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Evaluation of Tympanoplasty using Alloderm versus local tissue Grafts

Thesis
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By

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INTRODUCTION AND AIM OF THE WORK

Introduction

Tympanic membrane perforations are a commonly encountered disorder by the otorhinolaryngologist. Since first described in ١٨٧٨, a host of materials have been used for tympanic membrane grafting. *(Glasscock and Kanok, ١٩٩٧)*

The most common etiology for a tympanic membrane perforation is infection, trauma, or an extruded pressure equalizing tube. Tympanic membrane perforations may be acute perforations or chronic perforations. Most acute perforations heal spontaneously but approximately ١٠-٢٠% will become chronic. *(Downey et al, ٢٠٠٣)*

Although the tympanic membrane has demonstrated a remarkable ability for regeneration and spontaneous healing, chronic perforations do commonly occur and may require grafting as a means of repair. *(Kristenson, ١٩٩٣)*

There are several major reasons why the complete closure of a chronic tympanic membrane perforation is desirable. With a closed tympanic membrane perforation, patients experience a dramatic improvement in hearing, avoid the occurrence of otitis media and tolerate water in the ear canal. In addition, with complete closure of the

defect, recurrent otorrhea is unlikely to occur with upper respiratory tract infections and otitis media. *(Laidlaw et al, ٢٠٠١)*

A variety of autografts, allografts, xenografts and alloplasts have been described in the surgical closure of tympanic membrane perforation: (as shown in table ١)

Autografts	Allografts	Xenografts	Alloplasts
Temporalis fascia	Tympanic membrane	Bovine periostium	Polygalactin
Tragal perichondrium	Dura	Bovine Vein	Gel foam
Fascia lata		Porcine skin	Polyvinyl alcohol
Periostium		Porcine dura	Polylactic acid
Vein			Collagen
Fat			Polyactive copolymer
Skin			

Table (١): Varieties of grafting materials

Temporalis fascia has been the most popular and the standard to which all other materials are compared with today. *(Downey et al, ٢٠٠٣)*

In revision procedures the availability of suitable fascia or perichondrium may be limited. In patients who have undergone several grafting attempts, there may be no suitable grafting material at all in the vicinity of the operative field. Finding autogenous tissue for grafting may be time consuming and may add morbidity in the form of a remote donor site. *(Benecke, ٢٠٠١)*

Alloderm®, an acellular human dermal matrix, is a new biomaterial that serves as a connective tissue matrix, providing soft tissue support and coverage that becomes integrated into the implanted bed. *(Kridel et al, ١٩٩٨)*

Alloderm® is processed from human donor skin obtained from an approved tissue bank. Donors are screened for HIV type ١ and ٢ viruses, T lymphotropic virus type ١, hepatitis B and C viruses and syphilis. *(Harpar and Livesey, ١٩٩٨)*

In addition to the safety margin generated through donor screening and serological testing guidelines, the processing of Alloderm increases this safety margin in two ways; all the cells within the dermal tissue are solubilised, leaving no potential reservoir for viral replication, furthermore, this detergent decellularization step has

been shown to actually inactivate viruses even high titers of HIV. *(Jones et al, ١٩٩٦)*

Removal of cellular components of the skin, the target of the rejection process, reduces the chances of an immune response in the recipient. *(Jones et al. ١٩٩٦)*

Special freezing and drying techniques preserves the integrity of the matrix protein of the alloderm graft. *(Youssef, ١٩٩٩)*

Alloderm has been successfully used as a soft tissue graft for various cosmetic and reconstructive surgeries. *(Wainwright, ١٩٩٦)*

Aim of the work

The aim of this work is to:

- Study the hypothesis of using Alloderm as a substitute to local tissue grafts routinely harvested for tympanoplasty like temporalis fascia graft or tragal cartilage.
- Compare take rate and closure of tympanic membrane perforations when using Alloderm compared with local tissue grafts
- Compare the post operative sequels when using Alloderm in modified radical mastoidectomies compared with temporalis fascia graft when lining the mastoid cavity
- Analyze hearing outcome and audiological gain when using Alloderm compared with local tissue grafts.

Anatomy and physiology of the ear

The ears are paired sensory organs comprising the auditory system involved in the detection of sound, and the vestibular system involved with maintaining body balance/ equilibrium. The ear divides anatomically and functionally into three regions: the external ear, the middle ear, and the inner ear. All three regions are involved in hearing. Only the inner ear functions in the vestibular system. *(Lee, ٢٠٠٨)*

Anatomy of the ear

The external ear (*pinna*) serves to protect the tympanic membrane, as well as to collect and direct sound waves through the external auditory meatus to the tympanic membrane. About ٣٦ mm long, the canal contains modified sweat glands that secrete *cerumen.* (Figure ١) *(Moore et al, ١٩٨٩)*