Pericardium membranes - A Critical Appraisal

Vinod Nair S

Email: vinodnair145@gmail.com

Abstract

There is plenty of evidence suggesting the role of barrier membranes in augmentation of bone at locales lacking bone volume and height. Among the resorbable membranes, local collagen membranes are the standard treatment for guided regeneration procedures. Be that as it may, native collagen resorbs quickly, while cross linking postpones it. The pericardium membranes are multi-layered, bringing about delayed hindrance work with the properties of native collagen in place. These layers have demonstrated their utility in the field of vascular, heart and thoracic surgery in light of their mechanical and clinical handling properties. In any case, there is almost no confirmation of bone augmentation with pericardium films in the field of dentistry, especially Implantology. The motivation behind this audit is to discuss the potential utilization of these membranes in guided bone regeneration.

Key words: Bovine membranes, guided bone regeneration, human pericardium membrane

Introduction

The periodontal treatment has quite often focused around the hindrance of the disease progress and maintenance of the retaining periodontal support. The treatment techniques to re-establish periodontal health and accomplish restitution of attachment apparatus involve options like root planning, tissue curettage and flap techniques with or without the use of bone substitutes. Most of the methods that have been tried, have brought about tissue repair. The regenerative procedures used at present in periodontal treatment have not achieved full regeneration. There have been reports of increasing new attachment by the arrangement of new cementum.1

The Melchers theory of selective cell repopulation added to the comprehension of the mechanics of wound healing. This idea was utilized further by a series of experiments, and shaped the premise of the biological standard of guided tissue regeneration. Guided tissue regeneration (GTR) is utilized to characterize techniques wherein regeneration of lost periodontal structures (cementum, periodontal ligament and alveolar bone) is looked for through selective cell and tissue repopulation of the periodontal wound.

The GTR advances bone formation by assurance against attack of competing, non-osteogenic tissues with the utilization of barrier membranes. There are three generation of membranes which incorporates resorbable membranes like collagen and poly lactic-co-glycolide, non resorbable membranes like ePTFE and Gore tex and a couple of other membranes under scrutiny, which incorporates membranes like allo derm, gel foam, cargile and pericardium layers. The motivation behind this survey is to throw light on the potential use of pericardium membranes in Guided Bone Regeneration (GBR).

The pericardium is a fibro serous sac encompassing the mammalian heart. For quite some time, it has been utilized as a part of cardiac repair for reconstruction, valve repair and pericardial...
The pericardial tissue has uniform suture retention, it is non thrombogenic, and normally opposes contamination. The xenogenic pericardium is ordinarily derived from bovine, porcine and less oftentimes, equine sources. The tissues from these sources are accessible in substantial patches, enabling custom arrangement to an assortment of cardiovascular applications. It generally includes collagen strands, and has elastic properties enabling adjustment to complex anatomy.

I. Bovine pericardium (BP)

The BP discovered its application at first as patches for arterial closure amid vascular and cardiovascular surgery. The native structure of BP has three layers; the serosa, which is a thin layer of mesothelial cells; the fibrosa, which is formed by collagen and elastin; and the epipericardial connective tissue layer. The BP is generally utilized as a part of cardiovascular and thoracic surgery, as bio prosthetic valve leaflets for repair of intracardiac defects, for repair of diaphragmatic defects, vascular surgery, including general surgery, urologic surgery and ophthalmology. The different helpful properties advancing the utilization of BP in tissue regeneration is a direct result of its acellularity, solid consistency, capacity to be produced and prepared to a steady nominal 0.5 mm thickness, providing dependable suture retention and ideal operative handling characteristics.

