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Abdominoplasty, Suction Lipectomy, and Ventral Hernia Repair

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Policy

Scope of Policy

This Clinical Policy Bulletin addresses abdominoplasty, suction lipectomy, and ventral hernia repair.

I. Medical Necessity

A. Aetna considers panniculectomy/apronectomy medically necessary according to the following criteria:

1. Panniculus hangs below level of pubis (below the distal end of the symphysis pubis), documented by high-quality color frontal-view and side-view photographs; *and*
2. The medical records document that the panniculus causes chronic intertrigo (dermatitis occurring on opposed surfaces of the skin, skin irritation, infection or chafing) that consistently recurs over 3 months while receiving appropriate medical therapy (e.g., oral or topical prescription medication), or remains refractory to appropriate medical therapy over a period of 3 months; *and*
3. Documentation of high-quality color frontal-view and side-view photographs with pannus lifted to document presence of intertrigo.

B. Aetna considers repair of a true incisional or ventral hernia medically necessary.

C. Aetna considers liposuction (e.g., water jet-assisted liposuction, micro-cannular), lipectomy, and excision of excessive skin medically necessary in persons with pain and disability from lipedema of the extremities who have failed to respond to three or more months of conservative management (compression or manual therapy) and who meet the following diagnostic criteria for lipedema:

1. *Medical History*

    a. Pain and hypersensitivity to touch in lipedema affected areas;
    b. History of easy bruising or bruising without apparent cause in lipedema affected areas;
    c. Physical functional impairment (e.g., difficulty ambulating, performing activities of daily living);
    d. Relative lack of effect of weight loss on lipedema affected areas;
    e. Lack of effect of limb elevation on reducing swelling;

2. *Physical examination findings (documentation of high-quality color photographs must accompany requests):*

a. Disproportional fat distribution (e.g., lower body disproportionately large compared to upper body). **Note**: As a significant proportion of persons with lipedema will not have disproportional fat distribution, especially earlier on in disease progression, the requirement for disproportionate fat distribution can be waived for persons who meet the other listed diagnostic criteria;
b. Thickened subcutaneous fat in the affected extremities bilaterally and symmetrically (legs, thighs, hips or buttocks, or occasionally arms are affected);
c. Tenderness and nodularity of fat deposits in lipedema affected areas (dimpled or orange peel texture);
d. Stemmer sign negative (Stemmer's sign is negative when a fold of skin can be pinched and lifted up at the base of the second toe or at the base of the middle finger) (unless the member has comorbid lymphedema);
e. Absence of pitting edema (no "pitting" when finger or thumb pressure is applied to the area of fat) (unless the member has comorbid lymphedema);
f. Evidence of "cuffing" (tissue enlargement ends abruptly at ankles or wrists, with sparing of hands and feet) (also called "braceleting" or "inverse shouldering"). **Note**: A minority of persons with lipedema may not exhibit cuffing or shouldering. This criterion may be waived for persons who meet the other listed diagnostic criteria.

D. Aetna considers suction lipectomy of the trunk medically necessary for lipedema when the following criteria are met:

1. There is specific documentation of pain and hypersensitivity to touch in lipedema affected areas of the trunk;
2. There are documented physical functional impairments due to pain (limiting motion and physical activity) and mechanical restriction due to increased lipedema tissue;
3. History of easy bruising or bruising without apparent cause in lipedema affected areas of the trunk;
4. Relative lack of effect of weight loss on lipedema affected areas of the trunk;

5. Tenderness and nodularity of fat deposits in lipedema affected areas of the trunk (dimpled or orange peel texture);
6. Symptoms have been refractory to conservative treatment for greater than or equal to 3 months.

E. Aetna considers suction lipectomy cosmetic for indications other than lipedema and lymphedema.

F. Aetna considers repair of a diastasis recti, defined as a thinning out of the anterior abdominal wall fascia, not medically necessary because, according to the clinical literature, it does not represent a "true" hernia and is of no clinical significance.

G. Aetna considers surgical correction of adult acquired buried penis medically necessary when the following selection criteria are met:

1. The buried penis engulfs the entire penis, documented by high-quality color frontal-view and side-view photographs; *and*
2. The medical records document that the buried penis causes *either* of the following:

   a. Chronic intertrigo (dermatitis occurring on opposed surfaces of the skin, skin irritation, infection or chafing) that consistently recurs over 3 months while receiving appropriate medical therapy (e.g., oral or topical prescription medication), or remains refractory to appropriate medical therapy over a period of 3 months; *or*
   b. Lichen sclerosis with or without urethral meatal stenosis.

Note: Correction of congenital buried penis is considered medically necessary if/when it is performed with/without other surgery on the penis (e.g., circumcision, meatotomy) to prevent complications such as cicatrix formation.

H. Aetna considers component separation (also referred to as myofascial advancement flaps, rectus muscle flap, rectorectus myocutaneous advancement flap, bilateral myofascial flaps

and transversus abdominis release procedure, not an all-inclusive list) to be a medically necessary adjunct to ventral hernia repair when *any* the following criteria are met:

1. The member has at least one ventral hernia with a dimension in any direction larger than 10 cm; *or*
2. The member has a hernia associated with loss of domain (i.e., having greater than 50% of viscera outside of the boundaries of the abdomen); *or*
3. The member's hernia width is 7 to 10 cm and hernia width to rectus abdominus muscle width ratio is greater than or equal to 2; *or*
4. The member has a complex hernia with tissue loss; *or*
5. The member has prior failed ventral hernia repairs.

II. Experimental, Investigational, or Unproven

A. Aetna considers panniculectomy/apronectomy experimental, investigational, or unproven for minimizing the risk of hernia formation or recurrence.

There is inadequate evidence that pannus contributes to hernia formation. The primary cause of hernia formation is an abdominal wall defect or weakness, not a pulling effect from a large or redundant pannus.

B. The following procedures are considered experimental, investigational, or unproven because of insufficient evidence of its effectiveness:

- Abdominal lipectomy and/or correction of buried penis for the treatment of metabolic syndrome, or as an adjunctive procedure to assist with long-term weight loss following bariatric surgery;
- Adipose derived stem cell-assisted lipotransfer;
- Correction of buried penis for the treatment of erectile dysfunction;
- Enhanced-view totally extra-peritoneal repair for ventral hernia;

- Epigastric VHR through vaginal Natural Orifice Transluminal Endoscopic Surgery (NOTES);
- Laparoscopic intracorporeal rectus aponeuroplasty for VHR;
- Panniculectomy for the treatment of back pain;
- Peritoneal flap hernioplasty for VHR;
- Trans-abdominal pre-peritoneal repair with concurrent rectus aponeuroplasty (TAPPRA) for incisional and recurrent ventral hernia.

III. Cosmetic

The following procedures are considered cosmetic:

A. Abdominoplasty or lipoabdominoplasty;
B. Abdominoplasty combined with hip expansion by fat grafting for waistline contouring;
C. Panniculectomy/apronectomy when criteria are not met;
D. Suction lipectomy, for indications other than lipedema and lymphedema. For liposuction for lymphedema, see CPB 0069 - Lymphedema (../1_99/0069.html).

IV. Related Policies

- CPB 0031 - Cosmetic Surgery and Procedures (../1_99/0031.html)
- CPB 0069 - Lymphedema (../1_99/0069.html)

Applicable CPT / HCPCS / ICD-10 Codes

Code	Code Description

Code	Code Description
Abdominoplasty, Suction Lipectomy other than for lymphedema, and Ventral Hernia Repair:	
CPT codes covered if selection criteria are met:	
0437T	Implantation of non-biologic or synthetic implant (eg, polypropylene) for fascial reinforcement of the abdominal wall (List separately in addition to code for primary procedure)
15734	Muscle, myocutaneous, or fasciocutaneous flap; trunk
15830	Excision, excessive skin and subcutaneous tissue (including lipectomy); abdomen, infraumbilical panniculectomy [documentation required]
49591	Repair of anterior abdominal hernia(s) (ie, epigastric, incisional, ventral, umbilical, spigelian), any approach (ie, open, laparoscopic, robotic), initial, including implantation of mesh or other prosthesis when performed, total length of defect(s); less than 3 cm, reducible
49592	less than 3 cm, incarcerated or strangulated
49593	3 cm to 10 cm, reducible
49594	3 cm to 10 cm, incarcerated or strangulated
49595	greater than 10 cm, reducible
49596	greater than 10 cm, incarcerated or strangulated
49613	Repair of anterior abdominal hernia(s) (ie, epigastric, incisional, ventral, umbilical, spigelian), any approach (ie, open, laparoscopic, robotic), recurrent, including implantation of mesh or other prosthesis when performed, total length of defect(s); less than 3 cm, reducible
49614	less than 3 cm, incarcerated or strangulated
49615	3 cm to 10 cm, reducible
49616	3 cm to 10 cm, incarcerated or strangulated
49617	greater than 10 cm, reducible
49618	greater than 10 cm, incarcerated or strangulated

Code	Code Description
49623	Removal of total or near total non-infected mesh or other prosthesis at the time of initial or recurrent anterior abdominal hernia repair or parastomal hernia repair, any approach (ie, open, laparoscopic, robotic) (List separately in addition to code for primary procedure)
CPT codes not covered for indications listed in the CPB:	
Epigastric VHR through vaginal natural orifice transluminal endoscopic surgery (NOTES), enhanced-view totally extra-peritoneal repair, laparoscopic intracorporeal rectus aponeuroplasty, peritoneal flap hernioplasty, trans-abdominal pre-peritoneal repair with concurrent rectus aponeuroplasty (TAPPRA) - No specific codes	
15778	Implantation of absorbable mesh or other prosthesis for delayed closure of defect(s) (ie, external genitalia, perineum, abdominal wall) due to soft tissue infection or trauma
+ 15847	Excision, excessive skin and subcutaneous tissue (includes lipectomy), abdomen (e.g. abdominoplasty) (includes umbilical transposition and fascial plication) (List separately in addition to code for primary procedure) [documentation required]
15877	Suction assisted lipectomy; trunk
HCPCS codes covered if selection criteria are met:	
C7565	Repair of anterior abdominal hernia(s) (ie, epigastric, incisional, ventral, umbilical, spigelian), any approach (ie, open, laparoscopic, robotic), recurrent, including implantation of mesh or other prosthesis when performed, total length of defect(s) less than 3 cm, reducible with removal of total or near total non-infected mesh or other prosthesis at the time of initial or recurrent anterior abdominal hernia repair or parastomal hernia repair
ICD-10 codes covered if selection criteria are met:	
E65	Localized adiposity [abdomen] [documentation required]
K43.0 - K43.9	Ventral hernia
L30.4	Erythema intertrigo [chronic, documentation required]
L98.7	Excessive and redundant skin and subcutaneous tissue
M79.3	Panniculitis [abdomen]

Code	Code Description
R60.9	Edema, unspecified [lipedema]
ICD-10 codes not covered for indications listed in the CPB:	
E88.810 - E88.819	Metabolic syndrome
M54.2	Cervicalgia
M54.30 - M54.32	Sciatica
M54.40 - M54.42	Lumbago with sciatica
M54.50 - M54.59	Low back pain
M54.6	Pain in thoracic spine
M54.81 - M54.9	Other and unspecified dorsalgia
M62.08	Separation of muscle, (non-traumatic) other site [diastasis recti]
Q79.59	Other congenital malformations of abdominal wall [congenital diastasis recti]
Lipectomy for lymphedema and lipedema:	
CPT codes covered if selection criteria are met:	
15830	Excision, excessive skin and subcutaneous tissue (includes lipectomy); abdomen, infraumbilical panniculectomy
15832	Excision, excessive skin and subcutaneous tissue (includes lipectomy); thigh
15833	Excision, excessive skin and subcutaneous tissue (includes lipectomy); leg
15834	Excision, excessive skin and subcutaneous tissue (includes lipectomy); hip
15835	Excision, excessive skin and subcutaneous tissue (includes lipectomy); buttock
15836	Excision, excessive skin and subcutaneous tissue (includes lipectomy); arm
15837	Excision, excessive skin and subcutaneous tissue (includes lipectomy); forearm or hand

Code	Code Description
15838	Excision, excessive skin and subcutaneous tissue (includes lipectomy); submental fat pad
15839	Excision, excessive skin and subcutaneous tissue (includes lipectomy); other area
15847	Excision, excessive skin and subcutaneous tissue (includes lipectomy), abdomen (eg, abdominoplasty) (includes umbilical transposition and fascial plication) (List separately in addition to code for primary procedure)
15876	Suction assisted lipectomy; head and neck
15877	Suction assisted lipectomy; trunk
15878	Suction assisted lipectomy; upper extremity
15879	Suction assisted lipectomy; lower extremity
ICD-10 codes covered if selection criteria are met:	
E65	Localized adiposity [lipedema]
E88.2	Lipomatosis, not elsewhere classified [lipedema]
R60.9	Edema, unspecified [lipedema]
Correction of adult buried penis:	
CPT codes covered if selection criteria are met:	
15839	Excision, excessive skin and subcutaneous tissue (includes lipectomy); other area [Correction of adult acquired buried penis]
54300	Plastic operation of penis for straightening of chordee (eg, hypospadias), with or without mobilization of urethra [Correction of adult acquired buried penis]
Other CPT codes related to the CPB:	
43632	Gastrectomy
43644 - 43645	Laparoscopy, surgical, gastric
43770 - 43775	Bariatric surgery - laparoscopy
43843 - 43888	Gastric restrictive procedure
53020	Meatotomy, cutting of meatus (separate procedure); except infant
54150	Circumcision, using clamp or other device with regional dorsal penile or ring block

