INTRODUCTION & OBJECTIVES

Stem cells are unspecialized cells capable of continuous self-renewal and to differentiate into a variety of mature cell types (Fig. 1) when exposed to specific environments and stimuli. Thus, innumerable investigators have been studying their mechanism of differentiation in order to use them to regenerate damaged tissues, contributing to homeostasis, and improving the prognosis of some diseases. Stem cells can be isolated during the embryogenesis or collected from adult tissues, such as the bone marrow; however, dental stem cells represent a good alternative since they are easy to obtain and present ability to differentiate into various types of specialized cells. In this study, we will focus on tooth derived stem cells, their characterization and clinical application, specially in regenerative endodontics.

MATERIAL AND METHODS

This literature review was carried in the PubMed database, using the combination of the keywords and the Boolean operator “AND”. 14 relevant studies were selected, complemented with 4 crossed references, making a total of 18 bibliographic sources.

RESULTS AND DISCUSSION

Dental tissues are an easily available source of stem cells, specifically the mesenchymal type, from which they can be obtained with low morbidity and with no additional risks for the donor, for example through the collecting of exfoliated/extracted teeth. However, they present as a limitation the small quantities of stem cells available from these teeth, specially at the time of the regenerative procedure. Until now, there have been already identified 6 types of tooth derived stem cells (TDCs) considering their origin and location (Fig 2; Table 1).

When it comes to applying these cells in endodontic treatments, there may be an association between regenerative endodontics and tissue engineering, which is a multidisciplinary research area with the ultimate goal of restoring, maintaining, and regenerating damaged/lost tissue, based on the association of 3 intervenients: scaffold, signaling molecules and stem cells. The tissue engineering in endodontics will allow us to achieve dentin/pulp regeneration through biological approaches. We have, so far two major mechanisms in tissue engineering, regarding endodontics: cell homing and cell transplantation.

• Cell homing - regenerative procedure that consists in a cell free method of regeneration of the pulp-dentin complex. This process induces the recruitment of MSCs from the peripheral area into the root canal and is stimulated by the colocalization of growing factors and a scaffold in the place where we want regeneration.

• Cell transplantation - regenerative procedure, alternative to cell homing, that consists in a cell-based approach of regeneration of the pulp-dentin complex. This mechanism implicates the implantation of autologous or allogenic stem cells directly into the root canal system in order to occur regeneration.

CONCLUSION

Tissue engineering of the dental pulp is a promising field that can potentially bring great benefits when it comes to oral health. However, there are still missing the necessary methods for the isolation and treatment of the stem cells as well as more studies mattering the best scaffolds to use in these procedures. Collectively, future research prospects in regenerative endodontics depend on the multidisciplinary cooperation of clinicians, scientists, engineers and their joint contributions to the development of techniques that help reestablishing the tooth vitality.

REFERENCES