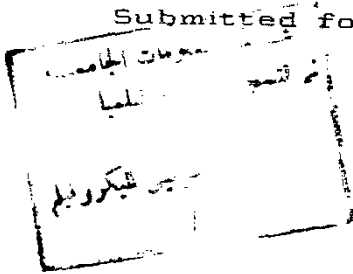


TYMPANIC MEMBRANE GRAFTING

ESSAY

Submitted for partial fulfilment of the Master Degree
in

Otorhinolaryngology

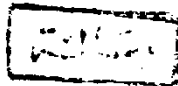


Presented By

Saad El-Sayed Refaat Hussain

(M.B. B.Ch.)

618.21
S A



Supervised By

Prof. Dr. Mamdouh El-Gohary

Professor of Otorhinolaryngology

Ain Shams University

Dr. Mohamed El Begermey

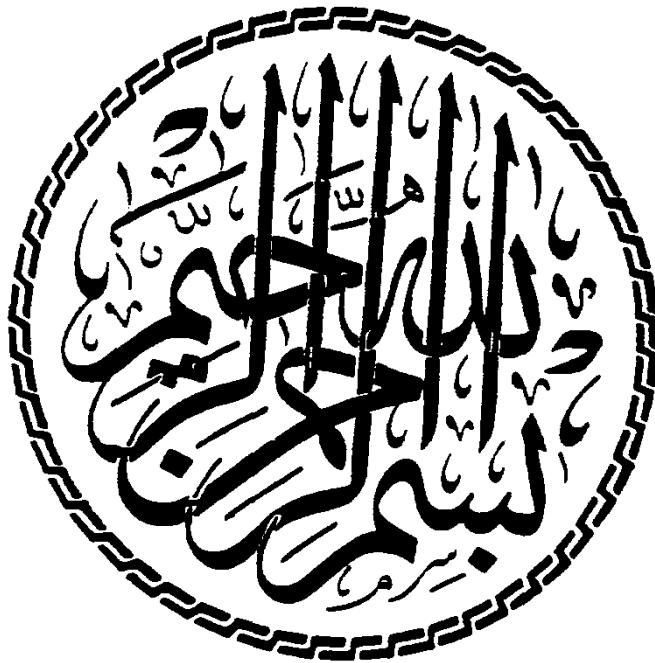
Assistant Professor of Otorhinolaryngology

Ain Shams University



FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY
1993

45844





بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
قَالُوا

سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا
إِنَّا أَنْتَ الْعَلِيمُ الْحَكِيمُ

صَلَّى اللَّهُ عَلَى الْغُضَّيَّةِ

سورة البقرة آية ٢٢

Acknowledgement

I am greatly indebted to professor **Dr. Mandouh El Gohary**, Professor of Otorhinolaryngology, Ain Shams University, for his kind guidance, great help and continuous support.

I wish to express my deep gratitude to **Dr. Mohamed El Beghermy**, Assistant Professor of Otorhinolaryngology, Ain Shams University, for his supervision, encouragement and support.

My special thanks go to **Dr. Ali Gamal El Din**, Assistant Professor of Otorhinolaryngology, Ain Shams University, for his valuable help.

Finally I would like to record my thanks to my family and my senior staff and colleagues in the department of Otorhinolaryngology, Ain Shams University.

S.EL-Sayed Hussain

1993

LIST OF FIGURES

- Fig. 1: Anatomy of the tympanic membrane.
- Fig. 2: Anatomy of the tympanic membrane.
- Fig. 3: Normal tympanic membrane.
- Fig. 4: The epidermis of the tympanic membrane. The surface is partially desquamated by transmission electron microscope x 400.
- Fig. 5: Lamina propria: by the transmission electron microscope x 400.
- Fig. 6: The mucosal layer with microvilli by electron microscope x 400.
- Fig. 7: Congested tympanic membrane to demonstrate the vascular arrangement of the blood supply.
- Fig. 8: Relation between vibration and fiber arrangement of the tympanic membrane.
- Fig. 9: Three sectional parts of the tympanic membrane and mode of vibration.
- Fig. 10: Healing of the tympanic membrane.
- Fig. 11: Marginal perforation (Unsafe type).
- Fig. 12: Marginal perforation, the arrow indicates the ingrowth of the epithelium forming cholesteatoma.
- Fig. 13: Subtotal perforation after acute necrotizing otitis media.
- Fig. 14: Spontaneous healing of the perforation after acute otitis media.
- Fig. 15: Use of canal skin for myringoplasty.
- Fig. 16: Tympanoplasty, using cartilage perichondrium the graft appears as tympanosclerotic patch.
- Fig. 17: Spirit-lamp dehydrated fascia seen through scanning electron microscope (x 1000) with ulcer crater.

