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Combining total laparoscopic hysterectomy and bilateral salpingo-oophorectomy with subcutaneous mastectomy in trans men: The effect on safety outcomes

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ABSTRACT

Background: Masculinizing mastectomy is the most requested gender affirming surgery (GAS) in trans men, followed by genital GAS. Mastectomy and total laparoscopic hysterectomy, with or without bilateral salpingo-oophorectomy (TLH ± BSO), can both be performed in one single operation session. However, data on complication rates of the combined procedure is scarce and no consensus exists on the preferred order of procedures.

Aims: To compare safety outcomes between mastectomy performed in a single procedure with those when performed in a combined procedure and assess whether the order of procedures matters when they are combined.

Methods: A retrospective chart review was performed of trans men who underwent masculinizing mastectomy with or without TLH ± BSO in a combined session. The effects of the surgical procedure on complication and reoperation rate of the chest were assessed using logistic regression.

Results: In total, 480 trans men were included in the study. Of these, 212 patients underwent the combined procedure. The gynecological procedure was performed first in 152 (71.7%) patients. In the total sample, postoperative hematoma of the chest occurred in 11.3%; 16% in the combined versus 7.5% in the single mastectomy group ($p = 0.001$). Reoperations due to hematoma of the chest were performed in 7.5% of all patients; 10.8% in the combined versus 4.9% in the single mastectomy group ($p = 0.017$). The order of procedures in the combined group had no significant effect on postoperative hematoma of the chest ($p = 0.856$), and reoperations ($p = 0.689$).

Conclusion: Combining masculinizing mastectomy with TLH ± BSO in one session was associated with significantly more hematoma and reoperations compared with separately performing mastectomy. This increased risk of complications after a combined procedure should be considered when deciding on surgical options. The order of procedures in a combined procedure did not have an effect on safety outcomes.

KEYWORDS
Chest wall reconstruction; gender affirming surgery; hematoma; hysterectomy; mastectomy; surgical outcome; transgender

Introduction

Bilateral subcutaneous mastectomy, or chest wall masculinization surgery, is the most requested and usually the first gender affirming surgical treatment in trans men. Trans men are generally dissatisfied with their breasts, and often opt for this type of surgery to get a more masculine looking and esthetically pleasing chest (Hage & van Kesteren, 1995; van de Grift et al., 2016). Masculinizing mastectomy aims at the removal of feminine breast tissue and excessive skin, a proper reduction and positioning of the nipple-areola complex, obliteration of the inframammary fold, and minimization of chest-wall scars (Cregten-Escobar et al., 2012; Hage & Bloem, 1995; Hage & van Kesteren, 1995; Monstrey et al., 2011). Multiple techniques exist for performing masculinizing mastectomy, the choice of which

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depends on the properties of the breast and the skin (Cregten-Escobar et al., 2012; van de Grift et al., 2017). Reported postoperative complication rates of the subcutaneous mastectomy vary between 5% and 21.3%, of which hematoma is the most common complication and primary reason for reoperation (Cregten-Escobar et al., 2012; Frederick et al., 2017; Monstrey et al., 2011; Wolter et al., 2015). Paradoxically, the risk of complications is highest for the mastectomy technique without skin resection or with periareolar skin resection used mostly for smaller breast sizes (Cregten-Escobar et al., 2012; Knox et al., 2016; van de Grift et al., 2017).

Some trans men want to undergo genital gender affirming surgery as well as chest masculinization surgery. Depending on the choice of genital masculinizing procedure, this may involve the removal of the internal female reproductive organs. Vaginal hysterectomy (VH) with or without a bilateral salpingo-oophorectomy (BSO) is thought to have advantages over total laparoscopic hysterectomy (TLH) (Sandberg et al., 2017). Available data suggest that a VH or TLH and BSO for trans men is safe, not associated with any additional risks compared to TLH and BSO in cisgender women, and is correlated with improved quality of life (Kaiser et al., 2011; Louie & Moulder, 2017; Obedin-Maliver et al., 2017).