Code	Code Description
54160	Circumcision, surgical excision other than clamp, device, or dorsal slit; neonate (28 days of age or less)
54161	Circumcision, surgical excision other than clamp, device, or dorsal slit; older than 28 days of age
ICD-10 codes covered if selection criteria are met:	
L30.4	Erythema intertrigo [chronic, documentation required]
L90.0	Lichen sclerosus et atrophicus
Q55.64	Hidden penis
Z98.84	Bariatric surgery status
ICD-10 codes not covered for indications listed in the CPB:	
N52.01 - N52.9	Male erectile dysfunction
Abdominoplasty combined with hip expansion:	
CPT codes not covered for indications listed in the CPB:	
Abdominoplasty combined with hip expansion - No specific code	
Other CPT codes related to the CPB:	
15771	Grafting of autologous fat harvested by liposuction technique to trunk, breasts, scalp, arms, and/or legs; 50 cc or less injectate
15772	Grafting of autologous fat harvested by liposuction technique to trunk, breasts, scalp, arms, and/or legs; each additional 50 cc injectate, or part thereof
15830	Excision, excessive skin and subcutaneous tissue (includes lipectomy); abdomen, infraumbilical panniculectomy
15847	Excision, excessive skin and subcutaneous tissue (includes lipectomy), abdomen (eg, abdominoplasty) (includes umbilical transposition and fascial plication)
15877	Suction assisted lipectomy; trunk
ICD-10 codes not covered for indications listed in the CPB:	
Z41.1	Encounter for cosmetic surgery

Background

In order to distinguish a ventral hernia repair from a purely cosmetic abdominoplasty, Aetna requires documentation of the size of the hernia, whether the ventral hernia is reducible, whether the hernia is accompanied by pain or other symptoms, the extent of diastasis (separation) of rectus abdominus muscles, whether there is a defect (as opposed to mere thinning) of the abdominal fascia, and office notes indicating the presence and size of the fascial defect.

Abdominoplasty, known more commonly as a "tummy tuck," is a surgical procedure to remove excess skin and fat from the middle and lower abdomen and to tighten the muscles of the abdominal wall. The procedure can improve cosmesis by reducing the protrusion of the abdomen. However, abdominoplasty is considered by Aetna to be cosmetic because it is not associated with functional improvements.

Danilla et al (2013) examined if suction-assisted lipectomy (SAL) decreases the incidence of early cardiovascular disease risk factors or its biochemical and clinical risk indicators. A systematic review of the literature was performed by conducting a pre-defined, sensitive search in MEDLINE without limiting the year of publication or language. The extracted data included the basal characteristics of the patients, the surgical technique, the amount of fat extracted, the cardiovascular risk factors and the biochemical and clinical markers monitored over time. The data were analyzed using pooled curves, risk ratios and standardized means with meta-analytical techniques. A total of 15 studies were identified involving 357 patients. In all of the studies, measurements of pre-defined variables were recorded before and after the SAL procedure. The median follow-up was 3 months (interquartile range (IQR) 1 to 6, range of 0.5 to 10.5). The mean amount of extracted fat ranged from 2,063 to 16,300 ml, with a mean ± standard deviation (SD) of 6,138 ± 4,735 ml. After adjusting for time and body mass index (BMI), leptin and fasting insulin were the only markers that were significantly associated with the amount of aspirated fat. No associations were observed for high sensitive C-reactive protein (hCRP), interleukin-6 (IL-6), adiponectin, resistin, tumor necrosis factor-alpha (TNF-α), Homeostasis Model of Assessment (HOMA), total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides, free

fatty acids or systolic blood pressure. The authors concluded that based on the results of this analysis, the authors concluded that there is no evidence to support the hypothesis that subcutaneous fat removal reduces early cardiovascular or metabolic disease, its markers or its risk factors.

Aboelatta and colleagues (2014) stated that lipoabdominoplasty is nearly a daily aesthetic procedure. Despite the emergence of laser-assisted liposuction, to-date, it has not been clearly evaluated combined with abdominoplasty. This prospective study aimed to evaluate the safety and effectiveness of laser-assisted liposuction relative to traditional liposuction combined with high-lateral-tension abdominoplasty. This study investigated 36 consecutive female patients who underwent high-lateral-tension abdominoplasty combined with liposuction of the upper central abdomen and both flanks. The patients were divided into 3 equal groups based on the technique used for liposuction: (i) Group 1 underwent conventional liposuction with abdominoplasty, (ii) Group 2 underwent a mixture of conventional and laser-assisted liposuction with abdominoplasty, and (iii) Group 3 underwent laser-assisted liposuction with abdominoplasty. Patients in groups 2 and 3 had a better aesthetic outcome than those in group 1 with regard to abdominal contour and skin tightness. No major complications were observed in groups 1 and 2. The patients in group 3 had a higher incidence of complications (3 seromas, 3 central necroses and dehiscence), and 1 patient underwent secondary sutures. The authors concluded that laser-assisted liposuction combined with abdominoplasty in the lateral abdomen seems to be a safe technique with good aesthetic outcomes. Although the combined use of laser-assisted liposuction in the lateral and central abdomen can achieve relatively better aesthetic results, it is associated with significant complications, and its use cannot be supported. Moreover, they stated that proper laser parameters in the central abdominal area still need further study.

van Schalkwyk and associates (2018) noted that umbilical hernia is a common finding in patients undergoing abdominoplasty, especially those who are post-partum with rectus divarication. Concurrent surgical treatment of the umbilical hernia at abdominoplasty presents a "vascular challenge" due to the disruption of dermal blood supply to the umbilicus,

leaving the stalk as the sole axis of perfusion. To-date, there have been no surgical techniques described to adequately address large umbilical herniae during abdominoplasty. These investigators presented a safe and effective technique that can address large umbilical herniae during abdominoplasty. A prospective series of 10 consecutive patients, undergoing concurrent abdominoplasty and laparoscopic umbilical hernia repair between 2014 and 2017 were included in the study. All procedures were performed by the same general surgeon and plastic surgeon at the Macquarie University Hospital in North Ryde, NSW, Australia. At 12-month follow-up, there were no instances of umbilical necrosis, wound complications, seroma, or recurrent hernia. The mean BMI was 23.8 kg/m2 (range of 16.1 to 30.1 kg/m2). Rectus divarication ranged from 35 to 80 mm (mean of 53.5 mm). Umbilical hernia repair took a mean of 25.9 mins to complete (range of 18 to 35 mins). The authors presented a technique that avoids incision of the rectus fascia, minimizes dissection of the umbilical stalk and is able to provide a gold standard hernia repair with mesh. This procedure is particularly suited to post-partum patients with large herniae (greater than 3 to 4 cm diameter) and wide rectus divarication, where mesh repair with adequate overlap is the recommended treatment. Level of evidence = 4.

Lari and colleagues (2019) performed a retrospective evaluation of patients who underwent concomitant abdominoplasty with laparoscopic umbilical hernia repair from 2007 to 2017. All patients were followed-up and evaluated for complications, including the incidence of umbilical skin necrosis. A total of 47 patients were included in this study. The average operative duration was 3.3 hours with an average hospital stay of 2.5 days. No cases of post-operative umbilical necrosis were encountered. A mean follow-up period of 2.4 years showed no cases of hernia or rectus abdominis diastasis recurrence. Minor complications included 4 cases of dehiscence, 1 hematoma; there was no major complications. The authors concluded that the combined use of laparoscopic umbilical hernia repair and abdominoplasty is a feasible approach to reduce the risks of umbilical de-vascularization, especially in larger hernias and in patients with higher risk of recurrence.

Abdominal Lipectomy for the Treatment of Metabolic Syndrome

In a systematic and meta-analysis, Seretis et al (2015) examined the effect of abdominal lipectomy on metabolic syndrome components and insulin sensitivity in women. A pre-determined protocol, established according to the Cochrane Handbook's recommendations, was used. An electronic search in MEDLINE, Scopus, the Cochrane Library and CENTRAL electronic databases was conducted from inception to May 14, 2015. This search was supplemented by a review of reference lists of potentially eligible studies and a manual search of key journals in the field of plastic surgery. Eligible studies were prospective studies with greater than or equal to 1month of follow-up that included females only who underwent abdominal lipectomy and reported on parameters of metabolic syndrome and insulin sensitivity. The systematic review included 11 studies with a total of 271 individuals. Conflicting results were revealed, though most studies showed no significant metabolic effects after lipectomy. The meta-analysis included 4 studies with 140 subjects. No significant changes were revealed between lipectomy and control groups. The authors concluded that this meta-analysis provided evidence that abdominal lipectomy in females did not affect significantly the components of metabolic syndrome and insulin sensitivity. They stated that further high quality studies are needed to elucidate the potential metabolic effects of abdominal lipectomy.

Panniculectomy for the Treatment of Back Pain

An UpToDate review on “Subacute and chronic low back pain: Surgical treatment” (Chou, 2016) does not mention panniculectomy as a therapeutic option.

Adipose Derived Stem Cell-Assisted Lipotransfer

Grabin and colleagues (2015) stated that because of their easy accessibility and versatile biological properties, mesenchymal stem cells taken from fatty tissue (adipose-derived stem cells, ADSC) are attractive for various potential clinical uses. For example, ADSC can be added to fatty tissue before transplantation in the hope of improving the outcome of autologous lipotransfer: The modified procedure is called cell-assisted lipotransfer (CAL). The clinical use and commercial promotion of this

novel stem-cell treatment (and others) are spreading rapidly, even though there is not yet any clear clinical evidence for its safety and effectiveness. In cooperation with the German Cochrane Center, these researchers systematically searched the literature according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria; 8 major medical databases were searched. The retrieved publications were examined by 2 independent reviewers and assessed using objective criteria. After screening of the 3,161 retrieved publications by title, abstract, and (where appropriate) full text, 78 were still considered relevant; 13 of these were reports of clinical studies; only 3 of the 13 met criteria for grade II or III evidence. The studies that were analyzed involved a total of 286 CAL procedures with a longest follow-up time of 42 months. Oncological safety was not demonstrated. The authors concluded that the studies published to-date have not shown that CAL is generally superior to conventional autologous lipotransfer. They dealt with safety aspects inappropriately or not at all. These investigators stated that the case of CAL illustrated the indispensability of high-quality clinical evidence before the introduction of novel stem-cell-based treatments.

Huang and associates (2016) stated that CAL has been widely used in various clinical applications, including breast augmentation following mammectomy, soft-tissue reconstruction and wound healing. However, the clinical application of CAL has been restricted due to the transplanted fat tissues being readily liquefied and absorbed. These investigators examined 57 previously published studies involving CAL, including fat grafting or fat transfer with human adipose-stem cells in all known databases. Of these 57 articles, 7 reported the clinical application of CAL. In the 57 studies, the majority of the fat tissues were obtained from the abdomen via liposuction of the 7 clinical studies, 4 were performed in patients requiring breast augmentation, 1 in a patient requiring facial augmentation, 1 in a patient requiring soft tissue augmentation/reconstruction and 1 in a patient requiring fat in their upper arms. The authors stated that the therapeutic effect of CAL in cosmetics and aesthetics remains controversial, most likely because of the lack of a standard method for isolating pure ADSCs. Currently, the explanation for why adding ADSC to adipose tissues for transplantation allows improved grafting, compared with using adipose tissue only, remains to be elucidated. Quantitative and qualitative investigations, comparing the

therapeutic effects of using pure ADSC and a mixture of ADSC with certain types of fat components or other components are needed to confirm the previous conclusion. Certain studies have hypothesized that the robust ectopic adipogenesis of ADSC in-vivo relies on their pre-differentiation induced in-vitro prior to their transplantation. The induced differentiation of ADSC in-vitro may be replaced by supplying adipogenic stimuli to transplanted ADSC, in a process referred to as in-situ adipogenesis. These investigators also noted that the limited proliferation capacity of ADSC also prevented their widespread clinical use; ADSC lack telomerase and their telomeres are short; thus they can only proliferate in-vitro for a limited period of time. Studies have shown that the ADSC isolated from aged patients have reduced proliferation capacity and stability. Therefore, it is reasonable to perform allografts using the ADSC from younger individuals. The authors concluded that other questions require addressing before CAL being used widely in clinical settings include: (i) how the proliferation and differentiation process of ADSC can be regulated in-vitro and in-vivo; (ii) which factors control the proliferation and differentiation of ADSC; (iii) the predominant factors controlling the proliferation and differentiation process of ADSC; (iv) which factors stimulate ADSC to secrete paracrine factors; (v) whether transplanted ADSC are tumorigenic; and (vi) what causes ADSC to become liquefied in-vivo. Furthermore, the authors stated that criteria and guidelines are needed for the clinical application of CAL technology.

