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The Goal of Abdominal Plastic Surgery is to Correct Abnormalities of the Skin, Fat Tissue and Muscle Wall

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1. Abstract

The appearance of the abdominal wall seriously preoccupies people. The social emphasis on a youthful appearance and revealing clothing, free sexual behavior, and the fact that the results of abdominal reconstruction are excellent contribution to this becoming one of the most wanted procedures. Correction of sagging abdominal skin is a procedure that improves the appearance of the abdomen in patients who have a problem with excess skin and fatty tissue. Plastic reconstruction of the abdomen is a combination of aesthetic and functional reconstruction of the anterior abdominal wall, and the goal of this operation is to correct abnormalities of the skin, fat tissue and muscle wall. Common patient complaints are skin folds that "hang" when the body is naked or when there is a large belly that catches the eye even when clothes are worn. Aesthetic correction of the abdomen restores self-confidence to patients who are dissatisfied with the appearance of their abdomen.

2. Introduction

Defects resulting from failed laparotomy closures, tumor resection, congenital anomalies, and trauma are the most common indications for abdominal wall reconstruction (AWR) [1]. Ventral hernias can be the result of a genetic predisposition to decreased collagen production or acquired structural abnormalities of collagen resulting from mechanical stress and predisposing risk factors such as smoking, diabetes and obesity. The direct suture repair of ventral fractures results in an extremely high recurrence rate compared to mesh reinforcement of similar hernia defects. Tissue-based bioprosthetic meshes have gained popularity for use in complex AWR due to lower rates of mesh infection, fistula formation, and mesh explantation compared to synthetic meshes. Successful surgical techniques require full fascial adaptation, insertion of a tension mesh, judicious use of drainage catheters, and reduction of subcutaneous dead space with cushioned sutures. Additional reconstructive techniques, such as component separation with myofascial flaps, pedicled muscle flaps, and free flaps are important to promote fascial closure and soft tissue coverage of large abdominal wall defects.

3. Abdominal Wall

The abdominal wall is a multi-layered dynamic muscular and aponeurotic structure that stabilizes the trunk and allows multidirectional movement, protects and contains abdominal organs in the abdominal cavity, and aids in respiratory function [2]. The relaxation of the abdominal wall during inhalation allows the abdominal viscera to move downward as the diaphragm contracts, and the contraction during exhalation helps lift the diaphragm and reduce volume in the chest.

The abdomen can be imagined as a pressure cylinder. The abdominal viscera are subject to external pressure due to gravity and the lowering of the diaphragm. The contraction of the abdominal wall muscles resists this outward force and pushes the abdominal contents into the abdominal cavity. Maintaining this abdominal pressure facilitates core and shoulder movement because it provides a stable platform for the upper body to "push off" from, and is essential for performing all of the functions that require the Valsalva maneuver. In the Valsalva maneuver, the abdominal muscles are contracted while the diaphragm is immobilized, resulting in a dramatic increase in intra-abdominal pressure. This increase in

pressure is used during coughing, defecation, urination, vomiting and childbirth. A local weakness in the muscle wall causes a bulge, and a wall defect causes an inguinal hernia.These disorders of the abdominal wall impair function, cause discomfort or pain, and potentially put abdominal organs at risk of pinching. Accurate assessment of missing or compromised structures is the starting point for planning abdominal reconstruction.

4. Muscles

The external oblique muscle is the most superficial and largest of the three muscles of the lateral abdominal wall [3]. It arises from the lower eight ribs and passes through the serratus anterior and the latissimus dorsi muscles. It attaches to the front half of the iliac crest; below its aponeurosis it forms the inguinal ligament (Poupart's ligament), which extends from the anterior superior iliac spine to the pubic spine. Its bundles are directed superolaterally to inferomedially. Its aponeurosis runs in front of the rectus abdominis muscle.

The internal oblique muscle lies inferior to the external oblique muscle and its fibers run in opposite directions. It originates in the dorsal lumbar fascia, the anterior two-thirds of the iliac crest, and the lateral two-thirds of the inguinal ligament. The inferior fibers combine with the fibers of the transversus abdominis to form the fused tendon, which inserts at the pubic crest and spine and iliac spine. The superior fibers penetrate the linea alba and the cartilages of the seventh through ninth ribs as a broad aponeurosis. Its aponeurosis divides above the arch line and engulfs the rectus abdominis.Below the arch line, it runs in front of the rectus abdominis muscle.