In many transgender health services, surgeons offer patients the possibility to combine masculinizing mastectomy and TLH ± BSO procedures in one single operative session. Combined surgery could be of value for trans men for several reasons: patients require general anesthesia only once, consume shorter hospital stays, have a reduced recovery time and therefore experience lower levels of stress and anxiety (Hager et al., 2019; Kaiser et al., 2011; Mitchell, 2003). To date, only five studies reviewed the outcomes of this combined procedure, four in trans men (Cizek et al., 2017; Hager et al., 2019; Ott et al., 2010; Stojanovic et al., 2017) and one in cis women (Sinkey et al., 2016). All authors concluded that the combined procedure is safe, feasible, time- and cost-saving and valuable (Cizek et al., 2017; Hager et al., 2019; Ott et al., 2010; Sinkey et al., 2016; Stojanovic et al., 2017). Only minor adverse events were described in these studies, and, if reported, described complications were mainly hematomas (Hager et al., 2019; Stojanovic et al., 2017). Cizek et al. stated that no complications could be attributed to the fact that the two procedures were combined in a single incident (Cizek et al., 2017). Concerning the order of the two procedures, Ott et al. advised to perform the TLH ± BSO before mastectomy, because they observed a slightly (but not significantly) higher complication rate when performed in a reverse order (Ott et al., 2010). However, a more recent study of the same research group (2019) revoked their former conclusion (Hager et al., 2019). Unfortunately, sample sizes in all of these studies are limited, which makes it difficult to draw conclusions on the effects of combining these procedures and their order on safety outcomes. Therefore, the main objective of this study is to evaluate complication and reoperation rates of the chest in single masculinizing mastectomy versus combined procedures (mastectomy and TLH ± BSO) in trans men. Additionally, it will be assessed whether the order of the combined procedures (TLH ± BSO-first or mastectomy-first) influences the complication and reoperation rates of the chest. It is hypothesized that combining the procedures and the order of procedures do not affect the safety outcomes of the mastectomy.

Materials and methods

Study setup and subjects

A retrospective chart review was performed. All trans men who underwent a masculinizing mastectomy whether or not in combination with TLH ± BSO, in the Amsterdam UMC (VUmc) and the Slotervaart Medical Center between July 2012 and December 2017 were retrospectively identified from the hospital registries. Trans men were treated according to the WPATH Standards of Care (Coleman et al., 2012). They were considered eligible for surgery if they were at least 18 years old and had a BMI between 18 and 35 kg/m^2. This study was performed in accordance with 1964 Helsinki declaration and guidelines for Good Clinical Practice and was approved by our institutional medical ethical committee (METC, 2017-525).

Surgical techniques

Mastectomy

Mastectomy was performed by a plastic surgeon experienced with performing mastectomy in trans men. In all trans men the technique for masculinizing mastectomy was decided at the first consultation based on breast size, ptosis grade and skin elasticity (van de Grift et al., 2017). One of three surgical methods was selected (Cregten-Escobar et al., 2012):

1. Mastectomy without skin resection; an incision of the lower half of the periphery of the areola is made, whereby extirpation of the mammary gland either or not combined with liposuction is performed. No extra skin is resected.
2. Concentric circular mastectomy; also called Donut-technique - a periareolar skin resection is performed. The nipple remains pedicled on a strip of dermal tissue.
3. Infra-mammary skin resection with a full thickness free nipple graft (IMF + FTG); also called double incision mastectomy - an infra-mammary skin resection is performed combined with a free nipple graft.

The standard postoperative regimen in all techniques included wound drainage until the 24-hour fluid production was below 30 cc, 6 weeks of chest compression and no heavy physical/sports activity. Patients returned for follow-up at the outpatient clinic at 2-3 weeks and 3 months after surgery (and 5-7 days postoperatively for bandage renewal in case of a free nipple graft).