Toyserkani and colleagues (2016) noted that autologous lipotransfer is seen as an ideal filler for soft tissue reconstruction. The main limitation of this procedure is the unpredictable resorption and volume loss of the fat graft. In the recent decade, an increasing amount of research has focused on the use of ADSC to enrich the fat graft, a procedure known as CAL. These investigators reviewed the current pre-clinical and clinical evidence for the effectiveness of CAL compared with conventional lipotransfer. They performed a systematic search on PubMed and other databases to identify all pre-clinical and clinical studies where CAL with ADSC was compared with conventional lipotransfer. A total of 20 pre-clinical studies and 7 clinical studies were included in the review. The pre-clinical studies consisted of 15 studies using immuno-deficient animal models and 5 studies using immuno-competent studies; 17 studies

examined weight/volume retention of which 15 studies favored CAL over conventional lipotransfer; 1 clinical study did not find any effectiveness of CAL and the remaining 6 studies favored CAL. The authors concluded that the present evidence suggested that there is a big potential for CAL in reconstructive surgery; however, the present studies are so far still of low quality with inherent weaknesses. Several aspects regarding CAL still remain unknown such as the optimal degree of cell enrichment and also its safety. They stated that further high-quality studies are needed to establish if CAL can live up to its potential. (Level of Evidence = 5). Moreover, the authors stated that "More studies are needed to examine if CAL and lipotransfer are correlated with increased cancer recurrence risk in relevant patient populations … The published human studies so far show promising results, and further properly designed clinical trials are needed in relevant patient groups to establish in which cases this technique could be relevant and superior to two separate regular lipotransfers".

Moustaki and associates (2017) stated that autologous fat is considered the ideal material for soft-tissue augmentation in plastic and reconstructive surgery. The primary drawback of autologous fat grafting is the high resorption rate. The isolation of mesenchymal stem cells from adipose tissue inevitably led to research focusing on the study of combined transplantation of autologous fat and ADSCs and introduced the theory of "cell-assisted lipotransfer". Transplantation of ADSCs is a promising strategy, due to the high proliferative capacity of stem cells, their potential to induce paracrine signaling and ability to differentiate into adipocytes and vascular cells. The current study examined the literature for clinical and experimental studies on CAL to assess the efficacy of this novel technique when compared with traditional fat grafting. A total of 30 studies were included in the present review. The authors concluded that the current study demonstrated that CAL has improved efficacy compared with conventional fat grafting. Moreover, they stated that a number of questions, including the long-term safety of CAL regarding previous cancer diagnosis and treatment, remain unanswered; and long-term and larger studies are needed to confirm previously documented favorable results in CAL.

Laloze and co-workers (2018) performed a meta-analysis of the efficacy of CAL with data analysis concerning fat survival rate. The incidence of complications and the need for multiple procedures were evaluated to determine the safety of CAL. These investigators identified 25 studies (a total of 696 patients) that were included in the systematic review; 16 studies were included in the meta-analysis to evaluate the efficacy of CAL. The fat survival rate was significantly higher with CAL than non-CAL (64 % versus 44 %, $p < 0.0001$) independent of injection site (breast and face). This benefit of CAL was significant for only injection volumes of less than 100 ml ($p = 0.03$). The 2 groups did not differ in frequency of multiple procedures after fat grafting, but the incidence of complications was greater with CAL than non-CAL (8.4 % versus 1.5 %, $p = 0.0019$). The CAL method is associated with better fat survival rate than with conventional fat grafting but only for small volumes of fat grafting (less than 100 ml). Nonetheless, the new technique is associated with more complications and did not reduce the number of surgical procedures needed after the first fat grafting. The authors concluded that more prospective studies are needed to draw clinical conclusions and to demonstrate the real benefit of CAL as compared with common autologous fat grafting.

Chen and colleagues (2018) analyzed factors related to lipotransfer for localized scleroderma, and examined the feasibility of CAL for localized scleroderma treatment. Abdominal fat samples were taken from 6 scleroderma patients without corticosteroid therapy, 5 scleroderma patients with corticosteroid therapy, and 10 normal liposuction patients. Their quantity, morphology, and proliferation ability were measured. Blood flow was measured by laser speckle contrast imaging in localized scleroderma lesions and normal contralateral regions for 8 localized scleroderma patients. Bleomycin-induced skin fibrosis nude mice were also used to examine differences between lipotransfer and CAL. Fat weight was measured, and expression of transforming growth factor (TGF)-β1 and type III collagen in the injected skin was determined by immunohistochemistry. The number of stem cells from scleroderma patients with corticosteroid treatment was significantly reduced. Mean blood perfusion in localized scleroderma lesions was not significantly different than in the contralateral normal regions. In normal nude mice, there were no significant changes in TGF-β1 and type III collagen between the control, lipotransfer, and CAL groups, whereas in bleomycin-

induced skin fibrosis nude mice, lipotransfer and CAL reduced TGF-β1 and type III collagen expression. The authors concluded that for scleroderma patients, fewer adipose-derived stem cells, because of a history of corticosteroid therapy and a local inflammatory microenvironment, were more important factors, whereas blood supply showed no significant change. Thus, CAL not only improved the survival rate of transplanted fat, but also improved skin texture in bleomycin-induced skin fibrosis nude mice. These preliminary findings need to be validated by well-designed studies.

Abdominal Lipectomy as an Adjunctive Procedure to Assist with Long-Term Weight Loss Following Bariatric Surgery

Abbed and colleagues (2017) stated that abdominal lipectomy after bariatric surgery is recommended because of residual excess skin resulting in difficulty with maintaining hygiene, recurrent infections, and functional impairment, interfering with daily activities. There is a dearth of literature examining weight loss outcomes in patients undergoing abdominal lipectomy post-sleeve gastrectomy (SG). In a retrospective study, these researchers examined whether post-SG patients who received abdominal lipectomy achieved greater percent excess weight loss (% EWL) than post-SG patients who did not receive abdominal lipectomy. Patients who underwent minimally invasive SG at the University of Illinois Hospital and Health Sciences System from March 2008 to June 2015 were included in this study. The cohort was divided into 2 groups: (i) patients who underwent abdominal lipectomy after SG (PS-SG), and (ii) patients who underwent SG alone (SG); demographics, co-morbidities, and % EWL were examined. A total of 29 patients were included in the PS-SG group versus 287 patients in the SG group. Significant differences were found in % EWL at 24 ($p < 0.0001$), 36 ($p < 0.005$), and more than 36 months ($p < 0.005$) follow-up between groups, with a greater % EWL in patients in the PS-SG group versus the SG group. The authors concluded that the findings of this preliminary study showed that patients in the PS-SG group achieved greater % EWL than patients with SG alone. Moreover, they stated that although larger studies are needed, this study supports using abdominal lipectomy as an adjunctive procedure to assist with long-term weight loss as part of the overall treatment of bariatric surgery patients.

Liposuction for the Treatment of **Lipedema**

Lipedema is a painful disorder in women characterized by abnormal deposition of adipose tissue in the lower extremities leading to circumferential bilateral lower extremity enlargement typically seen extending from the hips to the ankles resulting in edema, pain and bruising; with secondary lymphedema and fibrosis during later stages. The pathogenesis is unknown and no curative treatment is available. Conservative therapy consisting of lymphatic drainage and compression stockings is often recommended, which is effective against the edema. Some patients showed a short-term improvement when treated in this way. Combined decongestive therapy (CDT, namely manual lymphatic drainage, compression garments) is the standard of care in most countries. Since the introduction of tumescent technique, liposuction has been used as a surgical therapeutic option.

Rey and colleagues (2018) stated that lipedema is a progressive disease; the signs are limited to the lower limbs. Early signs are non-specific. Later, pain and heaviness of lower limbs become predominant. Finally, at an advanced stage, tissue fibrosis is associated with significant edema. At the early stage, the treatment is conservative. The authors state that liposuction is indicated at the onset of pain. The authors stated that late stages require surgeries combining dermo-lipectomy as well as liposuction.

In a review of lipedema, Buck and Herbst (2016) noted that "From a surgical perspective, the least invasive means of removing the painful fat of lipedema is through the use of suction lipectomy. It is important to note, however, that the techniques employed for lipectomy of lipedema fat are different from the techniques used for cosmetic liposuction. Specifically, the techniques employed for lipedema liposuction utilize devices that remove fat in a gentler manner, such as the vibrating cannula associated with power-assisted liposuction or water-assisted liposuction."

Rapprich and colleagues (2011) stated that the removal of the increased fat tissue of lipedema has become possible by employing advanced liposuction techniques, which utilize vibrating micro-cannulas under tumescent local anesthesia. These investigators examined the effectiveness of this approach to lipedema. A total of 25 patients were

examined before liposuction and 6 months thereafter. The survey included the measurement of the volume of the legs and several parameters of typical pain and discomfort. The parameters were measured using visual analogue scales (VAS, scale 0 to 10). The volume of the leg was reduced by 6.99 %. Pain, as the predominant symptom in lipedema, was significantly reduced from 7.2 ± 2.2 to 2.1 ± 2.1 ($p < 0.001$). Quality of life (QOL) as a measure of the psychological strain caused by lipedema improved from 8.7 ± 1.7 to 3.6 ± 2.5 ($p < 0.001$). Other parameters also showed a significant improvement and the over-all severity score improved in all patients. The authors concluded that liposuction reduced the symptoms of lipedema significantly.

Schmeller and associates (2012) examined the efficacy of liposuction concerning appearance and associated complaints after a long-term period. A total of 164 patients who had undergone conservative therapy over a period of years, were treated by liposuction under tumescent local anesthesia with vibrating micro-cannulas. In a monocentric study, 112 could be re-evaluated with a standardized questionnaire after a mean of 3 years and 8 months (range of 1 year and 1 month to 7 years and 4 months) following the initial surgery and a mean of 2 years and 11 months (8 months to 6 years and 10 months) following the last surgery. All patients showed a distinct reduction of subcutaneous fatty tissue (average of 9,846 ml per person) with improvement of shape and normalization of body proportions. Additionally, they reported either a marked improvement or a complete disappearance of spontaneous pain, sensitivity to pressure, edema, bruising, restriction of movement and cosmetic impairment, resulting in a tremendous increase in QOL; all these complaints were reduced significantly ($p < 0{\cdot}001$). Patients with lipedema stage II and III showed better improvement compared with patients with stage I. Physical decongestive therapy could be either omitted (22.4 % of cases) or continued to a much lower degree. No serious complications (wound infection rate 1.4 %, bleeding rate 0.3 %) were observed following surgery. The authors concluded that tumescent liposuction was a highly effective treatment for lipedema with good morphological and functional long-term results.

Peled and co-workers (2012) stated that diagnosis of lipedema is often challenging, and patients frequently undergo a variety of unsuccessful therapies before receiving the proper diagnosis and appropriate

management. Patients may experience pain and aching in the lower extremity in addition to distress from the cosmetic appearance of their legs and the resistance of the fatty changes to diet and exercise. These researchers reported a case of a patient with lipedema who was treated with suction-assisted lipectomy and use of compression garments, with successful treatment of the lipodystrophy and maintenance of improved aesthetic results at 4-year post-operative follow-up.

Wollina and associates (2014) noted that In advanced stages of lipedema, reduction of adipose tissue is the only available effective treatment. In elderly patients with advanced lipedema, correction of increased skin laxity has to be considered for an optimal outcome. These investigators reported on a tailored combined approach to improve advanced lipedema in elderly women with multiple co-morbidities. Micro-cannular laser-assisted liposuction of the upper legs and knees was performed under tumescent anesthesia. Medial thigh lift and partial lower abdominoplasty with minimal undermining were used to correct skin laxity and prevent intertrigo (intertriginous dermatitis). Post-surgical care with non-elastic flat knitted compression garments and manual lymph drainage were used. These researchers reported on 3 women aged 55 to 77 years with advanced lipedema of the legs and multiple co-morbidities. Using this step-by-step approach, a short operation time and early mobilization were possible. Minor adverse effects were temporary methemoglobinemia after tumescent anesthesia and post-surgical pain. No severe adverse effects were observed; and patient satisfaction was high. The authors concluded that a tailored approach may be useful in advanced lipedema and was applicable even in elderly patients with multiple co-morbidities.

