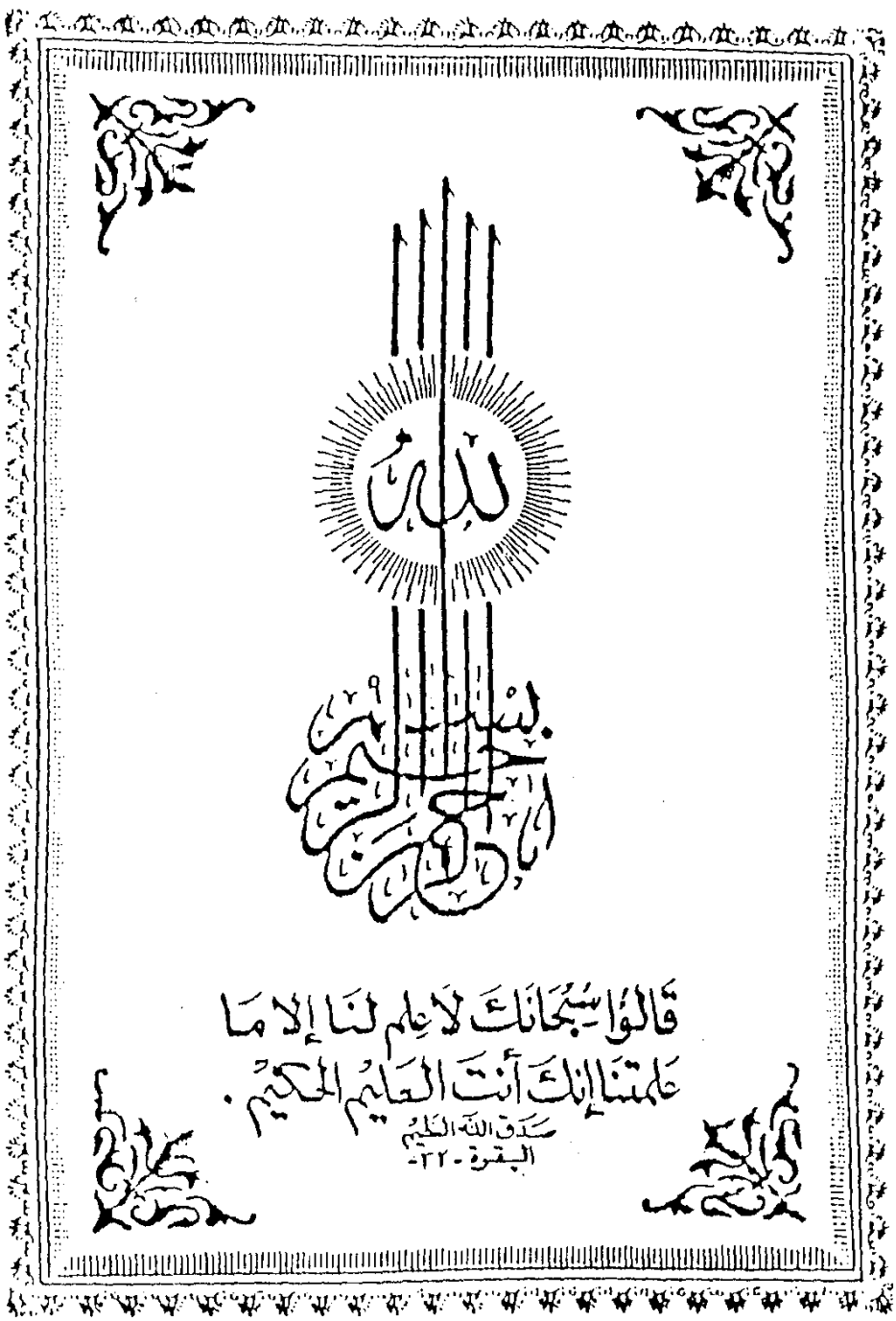


Incision and flap design for cochlear implantation : An arterial injection study

Thesis

Submitted in the partial fulfillment of the Master degree in Otorhinolaryngology

Presented by

Ashraf L. Fayed

M.B., B. Ch .

