

# Outcome, complications, and body mass index correlation of horizontal and combined horizontal and vertical thigh lift: A 16-year single-center experience

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## Abstract

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**Background:** Thigh lift is a procedure used within the aesthetic as well as the post-bariatric field of surgery as it focuses on reducing excess lipodermal tissue within the medial thigh area. Depending on the specific area of excess tissue, common thigh lifting procedures include horizontal (H) and combined horizontal and vertical (HV) tissue reduction. **Aims and Objectives:** The aim of this study was the analysis of outcome of H and HV thigh lift procedures, including evaluation of comorbidities and complications. **Subjects and Methods:** Over a 16-year period, all thigh lift procedures performed at our department were assessed for comorbidities and outcome through our hospital documentation system. **Results:** A total of 151 thigh lifts have been performed over 16 years. Of which, 124 were performed using the HV technique and 27 thigh lifts were performed using H tissue excision only. Of all the patients, 9 of 10 were female, the overall average age was 43 years. Approximately 48% of the HV group of patients had previously undergone bariatric surgery, the mean body mass index (BMI) was 29.3 kg/m<sup>2</sup> for this group. Around 19% of the H patient population had previously undergone bariatric surgery. This group had a mean BMI of 25.1kg/m<sup>2</sup>. Wound-associated problems occurred in 48%, for these patients, surgical revision was necessary for 12%. Remaining excess tissue was an issue for 20% of all patients, for this reason, 14% needed revision surgery. Age was found to be a significant cofactor for wound-associated complications ( $P = 0.02$ ) and nicotine abuse for scar-related problems ( $P = 0.032$ ). **Conclusion:** The rate of overall complication for thigh lifts is high, although surgical revision rate is low. Remaining excess tissue and wound-associated problems are most common, possibly reflecting a too restrictive and radical surgical approach, respectively. Increasing BMI increases the risk for development of complications.

**Keywords:** Body-contouring surgery, massive weight loss, medial thigh lift, thighplasty

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## Introduction

Introduced in 1957, the thigh lift was first described by Lewis,<sup>[1]</sup> and it evolved over the following decades with alterations aiming at preventing and consequently reducing postoperative complications. Depending on the extent and area of tissue excess in the thigh region, different lifting techniques may be appropriate and hence utilized. Patients showing mainly tissue excess in the proximal medial thigh region and firmer tissue toward the distal part of the thigh may be suitable for a sole horizontal (H) thigh lift technique. This technique addresses the excessive tissue, as an H crescent-shaped lipodermal block in the proximal medial thigh area is resected with the remaining scar preferably running parallel to the inguinal and genital area in the proximal fold of the thigh adjacent to the genito-inguinal area. With this technique, the distal margin of the wound is lifted toward the proximal margin after the excess tissue has been removed, hence lifting the remaining thigh area [Figure 1]A–G. For patients with lipodermal excess alone in the medial proximal thigh area, the H technique in many cases is sufficient and suitable as a lifting technique.



Figure 1: Patient before (A–C), early postoperative (D), and late postoperative (E–G) after H medial thigh lift surgery



For patients presenting excess tissue exceeding the proximal area of the medial thigh with tissue excess proceeding toward the distal thigh and surrounding knee area, a sole H tissue excision may not result in the desired thigh appearance and may hence be extended by the addition of a vertical crescent-shaped block of resection reaching from the H resection block in the upper thigh region down toward the distal medial thigh region and into the medial knee region, if necessary [Figure 2]A–H.