Atiyeh and colleagues (2015) stated that liposuction is the most common cosmetic surgical procedure worldwide. It has evolved from being designed primarily for body contouring to becoming essential adjunct to various other aesthetic procedures, greatly enhancing their outcome. Despite its hard clear differentiation between an aesthetic and therapeutic indication for some pathologic conditions, liposuction has been increasingly used in various disorders as a therapeutic tool or to improve function. In fact, liposuction has ceased to define a specific procedure and has become synonymous to a surgical technique or tool similar to the surgical knife, laser, electrocautery, suture material, or even wound-

dressing products. At present, there appeared to be an enormous potential for the application of liposuction in ablative and reconstructive surgery outside the realm of purely aesthetic procedures. These investigators considered the various non-aesthetic applications of liposuction; implications of this new definition of liposuction should induce 3rd-party public payers and insurance carriers to reconsider their remuneration and reimbursement policies.

Dadras and associates (2017) examined the outcome of liposuction used as treatment for lipedema. A total of 25 patients who received 72 liposuction procedures for the treatment of lipedema completed a standardized questionnaire. Lipedema-associated complaints and the need for CDT were assessed for the pre-operative period and during 2 separate post-operative follow-ups using a VAS and a composite CDT score. The mean follow-up times for the 1st post-operative follow-up and the 2nd post-operative follow-up were 16 months and 37 months, respectively. Patients showed significant reductions in spontaneous pain, sensitivity to pressure, feeling of tension, bruising, cosmetic impairment, and general impairment to QOL from the pre-operative period to the 1st post-operative follow-up, and these results remained consistent until the 2nd postoperative follow-up. A comparison of the pre-operative period to the last post-operative follow-up, after 4 patients without full pre-operative CDT were excluded from the analysis, indicated that the need for CDT was reduced significantly. An analysis of the different stages of the disease also indicated that better and more sustainable results could be achieved if patients were treated in earlier stages. The authors concluded that liposuction was effective in the treatment of lipedema and led to an improvement in QOL and a decrease in the need for conservative therapy.

Reich-Schupke and co-workers (2017) noted that the revised guidelines on lipedema were developed under the auspices of and funded by the German Society of Phlebology (DGP). The recommendations were based on a systematic literature search and the consensus of 8 medical societies and working groups. The guidelines contain recommendations with respect to diagnosis and management of lipedema. The diagnosis is established on the basis of medical history and clinical findings. Characteristically, there is a localized, symmetrical increase in subcutaneous adipose tissue in arms and legs that is in marked

disproportion to the trunk. Other findings include edema, easy bruising, and increased tenderness. Further diagnostic tests are usually reserved for special cases that require additional work-up. Lipedema is a chronic, progressive disorder marked by the individual variability and unpredictability of its clinical course. Treatment consists of 4 therapeutic mainstays that should be combined as necessary and address current clinical symptoms: complex physical therapy (manual lymphatic drainage, compression therapy, exercise therapy, and skin care), liposuction and plastic surgery, diet, and physical activity, as well as psychotherapy if necessary. Surgical procedures are indicated if, despite thorough conservative treatment, symptoms persist, or if there is progression of clinical findings and/or symptoms. If present, morbid obesity should be therapeutically addressed prior to liposuction.

Halk and Damstra (2017) noted that in 2011, the Dutch Society of Dermatology and Venereology organized a task force to create guidelines on lipedema, using the International Classification of Functioning, Disability and Health of the World Health Organization (WHO). Clinical questions on significant issues in lipedema care were proposed, involving: making the diagnosis of lipedema; clinimetric measurements for early detection and adequate follow-up; and treatment. A systematic review of literature published up to June 2013 was conducted. Based on available evidence and experience of the task force, answers were formed and recommendations were stated. The guidelines defined criteria to make a medical diagnosis of lipedema, a minimum data set of (repeated) clinical measurements that should be used to ensure early detection and an individually outlined follow-up plan, pillars on which conservative treatment should be based and recommendations on surgical therapeutic options. The authors concluded that little consistent information concerning either diagnostics or therapy could be found in the literature. It is likely that lipedema is frequently mis-diagnosed or wrongly diagnosed as only an aesthetic problem and therefore under- or mis-treated. Treatment is divided into conservative and chirurgic treatment. The only available technique to correct the abnormal adipose tissue is surgery. To ensure early detection and an individually outlined follow-up, the committee advised the use of a minimum data set of (repeated) measurements of waist circumference, circumference of involved limbs, body mass index (BMI) and scoring of the level of daily practice and psychosocial distress. Promotion of a healthy lifestyle with individually

adjusted weight control measures, graded activity training programs, edema reduction, and other supportive measures are pillars of conservative therapy. Tumescent liposuction is the treatment of choice for patients with a suitable health profile and/or inadequate response to conservative and supportive measures.

An assessment of surgery for lipedema by the Canadian Agency for Drugs and Technologies in Health (CADTH, 2019) (Peprah and MacDougall, 2019) reached the following conclusions: "Evidence of limited quality from five uncontrolled before-and-after studies suggests that liposuction may be effective in reducing the size of the extremities and complaints associated with lipedema such as spontaneous pain, easy bruising, sensitivity to pressure, impairment in quality of life, restrictions to mobility, edema, feeling of tension and general impairment. The findings have to be interpretated with caution, given that they are from single arm, non-randomized studies based on patients' self-assessment data collected using tools that have not been validated for the assessment lipedema-related complaints. One clinical practice guideline [citing Dutch guidelines described above] recommends tumescent liposuction, performed by a skilled healthcare professional at a specialized facility, as the treatment of choice for patients with a suitable health profile and/or inadequate response to conservative and supportive measures. The strength of the recommendations in the clinical guidelines and links to supporting evidence were not provided."

Lipoabdominoplasty (Liposuction-Assisted Abdominoplasty) with Rectus Plication for Donor-Site Closure in Abdominal-Based Free Flap Breast Reconstruction

Kotsougiani-Fischer and colleagues (2021) noted that the aesthetic and functional outcomes of the donor site following abdominal-based free flap breast reconstruction have been suboptimal. These researchers examined a modified liposuction-assisted abdominoplasty (lipoabdominoplasty) technique combined with rectus plication (LPARSP) adopted from cosmetic abdominoplasty practice. All abdominal-based free flap breast reconstructions from January 2017 to March 2019 were reviewed. Patients with central fullness and sufficient tissue surplus on the abdomen, thighs and flanks who received LPARSP and rectus plication were identified (LPARSP group) and matched for age and BMI

with patients who underwent conventional abdominoplasty (CA group). Abdominal skin sensation, objective functional and aesthetic measures of the abdomen, as well as patient-reported outcomes (Breast-Q), were analyzed. A total of 28 patients were included; groups were similar in demographics. The mean amount of lipoaspirate in the LPARSP group was 1,054 ± 613.5 ml. The post-operative course was similar in both groups. The LPARSP technique resulted in a lower positioned horizontal scar ($p = 0.03$). The aesthetic outcome was superior in the LPARSP group ($p < 0.0001$). Furthermore, the LPARSP group presented with a decreased bulging rate ($p = 0.05$), and secondary refinement procedures were less frequently demanded ($p = 0.02$). Furthermore, the abdominal wall sensation of the flanks was improved in the LPARSP group ($p = 0.05$), whereby patient-reported outcome measures did not differ between groups. The authors concluded that lipoabdominoplasty with rectus plication represented a safe approach for donor-site closure in selected patients undergoing abdominal-based free flap breast reconstruction. Superior functional and aesthetic results paired with improved abdominal wall sensation were achieved compared to CA. Level of Evidence = IV.

Surgical Correction of Adult Acquired Buried Penis

Ho and Gelman (2018) stated that adult acquired buried penis (AABP), a condition where the penis is hidden by abdominal or suprapubic skin or fat, represents the clinical manifestation of a wide spectrum of pathology due to a variety of etiologies. It can be related to obesity, a laxity in connective tissue, lichen sclerosis (LS), complications from penile/scrotal enlargement surgery, scrotal lymphedema, or hidradenitis suppurativa (HS). Buried penis can be associated with poor cosmesis and hygiene, voiding dysfunction, and sexual dysfunction. It is an increasingly common problem seen by reconstructive urologists and these researchers presented several frequently seen scenarios of buried penis and management options. The authors detailed the causes of buried penis, and their approach for surgical repair of buried penis in complex cases. Management can be challenging and is largely depends on the etiology of buried penis as well as the degree that local tissues are affected. While these procedures are often associated with a high incidence of wound complications, these are often self-limited and patients experienced significant improvement in QOL measures post-operatively. When combined with post-operative weight loss, surgical

repair of buried penis can greatly benefit patients by improving urinary and sexual function in addition to their mental and psychological well-being.

Smith-Harrison et al (2020) noted that ABP is a urologic condition that has significant morbidity and negative effect on QOL, including but not limited to sexual function, hygiene, micturition, and self-image. This disease process is characterized by a wide degree of variability and severity that requires a patient-specific approach and significant flexibility on the surgeon's behalf. These investigators reviewed the current evaluation and surgical management of this rare and complex patient population. They carried out a structured review of the English language literature from 1970 to June 2018 using the PubMed and Medline medical databases. Queried terms included "buried penis", "concealed penis", "hidden penis", "adult buried penis", "cicatricial penis" ,"trapped penis", "inconspicuous penis", "scrotoplasty and obesity", "penile release", "penile skin graft", "penile reconstruction", and "pubic lift". Papers were individually reviewed for their utility and applicability to the management of adult ABP. Manuscripts focusing on pediatric patients were excluded. Current surgical management options for adult ABP are heterogenous but focus on preserving shaft length while improving cosmesis and voiding function. Surgical versatility remains critical for successful outcomes. However, recent advances in surgical techniques for correction of adult ABP focus on the use of skin grafting to cover the shaft, along with lipectomy and/or scrotoplasty to further aid penile exposure. Collaboration with multiple surgical services is often needed to achieve optimal outcomes. The authors concluded that ABP is a complex urologic condition with equally complex surgical therapeutic options. Care must be taken when planning a surgical intervention, and support from plastic or general surgery may be required. However, with careful selection, surgical correction frequently resulted in significant improvement in function and QOL.

Cohen et al (2021) stated that in adult men, buried penis occurs as an acquired condition most commonly caused by morbid obesity. These researchers described the clinical characteristics of 3 obese men with AABP and the associated features of the buried penis. In addition to morbid obesity, a buried penis can result from other etiologies, such as HS, iatrogenic causes such as elective surgeries, infections, LS,

penoscrotal lymphedema, and traumatic events. Lower urinary tract symptoms (LUTS), such as voiding, and post-voiding problems are the most common presenting complaints; however, bacterial and fungal infections, phimosis, psychological issues, and sexual dysfunction, are also buried penis-related symptoms. The evaluation of a man with AABP begins with a detailed history for condition-related symptoms. Examination of the patient, both standing and supine with an attempt to demonstrate the penis using digital compression of the surrounding skin and fat, should be performed to determine the extent of the problem and whether co-morbid conditions such as infection and LS are present. Both buried penis and LS can predispose to the development of penile squamous cell carcinoma (SCC); the diagnosis of this tumor can be delayed in men with AABP since an adequate penile examination is difficult or impossible. A multi-disciplinary approach including surgeons, primary care physician, registered dietitian nutritionist, and psychiatrist should be considered for a patient with a buried penis. The surgical management is individualized and based on not only the extent of the problem but also whether an associated condition, such as urethral stricture, is present. Most patients are pleased with the functional and aesthetic outcome following surgery.

On behalf of the European Association of Urology (EAU) Guidelines Working on Male Sexual and Reproductive Health and EAU-Young Academic Urologists (EAU-YAU) Sexual and Reproductive Health Working Group, Falcone et al (2023) examined the literature to determine the benefits and harms of the surgical techniques used for the correction of AABP. This systematic review was carried out according to the PRISMA guidelines. The Pariser system was used to classify surgical procedures. A total of 170 studies were identified and screened, and 21 studies (570 patients) were included. In general, high-complexity reconstructive procedures (category greater than III) were performed, with split-thickness skin grafts for shaft reconstruction. The pooled mean operating time was 192.2 mins and the mean estimated blood loss (EBL) range was 57 to 326 ml. No intra-operative complications were recorded. The incidence of post-operative complications varied across studies (0 to 80.8 %), with greater than grade-4 complications reported in 3.1 % to 3.7 % of cases. Wound infection and genital lymphedema were reported in 4.7 % to 33 % and 7.1 % to 60 % of cases, respectively. The incidence of graft contracture and partial/total loss was 2.4 % to 14.3 %

and 1.5 % to 21 %, respectively. The incidence of recurrence was not systematically reported and ranged from 5.2 % to 13 %. Post-operative evaluation of functional outcomes showed significant improvements in sexual function, urinary function and cosmesis. Assessment of risk of bias demonstrated a high-risk of bias across all studies. The authors concluded that surgical management of AABP had a high incidence of complications but resulted in satisfactory outcomes, with significant improvement in patients' QOL. The high incidence of graft-related complications should be taken into account when counselling patients and AABP care should be centralized to high-volume centers.