Hysterectomy

Hysterectomy was performed laparoscopically by a gynecologist with or without bilateral salpingo-oophorectomy (TLH ± BSO) depending on the wish of the patient. Depending on surgical difficulty 3 or 4 trocars were used. Standard technique was used for laparoscopic hysterectomy with an intra-abdominal pressure of 14 mm Hg. The vaginal cuff was sutured laparoscopically. Preoperative gynecological screening consisted of an abdominal ultrasound of the internal genitalia to identify any large abnormalities of the internal genitals. In case of any difficulties to perform the procedure laparoscopically, conversion to a laparotomy was performed to finish the procedure. The standard postoperative regimen included no major physical activity during 6 weeks and an outpatient clinic visit 6 weeks postoperatively.

Outcome measures

Patient demographics, types of surgical procedure(s), surgical characteristics (for plastic surgery and gynecology), postoperative complications of the chest and their management and gynecological complications were recorded on standardized case report forms. Pain was not systematically recorded.

The primary outcomes in this study were 1) complication rate, especially the occurrence of hematoma of the chest, and 2) reoperation rate of the chest. The complication and reoperation rates were compared between the single masculinizing mastectomy procedures versus combined procedures (mastectomy and TLH ± BSO) in trans men. In addition, the effects were assessed of the order of the combined procedure (TLH ± BSO-first or mastectomy-first) on the incidence rate of hematoma and reoperation of the chest. Logistical determinants, such as availability of surgeons, determined the order of procedures.

Statistical analyses

The total group of patients was categorized by the type of procedure in 1) the single mastectomy group, or 2) the combined group (masculinizing mastectomy in combination with TLH ± BSO). The combined group was subdivided according to the order of procedure into a "TLH ± BSO-first" group, and a "mastectomy-first" group (see Figure 1). Descriptive statistics were used for all outcome variables. Continuous variables were presented as means with standard deviations (presumed Gaussian) or as medians with ranges (presumed non-Gaussian). For group comparisons, Student t-tests, chi-square tests or Mann-Whitney-U tests were used when appropriate. We assessed the effect of procedures on the primary outcomes using logistic regression analysis, and results are expressed as Odds Ratios with 95% CI's. The analyses were adjusted for the possible confounding factors: performed surgical technique, testosterone treatment and smoking. Statistical analyses were performed using SPSS 24 (IBM Corporation, 2016). P-values <0.05 were considered significant.

