Journal of Clinical Ophthalmology and Eye Disorders

Letter to Editor
Published: 06 Mar, 2018

Tissue Engineering in Filtering Surgery and Future Application

Wei-Cherng Hsu[1,2] and Yang Yun-Hsiang[1]*

[1]Department of Research, Taipei Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Taiwan

[2]Tzu Chi University College of Medicine, Taiwan

Letter to Editor

Tissue engineering involves the combination of a polymer scaffold with a population of stem, progenitor or precursor cells. Growth of the tissue in question is modeled to favor the development of a particular structure and, if the polymer scaffold used is biodegradable, it can result in the formation of structures which are remarkably similar to normal tissue (Young et al 2005). Engineered scaffolds can also be used to repair poorly-healed wounds and to fill tissue defects by their intrinsic characteristics. The application of a scaffold without cell seeding for a poorly healing wound or a large burn area can get satisfactory clinical results by enabling tissue to grow back. Connective tissue regeneration (skin, bone, cartilage) can be achieved more easily than functional tissues (liver, lung). Although most connective wounds can repair themselves, they suffer from scar formation which may lead to partial or total functional loss. Severe scar formation in some tissue is the major reason of surgical failure, an example in ophthalmology being the encapsulization of the bleb after trabeculectomy. Increasing resistance caused by scarring between the anterior chamber and subconjunctival space will slow down the effect of drainage of humors to the subconjunctival space, and result in elevated intraocular pressure. The dense and parallel deposition of secreted collagen during the natural wound healing process results in the failure of the filtering surgery. In contrast, randomized new collagen, guided by the porous structure of a subconjunctivally implanted scaffold during healing, can create a physiologic collagen deposition that can succeed in lowering the intraocular pressure [1-3].

The cellular alignment of the cornea is different from that of the conjunctiva. A parallel alignment of keratocytes and collagen in the stroma result in its transparency. In natural wound healing of the cornea, the myofibroblasts transformed from the fibroblasts migrate in the desired parallel manner, but due to their higher density, there is still no transparency [4,5]. When a randomized porous scaffold is applied in a corneal wound, this tissue engineering achieves a thicker cornea but it is still hazy due to the randomized non parallel structure.

Apart from the way the cells grow into the scaffold, the speed of degradation can also affect the healing result. In corneal wound healing both myofibroblasts and keratocytes grow from the limbus and cover the whole wound area gradually, moving from the perimeter inwards. In contrast, the scaffold might be infiltrated with inflammatory cells from the outset, causing degradation over the entire implant. By the time the myofibroblasts and keratocytes reach the center of the wound, the scaffold might already be completely degraded. It will be a big challenge for the researcher to create a stable and appropriate environment for cell migration and differentiation.

The principle of tissue engineering is to use controlled factors to produce a designed structure. By controlling all factors related to the extracellular matrix, the researcher can regulate the cellular migration and differentiation and improve the outcome of wound healing. Not only are the structure of scaffold but also the timing of degradation important to the outcome.

References

1. Hsu WC, Spilker MH, Yannas IV, Rubin PA. Inhibition of conjunctival scarring and contraction by a porous collagen-glycosaminoglycan implant. Invest Ophthalmol Vis Sci. 2000;41(9):2404-11.
2. Hsu WC, Ritch R, Krupin T, Chen HS. Tissue bioengineering for surgical bleb defects: an animal study. Graefes Arch Clin Exp Ophthalmol. 2008;246(5):709-17.
3. Chen HS, Ritch R, Krupin T, Hsu WC. Control of filtering bleb structure through tissue bioengineering: An animal model. Invest Ophthalmol Vis Sci. 2006;47(12):5310-4.

OPEN ACCESS

Correspondence:
Wei-Cherng Hsu, Department of Research, Taipei Tzu Chi Hospital, Tzu Chi University College of Medicine, Buddhist Tzu Chi Medical Foundation, Taiwan,
E-mail: cyao@seed.net.tw

Received Date: *23 Jan 2018*
Accepted Date: *02 Mar 2018*
Published Date: *06 Mar 2018*

Citation:
Hsu W-C, Yun-Hsiang Y. Tissue Engineering in Filtering Surgery and Future Application. J Clin Ophthalmol Eye Disord. 2018; 2(1): 1024.

4. Massoudi D, Malecaze F, Galiacy SD. Collagens and proteoglycans of the cornea: importance in transparency and visual disorders. Cell Tissue Res. 2016;363(2):337-49.

5. Torricelli AA, Santhanam A, Wu J, Singh V, Wilson SE. The corneal fibrosis response to epithelial-stromal injury. Exp Eye Res. 2016;142:110-8.