Inguinocrural dermolipectomy
A retrospective study

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Vincenzo Vindigni, Paolo Marchica, Andrea Pagani, Franco Bassetto

Department of Neurosciences, Clinic of Plastic Surgery of Padua, University of Padua, Padua, Italy

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INTRODUCTION AND AIM: *Inguinocrural dermolipectomy is a constantly increasing surgical procedure, especially for post-bariatric patients with significant weight loss. The "crescent medial" and "vertical medial" thigh lifting techniques (CMTL/VMTL) are the most effective type of surgery to treat laxity and excess of skin and soft tissues in the medial region of the thighs*
Aim of this article is to suggest which patients may be eligible for a surgical thighplasty with an acceptable risk of post-operative complications.
MATERIALS AND METHODS: *We performed a retrospective study with 30 female patients who underwent a surgical thigh-plasty between 2018 and 2008.*
Several parameters were evaluated such as age, patient weight and BMI before weight loss and before plastic surgery, the mode of weight loss (surgical vs. non-surgical), the type of technique performed ("crescent medial" vs. "vertical medial"), the association with other surgical procedures of size reduction plastic operation (ICD10 Procedure Code 8683), smoking at the time of the intervention. The correlations between these preoperative parameters and the development of postoperative complications were taken into consideration and different outcomes were evaluated, of which the modification of the size of the trousers after the thigh lifting operation, the days of hospitalization, the maintenance time drainage, the time needed to return to normal daily activities and improvement in the same, in walking and in physical activity after the execution of the procedure and the satisfaction in general of the patients.
RESULTS: *The association with other excisional surgeries such as brachioplasty, abdominoplasty or mastopexy, the BMI before thighplasty and weight loss modality condition significantly influence patient's post-operative outcomes.*
However, there is no clear correlation with age, smoking, the type of plastic surgery performed and its possible association with liposuction, and a drastic "drop" of BMI.
DISCUSSION: *In our opinion, even more than a single parameter predicts patients' post-operative complications. Acting on the significant findings of our investigation, surgeons could minimize post-operative risks as well as surgical minor complications.*
CONCLUSIONS: *Therefore we advise to evaluate these factors before the intervention in order to select the patients more accurately and define the ideal candidate patient for inguinocrural dermolipectomy, so as obtain a reduction in postoperative complications.*

KEY WORDS: Body contouring, Massive weight loss, Thigh lift

Introduction

Due to high number of surgeries after massive weight loss, the inguinocrural dermolipectomy represents an increasingly widespread procedure. Because of its weight history, the massive weight loss (MWL) patient represents a distinct entity from the other plastic surgery patients. The drastical change of the BMI following both bariatric surgery or lifestyle's changes causes a pressing modification in the soft tissue, leading progressively to excess skin in different body districts[1-3]. Among the most affected areas, the medial region of the thighs, by running from the inguinal fold to the distal third above the knee joint, plays a fundamental role[4]. Collagen fiber is reduced in postbariatric patient compared to the never

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Correspondence to: Paolo Marchica, MD, Department of Neurosciences, Clinic of Plastic Surgery, University of Padua, Via Nicolò Giustiniani 2, 35128, Padova, 35137, Italy (e-mail: paolomarchica91@gmail.com)

obese patient. Elastic fiber content is not damaged. Thus, weight loss leads an alteration of the collagen and elastic fibers ratio and developing of soft tissue laxity and characteristic asymmetries. Especially at this level, the continuous contact of excess tissues makes even daily activities difficult, causing, over time, irritative dermatitis and severe infections. Moreover, also the aesthetic impact of medial skin redundancy presents important psychological repercussions[5]. Massive weight loss patients feel uncomfortable with their physical appearance, with a wrong perception of their appearance, relationships and self-esteem[6,7] (Fig. 1).

