

Amniotic Membrane - A Novel Method for Periodontal Regeneration-A Review

K. V. Swathi

Abstract: *The protective amniotic sac that is covering the foetus plays a very pivotal role in many aspects. The material which was once thought to be discarded during the delivery of the baby has now found immense applications for regeneration and revitalization of devitalized tissues. The amniotic membrane can be processed and the dehydrated amnion allograft can be used for ocular transplants, treatment of gingival recession and as a source of stem cells in tissue engineering. Here in the article, the role of amniotic membrane in the treatment of gingival recession, the important structural and functional properties of amniotic membrane and other properties of amniotic membrane are discussed.*

1. Introduction

Amniotic membrane is the innermost layer of the placenta consisting of a thick basement membrane and an avascular stromal matrix. It can be used as a graft, as a dressing to promote healing and regeneration in certain devitalized biological tissues. Amniotic membrane has found many applications as a "Bio-Tissue" in ophthalmic transplants, periodontal regeneration, skin applications, tissue engineering, in stem cell biology etc., Here in this article, the role of amniotic membrane in periodontal regeneration has been reviewed.

2. Amniotic Membrane-Structure and Function

The amniotic membrane has an amnion layer, chorion layer, separated by a jelly like, intermediate layer. The amnion and chorion layers are composed of a basement membrane and stromal layer. Amniotic membrane has anti-inflammatory, anti-bacterial, anti-viral, anti-angiogenic, pro-apoptotic features. Amniotic membrane is a promoter of epithelialization. Amniotic membrane can prevent the delivery of nutrients and oxygen to cancer cells and interfere with tumour angiogenesis. The existence of pluripotent cells, and excellent revascularisation ability in periodontal guided tissue regeneration (1)

3. Procurement of Amniotic Membrane

Materials required are a sterile jar containing one litre normal saline, sterile scissors, thumb forceps, gloves, mackintosh, scale, sterile petri dishes. Criteria for selection of donors and membranes includes: No history of jaundice, venereal diseases, only membranes of caesarean section were obtained. Placentas of woman undergoing caesarean section are obtained at the time of delivery and placed in a jar of saline. The placenta is then processed for obtaining amniotic membrane. The membrane is then stripped and rinsed in normal saline or crystalline penicillin and then placed in a petri dish containing the same solution.(2)

4. Uses of Amniotic Membrane

Hyper dry amnion or cryopreserved amniotic membrane is used as a barrier membrane in the treatment of periodontal osseous defect with or without bone graft and is used in the management of gingival recession with guided tissue

regeneration(3)

Amniotic membrane is a very suitable substrate for culturing periodontal ligament cells. A study was conducted where amniotic membrane was obtained from women undergoing caesarean section and periodontal ligament tissue was obtained from human maxillary third molars. The periodontal ligament cells were cultured and after 3 weeks of culture, immunofluorescent studies showed that the periodontal ligament cells showed capabilities of proliferation and maintained their original properties.(4)

A novel allograft tissue composed of amnion tissue was used in periodontal surgery and for treatment of gingival recession. Processed dehydrated allograft amnion was used in the treatment of shallow to moderate recession defects. This study of the use of amniotic membrane in the treatment of gingival recession suggested that amniotic membrane closely mimics the basement membrane of human oral mucosa. The amnion layer possesses different types of laminins, the laminin-5 being the most important. The laminin-5 plays a role in cellular adhesion of gingival cells. This ability of self adhesion makes processed dehydrated allograft amnion an attractive option for multi teeth procedures and for recession defects(5)

Isolated gingival recession can also be corrected using coronally advanced flap with amnion membrane used as guided tissue regeneration (GTR) membrane. Two oblique vertical incisions along adjacent teeth were extended beyond the mucogingival junction and a trapezoidal mucoperiosteal flap was raised to the point of mucogingival junction. The processed dehydrated amniotic membrane was placed on the exposed root surface and proximal bone. Upon placement, the processed dehydrated amnion allograft became hydrated and self adhered to the exposed root and proximal bone, thus sutures were not required. The excellent revascularisation property of the amniotic membrane makes it ideal for guided tissue regeneration.(6)

Biomechanical GTR using amniotic membrane not only maintains the structural and anatomical configuration of regenerated tissues, but also contributes to the enhancement of healing through reduction of post-operative scarring and subsequent loss of function and providing a rich source of stem cells.(7)

Other uses of amniotic membrane include ocular surface

reconstruction using transplants, potential use in tissue engineering, amniotic epithelial cells have many properties like immunomodulator property, revascularisation property that makes it as a source of stem cells for tissue engineering(8)

5. Conclusion

Thus amniotic membrane have some proven potentialities to be used as an allograft for periodontal tissue guided regeneration. The wonderful properties of this protective membrane along with the advances in medicine should be utilised in a proper way for the proper palliative care and management.

References

- [1] Amniotic membrane: from structure and functions to clinical applications MamedeAC,ET AL.(Pubmed-Cell Tissue Res. 2012 Aug;349(2);447-58)
- [2] Method of obtaining and preparation of fresh Human amniotic membrane by clinical use. Mohammad Ashraf Ganatra (Journal of Pakistan Medical Association)
- [3] Clinical application of hyperdry amniotic membrane on surgical defects of the oral mucosa NayaoArai(Journal of Oral and Maxillofacial Surgery,September 2012,Vol.70(9);2221-2228)
- [4] Human periodontal ligament cell sheets cultured on amniotic membrane substrate K.Adachi and others(Oral diseases –Wiley Online Library)
- [5] A novel dehydrated amnion allograft for use in the treatment of gingival recession Brian Gurinsky(The Journal of Implant & Advanced Clinical Dentistry)
- [6] Bioactive amnion as a guided tissue regeneration (GTR) membrane for treatment of isolated gingival recession HarveenSingh,Harshneet Singh(Indian Journal of Dentistry 4(2013) 110-113)
- [7] Amniotic membrane:A potential candidate for periodontal tissue guided regeneration (Medical Hypotheses(2007)69,454-473)
- [8] Properties of the amniotic membrane for potential use in tissue engineering Hassan Niknejad and others(European Cells and Materials Vol.15 2008)