VASCULAR SUPPLY OF THE SCALP

Thesis

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in Surgery

By

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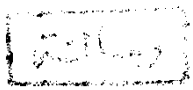

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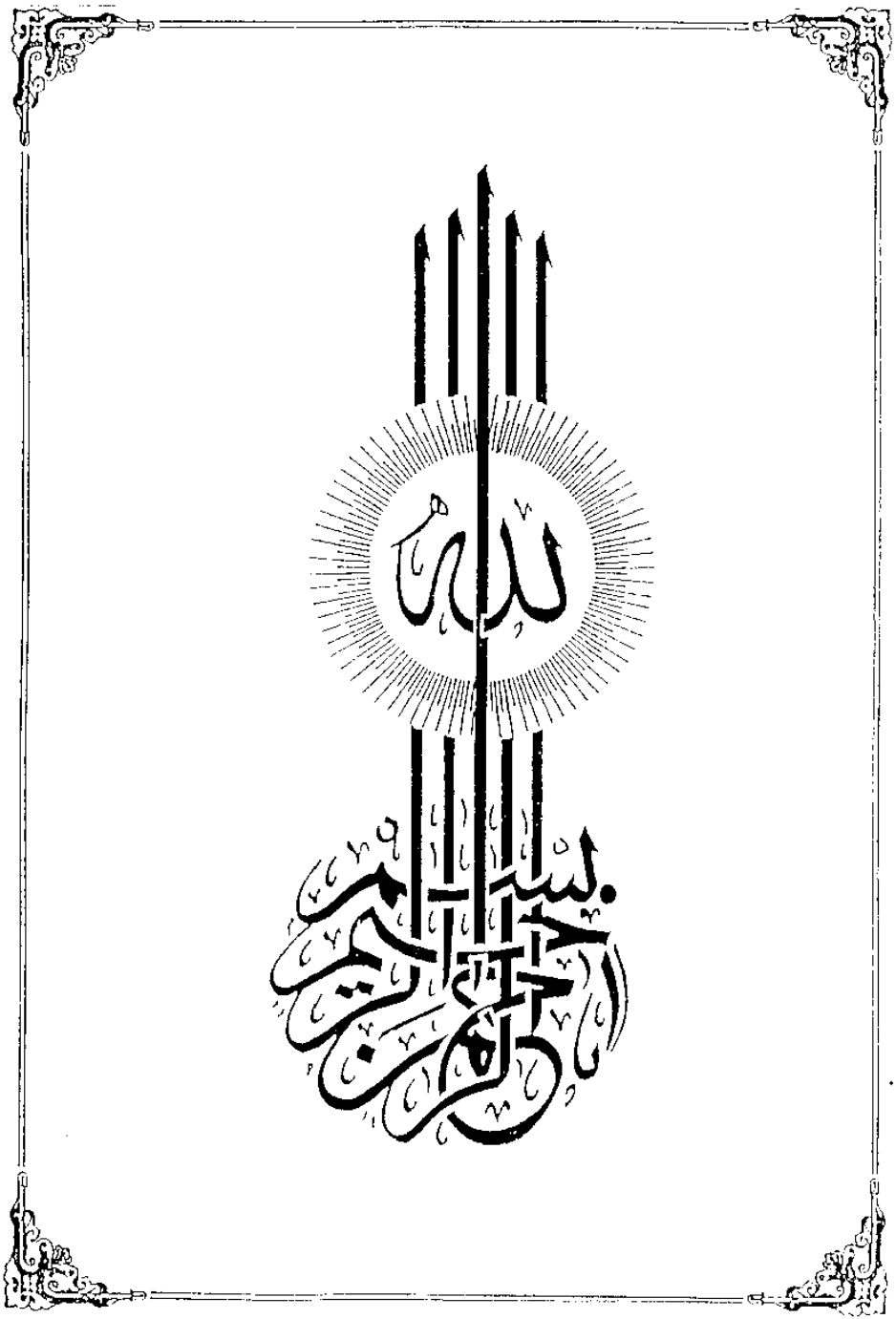
"بسم الله الرحمن الرحيم"



This Work is dedicated

to My Family..

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Introduction.

INTRODUCTION

In all Plastic Surgery conflict between blood supply and perfection of results is a constant factor.

So, the study of the vascular supply of the different parts of the body is a milestone in Plastic Surgery.

We must have a thorough understanding of the arterial supply of the scalp in order to be able to draw or perform most of the scalp flaps by simply basing the flap on a known blood vessel.

However, the blood supply of the scalp is very rich so that some people say that "Scalp flaps never die nor they prone to fade away".

In this piece of work, we are going to discuss the vascular supply of the scalp, the various types of flaps that had been raised from the scalp and some clinical application for the use of these flaps in the different reconstructive procedures.

Review of Literature:

ANATOMY & VASCULAR SUPPLY OF THE SCALP

ANATOMY OF THE SCALP

The scalp is defined as the area extending from the top of neck muscles at the back of the head to the forehead and eyebrows at the front of the head and extending down over the temples to the ears and zygomatic arches (Last, 1981).

According to Dingman and Argenta, (1982) the scalp is made up of five distinct layers:

1. Skin:

The thickness of the epidermis and dermis of the scalp varies from 3 to 8 mm. It is thickest in the occiput and diminishes as one moves frontally and temporally. Normally, most of the scalp, with the exception of the forehead and temporal area, is covered with hair.

2. Subcutaneum: (Superficial fascia of the scalp)

The second layer of the scalp is a dense layer of connective tissue and fat that binds the skin to the underlying galea by means of dense strands of fibrous tissue which traverse the subcutaneous tissue and split it into a large number of separate pockets filled with fat. It is continuous behind with the superficial fascia of the back of the neck. Laterally, it is prolonged into the temporal region, where it is looser in texture. It provides enough elasticity to prevent shearing of the dermis and epidermis from the deeper layers. In its deepest half, the subcutaneum contains adenxal tissues, nerves, lymphatics and the principal arteries and veins of the scalp.