The transversus abdominis lies deep on the obliquus internus. It is the deepest and smallest of the lateral abdominal wall muscles. It arises from the lower six ribs, the dorsal lumbar fascia, the anterior two-thirds of the iliac crest, and the lateral third of the inguinal ligament. It inserts into the linea alba and contributes to the fused tendon that attaches to the pubic spine and iliac line.

The rectus abdominis muscle is a longitudinal muscle located in the central part of the abdominal wall. It emerges from the anterior part of the pubic symphysis and pubic crest and attaches to the xiphoid process and cartilages of the fifth through seventh ribs.

The pyramidalis muscle is present in 80-90% of patients. It's a small triangular muscle located on the surface of the rectus muscle. It emerges at the front of the pubic bone and inserts on the linea alba halfway between the symphysis pubis and the navel.

5. Examination

Research should aim to determine the cause and uncover internal involvement [4]. Questioning may indicate infection; myalgia, abdominal pain, claudication, confusion, and neuritis may indicate systemic involvement. A physical examination, chest X-ray, ESR, and biochemical tests to monitor various organ functions are indicated. The most important test, however, is the urinalysis, which checks for proteinuria and hematuria, since vasculitis can affect the kidneys subtly, leading to renal failure; blood pressure should also be monitored in this context.

A skin biopsy confirms the diagnosis of small vessel inflammation. Finding circulating immune complexes or reduced levels of total complement (CH50) or C4 suggest immune complexes as the cause. Testing for paraproteins, hepatitis virus, cryoglobulins, rheumatoid factor, anti-neutrophil cytoplasmic antibodies (ANCA), and antinuclear antibodies may also be required.

Direct immunofluorescence can be used to identify immune complexes in blood vessel walls but is rarely performed due to false positive and false negative results, since inflammation can destroy complexes in true vasculitis and generate non-specific deposits in other diseases. Henoch-Schönlein vasculitis is confirmed when IgA deposits are found in the blood vessels of a patient with the clinical triad of palpable purpura, arthritis, and abdominal pain.

6. Hernia Surgery

Halsted's tenets still ring true 100 years later and are applicable to modern hernia surgery [1]:

- Aseptic technique.
- Atraumatic handling of tissues.
- Sharp anatomic dissection.
- Meticulous hemostasis.
- Using non-reactive sutures.
- Minimizing foreign body.
- Avoiding non-physiologic tension.
- Obliterating dead space.

The specific steps in hernia repair are:

(1) preparation of the wound by reducing bioburden;

(2) realignment of muscles;

(3) reinforcing attenuated areas;

(4) minimizing foreign body; and

(5) controlling dead space to prevent seroma, which will delay revascularization.

7. Injuries

Subsequent acute care management depends on the patient's ability to safely undergo various X-ray examinations, including computed tomography (CT) or magnetic resonance imaging (MRI) and angiography [5]. Angiography is the standard method for detecting clinically occult vascular lesions. Magnetic resonance angiography may be appropriate for some patients but does not provide the right resolution to rule out subtle vascular lesions that may require surgery. Uncontrolled bleeding, enlarging hematomas, or abdominal injuries are common reasons why a patient is suddenly transferred to the operating room without prior radiological evaluation

of the wound and surrounding vital structures.

Radiographic assessment prior to fracture reduction and hard and soft tissue reconstruction relies primarily on computed tomography. The entire facial skeleton can be assessed by computed tomography with a thin (2mm) slice in the frontal and axial planes. With this level of detail, a very precise 3D scan can be created, which can help the surgeon visualize the extent of the lesion. Stereolithography models can also be created from these types of scans, allowing the surgeon to visualize and manipulate the relevant anatomy prior to surgery.

It can be helpful to divide the head and neck into injury areas. Zone I is between the clavicle and the cricoid cartilage; Zone II lies between the cricoid cartilage and the angle of the mandible; Zone III is between the angle of the lower jaw and the base of the skull.