Abdominoplasty with Scarpa Fascia Preservation

Inforzato et al (2020) stated that the number of bariatric surgeries for the treatment of morbid obesity has increased, and there is growing demand for post-bariatric abdominoplasty. In a comparative, randomized study, these researchers examined the impacts of Scarpa's fascia preservation on total drainage volume, time to drain removal, and seroma formation in anchor-line abdominoplasty. A total of 42 post-bariatric patients were randomly assigned to 2 groups and underwent anchor-line abdominoplasty. Scarpa's fascia was not preserved during abdominoplasty in 1 group (n = 21) but was preserved in the other group (n = 21). A suction drain was left in place until the drainage volume was less than 30 ml/24 hour. Seroma formation was evaluated by abdominal ultrasound (US) on the 20th post-operative day; only fluid collections greater than 30 ml were considered seromas. The time to drain removal was shorter, and the total drainage volume was lower in the fascial preservation group than in the fascial dissection group. However, no difference in the seroma formation rate was observed between the 2 groups. The authors concluded that Scarpa's fascia preservation decreased the drainage volume and the time to drain removal but not the rate of seroma formation. Moreover, these researchers stated that further investigations with a larger number of patients, as well as anatomical and histological studies, are needed to better understand the impact of fascial preservation on seroma formation. Level of Evidence = II.

The authors stated that the small sample size (n = 21 in each group) was a drawback of this study and may prevent generalization of the results. The internal pilot study design was used to re-calculate the final sample

size of the main study based on data from the first 32 recruited patients. This approach may obviate or negate a type I error and has the advantage of allowing a more accurate sample size calculation without increasing the time needed to perform the full trial. Other drawbacks were that only fluid collections greater than 30 ml detected on US were considered seromas and that reduction in treatment costs or number of visits with the earliest removal of the aspiration drain was not evaluated.

Wijaya et al (2022) noted that scarpa fascia preservation has been proposed to minimize complications associated with conventional abdominoplasty; however, its effectiveness is unclear. In a systematic review and meta-analysis, these investigators examined the influence of preserving scarpa fascia on reducing post-abdominoplasty complications. They carried out a comprehensive search of Medline Ovid, PubMed, Web of Science, and the Cochrane CENTRAL databases from the inception till June 2021. Eligible studies were prospective, controlled studies examining post-operative complications following scarpa fascia preservation after abdominoplasty. Stata 15.1 software was used for the meta-analysis. The meta-analysis included 7 studies with 682 abdominoplasty patients. Abdominoplasty with scarpa fascia preservation could significantly reduce incidence of seroma (OR = -1.34, 95 % CI: -2.09 to -0.59, p < 0.05), hospital length of stay (LOS) (SMD = -1.65; 95 % CI: -3.50 to 0.20; p = 0.08), time to drain removal (SMD = -3.64; 95 % CI: -5.76 to -1.52; p < 0.05), and total drain output (SMD = -401.60; 95 % CI: -593.75 to -209.44; p < 0.05) compared with that of conventional abdominoplasty. However, it failed to achieve a statistically significant reduction in hematoma (OR= -1.30, 95 % CI: -2.79 to 0.18, p = 0.08), infection (OR = -1.03; 95 % CI: -2.17 to 0.12; p = 0.08), skin necrosis (OR = 0.63; 95 % CI: -1.20 to 2.45; p = 0.50), and wound dehiscence (OR = 0.28; 95 % CI: -0.28 to 0.83; p = 0.33). The seroma incidence rate was lower when a scalpel was used for dissection rather than electrocautery (3 % (95 % CI: 1 % to 7 %) versus 11 % (95 % CI: 5 % to 18 %)). The authors concluded that preservation of scarpa fascia during abdominoplasty might reduce the likelihood of post-operative seroma, hospital LOS, time to drain removal, and total drain output. However, it did not significantly affect the incidence of hematoma, infection, skin necrosis, and wound dehiscence. Level of Evidence = III.

Biologic Mesh for Ventral Hernia Repair

Harris et al (2021) noted that more than 400,000 ventral hernia repairs are performed in the U.S yearly. Although the most effective method for repairing ventral hernias involves using mesh, whether to use biologic mesh versus synthetic mesh is controversial. In a single-blind, randomized-controlled clinical trial, these researchers determined which mesh type would yield lower recurrence and complication rates following ventral hernia repair. This study was carried out from March 2014 through October 2018; a total of 165 patients enrolled with an average follow-up of 26 months. Patients were randomized 1:1 to have their ventral hernias repaired using either a biologic (porcine) or synthetic (polypropylene) mesh. The primary outcome measure was hernia recurrence at 2 years. A total of 165 patients (68 men), mean age of 55 years, were included in the study with a mean follow-up of 26 months. An intention-to-treat (ITT) analysis noted that hernias recurred in 25 patients (39.7 %) assigned to biologic mesh and in 14 patients (21.9 %) assigned to synthetic mesh ($p = 0.035$) at 2 years. Subgroup analysis identified an increased rate of hernia recurrence in the biologic versus the synthetic mesh group under contaminated wound conditions (50.0 % versus 5.9 %; p for interaction = 0.041). Post-operative complication rates were similar for the 2 mesh types. The authors concluded that the risk of hernia recurrence was significantly higher for patients undergoing ventral hernia repair with biologic mesh compared to synthetic mesh, with similar rates of post-operative complications. These researchers stated that these findings indicated that the use of synthetic mesh over biologic mesh to repair ventral hernias was effective and could be endorsed, including under contaminated wound conditions.

Rosen et al (2022) noted that biologic mesh is widely used for reinforcing contaminated ventral hernia repairs; however, it is expensive and has been associated with high rates of long-term hernia recurrence. Synthetic mesh is a lower-cost alternative; however, its effectiveness has not been rigorously studied in individuals with contaminated hernias. In a randomized, single-blinded, multi-center study, these researchers examined if synthetic mesh would result in superior reduction in risk of hernia recurrence compared with biologic mesh during the single-stage repair of clean-contaminated and contaminated ventral hernias. This trial was carried out from December 2012 to April 2019 with a follow-up

duration of 2 years. The trial was completed at 5 academic medical centers in the U.S. with specialized units for abdominal wall reconstruction. A total of 253 adult patients with clean-contaminated or contaminated ventral hernias were enrolled in this trial. Follow-up was completed in April 2021. Interventions were retro-muscular synthetic or biologic mesh at the time of fascial closure. The primary outcome was the superiority of synthetic mesh versus biologic mesh at reducing risk of hernia recurrence at 2 years based on ITT analysis. Secondary outcomes included mesh safety, defined as the rate of surgical site occurrence requiring a procedural intervention, and 30-day hospital direct costs and prosthetic costs. A total of 253 patients (median IQR age, 64 [55 to 70] years; 117 [46 %] male) were randomized (126 to synthetic mesh and 127 to biologic mesh) and the follow-up rate was 92 % at 2 years. Compared with biologic mesh, synthetic mesh significantly reduced the risk of hernia recurrence (hazard ratio [HR] of 0.31; 95 % confidence interval [CI]: 0.23 to 0.42; p < 0.001). The overall ITT hernia recurrence risk at 2 years was 13 % (33 of 253 patients). Recurrence risk with biologic mesh was 20.5 % (26 of 127 patients) and with synthetic mesh was 5.6 % (7 of 126 patients), with an absolute risk reduction of 14.9 % with the use of synthetic mesh (95 % CI: -23.8 % to -6.1 %; p = 0.001). There was no significant difference in overall 2-year risk of surgical site occurrence requiring a procedural intervention between the groups (odds ratio [OR] of 1.22; 95 % CI: 0.60 to 2.44; p = 0.58). Median (IQR) 30-day hospital direct costs were significantly greater in the biologic group versus the synthetic group ($44,936 [$35,877 to $52,656] versus $17,289 [$14,64 to -$22,901], respectively; p < 0.001). There was also a significant difference in the price of the prosthetic device between the 2 groups (median [IQR] cost biologic, $21,539 [$20,285 to $23,332] versus synthetic, $105 [$105 to $118]; p < 0.001). The authors concluded that synthetic mesh demonstrated a significantly superior hernia recurrence risk compared with biologic mesh in the single-stage repair of contaminated ventral hernias with similar safety outcomes. Furthermore, the secondary endpoint of cost was greatly reduced with the use of synthetic mesh (the price of biologic mesh was over 200 times that of synthetic mesh for these outcomes), suggesting that synthetic mesh should be the device of choice for the repair of contaminated ventral hernias.

In a prospective, non-randomized, single-arm, multi-center study, DeNoto et al (2022) examined the performance of OviTex 1S (a reinforced biologic; TELA Bio Inc., Malvern, PA) over 24 months when used for ventral hernia repair. This trial included 92 patients with ventral hernias. The surgical approach (open, laparoscopic, or robotic) and plane of placement (retro-rectus, intra-peritoneal, or pre-peritoneal) were at the discretion of the surgeon. Patients were characterized as high-risk for a surgical site occurrence (SSO) based on the following co-morbidities: BMI between 30 and 40, active smoker, chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), coronary artery disease (CAD), advanced age (75 years or older). Subjects underwent physical examinations to assess safety events and completed QOL surveys at 1 months, 3 months, 12 months, and 24 months post-surgery. A total of 65 of the 92 enrolled patients (70.7 %) completed 24-month follow-up. The Kaplan Meier estimate for risk of recurrence at day 730 (24 months) was 2.6 %; among subjects who completed their 24-month visit or had a previous recurrence, the unadjusted rate of recurrence was 4.5 % (3/66). SSOs were observed in 38.0 % of patients (35/92). The most prevalent SSO was surgical site infection occurring in 20.7 % (19/92) of patients, followed by seroma formation, which occurred in 13.0 % of patients; however, only 3.3 % required intervention. HerQLes and EQ-5D assessments showed improvement from baseline as soon as 3 months post-surgery. Continued improvement was observed through 24 months. The authors concluded that the BRAVO study showed that use of the ovine reinforced tissue matrix OviTex 1S was a viable option for use in ventral hernia repair. Moreover, these researchers stated that additional studies with longer term follow-up data are needed to draw definitive conclusions regarding the use of OviTex 1S.

The authors stated that this study had several drawbacks. First, this was a non-randomized, observational study with no comparisons to a direct control. Addition of a control arm could aid in definitively determining any direct effects of ventral hernia repair with a reinforced biologic. Second, this trial did not require a single surgical technique or plane of placement that may have contributed to varying results. Third, assessment of recurrence was based primarily on clinical examination, potentially missing asymptomatic recurrences. Fourth, due to the heterogeneity of ventral hernia repair patients and the unique study design for each clinical trial, comparisons with results published in the literature should be made

with caution. Fifth, long-term follow-up visits occurred during the period of March 2020 through August 2021 when COVID 19 was having significant impacts on healthcare facilities and staff. To account for higher than expected lost to follow-up, Kaplan Meier analysis was used; and these results were displayed alongside unadjusted observed results.

de Figueiredo et al (2023) stated that ventral hernia repair is one of the most common operations performed worldwide, and using mesh is standard of care (SOC) to lower recurrence. Biologic meshes are increasingly employed to minimize complications associated with synthetic mesh, but with significantly higher cost and unclear effectiveness. Until recently, most of the evidence supporting the use of biologic meshes was from retrospective cohorts with high heterogeneity and risk of bias. In a meta-analysis, these researchers examined randomized controlled trials (RCTs) comparing the outcomes of synthetic and biologic mesh in elective open ventral hernia repair. They carried out a literature search of PubMed, Embase, and Cochrane Library databases to identify RCTs comparing biologic and synthetic mesh in elective open ventral hernia repairs. The post-operative outcomes were evaluated by means of pooled analysis and meta-analysis. Statistical analysis was conducted using RevMan 5.4; heterogeneity was assessed with I2 statistics. A total of 1,090 studies were screened, and 22 were fully reviewed. A total of 4 RCTs and 632 patients were included in the meta-analysis; 58 % of patients had contaminated wounds (Wound Classification II to IV). Hernia recurrence (OR of 2.75; 95 % CI: 1.76 to 4.31; $p < 0.00001$; I2 = 0 %) and surgical site infections (OR of 1.53; 95 % CI: 1.02 to 2.29; $p = 0.04$; I2 = 0 %) were significantly more common in patients with biologic mesh. The rates of seroma, hematoma, and mesh removal were similar in both groups. The authors concluded that as compared to synthetic mesh, biologic meshes resulted in increased hernia recurrences and surgical site infections. These researchers stated that available evidence supports macroporous, uncoated synthetic mesh as the implant of choice for elective open ventral hernia repair, and its use should be considered even in contaminated cases.

