وقل اعملوا فسيرى الله عملكم ورسوله والمؤمنون

صدق الله العظيم

Fasciocutaneous Flaps of the Upper Arm

Thesis

Submitted for the Partial Fulfilment of the Requirements of M.D. Degree

in

Plastic Surgery

Presented by

Ayman Abu El-Makarem Shaker

Ass. Lecturer of Plastic and Reconstructive Surgery

Supervisors

PROF. DR. MOHAMED MAMDOUH NAFEH

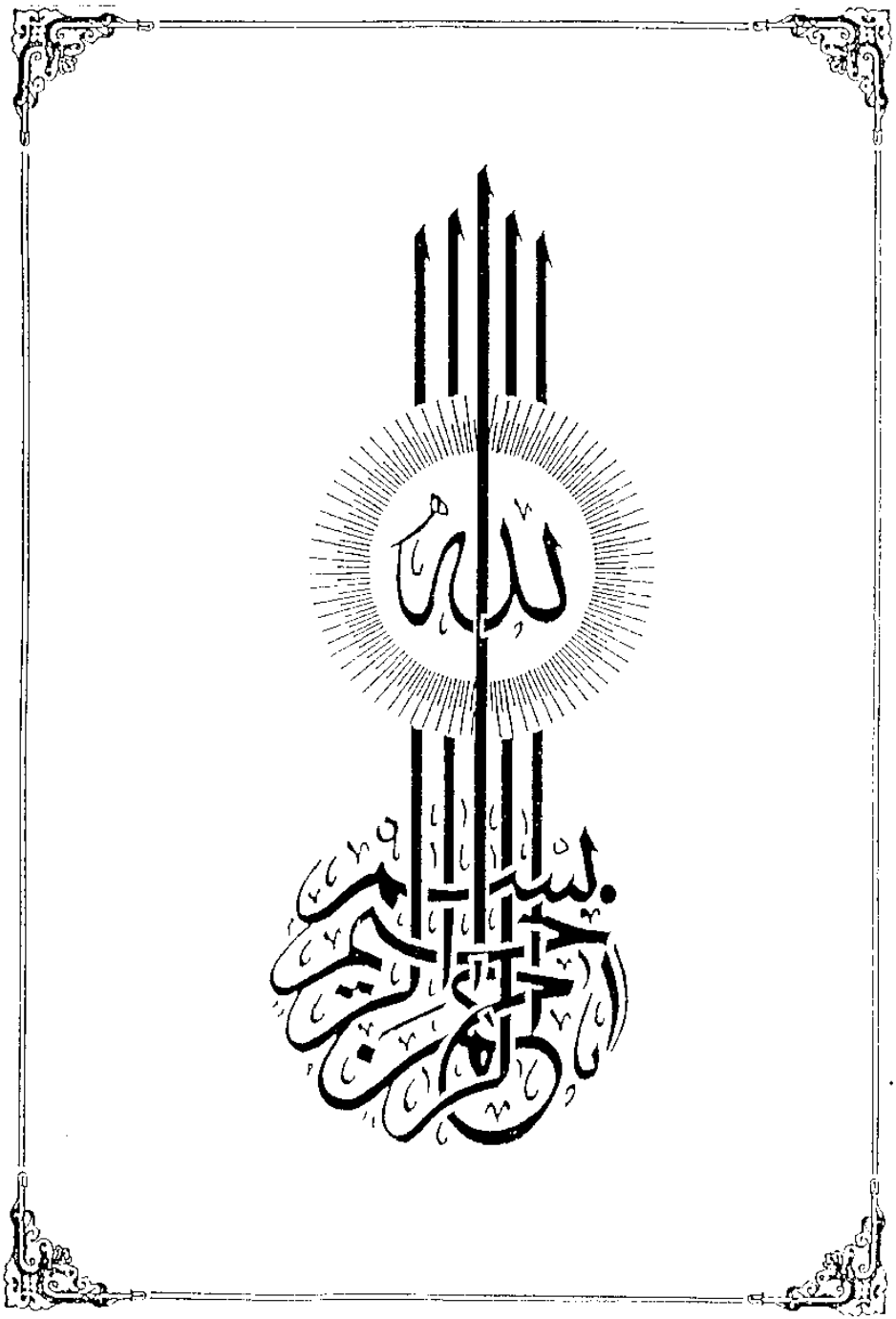
Professor and Head of the Plastic and Reconstructive Surgery Unit
Faculty of Medicine - Ain Shams University

DR. IKRAM EBRAHIM SAFE

Ass. Professor of Plastic and Reconstructive Surgery
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University

1991



To My Dear Family

ACKNOWLEDGEMENT

I would like to express my deepest gratitude and appreciation to Professor Dr. **M.M. NAFEH** for his kind supervision, support and encouragement.

I am faithfully grateful to Dr. **I.E. SAFE** for his unique cooperation, suggestions, and assistance throughout the work.

I owe much to my dear colleagues Dr. **M. SHERIF** and Dr. **M. KHALED** for their continuous help and guidance.

I wish also to express my deepest thanks to all the members of Plastic and Reconstructive Surgery unit, Ain Shams University.

I am also grateful to **MR. M. HABASHY**, technician of the autopsy room, Pathology Department, Ain Shams Faculty of Medicine, for his great help in doing the cadaveric dissection needed for this study.

