Regenerative endodontics – fact or pulp fiction?

ENDO

In Greek mythology, the Titan Prometheus stole fire from Zeus and gave it to mankind. As punishment, Zeus ordered Prometheus chained to a rock and sent an eagle to eat his liver every day. However, the liver of Prometheus was able to regenerate itself, enabling him to survive, only to endure the torture again the next day.

Diseased, degenerating or damaged tissues and organs can cause a variety of illnesses and health problems. At present, most treatment modalities are directed towards eliminating, controlling or alleviating symptoms. Regenerative medicine, on the other hand, aims to restore or establish the normal function of lost, diseased, damaged or ageing cells, tissues and organs using a range of approaches; including cell-based and gene-based therapies, and tissue and biomedical engineering. Prometheus is often cited as an icon for regenerative medicine.

Regenerative medicine has been heralded as the next big treatment revolution, the extension into new and exciting frontiers. Stem cell and tissue engineering research and therapies, for example, have not only attracted mass media attention, provoked philosophical and bioethical debates but also entered the political arena. Advocates for stem cell and tissue engineering research and therapies argue that it offers potential medical benefits to patients afflicted by a wide range of conditions; opponents warn that it may be the opening of a Pandora's box.

Regenerative endodontics, the term may be considered an oxymoron, is a branch of regenerative medicine and an emerging discipline[1]. Regenerative endodontic procedures have been defined as biologically-based procedures designed to replace damaged, diseased or missing dental structures, including dentine and root as well as cells of the pulp-dentine complex, with living, viable tissues, preferably of the same origin, that restore the normal physiological functions of the pulp-dentine complex[2]. Regenerative endodontic procedures may encompass treatment that achieves pulp-dentine regeneration from the simplest blood clot revascularisation/revitalisation method[3] to more complex treatment, involving the creation of tissue-engineered dental pulp scaffolds in the laboratory and implanting them into cleaned and shaped root canals[4]. There are increasing numbers of clinical case reports, scientific and research development articles, topical discussions and presentations at conferences and meetings on regenerative endodontic procedures. The advent of revascularisation/revitalisation and tissue regeneration approaches has already encouraged a paradigm shift in the management of non-vital, immature permanent teeth[5].

A Regenerative Endodontics Committee has been established by the American Association of Endodontists to collect and evaluate data, and promote related scientific research and clinical practice in regenerative endodontics. A recent survey revealed that endodontists are enthusiastic, supportive and optimistic about the future use of regenerative endodontic procedures[6].

As patients continue to express the wish to retain their natural dentition, the ultimate goal of regenerative endodontics is to be able to regenerate dental pulp-like tissue as an alternative to conventional root canal treatment. Will this Promethean promise be fulfilled? Prometheus was saved when Heracles (Hercules) slew the eagle that tortured

him daily. Achieving the challenging goal of regenerative endodontics may be a Herculean task but, hopefully, the dream will become an everyday clinical reality in the future.

BS Chong

1. Huang GTJ. Pulp and dentin tissue engineering and regeneration: current progress. Regen Med 2009;4:697-707.
2. Murray PE, Garcia-Godoy F, Hargreaves KM. Regenerative endodontics: a review of current status and a call for action. J Endod 2007;33:377-390.
3. Wang X, Thibodeau B, Trope M, Lin LM, Huang GT. Histologic characterization of regenerated tissues in canal space after the revitalization/revascularization procedure of immature dog teeth with apical periodontitis. J Endod 2010;36:56-63.
4. Gotlieb EL, Murray PE, Namerow KN, Kuttler S, Garcia-Godoy F. An ultrastructural investigation of tissue-engineered pulp constructs implanted within endodontically treated teeth. J Am Dent Assoc 2008;139:457-465.
5. Huang GT-J. Apexification: the beginning of its end. Int Endod J 2009;42:855-866.
6. Epelman I, Murray PE, Garcia-Godoy F, Kuttler S, Namerow KN. A practitioner survey of opinions toward regenerative endodontics. J Endod 2009;35:1204-1210.