SOFT TISSUE RECONSTRUCTION OF POST TRAUMATIC LOWER ONE THIRD LEG DEFECTS DIFFERENT MODALITIES

THESIS

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By

Ahmed Mahmoud Hussein Mahmoud
M.B.B.Ch.
Faculty of Medicine
Cairo University

Supervisors

Prof. Dr. Safwat Abd El-Kader
Professor of General and plastic surgery
Faculty of Medicine
Cairo University

Prof. Dr. Motaz Abo El-Azm
Ass. Professor of General and Vascular surgery
Faculty of Medicine
Cairo University

Dr. Moheb Samir
Lecturer of General and Plastic surgery
Faculty of Medicine
Cairo University

Faculty of Medicine
Cairo University
2009

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Key Words :

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Abstract :

Coverage of soft tissue defects over the lower third of the leg still a difficult challenge to reconstructive surgeons. There are various methods of coverage including skin grafts, local flaps, distant flaps and free flaps. The choice of the reconstructive technique is influenced by many factors including the general condition of the patient, the local condition of the defect and the nearby tissues and personal factors.

Evaluation of different coverage methods was done in twenty patients of different ages and sex presented with post traumatic lower third leg defects

Comparison between the different used techniques showed that the use of skin grafts can be successful in covering defects not overlying bones or tendons devoid of periosteum and paratenon. Healing by secondary intention can be allower when there is small defect in a patient not fit for long surgery time.

Local random rotational flap can be used in small defects with exposed bone or tendons. Muscle flaps have a limited use in lower third leg defects. Fasciocutaneous flaps were proved to be a good choice for most of the defects unless extensively damaged nearby tissues or impaired limb vascularity. Free flaps are an excellent option and can be the only choice in markedly damaged and severely crushed defects.

CONTENTS

The Subject	Page
Introduction	1
Review of Literature	4
Anatomy	4
Pathophysiology of trauma	21
Management of mangled extremity	30
Factors affecting defect coverage	35
Various classic alternatives of wound reconstruction	37
Fasciocutaneous flaps	40
Muscle flaps	80
Free flaps	95
Patients and Methods	120
Results	123
Discussion and Conclusion	138
Summary	143
References	145
Arabic Summary	

List of Tables

Table	Subject	Page
Table 1 :	Compartments of the leg ……	10
Table 2 :	Classification of open leg fractures (Gustilo et al.)……	26
Table 3 :	Classification of open leg fractures (Byrd et al.)……	26
Table 4 :	AO/ASIF classification of soft tissue injury……...	27
Table 5 :	Mangled extremity severity scoring system (MESS)….	28
Table 6 :	Classification of lower extremity reconstruction……	99
Table 7 :	The patients data, reconstructive procedures and results	123
Table 8 :	The results according to the used technique……...	127
Table 9 :	The results according to age distribution……	127
Table 10:	The results according to sex distribution……	128
Table 11:	The results according to the presence of concomitant medical disorders……	128

List of Figures

Figures	Subject	Page
Fig. 1 :	The structure of the skin……..	5
Fig. 2 :	Patterns of blood supply to the skin……	7
Fig. 3 :	Vascular plexuses of the skin……..	7
Fig. 4 :	Cross section in the leg……	9
Fig. 5 :	Arterial supply to the leg…….	13
Fig. 6 :	Venous drainage of the leg……..	13
Fig. 7 :	The different sizes of anatomical, dynamic and potential territories……..	20
Fig. 8 :	Classification of open tibial fracture**(Byrd et al., 1985)**.	29
Fig. 9 :	Reconstructive ladder……..	34
Fig. 10 :	Classification of fasciocutaneous flaps……...	42
Fig. 11 :	Areas suitable for raising fasciocutaneous flaps…….	44
Fig. 12 :	Classification of anterior tibial flaps……...	46
Fig. 13 :	Standard anterior tibial artery flap……..	48
Fig. 14 :	Distally based anterior tibial artery flap……..	50
Fig. 15 :	Standard peroneal artery flap……..	55
Fig. 16 :	Distally based peroneal artery flap……..	56
Fig. 17 :	Vascular anatomy of the lateral calcaneal flap……	58
Fig. 18 :	Different types of lateral calcaneal flap……..	58
Fig. 19 :	The lateral supramalleolar flap……	59
Fig. 20 :	Surgical anatomy of sural arteries and its musculocutaneous perforators…….	62
Fig. 21 :	The distally based sural artery flap……..	63