8. Wound

The first step to comply with the surgical rules [1]. If necessary, clean the wound mechanically by pulsed lavage or en bloc "oncological" excision. During wound preparation, remove all dead tissue, sclerotic, and fibrotic tissue susceptible to devascularization, as well as any prosthesis and mesh previously retained with foreign objects. Debridement may require removal of the umbilicus, as it is often only slightly connected to one of the skin flaps, or it may be considered non-vital after the operation is complete. The patient must be prepared for this and the navel can be reconstructed at any time. Existing fistulas can be treated by controlling them with surgical drainage, percutaneous drainage and reservoir bypass, surgical lavage, and antibiotic therapy of existing infection or colonization. After 24-72 hours of non-surgical treatment, final closure can be planned. Pockets and pathologies in the abdomen, such as fistulas and tumors, should be addressed during critical repair.

9. Tissue Debridement

Debridement of inflamed tissue is essential and the success of the procedure must not depend on healing of the fibrous scar tissue without pulsatile blood flow [6]. After wound debridement, two independent decisions must be made for intraoperative planning: first, how good is the abdominal wall and second, how good is the soft tissue (skin) coverage? Abdominal wall integrity is achieved with a midline defect separation procedure. For defects beyond the midline, our tissue of choice is an autogenous fascia lata flap. There is interest in using new biological agents such as Alloderm® and Surgisys® also in these situations to avoid morbidity of the fascia lata. These sheets of tissue are sutured to the underside of the intact abdominal wall using horizontal mattress sutures with as much overlap as possible over healthy tissues. When the skin can be loosened and closed (medially or laterally), the procedure is complete. In some cases, TFL (tensor fascia lata) and myocutaneous rectus abdominis flaps are used to provide vascular coverage of the full-thickness abdominal wall reconstruction.

The radiated pelvis is a separate issue, as radiated bowel loops of bowel can often become attached and cause fistulas in the perineum. The abdominal wall reconstruction is usually not as important as keeping the bowel out of the pelvis after surgery. After a colon resection and placement of a new anastomosis outside of the radiated area, a flap is chosen to separate the abdominal contents from the difficult-to-remove pelvic inflammation. In such cases, the right lobe is elevated and lowered into the pelvis with the skin blade, which is placed diagonally against the periumbilical perforators and angled toward the apex of the scapula. This musculocutaneous rectus abdominis oblique flap is superior to the standard VRAM flap because this technique significantly reduces the amount of muscle absorbed while adequately filling the pelvic dead space. Subcutaneous fat does not disappear over time, so the bowel loops are unable to slowly return to the pelvis.

10. Cancer Patient

Thanks to various surgical and non-surgical innovations in the treatment of malignancies, disease-related survival has improved for most tumor entities in recent decades [7]. Extended survival allows many cancer patients to live longer despite the advanced stage of the cancer. By collaborating with other cancer specialists such as the oncologist, radiotherapist, and other surgical specialties, the plastic and reconstructive surgeon can add valuable tools to the arsenal of palliative cancer care and have a significant impact on the quality of life of cancer patients. Plastic surgery can help cover cavities after resection of ulcers, bleeding, and foul-smelling tumors.Painful ulcers can be removed and closed with tissue transfer. Large tumor masses that cause pain or functional limitations can be removed and the defects covered. Patient care is made easier and the quality of life of palliative care patients is improved by allowing them to participate in social life for the remaining time.

Furthermore, plastic surgery techniques can be used to cover defects following curative tumor resection and, thereby, make resections possible that otherwise would not be compatible with life, such as large skull, thoracic, and abdominal wall resections. Tissue transfer allows for tension-free defect coverage and reduces wound complication rates and time to healing. Adjuvant radiation and chemotherapy can be administered early, and hospitalization is shorter. By augmenting the soft-tissue envelope, flap coverage can not only enable a timely start of radiation therapy but can also be used to mitigate its adverse effects by the transfer of healthy tissue in case of radiation ulcers. By tendon, nerve, or muscle transfers, reconstruction of motor function follows resection of nerves or important muscles. Vessels can be replaced by autologous or synthetic grafts. By a combination of these techniques, limb salvage is possible in most cases with malignancies at the extremities. In cases where limb salvage is not possible because of excessive tumor growth, advanced resection techniques like intra-thoraco-scapular amputations or hemipelvectomies may become necessary. Resulting defects can then be covered with remaining soft-tissue flaps

from the amputated extremity. In situations where a complete resection of the tumor cannot be achieved, despite these techniques, it is even feasible to cover remaining tumor tissue with bulky flaps to delay ulceration.

