



REVIEW ARTICLE



## Scar versus shape: patient-reported outcome after different surgical approaches to gynecomastia measured by modified BREAST Q®

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### ABSTRACT

**Objectives:** The challenge in the operative therapy for enlargement of the male breast is to deal with the skin excess. Shape and scars are the major parameters after which patients assess their operative result. Therefore, we assessed the satisfaction rate among patients undergoing subcutaneous mastectomy at our institution with special regard to scar tissue formation and the postoperative appearance of the chest wall in dependence of the surgical approach (periareolar versus inframammary fold).

**Methods:** The study includes  $n=36$  male patients who underwent subcutaneous mastectomy at AGAPLESION Markus Hospital Frankfurt/Main. Patient's satisfaction dependent with the appearance of the chest wall and scar formation was evaluated by a modified BREAST Q® questionnaire plus two male-based additional questions.

**Results:** There is no statistically significant difference in satisfaction with the operative result depending on the pattern of incision (periareolar versus submammary periareolar; 81.9% versus 75.5%) with the operative result. Evaluation of additional questions of the modified BREAST Q® questionnaire showed that 86% of the patients ( $n=31$ ) would rather have more scars and a flatter chest wall. A BMI  $>25 \text{ kg/m}^2$  is accompanied by a higher risk for complications ( $p=0.04$ ).

**Conclusions:** Periareolar incision is still the method of choice, if promising an aesthetic appealing result. When reaching its limits though, we showed that a flat and male-shaped appearance of the chest wall is priority for the patients and should therefore be for the surgeon as well.

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### Introduction

Gynecomastia is defined as a benign proliferation of fibroglandular tissue in male patients. Although benign in nature, gynecomastia typically has a huge psychological impact on the affected male [1–5]. There are three peaks in age distribution described [1]. The first peak occurs in the neonatal period due to the maternal hormones flowing in the baby boy's blood circulation, the second at the time of puberty and the third at the age of 50–80 years [1]. Gynecomastia has multifactorial causes: while it is idiopathic in 25% of cases [6], it can be due to the abuse of drugs and substances, such as anabolics, or relate to malign proliferations, such as testicular or prostate cancer. The life-time prevalence of gynecomastia in the male population varies from 32% to 65% [4]. Gynecomastia is to be distinguished from pseudogynecomastia, where enlargement of the male breast is due to an increased retro areolar accumulation of adipose tissue.

An interdisciplinary approach among endocrinologists, urologists, and radiologists is needed to determine the cause, consisting of a misbalance in estrogens and androgens, of male breast enlargement [4].

Braunstein described that gynecomastia is reversible in the first florid phase, but irreversible in the second fibrous phase [1]. In literature, there are various described techniques for removal of the irreversibly enlarged fibroglandular tissue, with its limitation

regarding the skin excess [2–5,7–10]. Namely subcutaneous mastectomy with different operative approaches e.g. periareolar incision with or without skin resection versus a scar in the inframammary fold; which can be combined by standard liposuction [2,3,6,7,11]; or ultrasound-assisted liposuction alone in the presence of fibrous areas with moderate skin excess [5].

The choice for a periareolar incision appears tempting, since in theory, scars are only invisible in the early postoperative period. Patients must be counseled that there is a high chance of hypertrophy during scar maturation [2]. An approach in the inframammary fold might have large scars initially, but with a high chance of favorable scar maturation [10].

Our hypothesis was that as long as breast shape was satisfactory for the patient, the extent of scars is less important. This study assessed the satisfaction rate among patients undergoing subcutaneous mastectomy at our institution with special regard to scar tissue formation and the postoperative appearance of the chest wall. Based on a modified BREAST Q® questionnaire, 'reconstruction' module, we assessed patients' satisfaction with the operative outcome, patients' psychological, sexual and physical well-being after subcutaneous mastectomy [12,13], as well as satisfaction with the flatness and shape of the chest wall and patients' attitude toward scarring on the chest wall.

