ANAESTHESIA
IN OTOLOGIC SURGERY

THESIS

Submitted in partial fulfilment for the
Master Degree in Anaesthesiology

By

Soad Mostafa Morsy

M.B., B.Ch.

Supervised By

Dr. YOUSRY ROUBIN GHATTAS

professor of Anaesthesiology

Dr. AHMAD ABD EL-KADER

Lecturer of Anaestesiology

Faculty of Medicine

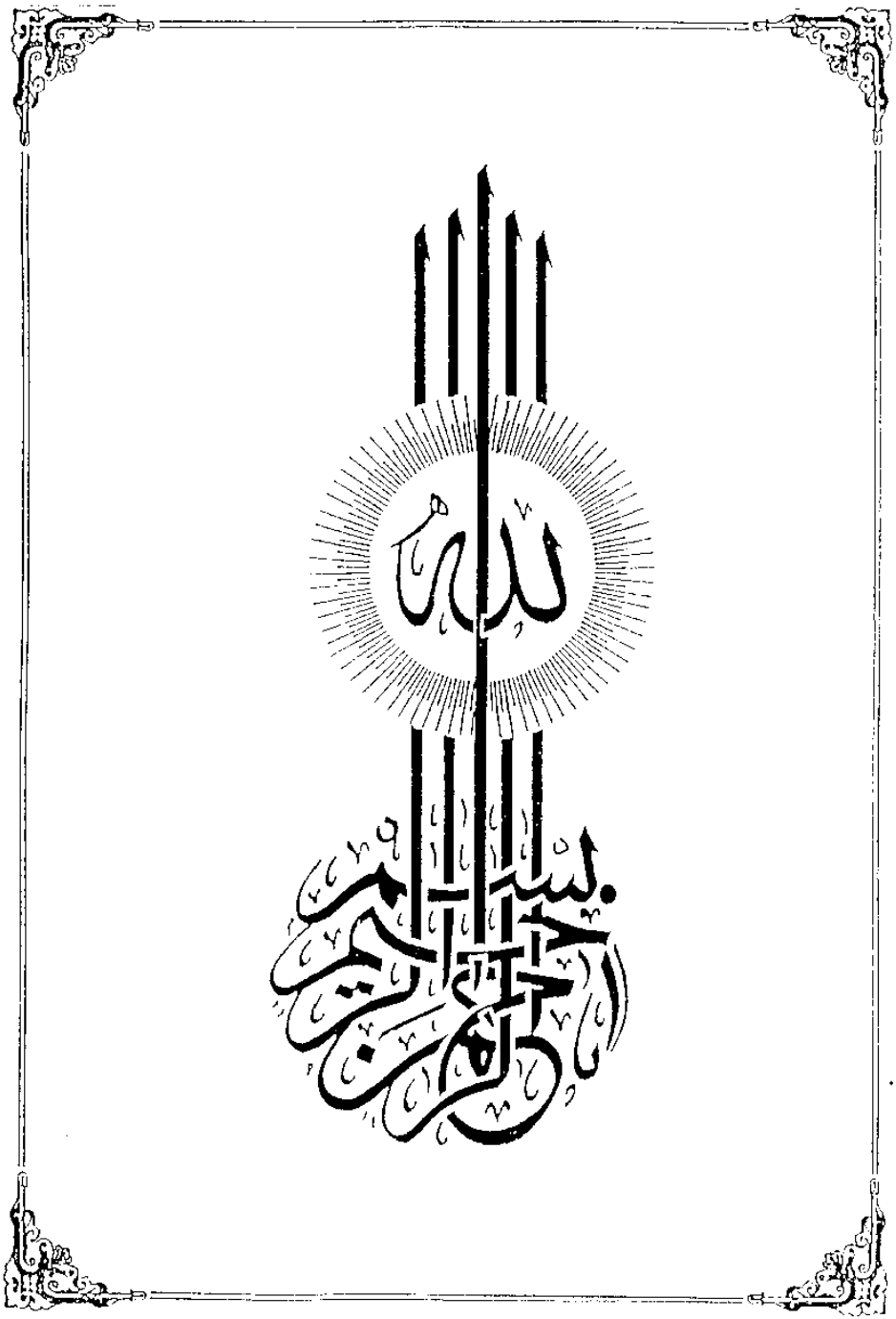
Ain Shams University

1984

ACKNOWLEDGEMENT

I am really grateful to Prof. Dr. YOUSRY ROUBIN GHATTAS, Professor of Anaesthesiology, Ain Shams University, whose valuable suggestions have helped me greatly in the completion of this work.

I would like to convey my deep appreciation and indebtness to Dr. AHMAD ABD EL KADER, Lecturer of Anaesthesiology, Ain shams University, who has, freely, given me his time and helped to make this work possible.



CONTENTS

INTRODUCTION

It has been generally acknowledged by otologists that anaesthesia has played a major part in the development of the aural surgery. Smyth (1972) in his paper on the "outline of surgical management in chronic ear disease" stated that during the latter half of the last century and until the early 1950, the main aim of the otologists in treating chronic otitis media, was to prevent the serious complication of disease. Research was undertaken by many surgeons in an attempt to design an operation which would not only eradicate disease but also restores function. These men failed in their efforts until the advent of hypotensive anaesthesia and the invention of the operating microscope, both of these advnces have combined to realise the dreams of the pioneer otologists.