These properties give a characteristic micro environment to have cell relocation and proliferation, quickening endothelialisation and tissue regeneration. Treating the pericardium with glutamic acid, decellularization and nano-coating of grafts are a few methods employed to retain the extracellular matrix (ECM) substance, and to fortify the biological tissues without calcification in vivo. One of the trials recommended that cellular tissue engineered the BP covered with poly(L-lactic acid)- co-poly(ε-caprolactone) (PLACL)/mix of PLACL and gelatin nanofibrous scaffolds, alongside human bone marrow derived MSCs separated into endothelial cells, may enhance the scaffold’s usefulness for tissue engineering. Puros® pericardium, Copios pericardium fabricated by Zimmer dental are intended for guided tissue regeneration and guided bone regeneration techniques. It holds the natural collagen matrix and mechanical properties of native pericardium because of the proprietary Tutoplast® process.

It is described by its multidirectional quality, fast hydration, five-year time span of usability and room temperature stockpiling. These have a resorption profile of four to a half year. The time period for remodelling relies on the site, patient’s age, health, metabolic and dietary status and biomechanical load on the graft. Owing to its properties, the BP has been acknowledged in the field of dentistry, and it discovers its use in alveolar ridge augmentation, guided bone regeneration, root coverage and in the treatment of dehiscence defects.

II. Porcine Pericardium (PP)

The PP has lesser collagen content, and does not display significant difference in the level of calcification under varying glutaraldehyde treatments, as compared to the BP. The valves manufactured from the BP have demonstrated less impediment than valves produced using porcine pericardial tissue, albeit both the valves indicate comparative haemodynamic results. In the field of heart surgery, the PP represents, to a conceivable platform, a choice for the recovery of the mitral leaflets in vitro or in vivo respectively. The decellularized pericardium has been appeared to be an ideal material for cell repopulation, conveying the important biological and biomechanical prompts to seeded or relocating cells.

The PP has discovered its applications in the field of implantology. The different types of biomaterials such as a-tricalciumphosphate (Ceros TCP granules) joining material and a porcine, collagen pericardium resorbable membrane (Remotis) were utilized on the test side and a deproteinized, bovine bone matrix (Bio-Oss) and a porcine, collagen resorbable membrane (Bio-Gide) on the control side.

III. Human Pericardium (HP)

The benefits of pericardium films are complex, and thus, apart from BP and PP, the HP membranes have also been produced. As indicated by the outcomes from investigation by Thomaidis et al., the belt lata, HP, BP and e-PTFE propel bone regeneration, and
can be effectively utilized as GBR membranes for osseous defects past the critical size. Consequently, human pericardium can be considered as an appropriate bone graft in bone repair, prompting adequate bone strength. The human pericardium layer has been tried for its possibility to expand restricted alveolar edge deserts for the ensuing the situation of dental implants in incompletely healed extraction sockets. The outcomes proposed that HP Allograft film might be a reasonable part for enlargement of confined alveolar edge defects. The human pericardium has been used with freeze-dried bone allograft, for cortical channel expansion for the treatment of facial maxillary alveolar bone deformity. A change in the bone form with regeneration of bone was achieved. It also helped in achieving a favourable aesthetic soft tissue contour, enabling the placement of a final fixed partial denture.

**Conclusion**
The criteria required to choose suitable barrier membranes for guided bone regeneration include biocompatibility, integration by the host tissue, cell conclusiveness, space-production capacity and sufficient clinical manageability. The trouble of keeping up the barrier function for an appropriate period of time is viewed as a noteworthy downside of resorbable membranes. In spite of the fact that collagen membranes demonstrate a successful crosslinking, their significant downside is the quick resorption, bringing about early loss of barrier function. The pericardium layers, in contrast with collagen layers, have demonstrated a compelling crosslinking, recommending delayed resorption time. Different vitro and in vivo examination have figured out how to demonstrate the bio effectiveness of these pericardium membranes in upgrading bone augmentation. Be that as it may, more clinical trials are required to demonstrate their success in guided bone regeneration.

**Acknowledgements**
I would like to acknowledge Dr Arun Kumar Vidhyadaran (Implantologist) and Dr Anjana Ravindran (Oral and Maxillofacial Prosthodontist) for their constant support in collecting relevant articles, analysing and framing the manuscript.

**References**