Materials and methods

In this retrospective study at the Department of Plastic & Aesthetic, Reconstructive & Hand Surgery, AGAPLESION Markus Hospital, Johann Wolfgang von Goethe University, Frankfurt, Germany, the charts of  $n=58$  male patients with  $n=110$  who were diagnosed with gynecomastia and subsequent underwent subcutaneous mastectomies between 2014 and 2016 were retrospectively reviewed. The inclusion criteria were defined as follows: biological male patients  $\geq 18$  years who underwent subcutaneous mastectomy at our institution between January 2014 and December 2016, with complete records, who gave consent to participate at the study.

If an enlargement of the retromammary gland is seen in ultrasound, patients are sent to endocrinology to exclude a curable hormonal imbalance causing gynecomastia. Before presenting to surgery the endocrinologist attests the irreversibility of the enlarged gland, by stating that conservative therapy options have been exhausted. Thus, to ensure that only patients suffering from a veritable gynecomastia present to surgery. Patients with a pseudogynecomastia are excluded from the study. In total  $n=36$ , male patients who underwent subcutaneous mastectomy for gynecomastia and completed the modified BREAST Q® questionnaire and for whom complete records were available were included in the study. Age, site of subcutaneous mastectomies, comorbidities, operative technique, resection weight, complications, complication management, scar quality, its patients' satisfaction, and time of follow-up were analyzed. According to our institutional standard protocol, a multi-staged informed consent is conducted with every patient.

Ethics approval for the study was obtained from the ethical committee of the Hessian Medical Association.

Statistical analysis was performed using the software *BiAS (v 11.3 (epsilon)) for Windows*. The significance of the differences was tested with *t*-test.  $p < 0.05$  was defined as statistically significant.

Preoperative workup prior to subcutaneous mastectomy included endocrinological evaluation of serum hormone levels of estradiol, testosterone, human chorionic gonadotropin, luteinizing

hormone; clinical urological examination including ultrasound imaging of the testicles, and ultrasound imaging of the enlarged breast. Only patients without any secondary causes of gynecomastia, which would require therapy prior to subcutaneous mastectomy, were accepted for surgery.

At our institution, patients are individually advised to the choice of operative technique, taking under consideration operative specific benefits and their limitations, as well as patients' specific conditions such as patients' age, skin elasticity, preoperative breast volume, and patients' idea of postoperative width of scars at the outpatient clinic. There is no set algorithm defining the operative technique due to the clinical findings.

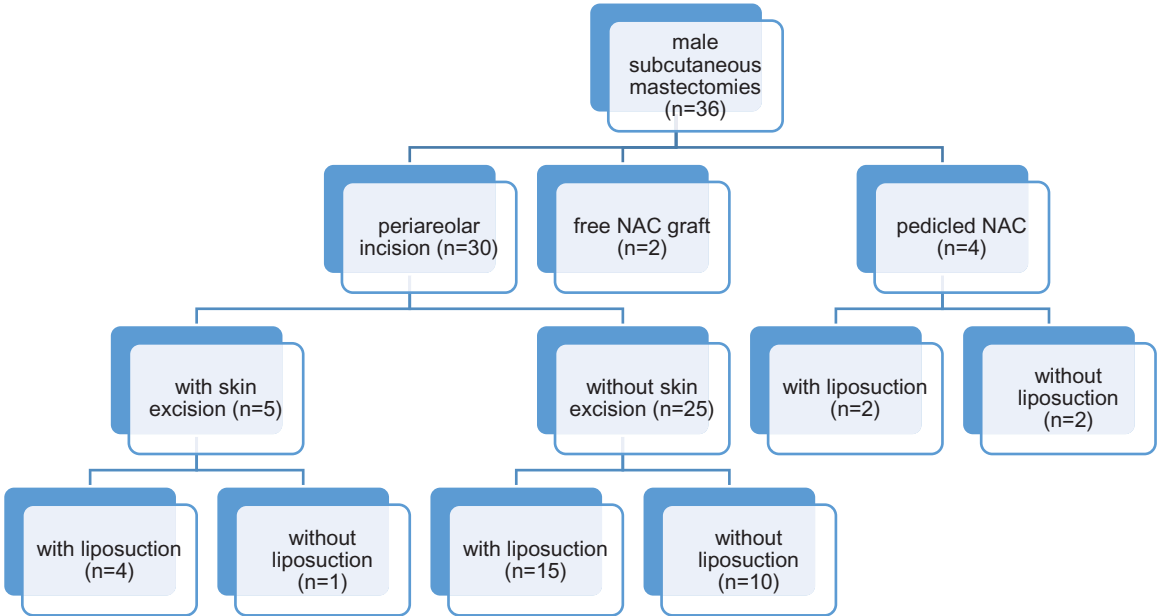
The applied surgical techniques are illustrated in Table 1. Surgery ideally leads to a symmetrization of the chest wall, minimal scarring, and the preservation of the sensitivity, male shape, and position of the nipple–areola complex (NAC). The enlargement of the breast was classified according to the Simon classification [14].