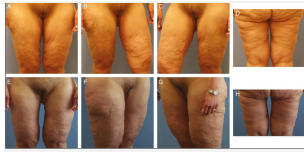
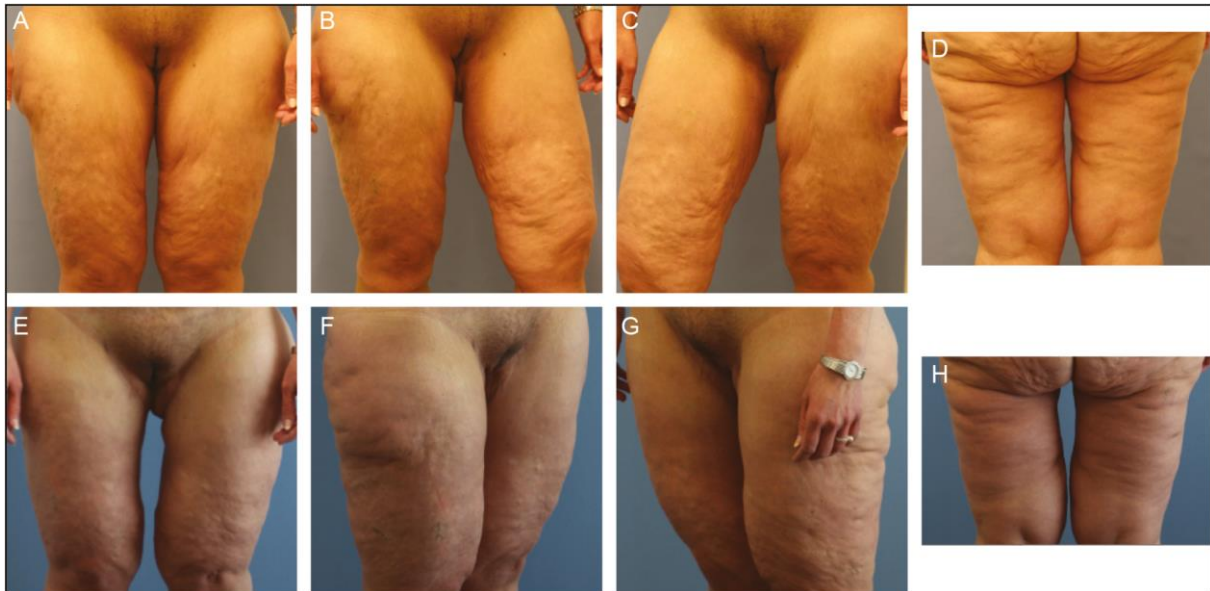


Figure 2: Massive weight loss patient before (A–D) and after (E–H) combined HV medial thigh lift surgery



Overall, complication rates after thigh lift are described with high numbers, including wound-associated problems, such as dehiscence, infection or necrosis as well as lymphatic edema, hematoma, seroma or scar migration or widening, and remaining tissue excess.<sup>[2],[3],[4],[5]</sup> Also, it is suggested that comorbidities may have an influence on the occurrence of postoperative complications.<sup>[2],[4]</sup>

The aim of this study was to use the quantity of experience in lipothighplasty at our institution over a 16-year time frame, examine our patient population undergoing thigh lift surgery, evaluate postoperative complications, and determine possible correlation of comorbidities after H and combined horizontal and vertical (HV) medial thigh lift.

## Subjects and Methods

Retrospective statistical evaluation of patient data was collected for patients who had undergone thigh lift surgery at our department from 2000 to 2016. The procedures were performed by different surgeons. This study depicts a single-center study including the work of several senior plastic surgeons. Surgeon bias was not evaluated as it was not the aim of this study. All perioperative data were gathered and evaluated statistically by a member of our research staff. These included demographic data, all documented comorbidities presented by the patient, and complications, which occurred surrounding the operation. Furthermore, the results of the collected parameters, which included age, gender, body mass index (BMI), and overall weight loss before thigh lift surgery, previous bariatric surgery, and comorbidities, such as hypertension and diabetes mellitus, were compiled separately for the H and HV patient population and compared to each other, respectively. Statistical analysis was carried out using the appropriate respective calculations, which included Kolmogorov–Smirnov test, Fisher's exact test, Pearson's chi-squared test, and Student's *t*-test according to applicability. Results that showed a  $P < 0.05$  were defined as statistically significant.