Fascial Defect Closure During Ventral Hernia Repair

Jeong et al (2023) stated that during minimally invasive ventral hernia repair (VHR), it is unclear if a fascial defect closure, as opposed to a bridged repair (current care), is beneficial for patients. In a systematic review and meta-analysis, these investigators examined the available evidence on the role of fascial defect closure during minimally invasive VHR. PubMed, Embase, Scopus, Cochrane, and Clinicaltrials.gov were reviewed for RCTs that compared fascial defect closure with bridged repair. The primary outcome was major complications defined as deep/organ-space surgical site infections (SSIs), re-operations, hernia recurrences, or deaths. Secondary outcomes included SSI, seroma, eventration, hernia recurrence, post-operative pain, and QOL. Pooled risk ratios (RRs) with 95 % CIs were obtained via random effect meta-analyses. Of 579 screened studies, 6 publications of 5 RCTs were included. No significant difference in major complications (10.6 % versus 10.4 %, RR = 1.05, 95 % CI: 0.51 to 2.14, p = 0.90) or recurrences (9.0 % versus 10.6 %, RR = 0.92, 95 % CI: 0.32 to 2.61, p= 0.87) were found between groups. Fascial defect closure decreased the risk of seromas (22.9 % versus 34.2 %, RR = 0.60, 95 % CI: 0.37 to 0.97, p = 0.04) and may decrease the risk of eventrations (6.7 % versus 9.0 %, RR = 0.74, 95 % CI: 0.37 to 1.50, p = 0.41) at the expense of potentially increasing the risk of SSI (3.2 % versus 1.4 %, RR = 1.89, 95 % CI: 0.60 to 5.93; p = 0.28). Reporting of pain and QOL scores was inconsistent. The authors concluded that while fascial defect closure has sound physiologic rationale, the current evidence is inadequate to make a strong recommendation. These researchers stated that more high-quality, well-designed, multi-center studies with standardization of technique and improved reporting and analysis of clinical and patient-centered outcomes are needed.

The authors stated that this systematic review had several drawbacks. First, due to the heterogeneity and quality of reported evidence regarding patient centered outcomes in existing RCTs, these investigators were unable to carry out meta-analysis of these outcomes. Second, substantial limitations and heterogeneity among the studies made it inadvisable to use results of the meta-analysis for informing clinical patient care. Rather, the results should be used for estimates of future trials. Researchers examining this intervention should come to

consensus on standardized reporting of surgical techniques, surgeon experience, and clinical and patient centered outcome measures. Third, the total number of studies and patients on this topic is limited.

Heavy-Weight Mesh in Ventral Hernia Repair

Trindade et al (2024) noted that there is considerable variability among surgeons regarding the type of mesh used in VHR. There has been an increasing incidence of mesh fractures with light-weight (LW) and medium-weight (MW) meshes; however, height-weight (HW) mesh has been associated with a greater foreign body sensation and chronic pain. In a systematic review and meta-analysis, these investigators compared the outcomes of HW and non-HW (NHW) meshes in VHR. They systematically reviewed the PubMed, Embase, Cochrane, and Scopus databases to identify studies comparing HW with NHW meshes in VHR. Outcomes analyzed included hernia recurrence, seroma, hematoma, foreign body sensation, post-operative pain, and wound infection. These researchers carried out 2 subgroup analyses focusing on RCTs and open retro-muscular repairs. Statistical analysis was carried out using RevMan 5.4. They screened 1,704 studies; 9 studies were finally included in this meta-analysis and comprised 3,001 patients from 4 RCTs and 5 non-RCTs. The majority of patients (57.1 %) underwent open retro-muscular repair. HW mesh was significantly associated with increased in foreign body sensation (OR 3.71; 95 % CI: 1.40 to 9.84; p = 0.008); however, there was no difference in other outcomes. In RCTs analysis, there was no difference between meshes. In open retro-muscular repairs, HW mesh was associated with more seromas (OR 1.48; 95 % CI: 1.01 to 2.17; p = 0.05). The authors concluded that this study found that HW mesh was associated with more foreign body sensation. Furthermore, open retro-muscular repairs analysis demonstrated that HW was associated with more seromas. These researchers stated that further randomized studies are needed to better understand the role of HW mesh in VHR.

Routine Surgical Wound Drainage After Ventral Hernia Repair

Arora et al (2022) noted that drain practices in minimally invasive retro-muscular VHRs have largely been transferred over from open surgery without significant review. In a retrospective study, these researchers

examined the role of drains in these repairs. Using the Abdominal Wall Reconstruction Surgical Collaborative (AWRSC) registry, patients with ventral hernias who underwent enhanced-view totally extra-peritoneal (eTEP) repairs between February 2016 and September 2019 were evaluated. Patients with contamination or active infection within the surgical field, those who underwent an emergent or hybrid repair, or received a concomitant procedure were excluded. Propensity score matching based on the defect size, previous hernia repair status, and the use of posterior component separation (PCS) was used to match patients with drains to patients without drains. These investigators evaluated 180-day outcomes in terms of SSIs, surgical site occurrence (SSO), and recurrence. A total of 308 patients met the inclusion criteria. After propensity score matching, 48 patients with drains and 72 without drains were included in the analysis cohort. Those with drains were older with a greater likelihood of an incisional hernia, but were broadly similar for other relevant demographic and hernia-related variables. While there was no difference in the incidence of SSOs and SSIs between the 2 groups, these investigators reported a higher risk of SSOs needing procedural intervention (SSOPI) and recurrence, with a lengthened hospital stay in the cohort that received surgical drains. The authors concluded that the use of surgical drains in "clean" eTEP repairs of ventral hernias appeared to be common, with a selection bias for more complex cases. Based on this meat-analysis, these investigators found the use of drains was associated with longer hospital stays. The use of drains did not change the likelihood of suffering an SSI or SSO; however, the incidence of SSOPIs was higher despite the use of drains, which raised questions regarding their protective role in these repairs.

In a systematic review and meta-analysis, Mohamedahmed et al (2023) examined outcomes of drain use versus no-drain use during VHR. These investigators carried out a PRISMA-compliant systematic review using the following databases: PubMed, Scopus, Cochrane database, the Virtual Health Library, Clinical trials.gov and Science Direct. Studies comparing use of drains with no-drain during VHR (primary or incisional) were included. Wound-related complications, operative time, need for mesh removal and early recurrence were the evaluated outcome parameters. A total of 8 studies reporting a total number of 2,468 patients (drain group = 1,214; no-drain group = 1,254) were included. The drain group had a significantly higher rate of SSIs and longer operative time

compared with the no-drain group (OR: 1.63, p = 0.01) and (mean difference [MD]: 57.30, p = 0.007), respectively. Overall wound-related complications (OR: 0.95, p = 0.88], seroma formation [OR: 0.66, p = 0.24], hematoma occurrence [OR: 0.78, p = 0.61], mesh removal [OR: 1.32, p = 0.74] and early hernia recurrence [OR: 1.10, p = 0.94] did not differ significantly between the 2 groups. The authors concluded that the available evidence does not appear to support the routine use of surgical drains during primary or incisional VHRs. They were associated with increased rates of SSIs and longer total operative time with no significant advantage in terms of wound-related complications.

Marcolin et al (2023) stated that drain placement in retro-muscular VHR is controversial. Although it may reduce seroma formation, there is a concern regarding an increase in infectious complications. These investigators carried out a systematic review and meta-analysis on retro-muscular drain placement in retro-muscular VHR. They carried out a literature search of Cochrane, Scopus and PubMed databases to identify studies comparing drain placement and the absence of drain in patients undergoing retro-muscular VHR. Post-operative outcomes were assessed by pooled analysis and meta-analysis. Statistical analysis was carried out using RevMan 5.4. Heterogeneity was evaluated with I2 statistics. A total of 3,808 studies were screened and 48 were thoroughly reviewed; 4 studies comprising 1,724 patients were included in the analysis. These researchers found that drain placement was significantly associated with a decrease in seroma (OR 0.34; 95 % CI: 0.12 to 0.96; p = 0.04; I2 = 78 %). Moreover, no differences were observed in SSI, hematoma, surgical site occurrences or surgical site occurrences requiring procedural intervention. The authors concluded that based on the analysis of short-term outcomes, retro-muscular drain placement following retro-muscular VHR significantly reduced seroma and did not increase infectious complications. Moreover, these researchers stated that further prospective RCTs are needed to confirm these findings, evaluate the optimal duration of drain placement, and report longer-term outcomes.

Abdominal Binder after Ventral Hernia Repair

Deerenberg et al (2022) noted that incisional hernia is a frequent complication of abdominal wall incision. Surgical technique is an important risk factor for the development of incisional hernia. The objective of these updated guidelines (from the European Hernia Society [EHS] and the American Hernia Society [AHS]) was to provide recommendations to decrease the incidence of incisional hernia. These investigators carried out a systematic literature search of Medline, Embase, and Cochrane CENTRAL on January 22, 2022. The Scottish Intercollegiate Guidelines Network instrument was used to examine systematic reviews and meta-analyses, RCTs, and cohort studies. The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach was used to appraise the certainty of the evidence. A total of 39 studies were included covering 7 key questions, and weak recommendations were made for all of these. Laparoscopic surgery and non-midline incisions were suggested to be preferred when safe and feasible. In laparoscopic surgery, suturing the fascial defect of trocar sites of 10 mm and larger was advised, especially after single-incision laparoscopic surgery and at the umbilicus. For closure of an elective mid-line laparotomy, a continuous small-bites suturing technique with a slowly absorbable suture was suggested. Prophylactic mesh augmentation following elective mid-line laparotomy could be considered to reduce the risk of incisional hernia; a permanent synthetic mesh in either the onlay or retro-muscular position was advised. No recommendation could be made for or against the use of post-operative binders owing to the lack of data on their effect on incisional hernia or burst abdomen. The authors concluded that these updated guidelines may aid surgeons in selecting the optimal approach and location of abdominal wall incisions.

Ortiz et al (2023) stated that an abdominal binder (AB) is often prescribed following open incisional hernia repair (IHR) to reduce pain; however, the evidence is limited. In a prospective, randomized, multi-center, pilot study (the ABIHR-II Trial), these investigators examined the effectiveness of an AB on post-operative outcome following open IHR. This trial included 2 groups of patients (wearing an AB for 2 weeks during day-time versus not wearing an AB following open IHR with the sublay technique). Patient enrollment took place from July 2020 to February 2022. The primary endpoint was pain at rest on the 14th post-operative day (POD) using the

VAS. The use of analgesics was not systematically recorded. Mixed-effects linear regression models were employed. A total of 51 individuals were recruited (25 women, 26 men; mean age of 61.4 years; mean BMI of 30.65 kg/m2). The per-protocol analysis (PPA) included 40 cases (AB group, n = 21; No-AB group, n = 19). Neither group demonstrated a significant difference in terms of pain at rest, limited mobility, general well-being, and seroma formation and rate. Subjects in the AB group had a significantly lower rate of SSI on the 14th POD (AB group 4.8 % (n = 1) versus No-AB group 27.8 % (n = 5), p = 0.004). The authors concluded that wearing an AB did not have an impact on pain and seroma formation rate; but it may reduce the rate of post-operative SSI within the first 14 days after surgery. Moreover, these researchers stated that further investigations are mandatory to confirm these findings.

The authors stated that this study had several drawbacks. First, the ABIHR-II Trial, which began in 2019, faced recruitment challenges due to the COVID-19 pandemic. An amendment was requested in 2021 to reduce the pilot study's sample size from 60 to 50 patients due to the pandemic's impact on elective surgical programs in major hospitals in Germany. The authors enrolled 54 patients and examined the effect on ABs following laparoscopic umbilical and epigastric hernia repair. They enrolled 51 patients, unfortunately the drop-out rate was higher. However, from these investigators' perspective, they chose an appropriate sample size for a pilot study. Second, the SSI was not further differentiated due to a lack of a 30-day follow-up and the instruction to do so (the protocol stated: wound infection: yes or no). Third, the study relied on subjective measures, such as the VAS for pain at rest and mobility. Objective measures, such as pain medication intake and the six-min walk test (6MWT), could improve the study's reliability and generalizability. These investigators stated that future studies with power-calculated sample size, stratified randomization (hernia size) using the same mesh should consider these drawbacks to attain more robust and reliable results.

Graziani E Sousa et al (2024) noted that ABs consist of a wide compression belt that encircles the abdomen, theoretically supporting the abdominal wall; however, their use after VHR is controversial. In a systematic review and meta-analysis, these investigators examined the effectiveness of ABs in enhancing post-operative outcomes following VHR. They searched PubMed, Embase, and Cochrane Central for RCTs

comparing the effects of ABs after VHR. Outcomes included post-operative pain using the VAS, SSI, seroma formation and size, general well-being, activity limitation, forced expiratory volume in the first second (FEV1), and 6MWT. Statistical analysis was carried out with Review Manager 5.4.1 using a random-effects model. These researchers included 5 RCTs totaling 297 patients. Overall analysis showed decreased SSI rates (RR 0.21; 95 % CI: 0.07 to 0.59; p = 0.003; I2 = 0 %) and reduced pain 2 weeks after surgery (MD -0.89; 95 % CI: -1.41 to -0.37; p = 0.0008; I2 = 0 %) using ABs. For patients undergoing open VHR, it also showed reduced SSI, pain 4 weeks after surgery (MD -0.60; 95 % CI: -0.88 to -0.32; p < 0.0001; I2 = 66 %) and increased 6MWT performance 4 weeks after the procedure (MD 32.78 m; 95 % CI: 15.28 m to 50.29 m; p = 0.0002; I2 = 0 %). The authors concluded that ABs may decrease SSI, post-operative pain, and increase physical condition, especially in open VHR. Moreover, these researchers stated that further investigations are still needed to examine the role of ABs in minimally invasive techniques.