Fig. 22 : Surgical anatomy of the posterior tibial artery…… 65
Fig. 23 : Proximally based posterior tibial artery flap……... 67
Fig. 24 : Distally based pedicled posterior tibial artery flap…….. 68
Fig. 25 : Dorsalis pedis flap……... 70
Fig. 26 : Bipedicle flap…….. 79
Fig. 27 : Patterns of vascular anatomy of muscles…… 81
Fig. 28 : Arc of rotation of muscle flaps…… 84
Fig. 29 : Distally based hemisoleus flap…… 87
Fig. 30 : Gastrocnemius flap planning…….. 89
Fig. 31 : Latissimus flap…… 102
Fig. 32 : Rectus abdominis flap……. 106
Fig. 33 : Gracilis muscle flap……. 108
Fig. 34 : Scapular flap…… 110
Fig. 35 : Parascapular flap……. 111
Fig. 36 : Radial forearm flap…….. 114
Fig. 37 : Anterolateral Thigh Flap……. 116
Fig. 38 : Groin flap…… 117
Fig. 39 : Vascularised fibula flap…….. 119

INTRODUCTION

Introduction

Trauma is the leading cause of mortality and disability during the first four decades of life and is the third most common cause of death overall. **(Charles V. Mann and R.C.G. Russel, 1992).** Trauma may produce damage or destruction to skin only (burn, avulsion, crush), may involve the skin and underlying soft tissues (deep burn, laceration, crush), or may involve soft tissues and bone with or without a break in the skin (deep burn, fracture, severe crush). The restoration of an intact cutaneous covering is the primary surgical requisite following trauma of the lower extremity because deep healing can be no better than the surface covering. **(Bradford Cannon et al , 1977).**

Lower-extremity wounds with exposed tendon or bone present a difficult treatment challenge. **(DeFranzo et al., 2001).** The distal third leg and calcaneal region is exposed to trauma and, when cutaneous coverage is made necessary, one ascertains how difficult the reconstruction of this zone may be. **(Jefferson Braga-Silva, 2006).**

Decision making in the management of combined major skeletal and soft tissue trauma to the lower limb is a complex process made more difficult by the uncertainty of surrounding outcomes. **(Lo C.H. et al., 2007).** Advances in the management of severe injury of the limbs have altered the outcome but, paradoxically, have made management decisions more difficult. The single most important question is whether to salvage or to amputate the limb. **(Z.M. Arnez et al., 1999).**

The evolving technology in trauma management today permits salvage of many severe lower extremity injuries previously even considered to be lethal. **(Hallock G.G., 2000).**

Reconstruction of soft tissue defects in the distal third of the lower extremity requires restoration of the function and achievement of a

satisfactory appearance. These goals must be reached while preserving form and function in the donor area. **(Philippe A. Giordano et al., 1989)**.

The techniques of lower extremity reconstruction are sufficiently well developed that care must be taken to avoid the salvage of nonfunctional , insensate , or chronically painful extremities. Complex reconstructive efforts must be restricted to those patients in whom the reconstruction is likely to yield a result superior to that which can be provided by amputation. **(McCarthy, 1990).**

Evaluation of any lower extremity wound begins with an analysis of what is missing and what vital structures are exposed. Any local or systemic factors that may alter the approach to a particular patient are assessed. The classic reconstructive ladder (primary closure,skin graft, local flap) is helpful but can not be the sole criterion used for planning a reconstructive procedure. **(McCarthy, 1990).**

Restoration of the surface as soon as possible after injury is essential to prevent further contamination, to avoid the development of infection and suppuration, and to lessen fibroses and interference with local blood supply. **(Bradford Cannon et al , 1977).**

The concepts of debridement and immobilization were introduced in the eighteenth and nineteenth centuries , respectively. **(Brown, 1965)** . Thorough wound debridement, external fixation and early soft tissue coverage (within 5 days of injury) were associated with lower infection rates and optimal outcomes**. (Lo C.H. et al., 2007).**

Skin grafts can be used only if there is no tendons, bones, nervous or vascular exposure. **(Jefferson Braga-Silva, 2006).** Local advancement skin flaps have an extremely limited use due to small surface area and adherence of the skin to the shaft of tibia. **(McCraw, 1980).**

Use of a fasciocutaneous flap for lower leg injuries was first described by **Ponten** in 1981, and both he and **Barclay et al.** stressed its

usefulness. Since then, a number of authors have described many proximally or distally based island flaps based on the perforating branches from the main arteries in the leg. **(Isao Koshima et al., 1992).**

Cross leg flaps are poorly tolerated and do not bring in any additional vascularisation. Their take on the area with poor local vascularity can be very uncertain. (**Shaheen Akhtar and A. Hameed, 2006).**

Using muscle only flaps avoids aesthetically unsatisfactory bulky flaps and unacceptable donor defects. **(Nahai & Mathes, 1984).** In the lower limb, local island flaps have been considered as ideal when adequate. Local flaps avoid prolonged operative time and microsurgical techniques needed for free flaps. **(Philippe A. Giordano et al., 1989).**

Free flaps are the first choice procedure to manage soft-tissue defect of the lower limb for many authors. **(Pinsolle V. et al., 2006).** Microvascular free tissue transfer has revolutionized the treatment of high energy lower extremity injuries with associated bone, soft tissue and muscle loss and with exposure of bone and vital structures. **(Charles H. Thorne et al., 2007).**