Since the first studies, numerous surgical techniques tried to solve definitely the soft tissue redundancy at this level, in order to improve outcome's predictability and post-operative complications[5]. At present, there is increasingly interesting to find the most effective surgery for skin excess along the thigh region. The main technique is represented by the Pitanguy's procedure, with two different variants, the crescent medial thigh lift (CMTL) and the vertical medial thigh lift (VMTL). Both surgeries are associated with suspension to Colles' fascia in order to reduce postoperative complications as cutaneous ptosis and vulvar widening. Whereas the crescent medial thighplasty manages vertical excess with a superomedial incision along the thigh and a concomitant resection of horizontal adipocutaneous tissue, the vertical medial thighplasty is extended beyond the proximal third of the thigh, ideal to treat major cutaneous deformities and fat excess. The CMTL variant is mostly associated with liposuction and leads to a characteristic scar, specifically in the inguinal region and perineal crease. Its ability to manage minor medial laxities at proximal one third of thigh lowers operative times allowing a faster recovery time. On the other side, the VTML determines a vertical inguinal and perineal scar, able to manage skin laxity and major adiposity until the third inferior of thighs. Nevertheless, it leads to increased risk of lymphedema, impaired wound-healing, longer recovery and operative times. A variation of Pitanguy's techniques is represented by the characteristic heart-shaped incision with a circumferential thigh lift (CTL). Although this surgery forms often a deep undesired scar, it presents lower risk of ptosis, and a stronger anchorage of the thigh flap[8]. To date, overall complication rates are about 49% for the crescent medial technique and 74% for long vertical technique[9]. While major complications (e.g. reintervention (Fig. 2), lymphedema, severe anemia, deep vein thrombosis and pulmonary embolism) are fortunately rare (<1%), this surgery entails numerous minor complications (e.g. hematoma, hypertrophic scars, skin necrosis and wound infections) of which both patients and surgeons should be forewarned during preliminary consultation[10].

Considering all these aspects, aim of this retrospective study is to compare different patients' peri-operative aspects with consequent post-operative outcomes. This would allow surgeons to select patients in a more accurate way, so as to heightened outcomes' predictability and obtain a following reduction of minor as well as major complications.

Materials and Methods

Authors performed a retrospective study with 30 caucasian female patients who underwent a surgical thighplasty between June 2018 and June 2008. Requirements of the Declaration of Helsinki as well as principles of GCP were taken into consideration. Patients gave full consent to use their personal data. Patients were randomly selected from a list of all patients who underwent a thigh lift procedure, by respecting inclusions' and exclusions' criteria [11,12].

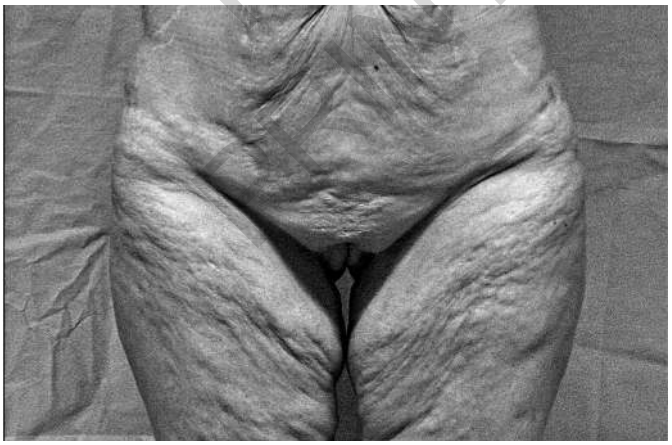

Fig. 1: The drastic change of the BMI causes a pressing modification in the soft tissues, leading progressively to excess skin and subcutaneous layer in the thigh region.

Fig. 2: Postoperative major complications after a Crescent Medial Thigh Lift.