According to our institutional standard protocol, a multi-stage informed consent process is conducted with every patient. In the operating theater, patients receive single-shot antibiotics (1 g cephazoline i.v., or Clindamycin 600 mg i.v. in case of allergies to cephazoline) 30 min prior to surgery. The operation starts with an injection of diluted epinephrine solution (1:400,000) at the incision sites, avoiding the NAC. Resection is always performed on both breasts by the same surgeon. Drains are used routinely. For smoother contouring of the chest wall, lipectomy can be suction-assisted. Only standard liposuction is performed at our institution.

The standardized BREAST Q®, 'reconstruction' module, was extended to evaluate patients' satisfaction with the appearance of the chest wall and scar formation. Two questions were added to the questionnaire: (a) Would you rather have more scars and a flatter chest wall? (b) Does the preservation of NAC sensitivity matter to you in sexual life?

Since the BREAST Q® evaluates patient satisfaction not only with regard to the operative results but also to the process of care, including for example the administrative process, we split the questionnaire into the sections 'total satisfaction' and

Table 1. Applied surgical techniques for subcutaneous mastectomies.



**Table 2.** Patient classification after Simon [14].

|           | Definition                                                                          | n  |
|-----------|-------------------------------------------------------------------------------------|----|
| Grade I   | Small visible breast enlargement – no skin redundancy                               | 0  |
| Grade IIa | Moderate breast enlargement without any skin redundancy                             | 8  |
| Grade IIb | Moderate breast enlargement with skin redundancy                                    | 8  |
| Grade III | Marked breast enlargement with marked skin redundancy i.e. pendulous female breasts | 20 |

'satisfaction with operative outcome'. Due to the various modification in the questionnaire in order to fit the requirements statistical evaluation was done by a standard software.

## Results

A total of  $n = 36$  male subjects, diagnosed with gynecomastia and consecutively underwent subcutaneous mastectomy and who met the inclusion criteria were included in this study. The average age was 31 years at the time of operation (range: 13–84 years). In all but one case, subcutaneous mastectomy was performed bilaterally, totaling 71 subcutaneous mastectomies.

The average BMI was  $25.6 \text{ kg/m}^2$  (range:  $16.9\text{--}39.3 \text{ kg/m}^2$ ). The patient with the highest BMI of  $39.3 \text{ kg/m}^2$  was the only postbariatric patient included in this study. He underwent periareolar incision with skin resection.