Supervised by

Professor Dr. A. A. Sarwat

Professor of Otorhinolaryngology

Dr. H. A. Wahba

Lecturer of Otorhinolaryngology

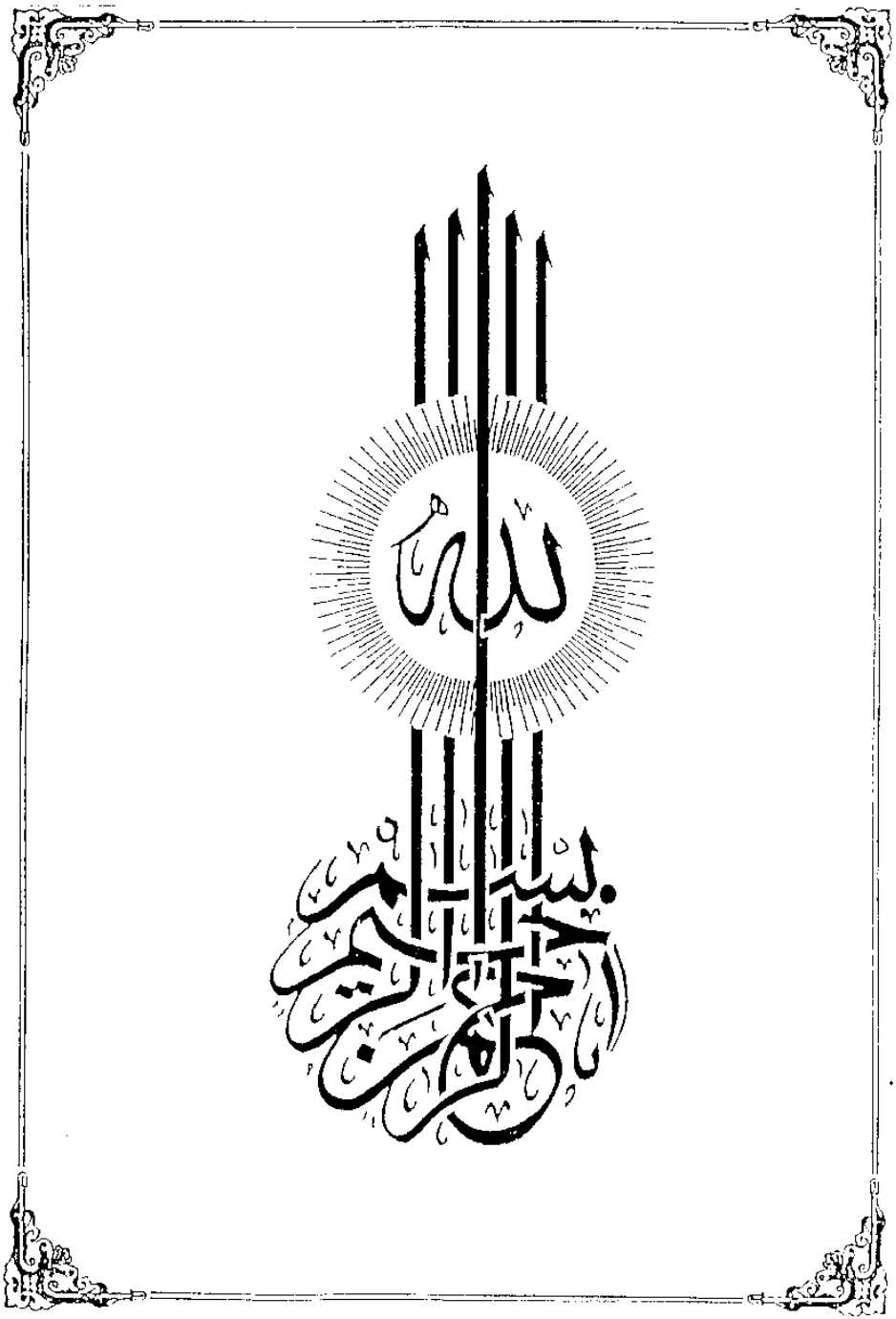
Ain Shams University

E. N. T. Department

Faculty of medicine

Cairo

1995



ACKNOWLEDGMENT

ACKNOWLEDGMENT

I would like to express my deep gratitude and sincere appreciation to **Professor Dr. A . A. Sarwat ,** Professor of E.N.T., Ain-Shams University, for his helpful and constructive suggestions , and for the continuous encouragement that he generously offered during this work . Also , he devoted much of his precious time and effort in order to achieve this work in a successful form .

I am also very grateful to **Dr. Hassan Wahba ,** Lecturer of E.N.T., Ain-Shams University, for his valuable guidance , encouragement, supervision and review of this work .

I am very thankful to **Dr. Ali Gamal El-Din** , Assistant professor of E.N.T., Ain-Shams University, for his help and guidance in this work .

It is a must to be mentioned here my congratulations to **Dr. Hassan El-Ebiary** , Lecturer of E.N.T., Ain-Shams University, who inspired with us the idea of this work .