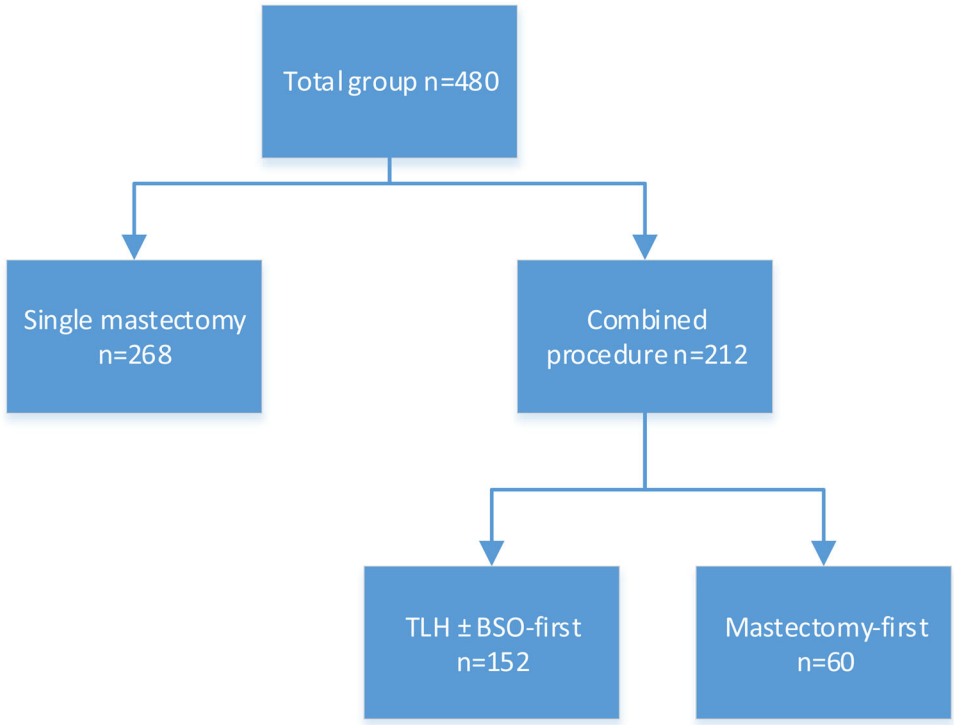

Figure 1. Inclusion of patients.

Results

Patient characteristics

In total, 480 trans men underwent masculinizing mastectomy. Of these, 212 patients underwent the mastectomy in combination with the TLH ± BSO in one single session (combined group). In 71.7% of these cases (152 patients), the combined procedure started with the gynecological procedure (TLH ± BSO-first group). Patient characteristics are presented in Table 1. Some characteristics differed significantly between the single mastectomy group compared with the combined group; in the combined group less patients smoked, and more patients received testosterone therapy. Within the combined group, patients of the mastectomy-first group received the IMF + FTG technique significantly more often. Also, for logistical reasons the combined procedure started more often with the TLH ± BSO surgery (n = 152 against n = 60).

Effect of procedures on primary outcomes in total group

In the total sample, any form of postoperative adverse events related to mastectomy were found in 227 patients (47.3%), including breast seroma as the most frequent complication (18.5%), followed by wound dehiscence (7.3%), nipple necrosis (6.0%) and infection (4.2%). Postoperative hematoma of the chest was seen in fifty-four patients (11.3%), of which twenty patients (7.5%) in the single mastectomy group versus 34 patients (16%) in the combined group (Table 2). Sixty-three (7.5%) reoperations were performed, all due to hematoma of the chest, thirteen patients (4.9%) in the single mastectomy group, versus 23 patients (10.8%) in combined procedure group. No blood transfusion was necessary.

Postoperative hematoma of the chest (Odds Ratio 2.716, 95% CI 1.48-4.98, p = 0.001; Table 3) and reoperation due to hematoma of the chest (Odds Ratio 2.388, 95% CI 1.17-4.90, p = 0.017; Table 3) occurred significantly more frequent in the combined surgery group, when correcting for performed surgical technique of the chest, testosterone treatment and smoking.

Effect of the order of procedures on hematoma and reoperations

Within the combined procedure group, the effect of the order of procedures did not significantly affect the risk of hematoma and/or reoperation of the

Table 1. Patient characteristics of patients who have had a single mastectomy or combined procedure.