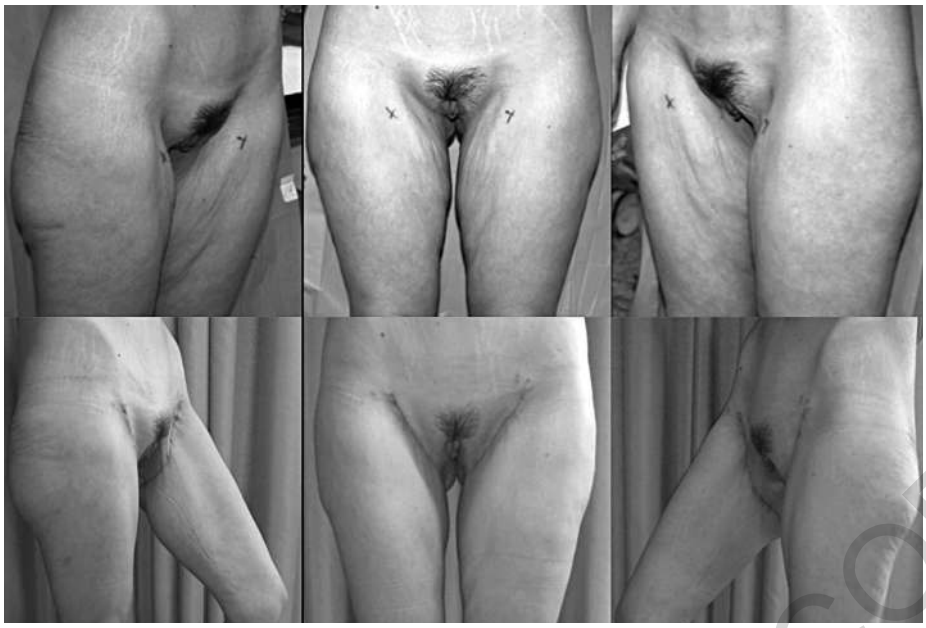

Fig. 3: Preoperative situation and postoperative results after the Crescent Medial Thigh Lift, case 1.

To undergo surgery, patients had to reach a stable weight condition at least for 6 months and resolve definitely their eventual medical and/or psychiatric comorbidities. In addition, we considered patients with a drop of their Body mass index of more than 5 (before weight loss vs. before thigh lift). While fourteen patients reported a delta BMI>15, the other sixteen were below this cutoff. Especially this consideration allowed us to include patients with a BMI of more than 35. In our investigation, the main exclusions criteria were represented by a significant drop of the BMI<5, presence of wound-healing disorders and systemic comorbidities. Moreover, comprehensive pathologies able to preclude general anesthesia and infections of the inguinocrural or genital district were considered as absolute contraindications for the surgical intervention [13]. As already considered by several authors, smoking was mentioned as a relative contraindication to surgery.

Patients were clinically evaluated and asked about few outcome's indicators. Mean age of the resulting sample was 45.7 years (range, 23-66 years). While 18 patients reduced their weight following a bariatric surgical path, the other 12 patients acted on their lifestyle. Mean delta trousers size was 2.26 [European Legislation EN13492 – Size designation of clothes]. The mean BMI before weight loss was 45.11 kg/m^2 (range, 31.60 – 63.25

Table I - *The Pittsburgh Rating Scale* [14].

Medial thighs	**0 - Normal**	**none**
	1 - Excessive adiposity	UAL and/or SAL + excisional lifting procedure
	2 - Severe adiposity and/or severe cellulitis	UAL and/or SAL + excisional lifting procedure
	3 - Skin folds	Excision lifting procedure

Table II - *The different perioperative aspects of the patient sample.*

Middle age - years	**45,7**	
Average final weight (prior to bariatric surgery) - kg	120,32	
Average initial weight (prior to bariatric surgery) - kg	75,72	
Initial average BMI (prior to bariatric surgery) – kg/cm2	45,11	
Finale average BMI (prior to thighplasty) - kg/cm2	28,28	
modality of weight loss (non-surgical/surgical)	12/30 (40%)	18/30 (60%)
Type of surgery (CMTL/VMTL)	24/30 (80%)	6/30 (20%)
Liposuction (yes/no)	23/30 (76.6%)	7/30 (23.3%)
Smoking (yes/no)	7/30 (23.3%)	23/30 (76.6%)
Other associated procedures (e.g. abdominoplasty, mastopexy, brachioplasty) - yes/no	11/30 (36.6%)	19/30 (63.3%)