Barron (1975) stated that "The new era in otology was heralded by Lempert's fenestration operation for otosclerosis soon to be followed by the introduction of tympanoplasty. In this procedure, skin grafts were employed to repair defects in the tympanic membrane. The importance of the bloodless field from surgical point of view cannot be too strongly stressed. The appearance of the blood means that suction is necessary and excessive use of the sucker not only distracts the surgeon but may

well upset the physiological balance between perilymph and endolymph affecting the outcome of the opration (Barron, 1976).

ANATOMY OF THE EAR

ANATOMY OF THE EAR

The ear can be divided, anatomically and clinically, into three parts; the external ear, the middle ear and the internal ear.

The external and middle ears are concerned, primarily, with the transmission of sound. The internal ear functions both as the organ of hearing and as part of the balance system of the body (McLay, 1982).

The external ear :consists of the auricle and external acoustic meatus. The auricle has two surfaces, lateral and medial. The underlying skeleton of the auricle consists of a plate of yellow elastic cartilage, except for the lobule which is composed only of fat and fibrio-areolar tissue. The external acoustic meatus measures in adult about 24 mm from the introitus to the tympanic membrane which forms its medial limit. The meatus is composed of two parts :

1) The lateral third which has cartilaginous skeleton continuous with that of the auricle. It is directed medially upwards and backwards. Its lining skin contains hair,sebacesus and ceruminous glands.

2) The medial two-thirds which has bony skeleton and is directed medially downwards and forwards (Gray, 1973).

Nerve supply of the external ear : The auricle and external meatus are supplied by branches of the Vth, IXth and Xth cranial nerves. The medial surface of the auricle is supplied by fibers of the great auricular nerve "C_2 C_3" and the lesser occipital nerve "C_2".

Blood supply : of the auricle comes from the superficial temporal and posterior auricular arteries. The meatus is also supplied by these vessels but it receives a further supply in its inner part from the deep auricular branch of the maxillary artery. The veins accompany the arteries (Hollinshead, 1962).

The lymph drainage : The lymphatic of the auricle and external meatus drain anteriorly into the preauricular lymph nodes, inferiorly into the superficial cervical nodes along the external jugular vein and posteriorly into the reteroauricular nodes.

Tympanic membrane : It separates the external meatus from the middle ear and is, functionally, a part of the middle ear. The rim of the tympanic membrane consists of fibrocartilaginous ring. The tympanic membrane is thin and, when examined with an auriscope, has a pearly grey colour with a triangular bright area extending from the centre "umbo" downwards and forwards as the cone of light.

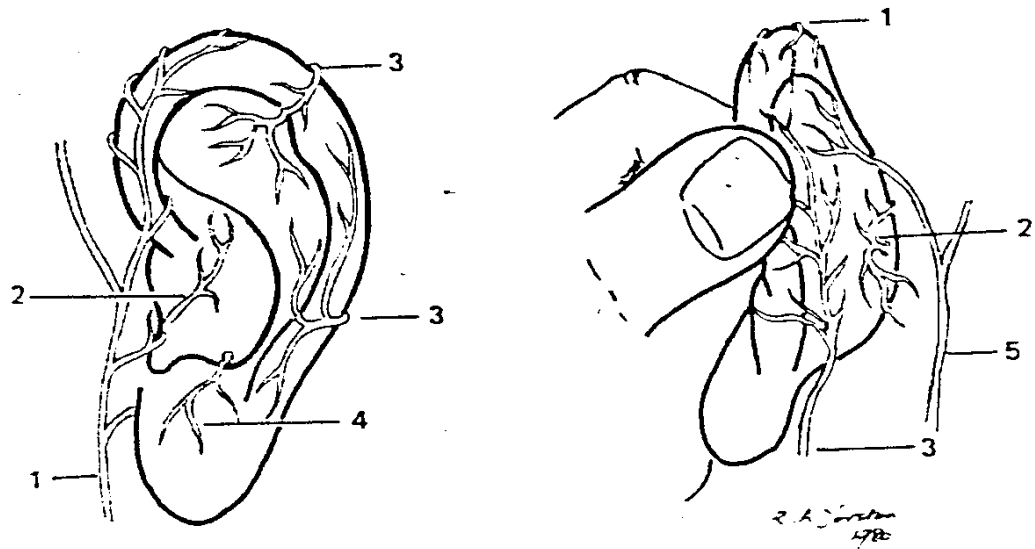


Fig. 136. Cutaneous innervation of pinna. 1, Auriculotemporal nerve (Vth). 2. Auricular branch of vagus nerve (Xth). 3; Great auricular nerve (C2, C3). 4, Branch of glossopharyngeal nerve (IXth). 5, Lesser occipital nerve (C2).

The membrane has an outer layer of squamous epithelium continuous with that of the meatus, a middle layer of fibrous tissue and an inner layer of mucous membrane continuous with the lining of the tympanic cavity (Ham, 1974).