	Procedure					Test statistics	
	Total population (%) (n = 480)	Single mastectomy (%) (n = 268)	Combined procedure: total (%) (n = 212)	Combined procedure: TLH ± BSO-first (%) (n = 152)	Combined procedure: mastectomy-first (%) (n = 60)	Test statistics single mastectomy vs combined procedure	Test statistics combined procedure TLH ± BSO-first vs mastectomy-first
Total n of patients;						$X^2(1) = 157.670$, p	
- Clinic 1 (%)	381 (79.4)	268 (100)	113 (79.4)	105 (69.1)	8 (13.3)	< 0.001	$X^2(1) = 53.7$,
- Clinic 2 (%)	99 (20.6)	0 (0)	99 (20.6)	47 (30.9)	52 (86.7)		$p < 0.001$
Age (median, IQR)	25 (19, 28)	22 (19, 27)	22 (20, 30)	22 (19.25, 30)	23 (20, 30.5)	U = 25712.5, p = 0.073	U = 4351.5, p = 0.603
Smoking, n (%)							
Yes	114 (23.8)	75 (28)	39 (18.4)	25 (16.4)	14 (23.3)	$X^2(1) = 6.010$,	$X^2(1) = 1.359$,
No	366 (76.2)	193 (72)	173 (81.6)	127 (83.6)	46 (76.7)	p = 0.014	p = 0.244
Body-mass index (kg/m^2), (mean, 95%)	25.16 (24.8, 25.6)	25.49 (24.9, 26.0)	24.75 (24.2, 25.3)	24.85 (24.2, 25.5)	24.51 (23.4, 25.6)	t(476) = 2.011, p = 0.732	t(210) = 0.341, p = 0.603
Testosterone treatment, n (%)		244 (91)	207 (97.6)	150 (98.7)	57 (95)		
Yes	451 (94)	24 (9)	5 (2.4)	2 (1.3)	3 (5)	$X^2(1) = 9.074$,	$X^2(1) = 2.536$,
No	29 (6)					p = 0.003	p = 0.111
Performed surgical technique, n (%)			5 (2.4)				
		14 (5.2)	78 (36.8)	4 (2.6)	1 (1.7)		
Periareolar	19 (4.0)	104 (38.8)	129 (60.8)	65 (42.8)	13 (21.7)	$X^2(2) = 3.066$,	$X^2(2) = 8.815$,
Concentric circular (donut)	181 (37.9)	150 (56)		83 (54.6)	46 (76.6)	p = 0.216	p = 0.012
Inframammary fold and free nipple graft (IMF + FTG)	279 (58.1)						

TLH ± BSO = hysterectomy with or without bilateral salpingo-oophorectomy, IQR = interquartile range.

Table 2. Complications of patients who have had single mastectomy or combined procedure.

	Procedure			
	Single mastectomy (%)	Combined procedure total (%)	Combined procedure TLH ± BSO-first (%)	Combined procedure mastectomy-first (%)
Number of operations, n (%)	268 (55.8)	212 (44.2)	152 (71.7)	60 (28.3)
Postoperative vaginal bleeding, n (%)	n.a.			
Yes		12 (6.1)	11 (8)	1 (1.7)
No		184 (93.9)	126 (92)	58 (98.3)
Gynaecological reoperation, n (%)	n.a.			
Yes		4 (2)	4 (2.6)	0 (0)
Abscess Prolapse Vaginal bleeding			1 (0.5)	0 (0)
			1 (0.5)	0 (0)
			2 (0.9)	0 (0)
No		192 (98)	133 (97.4)	59 (100)
Postoperative bleeding/ hematoma chest, n (%)	20 (7.5)	34 (16)	25 (16.4)	9 (15)
Yes	248 (92.5)	178 (84)	127 (83.6)	51 (85)
No				
Reoperation chest, n (%)				
Yes	13 (4.9)	23 (10.8)	16 (10.5)	7 (11.7)
No	255 (95.1)	189 (89.2)	136 (89.5)	53 (88.3)

TLH ± BSO = hysterectomy with or without bilateral salpingo-oophorectomy.

Table 3. Risk of hematoma of the chest and reoperation of the chest.

	Hematoma chest Odds ratio (95% CI)	p-value	Reoperation Odds ratio (95% CI)	p-value
Single mastectomy (reference) versus combined procedures				
Crude	2.369 (1.32–4.25)	0.004	2.387 (1.18–4.83)	0.016
Adjusted[a]	2.716 (1.48–4.98)	0.001	2.388 (1.17–4.90)	0.017
Order of procedures: mastectomy-first (reference) versus TLH ± BSO-first				
Crude	0.896 (0.39–2.05)	0.796	1.123 (0.44–2.88)	0.810
Adjusted[a]	0.922 (0.39–2.20)	0.856	1.121 (0.46–3.25)	0.689

TLH ± BSO = hysterectomy with or without bilateral salpingo-oophorectomy.
[a]Adjusted for performed surgical technique, testosterone treatment, smoking.

