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بواسطة

الطبيب/ وليد سعيد عبد الصادق

بكالوريوس الطب والجراحة

تحت إشراف

أ.د/ سمير عبد الحميد جلال

استاذ الجراحة العامة - كلية الطب - جامعة القاهرة

أ.د.م/ وائل رفعت صقر

استاذ مساعد الجراحة العامة - كلية الطب - جامعة القاهرة

د. ايمن رفعت عبد الحسيب

مدرس الجراحة العامة - كلية الطب - جامعة القاهرة

كلية طب - جامعة القاهرة

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Introduction

Major vascular trauma is one of the most challenging aspects of caring for injured patient presenting to the surgeon with problems of diagnosis, decision making , operative technique and postoperative care

Approximately 90% of all peripheral arterial injuries occur in Lower extremity injuries { being more common in the military experience upper extremity injuries are more common in the civilian reports .

Limb loss more likely to result from blunt trauma and high velocity gunshot injuries . low velocity gunshot and stab wounds have a better prognosis in that they rarely lead to limb loss. The rapidly increasing use of invasive diagnostic , monitoring and therapeutic modalities in many fields of medicine and surgery has brought a corresponding dramatic increase in iatrogenic vascular trauma.

Vascular repairs are now performed with such a high rate of success that they exert little influence on ultimate extremity function rather the associated orthopedic, nerve and soft tissue injuries are the critical factors that determine long term limb function .

Restoring adequate circulation is of utmost importance and priority through vascular repair of the injured arteries and veins then clinical decision should consider a good soft tissue coverage to the exposed structures especially the repaired blood vessels, and, exposed bones and this may require replacement with skin graft , local flap , or, distant tissue transfer

Most authors agree that early soft tissue coverage is associated with lower complication rate .

It was found that overall complication rate of wounds closed within the first week of injury was 18% compared to 50% complication rate for wounds closed in sub acute phase of 1-6 weeks

Ideally, definitive coverage would be performed when the wound is clean , stable and before it becomes colonized with pathogens . delayed coverage is generally indicated for badly contaminated wounds .

The goal of reconstructive surgeon must be salvage of an extremity that is more functional than an amputated leg with prosthesis .

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**SOFT TISSUE COVERING AFTER GROIN VASCULAR
RECONSTRUCTION FOLLOWING TRAUMA**

THESIS

**Submitted in Partial Fulfillment for
The M.Sc. Degree in
General Surgery**

By

**Waleed Said Abd EL-Sadek
(M.B.,B.Ch.)**

Prof .Dr.Samir Abd EL-Hamid Galal

***Professor of General Surgery
Faculty of Medicine, Cairo University***

Dr. Wael Refaat Sakr

***Assistant Professor of General Surgery
Faculty of Medicine, Cairo University***

Dr. Ayman Refaat Abd EI-Hassib

***Lecturer of General Surgery
Faculty of Medicine, Cairo University***

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Faculty of Medicine General Surgery

CERTIFIQATE

El Kasr El Aini Department of General Surgery decide that **Dr. Waleed Said Abd El Sadek** worked al 30 unit "**Samir Galal Unit of General Surgery**" as a resident of General Surgery for one year (from 12/10/2004 to 12/10/2005) and his performance during this period was satisfactory.

\ v
Prof. Dr. Samir Galal

Chairman of General Surgery Department
Faculty of Medicine

Cairo University

Anatomy of the Groin and Femoral triangle.

The Femoral triangle is a clinically important subfascial space in superomedial one third part of the thigh it appear as a depression inferior to inguinal ligament when the thigh is actively flexed at the hip joint. its main contents are femoral vessels and branches of femoral nerve. (Moore, 1992).

Boundaries of the femoral triangle.

The Femoral triangle is bounded superiorly by the inguinal ligament, medially by medial border of the adductor longus muscle, and laterally by medial border of sartorius muscle. The base of femoral triangle is formed by the inguinal ligament. The inferior boundary and apex of the femoral triangle are located where the medial borders of the sartorius and adductor muscles meet. The muscular floor of the femoral triangle is not flat, but gutter shape. It is formed medial to lateral by the adductor longus, pectineus, iliopsoas muscles. The juxtaposition of the iliopsoas and pectineus muscles that forms the deep gutter of the muscular floor. The roof of femoral triangle is formed by fascia lata, which includes the cribriform fascia. The skin covering the triangle is supplied by ilioinguinal nerve, which emerge from the anterior abdominal wall through the inguinal ring, and by the femoral branch of the genitofemoral nerve, Which enter the thigh just lateral to the femoral artery. (Moore, 1992).

Surface Anatomy of the Femoral Triangle.