## Results

From March 2000 to July 2016, a total of 151 thigh lifts were performed at our department. Of these, 124 were performed using the HV technique and 27 using the H thigh lift technique. Overall, 90% of the patient population

were female, and the average patient age was 43 years (min. 20 years, max. 70 years). Preoperative average patient BMI was found to be 28.5kg/m<sup>2</sup> (min. 19.6kg/m<sup>2</sup>, max. 42.6kg/m<sup>2</sup>). Overall, however, BMI for the H population was found to be 25.1kg/m<sup>2</sup> (min. 19.6kg/m<sup>2</sup>, max. 35.9kg/m<sup>2</sup>) as compared to the BMI of the HV population, which averaged 29.3kg/m<sup>2</sup> (min. 19.7kg/m<sup>2</sup>, max. 42.6kg/m<sup>2</sup>). On average, 48% of patients in the HV population had undergone bariatric surgery before the thigh lift procedure compared to only 19% of patients of the H group. The average weight loss before surgery was 63kg for the HV group and 46kg for the H group. Also, comorbidities, such as diabetes mellitus and hypertension, were lower in the H group (4% and 16%, respectively) as compared to those in the HV group on average (6% and 24%, respectively) [Table 1]. Further comorbidities and possible cofactors found in our patient population existing preoperatively were anemia, hypothyreosis, the occurrence of thrombosis in patients' medical history, chronic venous disease and varicosis, lymphatic edema, contraceptive prescription, and nicotine abuse. For all these comorbidities, no significant correlation to the occurrence of overall complication could be determined. However, age showed a statistically significant correlation to the occurrence of wound-associated problems ( $P = 0,02$ ), as the average age of patient with wound complications was 44.5 years compared to an average age of 40.4 years with no occurrence of wound complications. Also, smoking showed a significant correlation to postoperative occurrence of scar-associated problems ( $P = 0,032$ ), as 17.7% of scar-related complications were associated with smoking.

Demographic variables	Patient population		
	HV resection	H resection	HV + H resection
Female	91%	85%	90%
Male	9%	15%	10%
Age (years)	43	46	43
Preoperative BMI (kg/m <sup>2</sup> )	29.3	25.1	28.5
Previous bariatric surgery	48%	19%	42%
Overall weight loss (kg)	63	46	61
Diabetes mellitus	6%	4%	6%
Hypertension	24%	16%	23%

Table 1: Overview of patient population according to resection technique and specific demographic data and comorbidities

Demographic variables	Patient population		
	HV resection	H resection	HV + H resection
Female	91%	85%	90%
Male	9%	15%	10%
Age (years)	43	46	43
Preoperative BMI (kg/m <sup>2</sup> )	29.3	25.1	28.5
Previous bariatric surgery	48%	19%	42%
Overall weight loss (kg)	63	46	61
Diabetes mellitus	6%	4%	6%
Hypertension	24%	16%	23%

Regarding complication rate, wound-related complications, in which all wound-associated complications, which arose were summarized, that is, dehiscence and infection, showed the highest rate of all complications. Overall, 48% of patients were affected by minor or major wound complications. Of these, 14% needed revision in the HV population and 4% required surgical revision in the H population. Remaining tissue excess was seen in overall 20% of patients, with 16% surgical revision required in the HV group and 4% required revision in the H population. Scar-related complications, which included painful scars, scar widening, or hypertrophic scarring, were seen in 17% of all patients, with 11% scar revision surgery overall.

Hematoma was not seen in the H group, but was found in 11% within the HV group, with revision necessary for overall 8% in the HV group. Seroma was also not observed in the H population, but was found in 7% within the HV population with 2% of this population requiring revision surgery. Temporary lymphatic edema affected 5% of the overall patient population and was not observed within the H population [Table 2]. Major complications such as thromboembolism, sepsis, or death were not observed.