11. Cellulite

Cellulite - a common term - is also called “gynoid lipodystrophy”, “edemato-fibro- sclerotic pancicopathy” and “protrusus cutis status”. [8]” The term was first introduced in France and is a topographical skin symptom associated with depression or introflexion. It can be located in any area of the body where there is subcutaneous fat, most commonly in the abdomen, hips, pelvis, buttocks, and thighs. It can also be associated with nodules in the subcutaneous fat tissue and, in rarer cases, suspected inflammation. It cannot be classified as a pathology if there is no correlation with morbidity or mortality; However, an aesthetic question remains.

Case history are exceptionally high in 85-98% of pubescent and postpubertal women. Cellulite affects all races, with Caucasian and Asian women predominating, but is rarely observed in men, with the exception of Klinefelter syndrome, hypogonadism, prostate cancer, etc. Currently, the medical literature offers few studies on the physiology of cellulite, making it an enigmatic disease remains. The underlying cause of this phenomenon may be physiological or physiologically multifactorial, with various precipitating factors such as: connective tissue disorders; inflammatory factors and tissue revascularization; metabolic disorders; nutritional problems; changes in the specific subcutaneous architecture; hormonal factors; genetic factors; changes in the lymphatic system; and changes in the extracellular matrix.

Cellulite can be classified in different ways.Compact (hard) cellulite usually affects people who are in good physical condition and have good muscle tone. Palpation is painful. The epidermis is fine and delicate, the skin is generally rough and dry, often with visible stretch marks, and looks like the peel of an orange. The fabric seems almost glued to the underlying floors. Flaccid (soft) cellulite occurs mainly in middle-aged people, often over 40, who have hypotonic tissue, do not exercise, have lost weight rapidly and irregularly.Cellulose materials are very absorbent, which leads to fluctuations, especially when moving, and is associated with circulatory disorders. Edematous cellulitis occurs in association with compact cellulitis, usually on the thighs. It is a consequence of circulatory disorders characterized by a significant accumulation of fluid in the tissues. Palpation is painful and causes a feeling of heaviness.

12. MIS

Minimally invasive surgery (MIS) is more of a practice philosophy than a discipline [9]. Rather than just focusing on a specific disease, such as pancreatic cancer, the clinical scope of MIS practice can be quite broad. The MIS surgeon strives to treat surgical problems with as little tissue trauma and physiological disruption as possible. The MIS surgeon also leverages advances in technology and innovation to improve patient care. With the adoption of minimally invasive surgical techniques by other specialties such as colorectal surgery or hepatobiliary surgery, MIS has evolved to primarily include forelimb surgery, advanced abdominal wall repair, and bariatric surgery. Some practices remain broad and include solid organ surgery and colorectal procedures. The scope of practice depends on the local academic environment and department structure, role model and preferences, and training of the MIS surgeon.

Regardless of the subject, cooperation with other disciplines is required. For example, a close connection to gastroenterology promotes a healthy baseline and supports a patient-centred, multidisciplinary approach to gastrointestinal disorders such as acid reflux.

Because of the nature of the diseases that MIS surgeons treat, it is necessary to collaborate with other specialists in interventional radiology, gastroenterology, and pain management procedures. Emergency or adjuvant procedures such as biliary stenting, endoscopic retrograde cholangiopancreatography (ERCP), esophageal dilatation or stents, gastric dilatation or gastrojejunostomy, and seromaspiration are useful techniques that may reduce the need for repeat surgery. The complex practice of abdominal wall reconstruction will likely involve the management of some difficult patients with “sports hernias” or chronic groin pain. These patients are best cared for by a multidisciplinary team that includes a pain management specialist, a radiologist or pain specialist who offers targeted nerve ablation, a physical therapist, a cognitive therapist, and an orthopedic surgeon. In many cases of chronic neuropathic pain, image-guided ablation of the injection can reduce the need for reoperation, which can be problematic because of the potential for further or worsening pain.

13. Abdominoplasty

The development of surgical techniques over the last century now enables safe and effective surgical correction of contour deformities [10]. The abdomen and trunk are areas of most interest to the patient and require changes in surgical technique. Therefore, it is becoming increasingly important to know the appearance and effective treatment of these patients. Liposuction and abdominoplasty are used for trunk contour deformities. Although controversial, the combination of the two is becoming more common.