chest (Tables 2 and 3) (Odds Ratio 0.922, 95% CI 0.39-2.20, p = 0.856; Table 3) versus (Odds Ratio 1.121, 95% CI 0.46-3.25, p = 0.689; Table 3) when correcting for performed surgical technique, testosterone treatment, and smoking. With regard to gynecological complications, no major complication occurred. In the TLH ± BSO-first group adverse events occurred more often, but this did not reach significance (Tables 2 an 4). Postoperative vaginal bleeding ($\geq$ 500 mL) was seen in twelve patients (6.1%), of which eleven patients (8%) in TLH ± BSO-first group versus one patient (1.7%) in the combined group (Odds Ratio 0.853, 95% CI 0.18-4.08, p = 0.842; Tables 2 and 4). Four (2.6%) gynecological reoperations were performed (due to abscess n = 1, prolapse of intestines through vaginal top n = 1, vaginal bleeding n = 2), four patients (2.6%) in the TLH ± BSO-first group and zero (0%) patients in the mastectomy-first group. Because of these non-comparable groups a Chi-square test was performed ($X^2(1)=1.759$, p = 0.185).

Discussion

Combining mastectomy and hysterectomy in one surgical session in trans men who wish to undergo both chest masculinization surgery and hysterectomy with or without bilateral salpingo-oophorectomy is thought to be more efficient and less burdensome for the patient. However, the effect of combining these procedures on safety outcomes should also be considered. A previous study showed that combining esthetic surgery procedures increased the risk for major hematomas (Kaoutzanis et al., 2017). The present study of a cohort of 480 trans men confirms that hematoma of the chest and reoperation rates of the chest were both significantly higher in combined procedures (mastectomy and TLH ± BSO) compared with those in single masculinizing mastectomy. The order of procedures in the combined procedure seemed to be of no consequence, and did not significantly affect general and gynecological complication rates. Hematoma was the

Table 4. Risk of postoperative vaginal bleeding and gynaecological reoperation.

	Postoperative vaginal bleeding		Gynaecological reoperation	
	Odds ratio (95% CI)	p-value	Test statistics	p-value
Order of procedures: mastectomy-first (reference) versus TLH ± BSO-first				
Crude	0.197 (0.03–1.57)	0.125	$X^2(1) = 1.759$	0.185
Adjusted[a]	0.853 (0.18–4.08)	0.842		

TLH ± BSO = hysterectomy with or without bilateral salpingo-oophorectomy.
[a]Adjusted for testosterone treatment, smoking.

most commonly observed complication after mastectomy, and the risk of its occurrence was more than doubled when combining the procedure with hysterectomy with or without bilateral salpingo-oophorectomy (Odds Ratio 2.716, 95% CI 1.48-4.98, p = 0.001). Only few studies have previously examined the occurrence of hematomas in trans men after mastectomy in combined procedures. Smaller cohorts were described by Cizek et al. (2017) (n = 25) and Stojanovic et al. (2017) (n = 79), who reported fewer complications associated with the mastectomy (4% and 7.6% respectively), while similar complication rates after a combined procedure were reported by Hager et al. (16.7% hematomas, 3.7% reoperations, n = 108) Some studies assessed whether combining plastic surgery procedures affects safety outcomes, with varying conclusions. Coon et al. investigated the effects of combining body contouring procedures on complications (Coon et al., 2010). Rates of dehiscence, seroma, infection, and necrosis were associated with the number of combined procedures, although hematoma was not. Yet, in a more recent study of the same group no correlation between combining procedures and overall complication rate was found (Gusenoff et al., 2015). These retrospective associative studies, including the present study, cannot explain what causes the differences in complication risks. Hence, it is uncertain what causes the higher rate of complications and reoperations in the combined procedure. Reported risk factors for hematoma development in the most frequently performed esthetic surgeries are: age, breast procedures, male gender, combined procedures and type of OR facility (Hood et al., 2018). The increased risk in male gender was attributed to higher testosterone levels. Suggested reason for the increased risk in combined procedures was the increased operation time, possibly causing fatigue of the surgeon. The latter is not applicable to this study, since the two procedures are performed by separate teams. Whether risks were associated with a specific surgeon performing the mastectomy could not be established, since the size of the groups did not allow for such additional post-hoc analyses. Yet, all plastic surgeons involved were experienced with performing mastectomy in trans men. Possibly the Trendelenburg position during hysterectomy and prolonged surgery in the combined procedure play a role. The Trendelenburg position may have affected the blood-pressure in the upper-body. Furthermore, the median operation time was 250 minutes in case of the combined procedure and 120 minutes for the single mastectomy. Intraoperative hypothermia is more likely to occur in prolonged surgery, which could potentially disrupt the coagulation cascade. Since post-operative hypertension and pain were not recorded, their effects could not be assessed. We believe that hypertension is not likely to have played a major role since patients were all under the age of 30 years. Preoperative anticoagulation usage did not play a role, since it was used by only one patient in the combined group, who did not have a complication.