Michot et al (2024) stated that the incidence of incisional hernia after laparotomy varies between 2 % and 30 %. It is well-established that the need to control several risk factors before surgery exists (weight loss before surgery, diabetes control). Post-operative AB is frequently recommended by surgeons, yet evidence on this topic is lacking. In a systematic review, these investigators examined the available evidence on the use of AB after abdominal surgery. They carried out a comprehensive literature review between January and May 2024 using a range of search engines, including PubMed, Science Direct, Embase, Google Scholar, and Google. The following keywords were used: "abdominal binder", "abdominal support", "hernia", "girdle and hernia", "compression belt and hernia", and "abdominal support and hernia". A total of 16 studies were selected for further analysis (7 RCTs, 6 non-RCTs, and 3 meta-analyses). None of the studies reported a reduction in the incidence of abdominal dehiscence or incisional hernia. Post-operative use of the AB has been shown to reduce post-operative discomfort and pain for a limited period of up to 48 to 72 hours. There was no discernible difference in the incidence of SSI. The authors concluded that the available evidence showed that the use of AB following abdominal surgery was safe, although no benefit has been established (except for reduction in post-operative discomfort and pain for

a limited period of up to 48 to 72 hours). The natural history of incisional hernia and incisional hernia recurrence suggested that these events most commonly occur within 18 to 24 months after abdominal surgery, well beyond the time limit for wearing the AB. These researchers stated that AB may enhance comfort in select patients; however, prospective, large, randomized, multi-center studies are needed to justify their routine use, with a particular focus on the medical and economic implications.

Guideline on ventral hernias from the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) (Earle, et al., 2016) state that "Cauterization of the hernia sac, the use of pressure dressings (such as abdominal binders), or suture closure of the hernia defect may be utilized to reduce the incidence of postoperative seroma. (Low quality, Weak recommendation)." Similarly, guidelines from the International Endohernia Society (Bittner, et al., 2019) state that abdominal binders may decrease seroma formation.

Epigastric Ventral Hernia Repair Through Vaginal Natural Orifice Transluminal Endoscopic Surgery (NOTES)

Vancanneyt et al (2024) stated that VHR is a frequently performed operation and can be executed by open or laparoscopic approach. The search for even less invasive techniques continues; and natural orifice transluminal endoscopic surgery (NOTES) is a known method of minimally invasive surgery. These researchers carried out an epigastric VHR through vaginal NOTES during a concurrent hysterectomy and bilateral salpingectomy. They used the access to do a synchronous hernia repair with mesh augmentation. The technique of repair was identical to the laparoscopic intra-peritoneal onlay mesh repair (Lap. IPOM). These investigators reported a sufficient hernia repair without intra-operative complications. Furthermore, post-operatively, no problems were encountered. Follow-up after 4 weeks demonstrated a good and strong hernia repair. The complaints of the patient were relieved; and CT scan 10 months after operation revealed no recurrence nor signs of mesh infection. The authors concluded that VHR through vaginal NOTES can be considered a possible new and minimal invasive (scarless) technique for VHR; however, further investigations on a larger scale are needed to confirm the feasibility and safety of this new approach.

Enhanced-View Totally Extra-Peritoneal Repair for Ventral Hernia

Rasador et al (2024) stated that following concerns regarding an intra-peritoneal mesh, newer VHR approaches focus on placing the mesh outside of the peritoneal cavity. The enhanced-view totally extraperitoneal (e-TEP) technique employed the retro-muscular space and is suggested to be associated with decreased post-operative pain compared to the intraperitoneal onlay mesh plus (IPOM +) approach. In a systematic review and meta-analysis, these investigators compared the IPOM + with the e-TEP for VHR. They searched for studies comparing endoscopic IPOM + and e-TEP in PubMed, Embase, and Cochrane data-bases from inception until September 2023. Outcomes were VAS after 24 hours of surgery and between 7 and 10 days after surgery, operative time, LOS, seroma, recurrence, as well as re-admission. RStudio was used for statistical analysis; heterogeneity was assessed with I2 statistics, with random effect for I2 of greater than 25 %. From 149 records, 7 were included, from which 3 were RCTs, 3 were retrospective studies, and 1 was a prospective, observational study. A total of 521 patients were included (47 % received e-TEP, and 53 % received IPOM +); 1 study included only robotic surgeries, and 6 studies included only laparoscopy. Mean defect width was 3.62 cm ± 0.9 in the e-TEP group, and 3.56 cm ± 0.9 in the IPOM + group. IPOM + had higher VAS after 1 day of surgery (MD - 3.35; 95 % CI: - 6.44 to - 0.27; p = 0.033; I2 = 99 %) and between 7 and 10 days after surgery (MD - 3.3; 95 % CI: - 5.33 to - 1.28; p = 0.001; I2 = 99 %). e-TEP repair showed longer operative time (MD 52.89 mins; 95 % CI: 29.74 to 76.05; p < 0.001; I2 = 92 %). No differences were observed regarding LOS, seroma, recurrence, and re-admission. The authors concluded that the e-TEP repair was associated with lower short-term post-operative pain following VHR compared to IPOM +, but with longer operative time. Moreover, these researchers stated that further RCTs are needed to examine these findings with long-term follow-up and ascertain the role of e-TEP in the armamentarium of the abdominal wall surgeon.

Sholapur et al (2024) noted that primary ventral hernias are abnormal protrusions of abdominal viscera through the areas of weakness in the fascia of the abdominal wall. In a prospective, comparative study, these researchers compared the benefits and complications, and the overall outcome in the e-TEP Rives-Stoppa (eTEP-RS) repair versus IPOM +

repair in the management of primary ventral hernias. This trial was carried out in a tertiary-care hospital from December 2020 to January 2022. A total of 50 patients presenting with primary ventral hernias were included in the study, of whom 25 underwent IPOM + and 25 underwent eTEP-RS repairs. Group selection was carried out by simple randomization using the lottery method. Patients more than 18 years of age with primary ventral hernias presenting with a hernial defect width less than 6 cm, consenting to the study, were included in the study. Patients who did not fulfill the inclusion criteria, strangulated/obstructed hernias, recurrent/incisional hernias, connective tissue disorders, skin infections, enterocutaneous fistulas, pregnancy, morbid obesity, and parastomal hernias were excluded. The mean intra-operative duration in the eTEP-RS group (192.3 ± 16.20 mins) was significantly higher than in the IPOM + group (102.6 ± 16.78 mins, p = 0.001). The mean duration of hospital LOS in the IPOM + group (5.9 ± 2.19 days) was longer than in the eTEP-RS group (4.6 ± 3.17 days, p = 0.02). The mean post-operative pain scores, from the VAS, on days 1, 7, and 90 were 3.2 ± 1.11, 2.64 ± 1.11, and 1.68 ± 1.46 in the IPOM + group, and 1.84 ± 0.688, 0.76 ± 0.66 and 0.08 ± 0.40 in the eTEP-RS group, respectively (p = 0.001). The authors concluded that despite being a technically easy procedure requiring less intra-operative time, IPOM + had several disadvantages, such as increased post-operative pain, longer hospital LOS, higher chances of wound site seromas, and higher rates of post-operative paralytic ileus. On the other hand, eTEP-RS was a more challenging procedure requiring more intra-operative time; however, it had several advantages: less post-operative pain, shorter hospital LOS, early recovery, and fewer chances of seromas and paralytic ileus. Moreover, these researchers stated that a comparative, multi-center study with much more robust data are needed to compare and validate the differences between both procedures' short- and long-term outcomes. These investigators stated that this trial was a single-center study with a small sample size of 50. Only primary ventral hernias were included in the study, and incisional hernias were not included.

Wieland et al (2024) stated that the e-TEP is a relatively new laparoscopic approach for VHR. Since this technique is not widely used yet, the literature regarding its safety and effectiveness is limited, especially when compared to more established surgical techniques like IPOM. In a retrospective, non-randomized, single-center study, these

researchers compared the early outcomes of patients with ventral hernias that were treated with e-TEP or IPOM from 2019 to 2023. A total of 123 patients were analyzed -- 92 underwent e-TEP and 31 IPOM, respectively. Both groups were overall comparable. The IPOM group had a higher proportion of incisional hernias (61.29 % versus 21.74 %, p < 0.001). This was taken into account for in a subgroup analysis of only primary hernias. The IPOM group had a significantly longer admission time (e-TEP: 3 days, IPOM: 4 days, p < 0.001). The subgroup analysis showed a statistically significant shorter surgery time in IPOM (median of 66.5 mins versus 106.5 mins; p = 0,043) and a lower rate of post-operative complications in e-TEP (e-TEP: 4.17 %, IPOM: 25 %. p = 0.009). The e-TEP group reported lower post-operative pain, yet without statistical significance. The authors concluded that e-TEP for VHR appeared to be non-inferior to IPOM. Compared to IPOM it resulted in shorter post-operative hospital LOS and a potentially lower complication rate, despite a longer operation time. Moreover, these researchers stated that further investigations are needed to confirm these findings and examine long-term outcomes. These investigators stated that this trial had drawbacks that must be considered for interpreting the results. The most significant was the size difference between the IPOM and e-TEP groups, especially in the subgroup analysis. Due to the retrospective, non-randomized design and a decline in IPOM procedures at the authors' clinic, equal group sizes could not be achieved. The statistical power remained limited, posing a risk for type 2 errors. Furthermore, the retrospective nature of the study could result in information bias, and in some cases, not all medical data could be retrieved.

Saleh et al (2024) noted that the e-TEP repair has several theoretical advantages over the traditional IPOM repair for ventral hernias, including the use of less expensive non-barrier coated mesh and avoiding complications of intra-peritoneal mesh. However, one area in need of further investigation is cost and clinical comparisons following robotic e-TEP with IPOM. A retrospective, matched cohort study was carried out in patients with mid-line ventral hernias undergoing robotic e-TEP or IPOM at a single academic institution from November 2019 to August 2023. Participants were matched based on demographics, hernia defect size, and whether they underwent concomitant procedures. Primary outcomes included supply costs; and secondary outcomes included operative time, hospital LOS, complications, recurrence, as well as inpatient opioid use.

A total of 88 matched patients were included: 44 IPOM and 44 e-TEP. Mean age was 57 years, BMI was 35 kg/m2, and 54.5 % were men. Hernia size was similar for both groups: 25 (6 to 73) cm2 for the IPOMs versus 40 (14 to 68) cm2 for e-TEPs (p = 0.21). There was no significant difference in total supply costs between IPOMs and e-TEPs: $2,338 (2,021 to 3,249) versus $2,082 (1,619 to 3,394) (p = 0.5), respectively. Mean operative time was significantly lower for IPOMs 159.6 ± 57.8 mins versus 198.0 ± 67.1 mins (p = 0.006), while the average hospital LOS was significantly longer for IPOMs: 1.7 ± 1.2 days versus 1.2 ± 1.3 days (p = 0.021). Total inpatient milligram morphine equivalents (MME) utilized was greater for IPOM: 61 (36 to 102) MME versus 29 (10 to 64) MME (p = 0.003). Post-operative complications and recurrence rate were similar. The authors concluded that there was no difference in total supply costs between patients undergoing robotic IPOM and e-TEP repairs for mid-line ventral hernias. These investigators stated that although this trial found significant differences in total inpatient MME utilized and hospital LOS, it was debatable whether these were clinically significant. These researchers stated that further investigations are needed to determine appropriate indications for e-TEP over IPOM.