The goal in treatment of open tibial fracture and lower extremity salvage is to preserve a limb that will be more functional than if it is amputated. If the extremity can not be salvaged, the goal is to maintain the maximum functional length. **(Charles H. Thorne et al., 2007).**

REVIEW OF LITERATURE

ANATOMY

The methods and principles of reconstructive surgery of the lower extremity are similar to those of reconstructive procedures elsewhere in the body. There are, however, certain unique anatomical characteristics of the lower extremeties which may alter the standard reconstructive techniques :

(1) The anterior aspect of the tibia is covered only by a layer of skin with minimal subcutaneous tissue. Consequently a cutaneous defect of the pretibial area usually involves bone and does not provide a suitable bed for skin grafting.

(2) Another anatomical characteistic is the pattern of vascular anastomoses around the knee which makes possible the use of undelayed direct retrograde flaps in this area. However, the absence of such anastomoses below the knee endangers the vascularization of local flaps in this area.

(3) Futhermore, arteriosclerotic changes in the elderly and diabetic angiopathic changes complicate lower extremity reconstructive procedures in these patients.

(4) The lack of readily accessible sources of flap donor tissue requires special methods of transfer, such as cross-leg, muscle or microvascular free flaps.

(5) Because of the dependent position of the legs, they require a longer period of protection and support for the healing tissues, a period considerably longer than that required in other parts of the body. Adjunctive measures such as leg elevation and wraparound dressings promote venous and lymphatic return.

These special characteristics are but a few of those which must be considered when one is undetaking reconstructive procedures in the lower extremity**. (Bradford Cannon et al., 1977).**

1- ANATOMY OF SKIN AND SUBCUTANEOUS TISSUE

Epidermis

- Keratinized stratified squamous epithelium
- Stratum germinativum (basale) .
- Stratum spinosum.
- Stratum granulosum.
- Stratum lucidum.
- Stratum corneum. **(David Brown and Gregory Borschel, 2004).**

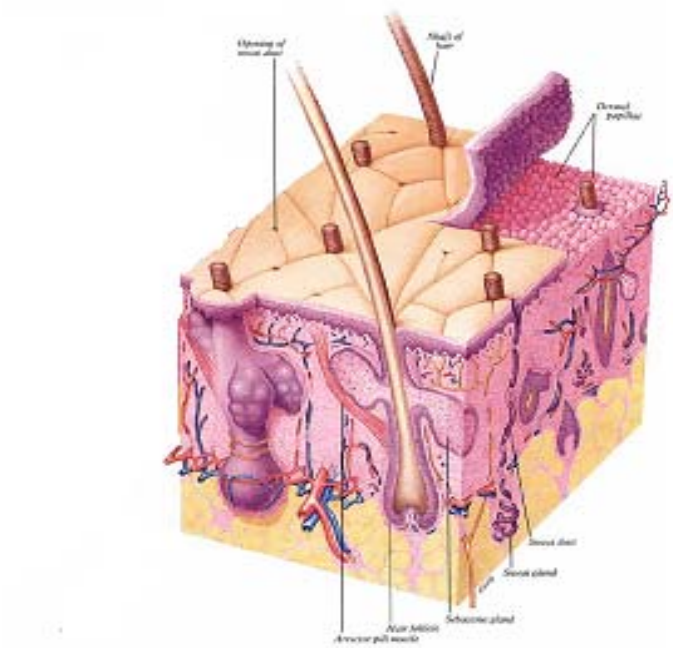

Fig. 1: Scheme showing the structure of skin**.(Peter L. Williams, 1996)**

Dermis

The layer immediately beneath the basement membrane is the papillary dermis which houses a network of blood vessels and nerves to the skin. The next layer is the reticular dermis, which is rich in collagen and elastic fibres. **(Glyn G. Jamieson, 2006).**

Hypodermis (subcutaneous layer)

It consists of sparser collagen fibers and contains mainly fat. Skin appendage such as sweat glands and hair follicles may reach into the hypodermis. **(Glyn G. Jamieson, 2006).**

Blood supply of the skin

Blood enters the skin from the underlying muscles and subcutis via small perforating arterioles which form an anastomosing horizontal reticular plexus at the interface between cutis and dermis. From this plexus, some arterioles pass deeply to supply the adipose tissue and, where present at this level, sweat glands and hair follicles. Other arterioles pass superficially, giving off anastomotic collaterals to glands and hair follicles, and form a second major horizontal plexus, at the junction of the reticular and papillary dermis, the papillary plexus. Capillaries from this plexus loop into the dermal papillae, usually one loop per papilla, and the loops drain into a superficial venous plexus interwined with the arteriolar papillary plexus. This venous plexus in turn drains into a flat intermediate plexus in the reticular layer, which further drains into a deeper plexus, receiving from capillary beds surrounding glands and hair follicles, and closely associated with the arteriolar reticular plexus. **(Peter L. Williams, 1996)**