Performed mastectomy technique, testosterone treatment and smoking have been shown or suggested to affect the risk of complications after surgery. Previous studies have shown that mastectomy technique significantly influences the risk of complications, with a higher risk for hematomas when performing a donut technique compared with the IMF + FTG (Cregten-Escobar et al., 2012; Frederick et al., 2017). Smoking is thought to increase the risk of complications after surgery, however, reported effects of smoking vary. In a large cohort of esthetic surgical procedures, it was not found to be an independent predictor of postoperative hematoma (Kaoutzanis et al., 2017). Furthermore, hormone treatments are known to be prothrombotic. Although 'male gender' was mentioned as a risk factor of hematoma, no correlation could be established between testosterone use and hematoma

formation or thrombotic complications (Berry et al., 2012; Frederick et al., 2017). Since mastectomy technique, testosterone treatment and smoking were not equally distributed in the single mastectomy and combined procedure groups (Table 1), the logistic regressions were adjusted for these confounding factors.

We did not include trans men who underwent TLH ± BSO in a separate procedure. Therefore, we cannot directly compare gynecological complication rates of the combined procedure with a single procedure. However, the gynecological complication rate in the combined procedure was low and was comparable to those reported in previous studies reporting on hysterectomy in trans men (0.9-8%) (Cizek et al., 2017; Hager et al., 2019; Kaiser et al., 2011). We believe that it is important to inform patients about the higher risk of hematomas and revisions after mastectomy when it is performed in a combined procedure. Since these operations are elective procedures, patient should be counseled with regard to the advantages and disadvantages of separate versus combined surgery. The combined procedure may be of benefit to patients because of the shorter hospital stay, having to undergo general anesthesia once instead of twice, and a reduced total recovery time. However, it comes with a higher risk of reoperation, which, when this occurs, may outweigh the benefits. Shared decision making is important to make an informed and transparent decision. In combined surgeries, the order of the procedures did not affect the risk for hematomas of the chest (Odds Ratio 0.922, 95% CI 0.39-2.20, $p = 0.856$) and reoperations (Odds Ratio 1.121, 95% CI 0.46-3.25, $p = 0.689$). In addition, general complication and gynecological complication rates were not significantly dependent on the order of procedures. Hence, if it is decided to combine mastectomy and hysterectomy procedures, the order of procedures can be varied, which facilitates planning of the surgeries. Although this study is of added value as it is one of only a few reports on the outcomes of postoperative hematoma and reoperation of the chest in trans men, it is limited by the retrospective study design and the heterogeneity of the groups. Despite these shortcomings, it is the first study which described and compared the complication and reoperation rates in single masculinizing mastectomy procedure versus the combined procedure whereas the effects of the order of the combined procedures is also taking into account.

This study shows that the risk for postoperative hematomas and reoperation are more than doubled when subcutaneous mastectomy is performed in a combined session compared to a single mastectomy. Patients have to be made aware of these additional risks during consultation. Furthermore, if it is decided to perform a combined total laparoscopic hysterectomy and mastectomy, the order of the procedures may be alternated without additional risks, which facilitates surgical planning.

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Disclosure statement

The authors have no conflict of interest to declare.

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