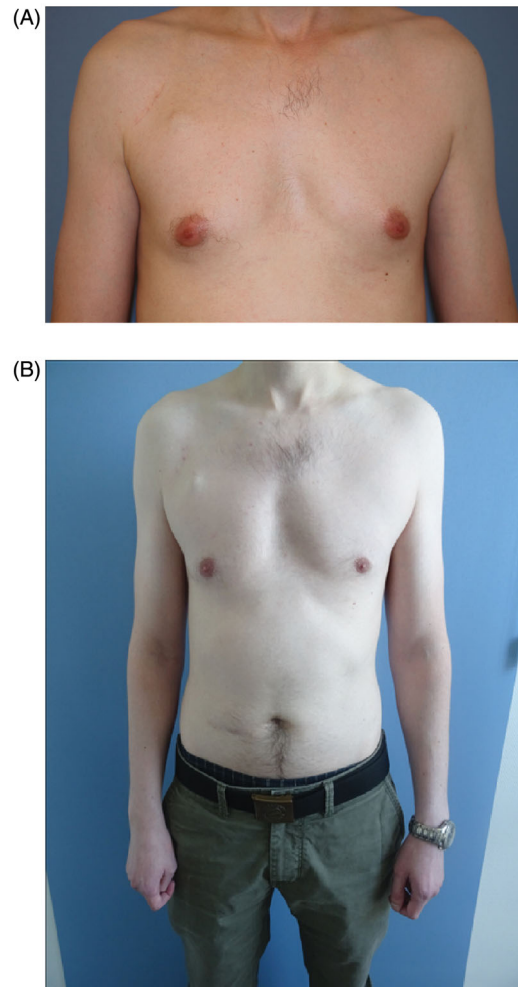
The study included patients with Simon grade IIa–III gynecomastia. Eight patients each presented with grade IIa and IIb gynecomastia, and 20 patients presented with Simon grade III gynecomastia (Table 2). Figure 1 shows a pre- and postoperative view of patients assigned to the different groups. The applied operative techniques are illustrated in Table 1.

The majority of our patients ( $n = 30$ ) underwent subcutaneous mastectomy by periareolar incision, of which five underwent additional resection of excess skin. Two patients underwent inframammary incision and free nipple graft; four patients underwent subcutaneous mastectomy with a pedicled NAC and incision in the inframammary fold. At our institution, subcutaneous mastectomy is often combined with standard liposuction ( $n = 21$ ; 58.3%). We consider liposuction an effective method of contouring the chest wall. Since this study excludes patients with pseudogynecomastia, standard liposuction alone was not performed in any of the cases in the presence of fibrous tissue. Two patients (5.6%) received a free nipple graft presented with grade III gynecomastia.

The majority of our patients presented to operation without any comorbidities ( $n = 22$ ; 61%). Nine patients were active smokers at the time of surgery (25%). The average resection weight equaled 94.5 g (range: 13–487.5 g). The average amount of liposuction equaled 94.5 g per side (range: 13–487.5 g). Three patients had postoperative hemorrhage (8.3%), all of which underwent subcutaneous mastectomy by periareolar incision. Four patients underwent scar revision, three of which had subcutaneous mastectomy by periareolar incision.

The evaluation of the two additional questions of the modified BREAST Q® questionnaire showed that 86% of the patients ( $n = 31$ ) would rather have more scars and a flatter and more male-shaped chest wall. NAC sensitivity seems to have a secondary role in sexual life. Only five patients (13.9%) consider the preservation of NAC sensitivity important or very important for their sexual life.

The satisfaction rate with the operative result was 80.9%. The satisfaction rate was higher in patients undergoing subcutaneous mastectomy by periareolar incision than in patients undergoing an inframammary incision (81.9% versus 75.5%). The 'total

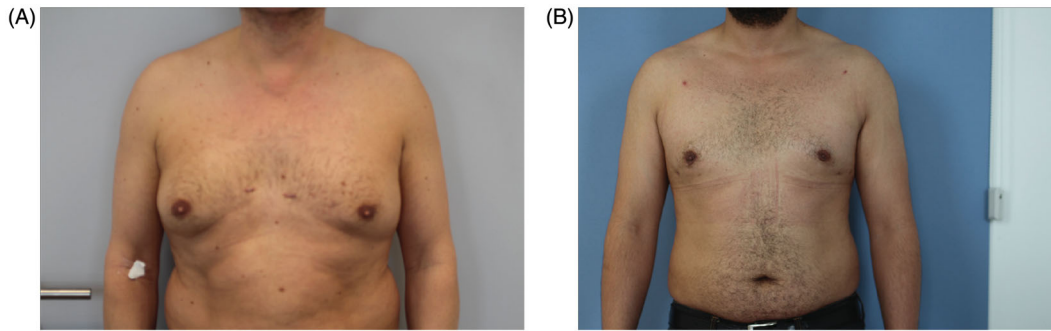


**Figure 1.** (A) Pre- and (B) postoperative view of a patient presenting with unilateral gynecomastia grade IIa, resection of the gland by periareolar incision alone.

