Different Modalities of Anterior abdominal wall reconstruction

Essay

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By

Walaa Khalil Saad El Din

M.B., B.ch

Supervised by

Prof. Dr. Awad Hassan Al – kayal

Professor of General Surgery

Faculty of Medicine – Ain Shams University

Dr. Sherine Mohammad Aboul Fotouh

Assistant Professor of Plastic & Reconstructive Surgery

Faculty of Medicine – Ain Shams University

Dr. Eman Mohammad Yehya Sadek

Lecturer of Plastic & Reconstructive Surgery

Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
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تحت إشراف
الأستاذ الدكتور/ عوض حسن الكيال
أستاذ الجراحة العامة
كلية الطب – جامعة عين شمس
الدكتور/ شيرين محمد أبو الفتوح
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كلية الطب – جامعة عين شمس
الدكتور/ إيمان محمد يحيى صادق
مدرس جراحة التجميل
كلية الطب – جامعة عين شمس

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List of Abbreviations

ALTF: anterolateral thigh flap

ACS : abdominal compartment syndrome

IAP : intraabdominal pressure

PkA : kelo per pressure

PTFE : polytetraflouroethyline

STSG : split thickness skin graft

TFL : tensor fascia lata flap

VAC : vacuum-Assisted Closure device

ICU: Intensive care unit

NF: necrotizing fasciitis

CRI: Cutanous radiation injury

ARS: Acute radiation syndrome

Gy: Gray

SSI: Surgical site infection

PEEP: Positive post expiratory pressure

CVP: Central venous pressure

PAWP: Pulmonary artery wedge pressure

ePTFE: Expanded polytetraflouroethylene

LIVH: Laparoscopic incisional and ventral hernia

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Introduction

Reconstruction of the abdominal wall is of importance in many clinical situations. It may require different procedures of reconstructive surgery. Choice of particular procedure depends on the clinical situation and the patient's individual profile ***(Germann et al., 2000)***.

Goals of abdominal reconstruction are restoration of function and integrity of the musculofascial abdominal wall, prevention of ventral herniation, and provision of dynamic muscle support. Differentiation between lifesaving primary measures and secondary correction to improve form and function must be clear ***(Liyanage, 2005)***.

Study of the layers of abdominal wall and the anatomic transitions is vital for diagnosis and management. The abdomen represents the portion of the trunk between the thorax and pleivs. The anterior abdominal wall is a complex anatomic and functional system comprising: skin, superficial fascia, muscles, transversalis fascia, extraperitoneal adipose tissue and peritoneum ***(Stanley, 1995).***

The abdominal skin envelope of an individual is related to body habits and previous surgery. For example the obese patient has an excess amount of skin. Patients with previous incisions may have significant disturbances in the cutaneous blood supply.

The subcutaneous tissue is divided into the superficial fatty layer (Camper's Fascia) and deep membranous layer (Scarpa's Fascia). This membranous layer is thin and fades out laterally and above, where it becomes continuous with the superficial fasica of the back and the thorax, respectively. Inferiorly, the membranes layer passes onto the front of the thigh, where if fuses with the deep fascia one finger breadth below the inguinal ligament ***(Stanley, 1995).***

The anterior abdominal musculoaponeurotic system consists of the external obliques, the internal obliques, and the transversus abdominis (which are muscular laterally but converge into aponeuroses medially), and the vertically directed rectus abdominis muscles, which lie within the two layers of the aponeuroses-the anterior and posterior rectus sheath. Strength and stability of the rectus sheath and linea allba is render to the presence of interlacing collagen fibers. Increased abdominal pressure may widen the linea alba, causing a diastasis of the recti ***(Richard & Mladick, 1996)***.

The main blood supply for the midanterior abdominal wall comes from the superior and inferior epigastric arteries. The superior epigastric (termination of internal mammary artery) lies deep in the rectus sheath, and descends to anastomose with the inferior epigastric artery (branch of external iliac artery). The anterior lateral abdominal wall

derives its blood supply from the lateral six intercostal and four lumbar arteries and the deep circumflex iliac arteries. These arteries run with the intercostal, iliohypogastric, and ilioinguinal nerves, piercing the lateral rectus sheath and freely anastomosing with the epigastric system.