And lastly , I would like to express my best wishes to my **wife** who suffered a lot during the preparation of this work .

CONTENTS

CONTENTS

LIST OF FIGURES

INTRODUCTION
&
AIM OF THE WORK

INTRODUCTION

The most common complication of cochlear implant surgery is flap necrosis and gaping of the skin incision .

Although a curable problem from the surgical point of view, but it leads to explantation of a very expensive device. This problem has been a great dilemma for surgeons and has led them to design various incisions and flaps as the **extended endaural** ***(Franz et al ., 1989)***,**C-shaped** ***(Clark , 1975)***, **inverted-U** ***(Clark et al ., 1979)*** , and many others . The main idea for all these incisions and flap designs was to preserve a constant uninterrupted blood supply , with adequate implant coverage ***(2 cm at least)*** from the incision line all around .

The ideal flap or incision has not been yet found . Each surgical center is using a preferred incision and still the complication of flap necrosis may occur , although less than in the past . Extremely careful and gentle handling of the flap during surgery is a must , but the crucial point in a healthy flap is of course its blood supply .

THE AIM OF THIS WORK

1 - To review the literature about :

** The vascular anatomy of the scalp (peri-auricular region) .

** The pathology of surgical flap necrosis .

** Flap and incision design for cochlear implantation .

** The complication of flap necrosis in cochlear implantation .

2 - To dissect a suitable number of cadavers to expose the superficial temporal , occipital and posterior auricular arteries , and to dye inject those arteries to identify their regional blood supply in the scalp .

3 - To correlate the findings with the different incisions mentioned in the literature and attempt to identify or even design a possible ideal flap or incision .

CHAPTER 1

VASCULAR ANATOMY OF THE SCALP (PERI-AURICULAR REGION)

VASCULAR ANATOMY OF THE SCALP (PERI-AURICULAR REGION)

Gray (1977) described the anatomy of the scalp . He said that the skin of the scalp is the thickest if compared to any other part of the body , and the hair follicles are very closely set together extending throughout the whole thickness of the skin .

The scalp covers the vault of the skull and extends between the right and left temporal lines, the eyebrows and the superior nuchal line.(***McMinn*** ,1990).

Har-Shai et al . (***1992***) from their histological sections of the injected galeal flaps with ***Jelly-China ink solution*** into the main trunk of the superficial temporal artery through a preauricular skin incision , showed the presence of four distinct layers in addition to the skin layers , from superficial to deep these consist of :-

1 - Fibrofatty subcutaneous layer .

2 - Aponeurotic layer (galea & muscle).

3 - Subgaleal loose areolar connective tissue layer .

4 - Periosteum (Pericranium) .

Abul-Hassan et al . ***(1986)*** from their fresh cadaver dissections , found that the superficial temporal fascia ***(epicranial aponeurosis)*** is a thin , highly vascular layer of moderately dense connective tissue lying immediately deep to the hair follicles and to the subdermal layer of fibrofatty tissue .

On its superficial aspect , the fascia is attached to the subdermal layer by fibers and numerous small blood vessels that pass from the superficial fascia to the subdermal layer .

This superficial layer is richly vascularized by the superficial temporal artery & vein and is separated from the deep temporal fascia by a distinct plane of loose areolar tissue ***(subaponeurotic plane)*** that gives the scalp its natural mobility .

This is an avascular plane . The deep temporal fascia ***(temporalis fascia)*** is a dense , tough , uniform layer and completely invests the outer aspect of the temporalis muscle down to the upper edge of the zygomatic arch . At every margin , it ends in an attachment to the periosteum of the skull and zygomatic arch . Both layers are called together the galea aponeurotica .

Whetzel & Mathes (1992) stated that the scalp is formed of an extensive deep fascial circulation that communicates with the subdermis through hundreds of small fasciocutaneous perforators . ***McMinn (1990),*** added that the arteries of the periauricular region of the scalp are derived from the external carotid artery by the occipital , posterior auricular, and the superficial temporal arteries .

The superficial temporal artery is a large terminal branch of the external carotid artery originating behind the neck of the mandible in , or deep to the parotid gland and divides into anterior and posterior branches that run towards the frontal and parietal eminences respectively (**Fig.1**). The posterior auricular artery is a small branch of the external carotid artery arising deep to the parotid gland and supplies the area below and behind the root of the auricle , while the occipital artery arises from the external carotid deep to the angle of the mandible and supplies the muscles of the neck and the back of the head (**Fig.1**).These arteries anastomose freely with each other and with those of the opposite side ***(Romanes , 1982)*** .