Comorbidity	P value (overall complication)
Diabetes mellitus	1
Hypertension	0.25
Anemia	0.34
Hypothyreosis	0.82
Thromboembolism in patients' history	0.74
Chronic venous disease + varicosis	1
Lymphatic edema	1
Contraceptive prescription	1
Age	0.02*
Preoperative BMI	0.23
Overall weight loss before surgery	0.29
Bariatric surgery in patients' history	0.12

Table 2: Comorbidities and their statistical *P* value in accordance to overall complication rate

Comorbidity	P value (overall complication)
Diabetes mellitus	1
Hypertension	0.25
Anemia	0.34
Hypothyreosis	0.82
Thromboembolism in patients' history	0.74
Chronic venous disease + varicosis	1
Lymphatic edema	1
Contraceptive prescription	1
Age	0.02*
Preoperative BMI	0.23
Overall weight loss before surgery	0.29
Bariatric surgery in patients' history	0.12

\*Statistically significant

Although not proven statistically significant, BMI was found to be associated with the postoperative occurrence of complications, as an increased BMI correlated with an increased rate of complications. The population of subjects with normal weight (<25kg/m<sup>2</sup>) showed an overall complication rate of 18.7%, whereas for overweight patients within the BMI group of 25–30kg/m<sup>2</sup>, complications occurred in 36%. Approximately 45.3% of the obese patient population with BMI >30kg/m<sup>2</sup> had complications [Table 3].

BMI (kg/m <sup>2</sup> )	Overall complication rate (%)
<25	18.7
25–30	36
>30	45.3

Table 3: Relation between BMI and overall complication rate

BMI (kg/m <sup>2</sup> )	Overall complication rate (%)
<25	18.7
25–30	36
>30	45.3

## Discussion

The reason for increased patients' request for medial thighplasty may be numerous. Thighplasty is mostly applied after massive weight loss or for aesthetic reasons owing to the natural aging process and increased tissue laxity. Besides the aesthetic patient seeking a firmer upper thigh region, the group of patients often presenting to plastic surgeons with the request for thighplasty usually has experienced massive weight loss, which may have been achieved independently or with the help of bariatric surgery. As obesity and previously performed bariatric surgery in patients presented to our field of practice seem inevitably increasing, body-contouring surgery has increasingly been the point of focus.<sup>[5],[6]</sup> This is mirrored by the findings of our study, as patients seeking medial thigh lift are averagely overweight (BMI 28.5kg/m<sup>2</sup>) and up to 42% of all patients have undergone bariatric surgery in their previous medical history. According to the review article by Sisti *et al.*,<sup>[5]</sup> the demand of medial thighplasty is growing with increasing popularity. The latter review study presents an overview of 16 studies and overall 447 patients who have undergone medial thigh lift. Our presented study evaluates a total of 151 patients.

The range of surgical techniques in an attempt to achieve the patients' desired outcome is vast, whether the aim is of pure aesthetic nature of firm thigh area or of a more functional aim, with less tissue excess to achieve alleviation from different symptoms, such as sweating, eczema, rash, itch, or other respective skin diseases. Thigh lifting techniques may include vertical lift, H lift, concentric medial lift, L-shaped lift, T-shaped lift, double triangle technique, fascial anchoring, scarpa lift, or even approaches of personal techniques.<sup>[2],[3],[4],[7],[8],[9],[10],[11],[12],[13],[14],[15],[16]</sup> However, in our patient population over a 16-year period, we have found the H and combined HV block resection approach to be useful and safe in our hands yielding predictable and aesthetic results. The technique hereby described as combined HV resection has also been described as L-shaped lifting.<sup>[4],[9]</sup>