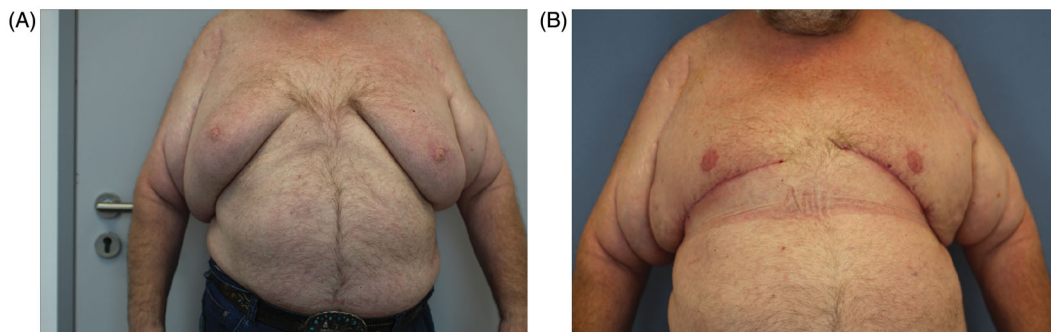
satisfaction' rate was 74.7%. Patients who received an inframammary incision were again less satisfied than patients undergoing periareolar incision (71.3% versus 75.4%).

Statistical evaluation showed a higher complication rate for patients with a BMI of  $25 \text{ kg/m}^2$  or higher ( $p = 0.04$ ) and patients undergoing periareolar incision ( $p = 0.04$ ). Note that there is no increase in complication rate for tobacco use ( $p = 0.39$ ). Interestingly, there is no statistically significant difference concerning the rate of satisfaction with the operative result depending on the grade of gynecomastia (IIa and IIb versus III;  $p = 0.59$ ) or the pattern of incision (periareolar versus submammary incision;  $p = 0.29$ ).

Complications, namely after bleeding in three cases, and one wound healing disorder (11.1%) showed no statistic significant impact on patients' satisfaction rate with the operative result ( $p = 0.53$ ) or the total satisfaction rate ( $p = 0.43$ ).



**Figure 2.** (A) Pre- and (B) postoperative view of a patient presenting with bilateral gynecomastia grade IIb, resection of the gland by periareolar incision combined with standard liposuction.



**Figure 3.** (A) Pre- and (B) postoperative view of a patient presenting with bilateral gynecomastia grade III, resection by free nipple graft.

## Discussion

The goals for the creation of an appealing male chest wall are well defined. As described above, the thorax is ideally flat and male-shaped, scars are invisible, symmetry is preserved or restored, and the sensitivity of the NAC is preserved [2,3,6,8,9]. All patients included in this study presented with enlargement of the glandular breast tissue as proven by a preoperative ultrasound. The excess of the mammary gland indicated surgical resection of the gland. The choice of operation technique is not based on a set algorithm at our institution, unlike at other institutions [8]. Instead, a multi-stage informed consent process was conducted with every patient. The surgeon in charge advises the patient about the different possible operative techniques for subcutaneous mastectomy and the limitations of each technique, taking patients' characteristics into consideration, e.g. age, skin elasticity, breast volume, and expectation of the operative result, thereby keeping in mind that the decision for a specific surgical technique is not always be as specifically defined by an algorithm as one might expect, i.e. in the real clinical world anatomic conditions may allow for different surgical techniques. In the event of enlarged subcutaneous fatty tissue, patients are recommended a liposuction-assisted technique. This individual approach was rated with a high satisfaction rate of 80.9%.