Laparoscopic Intracorporeal Rectus Aponeuroplasty (LIRA) for Ventral Hernia Repair

Balthazar da Silveira et al (2024) stated that laparoscopic intracorporeal rectus aponeuroplasty (LIRA) emerged as a method that combines benefits from minimally invasive and abdominal wall reconstruction with defect closure, restoring the mid-line without tension by folding the posterior aponeurosis of both abdominal rectus muscles and using intraperitoneal mesh repair. In a systematic review, these investigators examined available evidence on LIRA results and potential applications. They carried out a thorough search of Cochrane Central, Scopus, SciELO, LILACS, and PubMed/Medline, focusing on studies that examined LIRA's possible applications and results. Key outcomes evaluated included recurrence, seroma, hematoma, SSI, and hospital LOS. These researchers included both analytic data and descriptive studies. Out of 128 screened studies, 3 met the inclusion criteria and comprised 113 patients, of which 69 (61.1 %) were operated using LIRA. Three studies comprised 2 case series of conventional and robotic LIRA repair, and 1 comparative study of LIRA versus intraperitoneal underlay

mesh repair (IPUM plus). No SSI were reported. Seroma rates ranged between 11.1 % and 50 %, while no bleeding or hematoma was noted. There were no patients presenting recurrence in a median follow-up ranging from 12 to 15 months, despite the comparative study reporting a 4.4 % rate of bulging without clinical recurrence. The mean hospital LOS ranged from 12 hours to 36 hours. LIRA presented no differences in post-operative complications compared to the IPUM plus technique. The authors concluded that this systematic review of 3 studies and 113 patients showed that LIRA presented low SSI, hematoma and clinically relevant seroma rates, without registers of recurrence in a follow-up of up to 15 months. A trend toward low hospital LOS and an increased operative time was evidenced for the robotic approach highlighting the potential of LIRA to improve patient outcomes. Moreover, these researchers stated that it is important to point out the low number of patients and studies published on the literature; thus, further investigations with larger samples and an increased follow-up are needed to support the use of LIRA for VHR.

These investigators stated that among the studies included in this review, only 1 compared LIRA with another technique, and no studies compared LIRA with other minimally invasive surgery (MIS) techniques like TAPP (trans-abdominal pre-peritoneal), e-TEP, IPOM, and MILOS (mini- or less-open sublay operation). Furthermore, the hernia characteristics between the studies were highly heterogeneous, entailing primary, incisional, recurrent hernias as well as distasis. In addition, the learning curve for this new and not widely used technique needs to be better examined. Finally, due to the limited number of studies, a meta-analysis to show pooled results, especially related to post-operative complications, was not feasible. However, these findings also revealed a clinically important difference in important outcomes such as bulging rates, highlighting the need of more studies analyzing the LIRA technique.

Gomez-Menchero et al (2024) compared the post-operative outcomes of the LIRA technique to the IPOM + approach, in terms of recurrence and bulging rates at 1-year follow-up; secondary aim was to compare the post-operative complications, seroma, and pain at 30 days and 1-year after surgery. Patients with mid-line ventral hernia of 4 to 10 cm in width were included. Computed tomography (CT) scan was carried out before, 1 and 12 months after surgery; and pain was evaluated using the VAS. A

total of 45 and 47 consecutive patients underwent LIRA and IPOM +, respectively. Pre-operatively, smoke habits and COPD rates were statistically significantly higher in the LIRA group (p = 0.0001 and p = 0.012, respectively). Two bulging (4.4 %) occurred in the LIRA group, while in the IPOM + group occurred 10 bulging (21.3 %) and 3 recurrences (6.4 %) (p = 0.017 and p = 0.085, respectively). Post-operatively, 7 (15.6 %, Clavien-Dindo I) and 4 complications (8.5 %, 2 Clavien-Dindo I, 2 Clavien-Dindo III-b) occurred in the LIRA and in the IPOM plus group, respectively (p = 0.298). One month after surgery, clinical seroma, occurred in 5 (11.1 %) and 8 patients (17 %) in the LIRA and in the IPOM + group, respectively (p = 0.416). During follow-up, pain reduction occurred, without statistically significant differences. The authors concluded that even if they analyzed a small series, LIRA showed lower bulging and recurrence rates in comparison to IPOM + at 1-year follow-up. Moreover, these researchers stated that further prospective studies, with a large sample of patients and longer follow-up are needed to draw definitive conclusions.

Peritoneal Flap Hernioplasty for Repair of Ventral Hernia

Regmi et al (2024) noted that primary closure of large ventral hernia is difficult and is usually complicated by post-operative mesh bulge, migration, and higher recurrence. Techniques like component separation and bridging mesh, transversus abdominus release, da Silva triple-layer repair, as well as peritoneal flap hernioplasty (PFH) are common therapeutic options. In a systematic review and meta-analysis, these investigators examined the early post-operative and long-term outcomes of PFH for large ventral hernias. They carried out a systematic literature search on the electronic data-bases of PubMed, Web of Knowledge, and Scopus till July 28, 2024. These researchers conducted a single-arm meta-analysis of non-comparative studies using OpenMeta[Analyst] software (Center for Evidence-Based Medicine, Brown University, RI). A total of 5 studies including 432 patients (238 male and 194 female patients in a ratio of 1.23:1.0) underwent PFH for large ventral hernia. The estimated proportion of patients who may experience skin necrosis, seroma, hematoma, superficial SSI, and deep mesh infection were 1.2 % (95 % CI: 0.001 to 0.022; I2 = 0.53 %) 5.8 % (95 % CI: 0.036 to 0.080; I2 = 0 %), 3.7 % (95 % CI: 0.007 to 0.067; I2 = 59.32 %), 10.6 % (95 % CI: 0.077 to 0.135; I2 = 0 %), and 0.9 % (95 % CI: -0.004 to 0.022; I2 = 15.99

%) respectively. Similarly, the estimated recurrence rate and chronic pain following PFH was 1.9 % (95 % CI: 0.005 to 0.033; I2 = 2 %) and 11.6 % (95 % CI: 0.032 to 0.200; I2= 83.43 %), respectively during the mean follow-up time of 33 months (95 % CI: 1.9 to 64.1). The authors concluded that PFH appeared to be a safe and feasible procedure for the repair of complex or large ventral hernias where it was difficult to perform primary fascial closure. Moreover, these researchers stated that further investigations with a direct comparison of PFH with component separation techniques are needed to validate these findings.

Transabdominal Preperitoneal Ventral Hernia Repair With Rectus Aponeuroplasty (TAPPRA) for the Management of Incisional Hernia

Bosley et al (2024) noted that options for minimally invasive VHR continue to evolve as a function of the understanding of the abdominal wall and the development of new techniques. In a retrospective study, these researchers described a robotic trans-abdominal pre-peritoneal repair with concurrent rectus aponeuroplasty (TAPPRA) for incisional and recurrent ventral hernias. All patients in this trial underwent TAPPRA repair between October 2023 and March 2024. These investigators examined intra-operative feasibility of the technique and evaluated immediate post-operative outcomes. A total of 12 patients underwent TAPPRA repair for incisional and/or recurrent ventral hernias at an academic hernia center. The median case duration was 135 mins with no significant intra-operative complications noted. Average defect size for the hernias was 6.5 × 8.5 cm. Polypropylene mesh was used to reinforce all defects, with the average dimensions being 19.7 × 21.5 cm; and 83 % of patients were discharged within 24 hours of their procedure. No significant post-operative complications were noted. The authors described the 1st use of a novel ventral hernia repair technique, TAPPRA, and showed that it was safe, feasible, and associated with appropriate short-term outcomes for repair of moderate sized incisional hernias. Moreover, these researchers stated that further more robust investigations examining the optimal patient selection strategy and long-term outcomes are needed to examine if this technique can be more broadly applied. These investigators are currently collaborating with other hernia centers to examine the use of this technique and compare it to other minimally invasive surgery (MIS) techniques for VHR.

The authors stated that this study had several notable drawbacks. First, it was a retrospective review of select cases carried out at a high-volume hernia center. The surgeons included in this trial has completed a formal fellowship in abdominal wall reconstruction and has overcome their initial learning curve in robotic ventral hernia repair. Second, this study exclusively examined feasibility of conducting these repairs with limited information on long-term outcomes. Although those findings will be paramount, this technique is a derivative of commonly performed operations that are well described in the hernia literature and have shown acceptable long-term results. These investigators were encouraged by the low rate of short-term complications and looked forward to long-term follow-up with these participants. Third, the operations were carried out using robotic surgical platform. Although these techniques can be performed with traditional laparoscopic instruments, robotic assisted surgery facilitates management of complex peritoneal flaps and may make broad adoption challenging.

Abdominoplasty Combined with Hip Expansion by Fat Grafting for Waistline Contouring

Cortes et al (2024) stated that recent socio-cultural trends revealed many patients requesting more curvaceous profiles. Abdominoplasty techniques had evolved into a combination of fascial plication with liposuction of the lateral torso, but often left patients with "boxy" profiles. The senior author carried out 360-degree liposuction of abdomen and back, hip expansion with structural fat grafting, excision of redundant soft tissue, and wide plication of abdominal fascia to create the desired profile. These investigators carried out a retrospective review of patient charts and CosmetAssure claims of female patients treated from January 2014 through May 2022. They identified 1,125 patients with a minimum 6-month follow-up who underwent abdominoplasty using 360-degree liposuction of waist, back, and flanks; wide plication of the rectus abdominis muscle; and hip expansion with fat grafting. These researchers reviewed pre- and post-operative photographs to examine the technique's effectiveness. Hip expansion with fat grafting combined with abdominoplasty was successfully achieved in 1,125 cases. Average age was 38 years; average BMI was 29 kg per m2; average amount of aspirated fat was 1,896 ml; and average amount of fat injected into the bilateral hips was 493 ml. Complication rates were comparable to those

observed in similar abdominoplasty series reported in the literature. The authors concluded that abdominoplasty combining liposuction of the waist, back, abdomen, and flanks followed by wide fascial plication and expansion of the hips with fat grafting was a safe, reproducible technique for female patients. This technique prioritized the hip anatomical area as an aesthetic consideration in abdominoplasty and facilitated creating a harmonious hip-to-waist ratio characteristic of a feminine figure.

Component Separation for Management of Ventral Hernias

According to the StatPearls topic review on "Ventral Hernia" (Smith and Parmely, 2023), abdominal ventral hernias are non-inguinal, non-hiatal defects in the fascia of the abdominal wall. Ventral hernias can be acquired or congenital with the vast majority being of the former type. Acquired hernias can result fom previous surgery causing an incisional hernia, trauma, and repetitive stress on naturally occurring weak areas of the abdominal wall. These naturally occurring weak areas in the abdominal wall include the umbillicus, semilunar line, ostomy sites, bilateral inguinal regions, and esophageal hiatus. Obesity is another significant contributing factor of hernias due to stretching of the abdominal fascia and causing it to weaken. Ventral hernias are commonly managed with surgery.

Component separation is surgical technique employed to provide adequate coverage for midline abdominal wall defects such as a large ventral hernia. This approach is based on subcutaneous lateral dissection, fasciotomy lateral to the rectus abdominis muscle, and dissection on the plane between external and internal oblique muscles with medial advancement of the block that includes the rectus muscle and its fascia. This release enables medial advancement of the fascia and closure of up to 20-cm wide defects in the midline area (Heller, McNichols, and Ramirez, 2012).

In UpToDate topic reviews on "Management of ventral hernias" (Brooks and Petro, 2025) and "Overview of component separation" (Petro, 2025), the authors note that the need for component separation in ventral hernia repair is guided by hernia width > 10 cm or loss of domain (i.e., having > 50% of viscera outside of the boundaries of the abdomen) when used with open mesh repair or in cases where hernia width is > 10 cm

(component separation can facilitate anterior fascial closure) or in cases where hernia width is 7 to 10 cm and hernia width to rectus abdominus muscle width ratio is ≥ 2 (although component separation is unlikely required for anterior fascial closure, it can facilitate posterior fascial closure and retromuscular mesh placement).

Glossary of Terms

Term	Definition
Diastasis recti	A thinning out of the anterior abdominal wall fascia
Intertrigo	Dermatitis occurring on opposed surfaces of the skin, skin irritation, infection or chafing

Appendix

Diagnostic Criteria for **Lipedema**

The diagnosis is established when the member has the following findings from history (I) and physical examination (II). In equivocal cases, the extra findings (III) can establish the diagnosis.

I. Medical history - *all* of the following (A, B, C, D and E):

A. Disproportionate fat distribution; *and*
B. Lack of influence of weight loss on disproportionate fat distribution; *and*
C. Sensitivity to pain and easy bruising in fat distribution; *and*
D. Sensitivity to touch and fatigue in extremities; *and*
E. No reduction of pain when raising extremities.

II. Physical examination - one or more of the following (A, B, C, or D):

A. Upper leg:

1. Disproportionate fat distribution; *and*
2. Circularly thickened subcutaneous fat layer

B. Lower leg:

1. Proximal thickening of subcutaneous fat layer; *and*
2. Distal thickened of subcutaneous fat, accompanied by slender instep (cuff-sign)

C. Upper arm:

1. Significantly thickened subcutaneous fat layer in comparison with vicinity; *and*
2. Sudden stop at elbow

D. Lower arm:

1. Thickened subcutaneous fat; *and*
2. Slender back of hand (cuff-sign).

III. Extra criteria - *either* of the following (A or B):

A. Pain when applying bi-manual palpation; *or*
B. Distal fat tissue tendrils of the knee (popliteus).

Source: Adapted from Halk & Demstra (2016).

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The above policy is based on the following references:

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