- Fig. 18: Room temperature dehydrated fascia through scanning electron microscope with no ulcer crater.
- Fig. 19: Fresh fascia viewed through scanning electron microscope (x5000).
- Fig. 20: Fresh fascia under the transmission electron microscope (x46000).
- Fig. 21: Central perforation before grafting. The number indicates middle ear structures.
- Fig. 22: The same perforation after grafting.
- Fig. 23: Section medial to the tympanic membrane to get a homograft.
- Fig. 24: Complete tympano-ossicular homograft.
- Fig. 25: Histology of tympanic membrane homograft (fresh).
- Fig. 26: Histology of the tympanic membrane homograft (after preservation).
- Fig. 27: General principles of myringoplasty.
- Fig. 28: Complication of onlay myringoplasty.
- Fig. 29: Graft cholesteatoma following the onlay grafting.

CONTENTS

	PAGE
-INTRODUCTION AND AIM OF THE ESSAY.....	1
-ANATOMY OF THE HUMAN TYMPANIC MEMBRANE.....	4
-PHYSIOLOGY OF THE TYMPANIC MEMBRANE.....	10
-PATHOLOGY OF PERMANENT PERFORATIONS.....	14
-GRAFTS USED IN MYRINGOPLASTY.....	17
-AUTOGRAFTS.....	20
-Skin grafts.....	21
-Vein grafts.....	24
-Areolar tissue and fat grafts.....	25
-Cartilage-perichondrium graft.....	26
-Temporalis fascia graft.....	30
-HOMOGRAFTS.....	36
-Homograft tympanic membrane.....	36
-Homograft dura.....	44
-Homograft cartilage.....	47
-Homograft tympanic Fascia.....	49
-Homograft viens.....	49
-Homograft pericardium.....	50
-Human amniotic membrane.....	51
-XENOGRAFT.....	52
-BASIC TECHNIQUE OF TYMPANIC MEMBRANE GRAFTING.....	53
-Underlay technique.....	53
-Overlay technique.....	58
-FUNCTION OF THE GRAFT IN THE HEALING PATTERN OF THE DRUM MEMBRANE.....	66
-NO GRAFT MYRINGOPLASTY.....	70
-SUMMARY.....	73
-REFERENCES.....	75
-ARABIC SUMMARY.....	

Introduction

INTRODUCTION

Chronic suppurative otitis media is one of the commonest ear problems which face the otologist. Tympanic membrane repair is an essential step for tympano-ossicular reconstruction.

The first surgical attempt to close drum membrane perforations used splitthickness or full-thickness free skin grafts (*Berthold, 1878*).

As the failure rate was high, the surgeon was encouraged to find alternative grafting materials for tympanic membrane repair (*Wright, 1963*).

Today, most grafts used are composed of connective tissue, either alone or in combination with canal wall skin. For that purpose, temporalis fascia or tragal perichondrium are frequently used (*Brockman, 1965*). Other graft materials that have been used with satisfactory results are, vein, periosteum, and preserved homograft materials, such as, human tympanic membrane, dura, pericardium, heart valve and cornea (*Wright, 1963*).

The use of autogenous connective tissue such as vein or fascia avoids the complication of storage or transmission of

diseases and offers the greatest degree of success (*Austin, 1963*).

The connective tissue grafts are used to replace the missing fibrous element of the drum membrane, and the squamous layer and mucosa are allowed to regenerate over it (*Applebaum and Deutsch, 1986*).

Two basic grafting techniques have emerged; these are referred to as the overlay and underlay techniques.

Aim of the Essay:

- The objective of the present essay is to review the literature dealing with the subject of materials used for grafting the drum membrane with the purpose of defining the merits and demerits of each of them.

To achieve this goal the following items will be discussed in the essay:

- Update anatomy and physiology of the tympanic membrane.
- Update pathology of the tympanic membrane perforations
- Different graft tissues used in closure of tympanic membrane perforations.
- Discussion of the preparation, character, advantages and disadvantages of each graft tissue.
- The advantages and the disadvantages of overlay versus underlay techniques of tympanic membrane grafting.

*Anatomy of the
Tympanic Membrane*

ANATOMY OF THE TYMPANIC MEMBRANE

The tympanic membrane develops at the area of contact between the ectodermal meatal plug and the endodermal tubotympanic recess. The contact is oblique, so that the drum membrane lies obliquely with respect to the axis of the external meatus. Thus the membrane consists of three layers, an outer ectodermal layer continuous with the skin of the external canal skin, an intermediate layer of mesoderm, containing the handle of malleus and chorda tympani nerve, and an inner endodermal layer continuous with the mucous membrane of the middle ear, (Fig. 1).

The tympanic membrane is semitransparent and elliptical, although it has been generally accepted that its vertical axis is longer than the horizontal axis, recent information revealed that the horizontal axis of the tympanic membrane is 9 to 10 mm long and the vertical axis range around 8 to 9 mm long (Wajnberg, 1987), (Fig. 2).