When the thigh is actively flexed at the hip joint the femoral triangle appears as triangular depression in its proximal third. You can easily palpate and usually observe its base , the inguinal ligament. Its lateral boundary, the medial border of sartorius muscle, is obvious in

most people, but its medial boundary (medial border of adductor longus) is not easy to identify. The femoral pulse can easily be palpated in the femoral triangle, 2 to 3 cm inferior to the midpoint of the inguinal ligament. The head of femur lies posterior to the femoral artery at this site, making the compression of the vessels easy.(Moore, 1992).

Contents of the Femoral Triangle

This triangular space in the anterior aspect of the thigh contains the femoral artery and its branches, the femoral vein and its tributaries, the femoral nerve and its branches, the lateral femoral cutaneous nerve, the femoral branch of the genitofemoral nerve, lymphatic vessels, and some inguinal lymph nodes.(Moore, 1992).

I-The Femoral Artery

The femoral artery is a continuation of the external iliac artery, begins behind the inguinal ligament, midway between the anterior superior iliac spine and symphysis pubis, (midinguinal point), descends along the anteromedial part of the thigh in the femoral triangle and becomes the popliteal artery as it passes through the adductor canal, an opening in the adductor magnus near the junction of the middle and distal thirds of the thigh, (adductor hiatus). Its first 3 or 4 cm are enclosed with its vein in the femoral sheath. (Gabella, 1999).

The femoral artery has four main branches below the inguinal ligament and just below the termination of the femoral sheath it gives off its a large branch, the profunda femoris, the chief artery of the thigh. (Sinnatamby, 1999).

It is conventional to call the femoral artery above the profunda femoris the common femoral, and below it the superficial femoral artery. (Ellis, 2002).

The surface marking of the Femoral artery.

With the thigh slightly flexed and laterally rotated, the artery runs from the midpoint between the symphysis pubis and the anterior superior iliac spine and along the superior two thirds of a line running towards the adductor tubercle. (Moore, 1992).

Relation of femoral artery in the femoral triangle.

Anterior to the artery are the skin, superficial fascia, superficial inguinal lymph nodes, fascia lata, femoral sheath, superficial circumflex iliac vein and the femoral branch of genitofemoral nerve. Posterior are the femoral sheath and the tendons of psoas, pectineus and adductor longus. The artery is separated from the hip joint by the tendon of psoas major, from the pectineus by femoral vein and profunda vessels and from the adductor longus by the femoral vein. Laterally is the femoral nerve. The femoral vein is medial to the artery in the proximal part of the triangle and become posterior near the apex of the triangle.(Gabella, 1999).

The branches of the femoral artery.

1-Superficial epigastric artery.

Arising anteriorly from the femoral artery 1cm distal to the inguinal ligament, it traverses the cribriform fascia to ascend anterior to the ligament and run in the abdominal superficial fascia almost to the umbilicus. It supplies the superficial inguinal lymph nodes, superficial fascia and skin, anastomosing with branches of the inferior epigastric artery . (Gabella, 1999)

2-Superficial circumflex iliac artery.

This is the smallest superficial branch of the femoral: it arises near or with the superficial epigastric. Usually emerging through the fascia lata, lateral to the saphenous opening, turns laterally distal to the inguinal ligament towards the anterior-superior iliac spine; it supplies the skin. Superficial fascia and superficial inguinal lymph nodes, anastomosing with the deep circumflex iliac, superior gluteal and lateral circumflex femoral arteries. (Gabella, 1999).

3-superficial external pudendal artery.

It arises medially from the femoral, close to the preceding branches. Emerging from the cribriform fascia, it passes medially, usually deep to the great saphenous vein, across the spermatic cord or (round ligament) to supply the lower abdominal, penile, scrotal or labial skin. Anastomosing with branches of the internal pudendal artery. Veins accompanying the superficial epigastric, superficial circumflex iliac and external pudendal arteries join the great saphenous vein before it enters the saphenous opening. (Gabella, 1999).

4-Deep external pudendal artery.

This artery passes medially across the pectineus and anterior or posterior the adductor Longus, covered by fascia lata, piercing it to supply the skin of the perineum and scrotum or labium majus; its branches anastomose with the posterior scrotal or labial branches of the internal pudendal artery. (Gabella, 1999).

5-Muscular branches.

These supply the sartorius, vastus medialis and the adductors. (Gabella, 1999).

6-The profunda femoris artery

This deep vessel is the largest branch of the femoral artery and is the chief artery to the thigh. It arises from the lateral side of the femoral artery within the femoral triangle, about 4cm inferior to the inguinal ligament. It runs lateral to the femoral artery and then passes posterior to it and the femoral vein. The profunda femoris artery leaves the femoral triangle between the pectineus and adductor longus muscles and descends posterior to the latter muscle. (Moore, 1992).