Nerve supply of the tympanic membrane : The anterior portion is supplied by the auriculotemporal branch of the mandibular nerve and the posterior portion is supplied by the auricular branch of the vagus. The inner surface is supplied from the tympanic branch of the glossopharyngeal nerve.

Blood supply of the tympanic membrane : The outer surface has blood supply from the deep auricular branch of the maxillary artery. The inner surface receives branches from the posterior auricular artery and from the maxillary artery through its tympanic branch.

The middle ear : The middle ear cleft in the temporal bone includes the Eustachian tube, the tympanic cavity and the aditus which leads posteriorly to mastoid antrum and air cells. Anteriorly, the Eustachian tube opens into the nasopharynx (McLay, 1982).

The tympanic cavity lies between the tympanic membrane

laterally and the cochlea medially. The middle ear has six boundaries :-

1) The roof of the tympanic cavity is formed by a thin plate of bone, the tegment tympani, formed by the petrous and squamous parts of the temporal bone. This plate separates the tympanic cavity and mastoid antrum from the middle cranial fossa (Donaldson, 1980).

2) The floor is a thin bone which separates the cavity from the bulb of the internal jugular vein. The tympanic branch of the glossopharyngeal nerve enters the cavity through the floor.

3) The anterior wall; its lower portion is formed of a thin plate of bone separating the cavity from the internal carotid artery. The upper portion has two openings; the lower one being the Eustachian tube and above it lies the canal for the tensor tympani muscle.

4) The posterior wall; in its upper part, the aditus connects the epitympanic recess with the mastoid antrum. Below the aditus, a bony projection; the pyramid, gives exit to the tendon of the stapedius muscle and just above the pyramid, the fossa incudis gives attachement for short process of the incus. The facial nerve bends downwards at the level of the floor of the aditus and lies in close relation to posterior wall (Gray, 1973).

5) The medial wall; in it there are two openings : the upper one is the oval window and below it lies the round

window. In front of and between these two windows lies the promontory, which is furrowed by small grooves and contains the nerve of the tympanic plexus. The prominence of the facial nerve canal indicates the position of the upper part of the bony canal in which the facial nerve is contained.

6) The lateral wall : is formed by the tympanic membrane and the outer bony wall of the attic.

The tympanic cavity contains a chain of three movable ossicles :-

a- The malleus : it is the largest of the auditory ossicles. It consists of head, neck and three processes; the handle, anterior and lateral processes.

b- The incus : it consists of a body and two processes. The body articulate with the head of the malleus, the short process has a ligmentous attachement to the floor of the aditus, the long process extends downwards and its lentiform process articulate with the head of the stapes (Pratt, 1970).

c- The stapes : it has a head which articulates with long process of the incus. The neck is the constricted portion between the articular surface of the junction of the two crura. The tendon of the stapedius muscle is inserted into its posterior aspect. The crura diverge from the neck and are planted into the footplate which is

reniform in shape and thinner in the centre than at the edges. It is fixed to the margin of the fenstera vestibuli by a fibrous ring.

There are two auditory muscles : the tensor tympani muscle which receives its nerve supply from the mandibular division of the trigeminal nerve, and the stapedius muscle which is supplied by the facial nerve. They contract simultaneously and reflexly in response to sounds of high intensity exerting a protective damping effect upon sound vibrations reaching the internal ear. The tensor on contraction pulls inwards the tympanic membrane and renders it more tense and pushes the base of stapes downwards the oval window. The stapedius opposes the action of the tensor tympanic (Mawson, 1974).

The facial nerve enters the temporal bone at the internal auditory meatus close to the acoustic nerve. It passes laterally curving upwards over the Labyrinth until it reaches the anterior part of the medial wall of the tympanic cavity close to the roof, then it bends backwards at right angle, where the geniculate ganglion is situated and passes almost horizontally, enclosed in the fallopian canal above the oval window and below the lateral semicircular canal, then it turns downwards behind the pyramid where it gives nerve to stapedius muscle and

continues vertically until it emerges at the stylomastoid foramen. Shortly before this foramen, it gives off the chorda tympani which enters the tympanic cavity close to the upper posterior limit of the para tensa. Passing forwards between the long process of the incus and handle of the malleus, it passes out of the cavity through the anterior canaliculum and petrotympanic fissure (Ballantyne, 1979).

The Eustachian tube is the channel through which the tympanic cavity is connected with the nasopharynx. It is formed of a bony part about 12 mm and of fibrous and cartilagenous part about 24 mm long. The fibers of the origin of the tensor palati muscle are attached to the lateral wall of the tube so that contraction of this muscle on swallowing or yawning opens the tube and thus, equality of air pressure is maintained on both sides of the tympanic membrane (Donaldson, 1980).

The internal ear : It consists of two parts, the membranous Labyrinth contained within the bony Labyrinth. The bony Labyrinth is a series of channels in the petrous portion of the temporal bone : the vestibule; three semicircular canals, and the bony cochlear which is a coiled tube throughout its lenght. The basement membrane and Reissner's membrane divide it into three chambers or