VASCULAR TERRITORIES IN THE ANTEROLATERAL ABDOMINAL WALL AND THEIR APPLICATIONS IN FLAP SURGERY

THESIS

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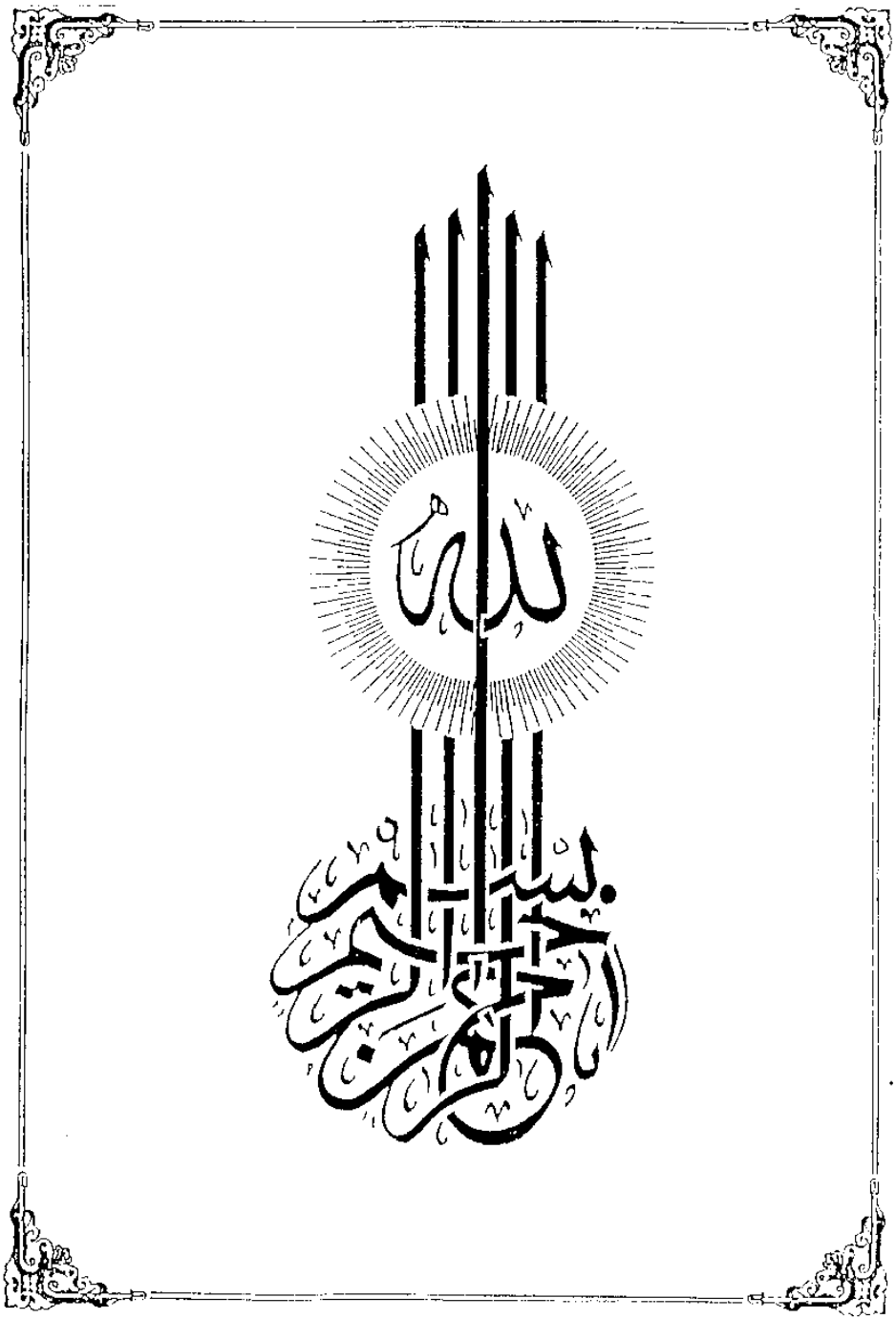

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INTRODUCTION

Skin flaps have been used for facial repairs since the sixth century B.C., but more generalised applications have been in use only since the beginning of this century. Selection of the appropriate skin flap remained for a long time depending on the surgeon's experience and knowledge. The accepted rules of the past continue to dominate the present and limit exploration of alternative methods for the future. Nevertheless, with the recent condemnation of the length-width ratio for cutaneous flaps, the development of arterial flaps, and the free transfer of flaps by microvascular anastomosis; a renaissance in skin flaps has occurred.

The definition of many arterial flaps in the torso stimulated us to search for other arterial flaps in this huge donor area. The skin of the abdomen specially that of the lower part, so often redundant, is an obvious donor site for skin flaps. This area provides the largest amount of skin and subcutaneous tissue without causing undue damage and visible deformity.

In this study, a review of the vascular anatomy of the anterolateral abdominal wall, history of skin flaps from this region as will as the haemodynamic basis of skin flaps will be given.

The experimental work include dissection of fresh cadavers to define the arteries supplying the antero-lateral abdominal wall. For each artery its cutaneous territory, branching pattern specially these supplying the skin, and the anastomosis with the other arteries will be investigated.