Abdominoplasty is indicated for laxity of the abdominal wall, excess skin, stretch marks and/or detachment of the rectus musculature. It is the only treatment available to remove excess skin and tighten the abdominal muscles. Many ways have been described to classify patients for abdominal contouring procedures based on myoaponeurotic layer, excess skin and subcutaneous tissue, and combinations thereof.

Liposuction, a surgical procedure used to treat superficial and deep subcutaneous fat deposits located in unsightly proportions,

has proven to be an effective method of improving body contour. It is indicated spontaneously in the abdominal cavity when there is excess subcutaneous fat, no excess skin, no stretch marks or laxity of the abdominal wall.It is the perfect complement to any abdominoplasty, providing refined contouring and modelling.

A guide has been provided to assist you in selecting the best procedure for your patient. We use the latest advances in abdominoplasty and liposuction to combine them effectively and safely depending on the degree of trunk involvement, excess skin and subcutaneous tissue, lipodystrophy and laxity of the abdominal wall. All abdominoplasty should be supplemented to varying degrees by liposuction.

14. Procedures

All types of abdominoplasty procedures start the same way [10]. The patient is first marked standing in the preoperative area. The abdominoplasty incision is marked below and extends from the midline approximately 7 cm across the cumulus fissure and extends laterally to the sides. The length of the incision depends on the type of procedure selected by the algorithm described above. In circumferential and augmentative abdominoplasty, the line is drawn in such a way that it meets in a V-shape in the sacrum at the level of the beginning of the buttock cleft.The patient is then brought to the operating room under general anesthesia with an endotracheal anesthetic and placed in the prone position with gel rolls.

Standard tumescent liposuction (SAL) is used on the sides and back. Liposuction is performed on multiple port sites, both deep and superficial. Ultrasonic or laser-assisted liposuction is useful when treating areas of the back, as this fat tends to be denser. It is also a useful addition if the patient has already undergone liposuction.

If you need to perform a peripheral lift at this point, you can perform the cuts in the conventional manner. We often combine a circular lift with an autologous musculocutaneous flap to achieve gluteal fullness. If an extensive abdominoplasty is planned, excess skin and subcutaneous tissue are removed laterally and the defect is closed in layers.

The patient then turned into the supine position. Here, too, post tumescent SAL is performed in the flanks at a superficial to deep level in a 1 to 1 ratio. Full abdominal liposuction is performed deep below Scarpa's fascia after tumescence.

Although the combination of extensive abdominal liposuction with a abdominoplasty can be controversial, the anatomy makes the procedure safe. After abdominoplasty, the blood supply to the skin and adipose tissue of the abdomen is shifted from the perforating vessels that pass through the rectus abdominis muscle to the perforating branches of the lateral intercostal arteries. The blood supply to the abdominal cavity begins superficially and laterally through the intercostal perforators and is finally perfused centrally and deeply. Because of this, the deep fat in Scarpa's fascia can be removed or liposuction performed.

After liposuction, abdominoplasty is performed in a conventional surgical manner. A lower abdominal incision is made and the ventral fascia is guided. The flap of abdominal skin and subcutaneous tissue is then raised to, but not above, the xiphoid process and the costal margin to expose the intercostal perforators. The navel remains attached to the abdominal wall. A triple fold of the ventral fascia is performed. The patient is flexed at the hips and excess abdominal flap tissue is removed. The fat that remains deep within Scarpa's fascia is then significantly removed. This step is often simplified by previous liposuction, and there is often a plane between Scarpa's fascia and deep fat. The patient is bent at the waist, and excess skin and subcutaneous tissue are removed from the abdominal flap. An opening is created in the abdominal lobe at the level of the navel. One or two drains are placed and the abdomen is closed in layers.

15. Conclusion

Each patient has a different ability to recover and heal, so the recovery time varies, as does the visibility of the scar that fades over time. Return to regular activities is possible after 3 to 4 weeks, depending on the patient's recovery and type of activity. The results of the operation are visible immediately, but the final result is visible after a couple of months when all the swelling disappears. Swelling and hematoma are normal and disappear during the postoperative phase.

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