It is helpful for the surgeon to remember the major zones of abdominal blood supply which are called Huger Zones. Huger zone I: The dominant blood supply arises from the deep arterial arcade, composed of superior and inferior epigastric arteries. Huger zone II: there is contribution from deep circumflex iliac artery perforators into superficial circumflex iliac system in addition to the superficial epigastric and superficial external pudendal arteries. In Huger Zone III: the suppling arteries are branches from the intercostal and lumbar arteries **(Huger, 1979)**.

The abdominal wall reconstruction is indicated in congenital defects (Omphalocele, Gastroschisis or Exstrophy) and acquired defects (after tumor resection, trauma, incisional hernia, infected mesh removal, post burn deformities or after radiation therapy) **(Koshy et al., 1999)**.

Analysis of the defect (as regard size, location, depth and contamination) and co-morbidity are preoperative considerations that influence the way of management of abdominal wall defects. Good surgical planning, meticulous

operative technique, and postoperative care are other considerations that offer reasonable functional and cosmetic outcomes in addition to patients' satisfaction, and acceptable complication rates ***(Trier, 1990)***.

There are different techniques for abdominal wall reconstruction including primary closure, grafts, flaps, abdominal components separation, synthetic mesh and recently vacum assisted closure. Primary closure is the approximation of the edges of the defect without tension. Grafts can be applied directly on exposed viscera or over granulating synthetic or absorbable mesh. This can only be utilized as a temporary closure in an emergency condition. Flaps are used to reconstruct large abdominal wall defects where glabrous tissue is required. They are either local, distant, expanded or free flaps ***(Douglas, 1997)***.

The possible complications after abdominal wall reconstruction are extensive and include, infection, dehiscence, donor site complication, ileus, enterotomy, loss of umbilicus, abdominal compartment syndrome, renal failure, respiratory failure, and pneumonia.

Aim of the Work

The aim of this study is to review the different modalities of reconstruction of anterior abdominal wall defects according to various clinical conditions and postoperative complications.

Anatomy of the Anterior Abdominal Wall

The goal of the reconstructive surgeon in managing complex abdominal wall defects is to restore the structural and functional continuity of the musculofascial system by providing stable coverage. Knowledge of anatomy has allowed the achievement of superior results and reduced complication rate.

Boundaries and surface markings

The anterolateral abdominal wall is bounded above by the flare of the costal margins and the xiphoid process of the sternum, and below by the iliac crests, inguinal ligaments, pubic crests and pubic symphysis (Fig.1). Its lateral margins are conventional vertical lines dropped from the costal margins to the most elevated portions of the iliac crests. The linea alba extends in the midline from the xiphoid process to the symphysis pubis. It is divided by the umbilicus into supraumbilical and infraumbilical segments of about equal lengths. The rectus muscles form bulging bands on each side of the linea alba. Across them tendinous intersections which produce palpable transverse depressions in more muscular persons. In the lateral margin of each rectus muscle there is a depression called linea semilunaris directed toward the symphysis pubis ***(McVay, 1984).***

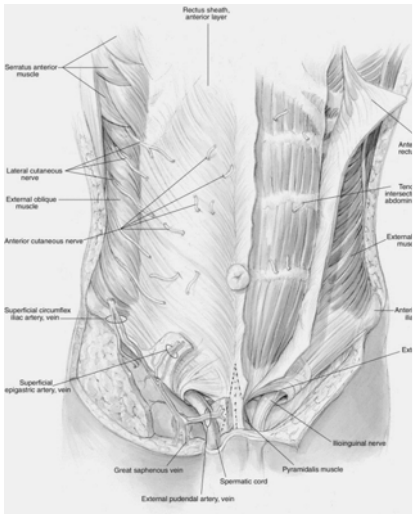

Fig. 1: anatomy and surface markings ***(MacVay, 1984).***

Embryology of anterior abdominal wall

During the second week of development, the embryo consists of a bilaminar disk of ectoderm and endoderm. That the mesoderm soon differentiates into an inner splanchnic and outer somatic layer with the primitive celom between them .The somatic mesoderm and ectoderm are intimately associated and have been called the somatopleure. During the third week of development a circumferential folding of the embryo occurs. Normally four folds can be distinguished. The cephalic fold forms the thoracic and epigastric wall. The two lateral folds form the lateral segments of the abdominal wall and allow midgut closure. The caudal fold forms the hypogastric wall. The caudal fold develops into the colon, rectum, bladder and