3. Epicranium:

The paired occipital and frontal muscles are connected over the vertex of the skull by the epicranium, or galea aponeurotica. Anatomically, the epicranium is a musculofascial layer supported by the areolar tissue of the subaponeurotic space.

The epicranium is extensive in its attachment, extending from the radix of the nose medially, along the supra-orbital margins. Laterally, across the temporal area to the superior auriculocephalic angle where it fades out laterally by blending with the temporal fascia just above the zygomatic arch. It then extends posteriorly and slightly downward along the inferior nuchal line to the spinous process of the seventh cervical vertebra.

Normally, considerable tension exists in this layer and it is the strongest layer of the scalp. The galea is separated from the pericranium by a layer of loose connective tissue (Hollinshead, 1974).

It is better to consider these previous three layers of the scalp as a single layer, since when torn off in accidents, or turned down surgically, they remain firmly connected to each other.

4. Subepicranium:

The subepicranium is also sometimes known as the subepicranial space and it is made up of loose, thin, relatively avascular connective tissue between the epicranium and the pericranium. Its looseness provides most of the mobility of the scalp. A varying number of emissary veins cross this space from the subcutaneous veins of the scalp to the intracranial venous sinuses.

5. Pericranium:

This is the innermost layer of the scalp and it is the outer periosteum of skull bones. The pericranium is so densely adherent to the outer table of the skull, particularly along the suture lines, that considerable effort is required to raise it with the scalp. The pericranium contains a rich vascular supply from the underlying bone.

Occipitofrontalis muscle:

The occipitofrontalis muscle is a broad, musculofibrous layer, covers the dome of the skull, from the nuchal lines to the eyebrows. It consists of four parts, two occipital and two frontal connected by the galea aponeurotica.

The occipital bellies are shorter and narrower than the frontal bellies, and they are widely separated by the aponeurosis passing to the external occipital protuberance and the medial part of the superior nuchal line. Each belly arises from the lateral part of the superior nuchal line and is inserted into the aponeurosis. The terminal branches of occipital artery lie superficial to the occipital belly of occipitofrontalis between it and the skin of the scalp.

The frontal bellies are longer and broader than the occipital bellies, and come close together above the nose where they are partly inserted into the skin of the nose. Each frontal belly lies in the forehead and the adjoining part of the top of the head. It has no bony attachment, but runs between the skin of the forehead and the epicranial aponeurosis, which it joins just anterior to the coronal suture. The supratrochlear and supraorbital arteries at first lie under the frontal belly and then pierce it to lie superficial to it in the dense subcutaneous tissue of the scalp.

Because of its attachment it not only tenses the aponeurosis, but also raises the eyebrows (if the occipital belly contracts) or wrinkles the forehead (if the occipital belly does not contract).

The occipital belly is supplied by the posterior auricular nerve from the facial nerve and the frontal belly is supplied by the temporal branches of the facial nerve.

Temporal Fascia:

The temporal fascia is a strong, fibrous investment which covers the temporalis muscle. It is covered laterally by the auricularis anterior and superior, the galea aponeurotica and part of orbicularis occuli. The superficial temporal vessels and auriculo-temporal nerve cross it upwards.

The superficial temporo-parietal fascia which is a well defined layer is separated from the underlying investing temporalis muscle fascia by loose areolar connective tissue. It is no more than 2 to 3 mm thick in its normal scalp location (Byrd, 1980). This fascia itself is the superior, cephalic extension of the superficial musculo-aponeurotic system (SMAS). Above the temporal crest, it becomes contiguous with the galea. Below, it attaches to the zygomatic arch, whereas the deep muscle fascia continues down with the temporalis muscle to the mandible's coronoid process, which is medial and deep to the arch (Brent et al., 1985).

The temporal fascia is pierced by the middle temporal branch of the superficial temporal artery immediately above the zygomatic arch. The zygomatico-orbital branch of the superficial temporal artery passes between its two layers along the upper border of the zygomatic arch.

The superficial temporo-parietal fascia is vascularized by the superficial temporal artery while the underlying deeper muscle fascia is vascularized by the middle temporal branch of the superficial temporal artery.

VASCULAR SUPPLY OF THE SCALP

Arteriographic studies carried out by Conway et al. (1952) in which they injected Umbrathor (Thorium dioxide) into the common carotid artery of a cadaver, demonstrated that the artery which contributes most of the blood supply of the soft tissue of the head and neck is the superficial temporal artery with its frontal and parietal branches and that other arteries which richly supply the scalp are the posterior auricular, the occipital, the supraorbital and the supratrochlear (Fig. 1).

So, the blood supply of the scalp is derived from the external carotid artery by the superficial temporal, occipital and posterior auricular arteries and from the internal carotid artery by the supraorbital and supratrochlear arteries. All these arteries anastomose very freely with each other. The junction of the forehead and temple, about the outer end of the eyebrow, is the area where the external and internal carotid arteries anastomose freely with each other (Last, 1981).

The vessels are arranged as five major paired vessels which enter the scalp radially and symmetrically, and anastomose to form an extensive interconnecting network. So, there is an extensive anastomosis and collateral circulation across the vertex of the cranial vault (Dingman and Argenta, 1982).

1. **Superficial temporal artery**:

The external carotid artery ascends along the postero-medial margin of the mandibular ramus with the stylohyoid muscle, the posterior belly of digastric muscle and the hypoglossal nerve lying lateral to it and the superior pharyngeal constrictor muscle lying medial to it. At the level of the condylar neck, the external carotid artery