Clinical skin flaps are done to apply and confirm the anatomical findings. This study tries to define arterial skin flaps based on the investigated arteries.

Review of literatures

VASCULAR ANATOMY OF THE ANTEROLATERAL ABDOMINAL WALL

The concept of arterial flaps became a wide spread one, and flaps which were not following the classic length to width ratio, like those of the head and neck, are realized to be arterial flaps.

Recognition of the arterio-venous systems in the torso had produced the deltopectoral flap (Bakamjian, 1965), the groin flap (Smith et al., 1972), and the lateral thoracic flap (Harri et al., 1978).

The groin and the axillary regions share a common feature. Those two regions with loose skin and well developed membranous layer of superficial fascia, resemble the skin of loose skin animals which have their skin supplied predominately by direct cutaneous arteries. But when we consider the anterior perforators of the chest, this feature is absent. So, the direct cutaneous arteries are not confined to the areas of loose skin and they can be found in the torso anywhere.

The anterolateral abdominal wall represent a very large area that can be a good donor for skin flaps. A review of the vasculature of this region will be given aiming at the detection of the direct

cutaneous arteries there, which can be taken as a source of the blood supply of arterial flaps in this area.

According to Brown et al. (1975), the vascular supply to the anterolateral abdominal wall appears to arise from three systems:

A- The perforating musculocutaneous branches of the intercostal, subcostal, and lumbar vessels.

B- The deep epigastric arcade.

C- The superficial inferior epigastric vessels.

A- <u>The perforating musculocutaneous branches of the intercostal, subcostal and lumbar arteries:</u>

The anterolateral abdominal wall is supplied by a series of segmental arteries that arise from the aorta, run circumferentially around the trunk, and eventually lie on the transversus abdominis muscle. Those segmental vessels run obliquely downward across the abdomen, so that the upper abdomen is supplied from the level of thoracic 7, 8 and 9, while the portion below the umbilicus is supplied from thoracic 11, and 12, and lumbar 1, with the umbilical region supplied by thoracic number 10.

Those segmental arteries; the intercostal and the subcostal arteries, are located together with associated vein and the same number nerve as a neurovascular bundle. Each structure in this bundle will be separately discussed.

I- The intercostal and the subcostal nerves:

The intercostal nerves are eleven in number on each side, and are the anterior primary rami of the upper eleven thoracic spinal nerves. The anterior primary ramus of the twelfth thoracic nerve is not intercostal, but lie inferior to the twelfth rib and is known as the subcostal (or last dorsal) nerve.

The lower five intercostal nerves ultimately leave the intercostal spaces and pass into the anterior abdominal wall.

The upper six intercostal nerves emerge from the intervertebral foramen and come into relation with the vessels of the corresponding space, being the most inferior of the three structures in the neurovascular bundle. Each nerve gives off a white ramus communicans to and receives a white ramus communicans from the corresponding sympathetic ganglion. These structures are all lying between the superior costo - transverse ligament and the posterior intercostal membrane, surrounded by loose areolar tissue. The nerve now pass laterally, anteriorly, and finally medially as it

incircles the thorax. It lies internal to the posterior intercostal membrane, passing inbetween this structure and the subcostal muscle, then enter the subcostal groove of the rib, pass between the internal intercostal and the intercostal muscle (intercostalis intimi). It now passes forwards between the internal intercostal and the anterior intracostal membrane, and reaching the anterior part of the thoracic wall, continues internal to the internal intercostal but external to the sternocostalis and the internal thoracic vessels. On reaching the side of the sternum; it passes directly anterior, and became an anterior cutaneous branch piercing in succession the following structures; the interchondral portion of the anterior intercostal membrane, the pectoralis major muscle, and the deep fascia.

The branches of the intercostal nerves are collateral, muscular, lateral cutaneous, and anterior cutaneous.

(1) The collateral branch: This branch leaves the intercostal nerve at or just lateral to the angle of the rib, and passing inferiorly, runs along the superior border of the rib below, between the same muscle layers as the intercostal nerve.

It supplies the muscles and terminates in them or forms a connecting loop with the main nerve lateral to the sternum.

(2) The muscular branches: Those supply the following muscles: The levator costorum, serratus posterior superior, subcostal muscles, intercostal muscles, the sternocostalis, the serratus posterior inferior, and the muscles of the anterior abdominal wall.

(3) The lateral cutaneous branches: They arise just lateral to the costal angles after the nerve has given off its collateral branch. The lateral cutaneous branches pierce the internal intercostal muscles and run anteriorly for a short distance between the internal and the external intercostals. Then they pierce the external intercostal muscles and make their appearance under fibrous arches connecting the costal slips of origin of the serratus anterior muscle. the first intercostal nerve as a rule does not give a lateral cutaneous branch, and that of the second is known as the intercosto brachial nerve.

On reaching the superficial fascia, each lateral cutaneous nerve divides into an anterior and posterior ramus, supplying the anterior and posterior parts of the lateral thoracic wall respectively.

(4) The anterior cutaneous nerve : This is the termination of the intercostal nerve which, having