Thighplasty is still described and associated with high complication rates even in current literature.<sup>[2],[3],[4],[5]</sup> With the quantity of experience at our institution over a period of 16 years we examined our outcome and complication rates as well as possible correlation factors. As presented by our results, we have found the most frequently occurring complications to be wound associated (48%). Hereby, we used wound-associated complications as an umbrella term to summarize wound dehiscence, wound infection (including all types of inflammatory signs), and wound necrosis. Because of this summarization, overall numbers were high for this complication; however, it is worth noting that wound complication rate requiring surgical revision, that is, major wound complications, was comparably low at 12% overall. The second most frequent complication was remaining tissue excess regarding 20% of all patients. Here, surgical revision rate was 14% for all patients. This is supported by respective data of available literature, in which wound complications and exceeding tissue remnants also belong to the most common complications faced by this patient population and their surgeons.<sup>[4],[5]</sup> Interestingly, patients of the HV group more often describe or have remaining tissue excess as compared to patients of the H group [Table 2]. Considering the lower number of previously performed bariatric surgery as well as the lower average BMI for patients of the H group, the conclusion may be drawn that the reason for patients to undergo H thigh lifting is more often of aesthetic nature as compared to that for patients of the HV group with higher rates of previously performed bariatric surgery and higher overall BMI preoperatively, possibly reflecting a need of a more functional rather than an aesthetic outcome. Hence, this may explain the higher rates of complaints regarding remaining tissue in the HV population, as the initial tissue situation of this group of patients usually shows overall more tissue excess as compared to the H group. Also the indication for H resection techniques includes less overall tissue excess, as tissue excess is narrowed to a smaller area in the proximal medial thigh area. However, it is important to specifically address and discuss this possible outcome with patients previous to surgery.

It might strike the reader that the two most common complications are of particularly opposing nature, as wound complications, especially wound dehiscence is often caused by high wound tension, possibly due to radical resection as opposed to the remaining tissue excess, which in turn is caused by conservative surgical resection. Reaching a balance between these two opposing approaches may arguably be the key to the ideal thighplasty.

Interestingly, the only statistically significant cofactor for wound-associated complication was age ( $P = 0.02$ ) and nicotine abuse for scar-related problems ( $P = 0,032$ ). As age and nicotine abuse are associated to a decrease or impairment of perfusion, this might present a reason for impaired wound healing and hence scar results. Nicotine abuse is linked to impaired wound healing, often resulting in wide or otherwise unaesthetic or displeasing wound situations. After completion of wound healing, we found respective patients to present themselves with scar-related problems. Hence, scar issues may be seen as a result of impaired wound healing due to nicotine abuse. All remaining factors examined did not play a significant role in the occurrence of complications.

However, we would like to outpoint that although not statistically significant ( $P = 0.228$ ), the BMI did show a

noticeable correlation in numbers in terms of overall complication rate in our study [Table 3]. With increase in BMI, there is a very noticeable increase in overall occurrence of complications. As almost half (45.3%) of all obese patients (BMI >30kg/m<sup>2</sup>) developed complications compared to just over a third (36%) of overweight patients (BMI, 25–30kg/m<sup>2</sup>) and less than one-fifth (18,7%) of all normal weight patients (BMI <25kg/m<sup>2</sup>). Hence, obesity is arguably an important determinant in the occurrence of complications. This supports the findings of Bertheuil *et al.*<sup>[2]</sup> in which BMI before massive weight loss and preoperatively was measured and found to be statistically significant in influencing the development of complications after thighplasty.<sup>[2]</sup>

Thigh lift procedures are well-established, frequently performed surgery for body-contouring purposes; this applies to desired aesthetic as well as post-bariatric functional outcomes. Depending on the area of tissue excess, our study has found the medial H and combined HV block resection to be useful and effective for thighplasty. Overall, complications for thigh lifting surgery are high. However, complications requiring surgical revision are comparably low. The two most common complications and reasons for surgical revision are presented by the group of wound-related complications on one hand and the group of remaining tissue excess on the other. Both groups may be seen as a result of opposing surgical approaches, which is a radical resection with resulting high wound tension and the risk of wound complications such as dehiscence, and an opposed conservative resection approach resulting in unsatisfying remaining tissue excess. As so often in life, the ideal approach may possibly be reached by finding the right balance between the two extremes. Also, BMI may be seen as a factor influencing postoperative complications because increasing BMI is associated with higher complication rates, as suggested by our study.

#### **Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

#### **Conflicts of interest**

There are no conflicts of interest.

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