Andersen for those of you who may not know the details. It was an Emperor who hires 2 swindlers to create a new suit of clothes for him. As the Emperor loved clothes they promise him the finest suit from beautiful cloth. They told him that they had invented a new method to weave a cloth so light and fine that it looks invisible to anyone who is too stupid and incompetent to appreciate quality.

The Emperor gave the men a bag of gold coins and the scoundrels started to work. After some time the Emperor sent the prime minister to check on the progress of weaving the cloth. The scoundrels showed the prime minister the empty loom and invited him to feel the cloth. The prime minister looked and looked but could not see or feel anything. He broke out in cold sweat as he realized he may be stupid or incompetent and may lose his position. He looked up and said: "What a marvelous fabric! I will tell the Emperor."

After his suit and mantel was fabricated the Emperor arranged for a ceremonial parade through his city. All people saw the naked Emperor and they all said: "Look at the Emperors beautiful clothes. The colors are beautiful." Nobody wanted to admit that they were stupid and incompetent until a child said loudly: "The Emperor is naked." "Fool," his father said and reprimanded his son. "Don't talk nonsense." The crowd took notice, however, and soon everyone said: "It is true. The Emperor has no cloth."

The Emperor realized that the people were right but could not admit to that. He thought it better to continue under the illusion that anyone who could not see his clothes was either stupid or incompetent and he stood stiffly on his carriage.

I am re-telling this fairy tale as it reminds me of many of the controversial issues we deal with in interpreting endodontic research. The most recent one is the excitement about "pulp regeneration." It is often discussed as a "paradigm shift" in endodontic treatment. (*This is where the cloth is woven.*) The problem with

the concept of "pulp regeneration" starts with how pulp tissue is defined. The definition appears to have changed in recent scientific writing. The traditional definition used to be a loose connective tissue with a peripheral border of odontoblasts lining the dentin walls. However, recently, it appears from the numerous publications on "pulp regeneration" that we should be satisfied with a "pulp tissue" that consists of fibrous connective tissue similar to periodontal tissue. Such tissue lacks odontoblasts and is not able to form dentin. It is not a pulp! There are, however, situations when remnants of the real pulp tissue remains in the apical part of the root canal and will regain its healthy function after the infection is brought under control. Thus, as real pulp tissue is present there is no need for pulp "regeneration," just disinfection followed by healing. This remaining pulp tissue will continue the apical root development but will not fill the empty pulp cavity. The coronal pulp tissue that is lost can be replaced by fibrous connective tissue only after a scaffold is provided.

Despite these facts, it was stated in a recent article that "This novel procedure exploits the full potential of the pulp for dentine deposition and produces a stronger mature root that is better able to withstand fracture . . ."<sup>1</sup> (*We have been shown the invisible cloth.*) It sounds great, but unfortunately the "dentin" deposition in the apical part of the root canal is old-fashioned cement tissue. The apical part of the root may be a little stronger owing to the cement build-up but the coronal half is as prone to fracture as before.

That connective tissue growth into the pulp space after necrosis is a concept that is at least 50 years old.<sup>2,3</sup> Nygaard-Østby and co-workers showed, on a number of occasions, how periodontal tissue could grow into the pulp space when a blood clot scaffold was available.<sup>3-5</sup> The root canal was often narrowed by the apposition of cementum. In cases with necrotic pulp, the root canals were filled with sulfathiazole as an

intracanal disinfecting dressing. This new tissue growth only lays down cellular and acellular cementum.

There are cases like traumatic injuries where the pulp tissue undergoes aseptic necrosis. In such case the dead pulp tissue will serve as a scaffold to allow fibrous connective tissue to repopulate the pulp space.<sup>6</sup> Hard tissue formed on root canal walls is cementum and not dentin. In immature teeth the apical growth zone may continue the root development.

Few have done more work than Miomir Cvek on rehabilitation of injured immature teeth with a necrotic pulp. In a number of publications he defines the term “complete revascularization” as the ingrowth of mesenchymal cells and capillaries that can be seen close to the coronal roof of the pulp space.<sup>7</sup> Although mesenchymal cells can function as stem cells, neither Cvek or anyone else appears to have shown the differentiation of these cells into odontoblasts and subsequently the formation of dentin. It is a fact that the apical growth zone of immature infected teeth can continue physiological root development when the infection is brought under control. However, in cases when coronal revascularization occurs, the tissue consists of undifferentiated mesenchymal tissue.

Pulp necrosis disintegration in immature teeth is a slow process and the apical growth zone is very resistant to infectious and inflammatory processes. This fact has been known for many years and the classical treatment of these infected tissues was dressing with calcium hydroxide. There has also been an emphasis on the preservation of as much vital tissue as possible. When continuous root development has been achieved, the final root canal filling is placed. No attempts have been made to induce connective tissue growth into the remaining coronal part of the pulp space. Instead, a coronal restoration with adhesive techniques is placed, aimed at strengthening the tooth structure.

It has been suggested that a “paradigm shift is taking place in treating immature teeth.”<sup>8</sup> I fail to see the paradigm shift, however, as the only change in treatment is that some investigators are trying another antimicrobial regimen with a triple antibiotic paste. It is important in this age of evidence-based treatment pro-

cedure to realize that there is no study comparing the more than 40-year-old calcium hydroxide treatment with this new antibiotic combination. There are no objective histological studies published on this novel treatment. But there is much indirect evidence that revascularization of necrotic pulp space content will result in fibrous connective tissue with cellular/acellular apposition on the root canal walls. There is also little evidence that such cementum will reinforce the coronal part of the tooth in a significant way.

When looking for the “*bag of gold coins from the Emperor*” we must separate the treatment of immature teeth from stem cell research. Both topics are valid topics for research but with very different objectives and pathways. Dental stem cell research is yet unproven and is looking for practical applications, but treatment of immature teeth is not the right one.

It is easy to be considered stupid and incompetent but this Emperor has no cloth!

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#### REFERENCES

1. Reynolds K, Johnson JD, Cohenca N. Pulp revascularization of necrotic bilateral bicuspid using a modified novel technique to eliminate potential coronal discoloration: a case report. *Int Endod J* 2009;42:84-92.
2. Öhman A. Healing and sensitivity to pain in young replanted human teeth. An experimental clinical and histological study. *Odont Tidskr* 1965;73:169-227.
3. Nygaard-Østby B. The role of the blood clot in endodontic therapy. An experimental histologic study. *Acta Odont Scand* 1961; 19:323-53.
4. Nygaard-Østby B, Hjortdal O. Tissue formation in the root canal following pulp removal. *Scand J Dent Res* 1971;79:333-49.
5. Hørsted P, Nygaard-Østby B. Tissue formation in the root canal after total pulpectomy and partial root filling. 1978;46:275-82.
6. Spangberg LS, Helldén L, Robertson PB, Levy BM. Pulpal effects of electrosurgery involving based and unbased cervical amalgam restorations. *Oral Surg Oral Path Oral Med* 1982;54:678-85.
7. Cvek M, Cleaton-Jones P, Austin J, Lownie J, Kling M, Fatti P. Pulp revascularization in reimplanted immature monkey incisors—predictability and the effect of antibiotic systemic prophylaxis. *Endod Dent Traumatol* 1990;6:157-69.
8. Huang GT-J. A paradigm shift in endodontic management of immature teeth: conservation of stem cells for regeneration. *J Dent* 2008;36:379-86.