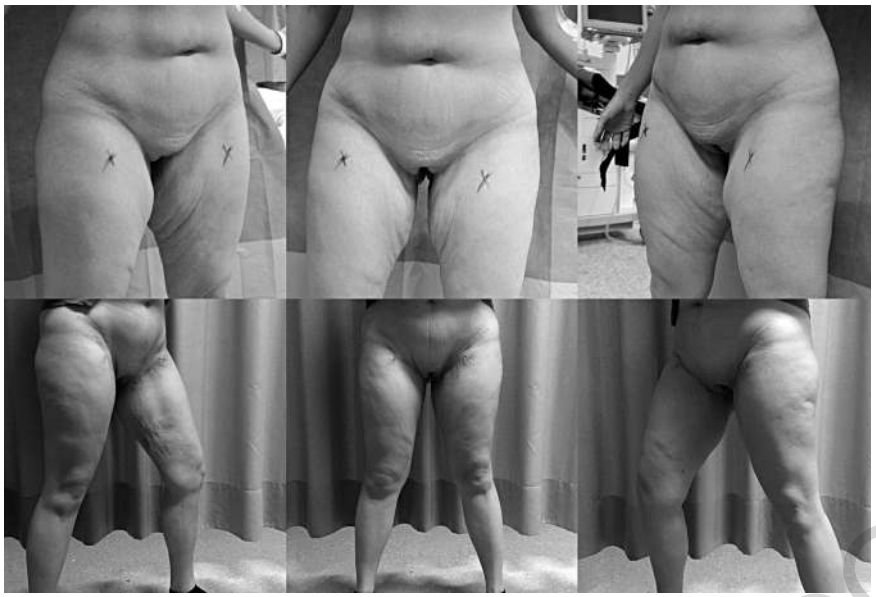

Fig. 4: Preoperative situation and postoperative results after the Crescent Medial Thigh Lift, case 2.

kg/m^2). The average BMI prior to thigh lift was 28.28 kg/m^2 (range, 19.95 – 44.38 kg/m^2). Consequently, we report a mean Delta BMI of 16,83 kg/m^2.

Regarding the type of surgery performed (CMTL vs. VMTL), every single patient received its specific treatment considering the Pittsburgh rating scale[14] (Table I). While the majority of the patients (24) received a crescent medial thighplasty, 6 patients underwent a vertical medial thigh lift (Figs. 3, 4). Patients were identified by the type of excisional procedure (CMTL/VMTL) performed. Other surgical procedures as abdominoplasty, mastopexy and brachioplasty were associated in some cases (11 times); 23 excisional lifts were specifically associated with liposuction (Table II). All patients received antibiotic and antithrombotic perioperative prophylaxis (e.g. pneumatic leggings up to departmental mobilization and enoxaparin sodium for 15 days after surgery). For the two months following the operation, all patients used thigh compression garments of class II, moderate 23-32 mmHG (The European Committee for Standardization CEN reference standard: CEN / TC205 - prEN12718).

In second instance, different clinical data were combined with corresponding responses of treated patients. Different aspects of which age, patients' weight (before weight loss and before thighplasty), delta BMI (before weight loss vs before thigh surgery), type of plastic surgery (CMTL vs. VMTL), modality of weight loss, the eventual association with other excisional procedures (e.g. liposuction, brachioplasty, abdominoplasty, mastopexy), use of tobacco and delta trousers (pre- and post-thighplasty) size were investigated. High quality perioperative pictures from the anterior, anterolateral right/left and lateral right/left view were performed. Additionally, various parameters such as number of hospitalization days, maintenance days of drainages, major and minor surgery complications, postoperative pain, the general physical improvement and time of return to daily activities, the deambulation and overall satisfaction were evaluated. All statistical analyses were performed using a 2-tailed Fisher Exact Test in order to assess pre-operative risk factors and post-operative complications. P-values<0.05 were considered statistically significant [GraphPad Prism 7 for Mac OS X, V. 7.0a, 2016; Office 365 MS Excel for Mac OS X, V. 16.18 (181014)].