The tympanic membrane is situated obliquely at the medial end of the external ear canal with the anterior angle between the tympanic membrane and the external canal being much more acute in infants and young children.

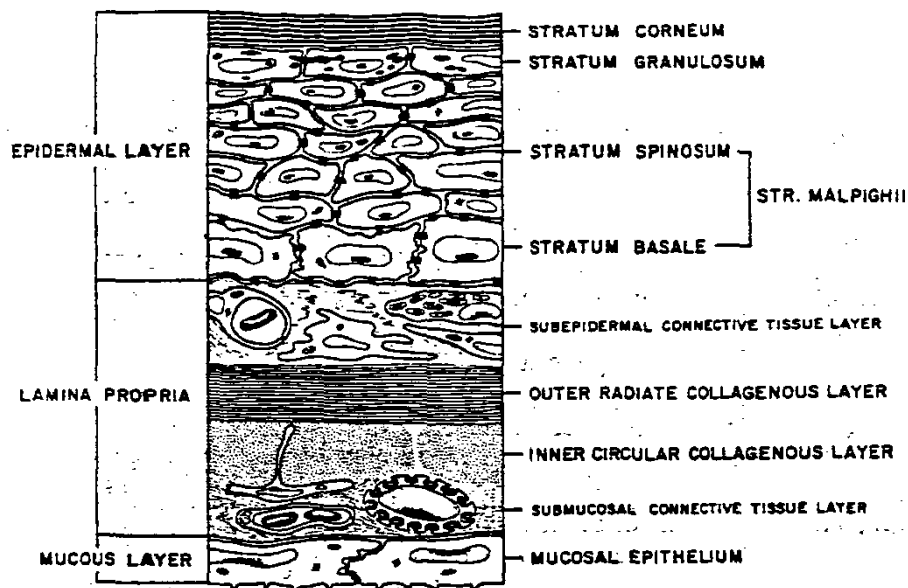


Fig. 1: Anatomy of the tympanic membrane.

Schematic diagram of the pars tensa

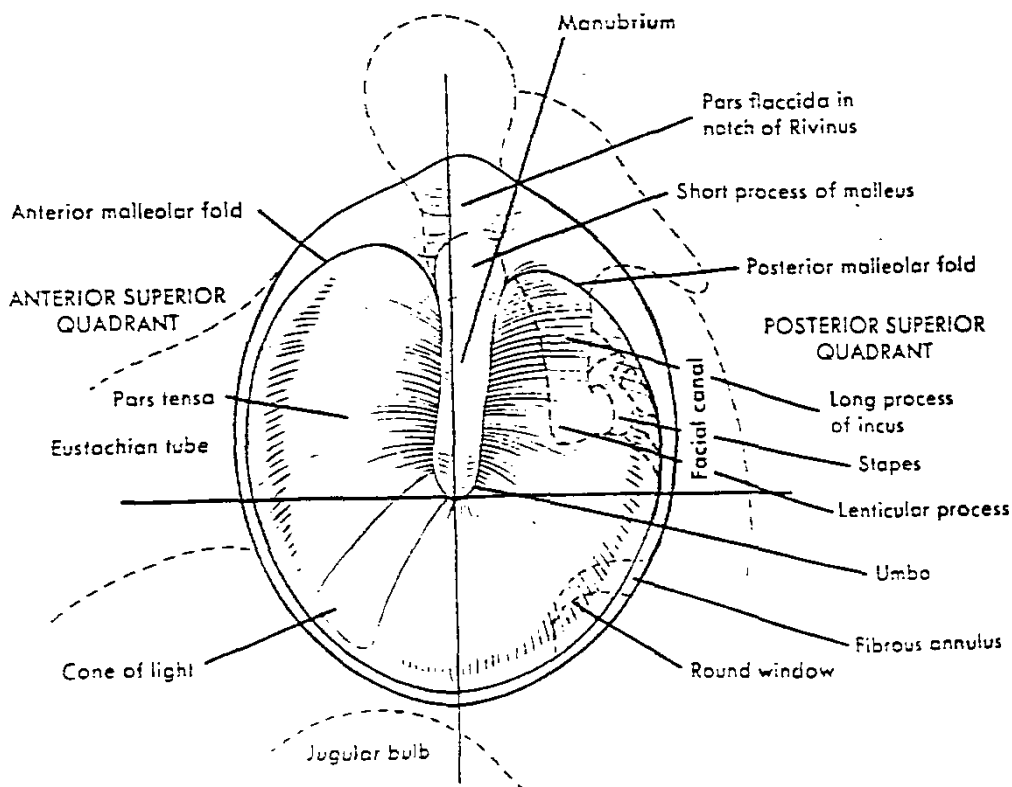


Fig. 2: Anatomy of the tympanic membrane.