LIST OF ABBREVIATIONS

ARCA	:	Anterior radial collateral artery.
AURA	:	Anterior ulnar recurrent artery.
FC	:	Fasciocutaneous.
IEL	:	Interepicondylar line.
IRA	:	Interosseous recurrent artery.
IUCA	:	Inferior ulnar collateral artery.
MC	:	Musculocutaneous.
MCA	:	Middle collateral artery.
PCHA	:	Posterior circumflex humeral artery.
PRCA	:	Posterior radial collateral artery.
PURA	:	Posterior ulnar recurrent artery.
RCA	:	Radial collateral artery.
RRA	:	Radial recurrent artery.
SUCA	:	Superior ulnar collateral artery.
URA	:	Ulnar recurrent artery.

CONTENTS

List Of Tables

Introduction

INTRODUCTION

Since very long time, plastic surgeons have been attracted to the upper arm as a potential donor site for flap transfer. The original description of the upper arm pedicle flap was done by *Tagliacozzi (1597)* for nasal and facial reconstruction. The classical Tagliacottian flap was distally based and thus its blood supply was compromised. This explained the need for a bipedicle delay procedure before this flap can be transferred with any degree of safety.

The skin of the arm is thin and pliable and, particularly in the medial aspect, is predominantly hairless. The skin of the upper limb in general has an extensive cutaneous nerve supply and the parallel course of these nerves makes them suitable for microneural anastomosis. Because of these characteristics the arm provides a very useful donor area for free tissue transfer, particularly when sensitive skin is required *(Webster and Soutar, 1986).*

The first free arm flap was described by *Daniel et al. (1975).* It was elevated from the medial side of the arm and it was recognized as axial pattern flap vascularized by the superficial branch of the superior ulnar collateral artery.

In addition to the axial and musculocutaneous blood supply of the skin, a third system has been recognized in the last 10 years. This is the fasciocutaneous system which consists of perforators that pass up to the surface along the fascial septa between adjacent muscle bellies and then fan out at the level of the deep fascia to form a plexus which always has an axiality *(Ponten. 1981).*

The planning of fasciocutaneous flaps requires to answer to these questions:

1. Where are the fasciocutaneous perforators located?
2. Is there a fascial plexus present at that site?
3. Does the fascial plexus posses any axiality?

With the discovery of the fasciocutaneous system of vessels, the vascular pattern of arm flaps is now better understood. Several flaps that were previously regarded as axial pattern flaps based on vessels of the direct cutaneous system are now known to be fasciocutaneous flaps as the medial arm flap *(Cormack and Lamberty, 1984a).*

It was also found that despite the large, fleshy nature of the biceps and the triceps, the blood supply to the arm skin is not through musculocutaneous perforators from the underlying muscles, but is by fasciocutaneous perforators emerging along the medial and lateral intermuscular septa *(Cormack and Lamberty, 1984b).*

The whole concept of fasciocutaneous flaps in the arm has led to reawakening of anatomical research. So, in the present thesis were are going to study the vascular anatomy of the deep fascia of the arm. The distribution of the fasciocutaneous blood vessels and the different fasciocutaneous flaps that can be raised from the arm will be investigated. Some clinical applications of these flaps will be presented.

Review of Literature

GENERAL ANATOMY OF THE DEEP FASCIA

The deep fascia is the name given to the bluish membrane that lies under cover of the superficial fascia. It is thin, but dense and strong, and the superficial fascia is loosely attached to it by fibrous strands *(Last, 1984).*

It is composed of a meshwork of collagen fibres with no particular structure or orientation except at certain sites where purely mechanical restraining functions are required such as across tendons (retinacula) or on the flexural aspects of joints. In some part the deep fascia is thick and aponeurotic, representing part of the origin or insertion of a muscle, e.g., the iliotibial tract which transmits the tendon of tensor fascia lata and part of gluteus maximus.

The aponeuroses often referred to as "fasciae" in the palm of the hand and the sole of the foot are protective layers that actually represent the degenerated remains of the expanded tendons of the palmaris longus and plantaris muscles. These are therefore not considered to be true deep fascia *(Cormack and Lamberty, 1986).*

According to *Warwick and Williams (1980),* the deep fascia in the limbs is particularly well developed, many fibres are longitudinal in arrangement, while others encircle the limb, binding the longitudinal fibres together into a tough, inelastic sheath for the musculature.

The deep fascia clothes the muscles, investing them so closely that it forms a tight sheath around the limb and preserves the contour of the limb. From its deep surface it sends wide sheets that form partitions or septa among

the muscles. In that way, the deep fascia provides fascial sheaths for many of the muscles and for the vessels and nerves that lie among the muscles. Parts of some muscles are attached both to the investing and to the septa of the deep fascia *(Last, 1984).*

Although the deep fascia is inelastic, it can adapt itself to the changing shape of the muscle compartments during contraction *(Cormack and Lamberty, 1986).*

Some of the collagen fibres of the deep fascia are attached to the tendons and ligaments of joints and also to parts of bone that come to the surface between muscles. The deep fascia on the bones is always anchored firmly, to the periosteum *(Last, 1984).*

The deep fascia is very sensitive. It is supplied by the nerves supplying the overlying skin which also supply the subcutaneous periosteum. The nerves to muscles do not supply the investing deep fascia but they supply the deep periosteum and the fibrous tissue of deep intermuscular spaces *(Last, 1984).*

Blood supply of the Deep Fascia

There is very little information on the blood supply of the deep fascia. Clinically, the value of the deep fascia in maintaining the vascularity of the overlying fat and skin has been clearly proved, but anatomists have not yet realized this vascular relationship *(Tolhurst et al., 1983).*

The only work that deals in any detail with this matter is that of *Schafer (1975).* He studied the blood supply of the deep fascia in legs of cadavers and reported his findings as follows: The deep fascia of the lower limb is supplied by cutaneous arteries which originate mainly from the larger leg arteries and less often from muscle arteries. These vessels run almost exclusively in intermuscular