TABLE III - *The statistical evaluation. Data were considered as significant when p<0.05.*

Smoking	**Yes**	**No**	**P>0.05**
Type of surgery	CMTL	VMTL	P>0.05
Modality of weight loss	Non-surgical	Surgical	P<0.05
BMI [cut off - 15]	<15	≥15	P>0.05
preoperative BMI [cut off - 30]	<30	≥30	P<0.05
Liposuction	Yes	No	P>0.05
Other associated surgeries (brachioplasty; mastopexy; abdominoplasty	Yes	No	P<0.05
Age [cut off - 50]	<50	≥50	P>0.05

TABLE IV - *The patients' postoperative outcomes.*

Delta trousers average size (EN13402)	**2,26**
Average hospitalization (days)	3,6
Drainages (average maintenance time - days)	3,5
Time to normal activities (days)	33,4
Improvement of daily movements	4,5/10
Walking improvement	4,6/10
Physical activity improvement	4,4/10
Satisfaction	6,9/10
Surgery complications	20 of 30
Major	2 of 20
Minor	18 of 20
Surgery complications (smokers/non-smokers)	5 of 7 / 15 of 23

Results

This retrospective study aims to suggest which patients can undergo thigh dermolipectomy with an acceptable risk of complications. Our results show that the association with other excisional treatments except for liposuction (e.g. brachioplasty, abdominoplasty, mastopexy), the BMI before thighplasty (cut off=30) and weight loss modality significantly condition patients' post-operative outcomes (Table III). Synergistically, avoiding the association with other excisional treatments except for liposuction, patients with a preoperative BMI of less than 30, and a non-surgical weight loss modality correlate positively with patients' outcomes.
Despite its proven negative impact in other studies[15-18], authors didn't find a significant correlation between the use of tobacco and following post-operative complications. No clear correlation between age (cut off = 50), patients' weight, type of surgical thigh lift (CTML vs. VTML) and its eventual association with liposuction, a drastic drop in the BMI (cut off = 15), and following patient's outcomes emerged. Additionally, authors evaluated the patient sample during the postoperative course at one year after surgery. In the following table, we report the evaluated patients' outcomes (Table IV).

Discussion

From the current literature, we analyzed two main studies correlating patients' risk factors and following outcomes [4,19-21]. Bertheuil et al.[10] considered the BMI both prior to massive weight loss and before plastic surgery as the main predictive factors able to condition the post-operative follow up. Other parameters as age, initial weight, weight loss prior to thigh lift and delta BMI, weight loss modalities, diabetes, hypertension, use of associated liposuction and type of excisional surgery performed (CMTL vs. VMTL), were not found to be significant risks. In a subsequent work, Gusenoff et al.[4] concluded that patients' age and anemia are statistically associated with a considerable rate of minor and major complications.
Coherently with most of the above-mentioned conclusions, our retrospective study proves that different risk factors as age, type of surgery (CTML/VTML), their association with liposuction and delta Body mass index did not significantly condition patients' outcomes and complications.
In addition to prior investigations, we report that more than a single parameter could significantly predict patients' outcomes and the eventual development of surgical complications [4,10]. The association with other excisional treatments except for liposuction (e.g. brachioplasty, abdominoplasty, mastopexy), the BMI value prior to plastic surgery (cut off-30) and the weight loss modality condition significantly patient's post-operative follow up. As a consequence, authors recommend minimizing post-operative risk by acting on these parameters during the surgical plan of action.
Since patients' before-thighplasty BMI and the association with other procedures are modifiable factors, authors suggest excluding patients who meet these conditions, in order to reduce substantially minor surgery complications and improve patients' outcomes. To date, this trend is already reported in the literature in regard to other bariatric procedures.
On the other side, being the weight loss modality a non-modifiable aspect, it is crucial to act synergically through an integrated approach on risk factors (e.g. smoking, physical activity, healthy lifestyle) in order to obtain a consequent decrease of post-operative complications. Concerning our clinical experience, avoiding the use of tobacco, setting extreme aged surgery candidates (>65 years) aside and excluding patients who undergone extremely wide drops of the BMI, or with poor glycemic control, should be always considered as valid pre-operative guidelines.
Nevertheless, given the reduced sample size, some results (e.g. use of tobacco) could be influenced by a sampling number error. Whereas the temporal distance between surgery time and patient's evaluation could represent a possible source of bias, a 1-year patients' observation time-from-surgery was established.