The upper border of the adductor longus muscle separates the femoral artery from the profunda. The profunda vein lies in front of the profunda artery, which continues down on adductor brevis and magnus and end as the fourth perforating artery. (Sinnatamby,1999).

It is giving off perforating arteries that supply the adductor magnus and hamstring muscles. The medial and lateral circumflex femoral arteries, which are branches of the profunda femoris, supply the thigh muscles and the proximal end of the femur .the medial circumflex femoral artery is clinically important because it supplies most of the blood to the head and neck of the femur. It pass deeply between the iliopsoas and pectineus muscles to reach the posterior part of the thigh. The lateral circumflex femoral artery passes laterally, deep to sartorius and rectus femoris muscles, and between the branches of femoral nerve. Here it divides into branches that supply the muscles on the lateral side of the thigh and the head of the femur. (Moore, 1992).

II-The Femoral Vein.

This is the large thigh vein. It accompanies its artery, beginning at the adductor opening as a continuation of the popliteal vein and ending posterior to the inguinal ligament, where it become the external iliac vein. It leaves the femoral triangle a little medial to the midinguinal point and femoral artery.

In the distal adductor canal it is posterolateral to the femoral artery, more proximally in the canal and in the apex of femoral triangle it is posterior to the artery, at the triangle base it lies medial to the artery. It has many muscular tributaries, about 4-12 cm distal to the inguinal ligament the venae comitantes of the profunda femoris joins it posteriorly and then the great saphenous vein which enters anteriorly, also it receives the medial and lateral circumflex femoral veins. There are four to five valves in the femoral vein. (Gabella, 1999).

III- The lymph nodes of the groin and the lymphatic vessels.

The lymph nodes of the groin are arranged in superficial and deep group. The superficial nodes lies in two chains, a longitudinal chain along the great saphenous vein, receiving the bulk of the superficial lymph drainage of the lower limb, and a horizontal chain, just distal to the inguinal ligament. These horizontal nodes receive lymphatics from the skin and superficial tissues of:

1. the lower trunk and back, below the level of the umbilicus;
2. the buttock;
3. the perineum, scrotum and the penis or (lower vagina and vulva) and the anus below mucocutaneous junction. And some lymphatics drain via the round ligament to these nodes from the fundus and uterus.

The two groups of superficial nodes drain through the saphenous opening in the fascia lata into the deep nodes lying medial to the femoral vein, which also receive the lymph drainage from the tissues of the lower limb beneath the deep fascia. The deep groin nodes drain to the external iliac nodes through the lymphatics which travel partly in front of the femoral artery and vein and partly through the femoral canal. (Ellis, 2002).

IV-Femoral Nerve.

This is the largest branch of the lumbar plexus (L2, L3, &L4);it forms in the abdomen within the substance of the psoas major muscle and descends posterolaterally through the pelvis to the midpoint of the inguinal ligament. It then passes lateral to the femoral vessels, outside the femoral sheath enclosing 10 cm. After passing distally in the femoral triangle, the femoral nerve divides into several terminal branches, which supply the anterior thigh muscles. It also sends articular branches to the hip and the knee joints and gives several branches to the skin of the ,anteromedial side of the lower limb. (Moore, 1992).

V-The Saphenous nerve.

This cutaneous'' branch of the femoral nerve descends through the femoral triangle, lateral to femoral sheath containing the femoral vessels. The saphenous accompanies the femoral artery in the adductor canal and become superficial by passing between the sartorius and gracilis muscles. It passes anteroinferiorly to supply the skin and fascia of the anterior aspect of the knee. (Moore, 1992).

VI- The Femoral sheath and femoral canal.

This oval, funnel-shaped fascial tube encloses the proximal parts of the femoral vessels, which lie inferior to the inguinal ligament. The femoral sheath is inferior prolongation of the fascia lining the abdomen (transversalis fascia anteriorly and iliac fascia posteriorly). It is covered by the fascia lata. The femoral sheath ends about 4 cm inferior to the inguinal ligament.

This sheath is subdivided by two vertical septa into three compartments: lateral compartments for the femoral artery;

intermediate compartment for the femoral vein and medial compartment called femoral canal. (Moore, 1992).

The femoral canal is about 12 mm in length and just admits the tip of the little finger. The canal contains a plug of fat and a constant lymph node (Cloquet's gland).

The boundaries of femoral canal are:

- Anteriorly the inguinal ligament.**
- Medially the lacunar ligament.**
- Laterally the femoral vein.**
- Posteriorly the pectineal ligament.**

The canal has two functions.

- 1. As a dead space for expansion of the distended femoral vein.**
- 2. a Sympathatic pathway from the lower limb to the external iliac nodes. (Ellis, 2002).**