

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

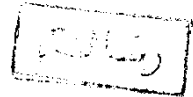
Thesis

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CONTENTS

CONTENTS

SUBJECT	PAGE
♦ Introduction and aim of the work	1 - 2
♦ Review of literature	
- Chapter 1	3 - 16
- Chapter 2	17 - 25
- Chapter 3	26 - 49
♦ Material and Method	50 - 54
♦ Results	55 - 66
♦ Discussion	67 - 70
♦ Conclusion	71 - 71
♦ Recommendations	72 - 73
♦ Summary	74 - 75
♦ References	76 - 83

LIST OF FIGURES

Figure No.		Page
*Fig. 1	The blood supply of the scalp .	5
*Fig. 2	The vascular cutaneous territories of the face and scalp.	7
*Fig. 3	The external carotid artery and its branches.	8
*Fig. 4	The course of the occipital artery and its relation to different structures.	9
*Fig. 5	The superficial temporal artery and blood supply of face.	12
*Fig. 6	Ten variations of the superficial temporal artery anatomy.	16
*Fig. 7	Flap necrosis following cochlear implantation .	28
*Fig. 8	Incisions . A) C-shaped. B) Inverted-U. C) Extended endaural.	31
*Fig. 9	Anteriorly based "C" and inverted "J" or "U" incisions.	32
*Fig. 10	Soft tissue incisions for cochlear implantation. The design of the anteriorly based C-shaped flap	36
*Fig. 11a.	Inverted U-shaped skin incision with endaural extension showing relationship with occipital artery and with implanted receiver/stimulator package	38
11b.	Endaural incision used at Ain-Shams Cochlear Implant Center	
*Fig. 12a.	The inverted-U incision with its blood supply	40
12b.	Surgical landmarkings of extended endaural incision in children	
*Fig. 13	Blood supply to anteriorly based flap.	43
*Fig. 14	Design of preferred inferiorly based flap with its blood supply.	44

*Fig. 15	A) Schematic demonstrating original C shaped flap, with L-shaped extension. B) Schematic demonstrating how L-shaped should be used to place device if flap necrosis should occur with U-shaped flap.	48
*Fig. 16	Exposure of external carotid system and marking of cutaneous vascular territories .	51
*Fig. 17	Exposure of external carotid artery and its branches . Cannulation of the occipital artery .	53
*Fig. 18	Abnormal variations of the external carotid branching .	56
*Fig. 19	Abnormal variation of occipital artery .	57
*Fig. 20	Cutaneous vascular territory of the superficial temporal artery (black).	59
*Fig. 21	Cutaneous vascular territory of superficial temporal artery (black) and posterior auricular artery (red) .	60
*Fig. 22	Cutaneous vascular territory of superficial temporal artery (black) , posterior auricular artery (red) and occipital artery (blue) .	61
*Fig. 23	Overlap of vascular territory . superficial temporal artery cannulation and injection (red).	64
*Fig. 24	Overlap of vascular territory . superficial temporal artery (red) and posterior auricular artery (black) .	65
*Fig. 25	Overlap of vascular territory . superficial temporal artery (black) , posterior auricular (red) and occipital (blue) .	66

**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*) .