Conclusions

Altogether, even more than a single parameter may predict patients' post-operative outcomes. Authors suggest minimizing post-operative risks by acting on the significant findings of our retrospective study: before-thighplasty BMI, the association with other excisional procedures except for liposuction and a surgical weight loss modality.
We suggest considering these aspects preoperatively, in order to help surgeons to select patients in a more accurate way, so as to envisage a reduction of surgical complications with a following reduction of post-operative complications. This would hopefully lead to a systematic

modification of inclusions' and exclusions' criteria, assessing consequently more effective peri-operative guidelines in this surgical field.

Riassunto

Introduzione e Obiettivo: La dermolipectomia inguinocrurale rappresenta una procedura chirurgica in costante aumento, specialmente per i pazienti postbariatrici con significative perdite di peso. Le tecniche di lifting delle cosce di tipo "crescent medial" e "vertical medial" rappresentano il tipo di chirurgia più efficace per trattare la lassità e l'eccesso di cute e tessuti molli della regione mediale delle cosce.
L'obiettivo di questo articolo è fornire un razionale per indicare quali pazienti siano i migliori candidati a questo tipo di procedura chirurgica con un rischio accettabile di complicanze postoperatorie.
Materiali e Metodi: Abbiamo eseguito uno studio retrospettivo su 30 pazienti donne che sono state sottoposte a dermolipectomia inguinocrurale tra il 2018 e il 2008. Sono stati valutati diversi parametri come l'età, il peso delle pazienti e il BMI prima della perdita di peso e prima dell'intervento di chirurgia plastica, la modalità della perdita di peso (chirurgica vs. non chirurgica), il tipo di tecnica eseguita ("crescent medial" vs. "vertical medial"), l'associazione con altre procedure chirurgiche di riduzione di ampiezza, il fumo all'epoca dell'intervento. Sono state prese in considerazione le correlazioni tra questi parametri preoperatori e lo sviluppo di complicanze postoperatorie e sono stati valutati diversi outcome, di cui la modifica della taglia dei pantaloni dopo l'intervento di lifting delle cosce, i giorni di ospedalizzazione, il tempo di mantenimento dei drenaggi, il tempo necessario per ritornare alle normali attività quotidiane e il miglioramento nelle stesse, nella deambulazione e nell'attività fisica dopo all'esecuzione della procedura e la soddisfazione in generale delle pazienti.
Risultati: È emerso che l'associazione con altre procedure di riduzione di ampiezza come la brachioplastica, l'addominoplastica o la mastopessi, il BMI prima dell'intervento di dermolipectomia inguinocrurale, e la modalità di perdita di peso condizionano significativamente i risultati postoperatori. Nel dettaglio, le pazienti sottoposte a dermolipectomia inguinocrurale insieme ad altre procedure chirurgiche o con un BMI preoperatorio>30 o andate incontro ad una perdita di peso dopo l'esecuzione di un intervento di chirurgia bariatrica presentano un maggior rischio di sviluppare complicanze postoperatorie. Non è stata evidenziata, tuttavia, una chiara correlazione con l'età, il fumo, il tipo di chirurgia plastica eseguita e la sua eventuale associazione con la lipoaspirazione, e un drastico "salto" di BMI.
Discussione: A nostro avviso, più di un singolo parametro può essere in grado di predire lo sviluppo di complicanze postoperatorie. Dunque agendo sui fattori preoperatori per i quali è stata evidenziata una correlazione con le complicanze, potrebbe essere possibile ridurre il rischio di svilupparne.
Conclusioni: Pertanto consigliamo di valutare questi fattori prima dell'intervento in modo da selezionare più accuratamente i pazienti e definire il paziente candidato ideale per la dermolipectomia inguinocrurale, in modo da ottenere una riduzione delle complicanze postoperatorie.

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