SHORT COMMUNICATION

Periodontal Tissue Regeneration: Current Evidence and Future Prospects

Ajay Mahajan[1], Kanwarjit Singh Asi[1], Poonam Mahajan[2] and Saroj Thakur[3]

ABSTRACT

Periodontal diseases are one of the most prevalent non communicable infectious diseases affecting the mankind. Various treatment options are available to prevent early loss of teeth and other signs and symptoms of the disease. Treatment modalities to regenerate the lost periodontal tissues are limited.The recent concept of tissue engineering has shown some promising results in few studies although the clinical evidence is still not sufficient enough to support various tissue engineered products and technologies.

Key-words: Periodontal regeneration, stem cells, tissue engineering.

INTRODUCTION

Periodontal diseases are among the most common forms of non-communicable infectious diseases. Most of the patients report to the periodontal clinic with the chief complaint of bleeding gums, dentinal hypersensitivity and mobility of teeth.[1] In recent times the association of periodontal diseases with systemic diseases has further emphasized the need for management of periodontal diseases, despite all these problems the major cause of concern for most of the patients with periodontal diseases is still loss of teeth due to clinical attachment loss and bone loss around the teeth.[2]

The main emphasis of periodontal treatment plan is to remove the cause and promote regeneration of lost periodontal tissues to gain clinical attachment. The treatment modalities range from the traditional non-surgical periodontal therapy, surgical regenerative flap procedures utilizing grafts, guided tissue regeneration, guided bone regeneration and most recently tissue engineered products and stem cells.[3] The aim of this paper is to discuss briefly the concept of tissue engineering in dentistry especially in periodontal regeneration and its clinical application.

DISCUSSION

Advances in tissue engineering life sciences over the past twenty years have lead to therapies for replacing, repairing, restoring or regenerating human tissue and organ function and tissue engineering plays the most important role in regenerating the tissue.[3] Tissue engineering has been defined as the application of principles and methods of engineering and life science towards fundamental understanding of structure function relationship in normal and pathological tissue and development of biological substitute to restore maintain or improve tissue functions.[4] There are four basic components which are required for tissue engineering:

1. A source of stem cells which can divide into the required tissue/organ

Dr. Ajay Mahajan completed his graduation (BDS) from Government Dental College & Hospital, Shimla (H.P.), in the year 2004 and post-graduation in Periodontology from King George's Medical University, Lucknow in 2007. Currently, he is working as Assistant Professor in the Department of Periodontics, Himachal Pradesh Government Dental College & Hospital, Shimla(HP), India.

[1]Department of Periodontology, Himachal Pradesh Government Dental College & Hospital, Shimla, [2]Department of Public Health Dentistry, [3]Conservative Dentistry & Endodontics, DAV Dental College, Solan (HP), India.

Address for Correspondence:
Dr. Ajay Mahajan, Assistant Professor, Department of Periodontology, Himachal Pradesh Government Dental College & Hospital, Shimla, India.
Contact: +91 9418017029,
E-mail: drajdent@yahoo.co.in
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2. A biochemical mediator (Growth factors) which promotes the growth of stem cells

3. A scaffold on which the cells can grow

4. Extracellular matrix (ECM)

When all the three components i.e., the stem cells, biological-mediator and scaffold are used appropriately in combination tissue engineering product is formed which can be used to repair or replace portions of or whole tissues. A number of criterions must be satisfied in order to achieve effective, long-lasting repair of damaged tissues:

- An adequate number of cells must be produced to fill the defect
- Cells must differentiate into desired phenotypes
- Cells must adopt appropriate three-dimensional structural scaffold and produce ECM
- Produced cells must be structurally and mechanically compliant with the native cell
- Cells must successfully be able to integrate with native cells and should not evoke any immunological reaction
- There should be no associated biological risks

Recently various tissue engineered products have been introduced in dentistry ranging from tissue engineered teethto oral mucosa; and acellular dermal matrix grafts have been utilized for treatment of gingival recessions.[5,6,7] The role of periosteum as a rich potential source of pleuripotent stem cells,[8] and the immense regenerative potential of grafts utilizing periosteum has also shown encouraging results,[9-11] and prompted researchers to investigate further in this area.

Although various theoretical advantages of tissue engineered products as well as immense potential of stem cells in regeneration has been claimed, there is lack of good quality strong evidence to support the use of these products in periodontal regeneration, at best the field of tissue engineering in dentistry can be described in its infancy which need great deal of nurturing in terms of research both in vitro and in vivo to prove its meltel in actually replacing the established treatments.

CONCLUSION

Unlike the tried and tested treatment modalities for other diseases the scope of tissue engineered products although immense needs to qualify various ethical standards as well as further longitudinal trials.

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