As stated by others, the higher the grade of gynecomastia and consequently the amount of excess skin, the more complicated it is to form the male chest wall without leaving large, visible scars [2,4,6,15]. According to our literature research, the operative approach by using ultrasound-assisted liposuction shows aesthetic appealing results in low-grade gynecomastia but has its limitations in the presence of high skin excess [4,15]. The example of the patients in Figure 1 illustrates the patients' different preoperative conditions. The chance of achieving an aesthetically pleasing result is clearly higher for patient A than for patient E. We assume

this to be the underlying reason why the majority of our patients stated that they 'would rather have more scars and a flatter chest wall' (86%;  $n = 31$ ), though the satisfaction rate with 'total satisfaction' and 'satisfaction with the operative result' was higher in the patient group undergoing periareolar incision only (81.9% versus 75.5% and 75.4% versus 71.3%).

Patients presenting at the outpatient clinic are accordingly informed that the periareolar incision is known to have a statistically higher complication rate than the incision in the inframammary fold at our institution ( $p = 0.04$ ) as well as at others [2,3,6]. Furthermore, the higher the grade of gynecomastia, the higher the chance of developing stigmatizing hypertrophic scarring when choosing the periareolar approach requiring scar revision [2,15]. To our experience, an operative correction cannot necessarily assure an aesthetic satisfactory result (Figures 2 and 3).

The amputation of the breast with a free NAC graft allows the surgeon to contour the chest wall very flat with large scars in the inframammary fold. Patients are explicitly counseled at the outpatient clinic about the postoperative loss of sensitivity of the NAC. At our institution, we critically questioned the indication for a free NAC graft, since sensitivity of the NAC is lost. This study reveals that the loss of sensation is no restraint for most of our patients (86.1%), especially in sexual life. The result of this survey has an impact on the way patients are advised preoperatively at our institution.

Given that correction of gynecomastia is among the four aesthetic surgical procedures most desired by men [16] and that the population of male patients seeking plastic surgery is increasing [16], it is beneficial for the surgeon to know what men desire.

According to literature research, the data on whether smoking is a statistically significant risk factor in breast surgery [17–19] or not [16,20] are controversial. Experimental studies by Ueng et al. showed an impairment of granulation tissue formation due to the vasoconstrictive influence of nicotine [18,21]. Nicotine inhibits

capillary blood flow through its direct cutaneous vasoconstrictive effect and indirect release of catecholamines [18,22]. At our institution, patients are, therefore, encouraged to quit tobacco use prior to surgery, ideally at least one month prior to surgery. There is no clear evidence in the literature concerning the ideal time range for quitting smoking prior to surgery. Some studies say 4 week while other studies suggest quitting smoking 2–4 weeks prior to surgery [18,19,22]. At our institution, the surgeon in charge is required to critically question the indications for any elective surgery in every patient and is free to define conditions that must be fulfilled before elective surgery [18].

In our study, statistical analyses revealed that a BMI greater than 25 kg/m<sup>2</sup> is a significant prognostic risk factor for complications. Likewise, other studies revealed that male patients with a high BMI (>25 kg/m<sup>2</sup>) are more likely to have complications after aesthetic surgery [16,23–25]. Since we face an increasing number of male patients in plastic surgery desiring an aesthetic procedure [16], risk factors should be clearly identified and discussed with the patient prior to surgery, since a well-informed patient is more likely to bear the consequences of surgical complications.

According to our literature research, there is no clear evidence as to whether patients' postoperative satisfaction is increased by adopting a scar-saving technique or vice versa [26]. As stated by others, we believe that the weight of resected tissue and skin quality has an impact on the aesthetic result after the operation. The length of scars plays a subordinate role [19,25].

## Conclusion

In the presence of moderate skin excess, a scar sparing technique is the method of choice. For patients with high skin excess, in which a scar sparing technique does not guarantee an aesthetic contour, flatness and symmetry of the chest wall, the width of scars plays a subordinate role. As a consequence of this study, we aim to form an aesthetically appealing chest wall. A scar-saving technique is only applied if it will presumably lead to patients and surgeons' satisfaction; otherwise, we aim for large scars.

A high BMI presents a risk factor for male patients in aesthetic surgery and should be discussed with the patient prior to surgery.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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