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ARTICLE

Integrating the Fast-Track surgery concept into the surgical treatment of gynecomastia

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ABSTRACT

Background: The use of fast-track surgery pathway has been reported to reduce the stress of operation and accelerate rehabilitation in various surgical specialties. However, there has been a relative dearth of research on this subject for surgical treatment of gynecomastia.

Materials and methods: The gynecomastia was treated by liposuction plus pull-through technique. The safety and recovery profiles were retrospectively compared between the patients in a standard pathway (including general anesthesia and postoperative drainage) and those in a fast-track pathway (including patient education, local tumescent anesthesia, no drainage, and effective pain control). Registered outcomes included postoperative complications, time to normal life, length of stay, patient satisfaction, etc.

Results: From October of 2017 to October of 2021, 126 gynecomastia patients with Simon's grade I or II who underwent the surgical treatments were included in the study, of which 25 patients were treated according to standard pathway, and 101 patients underwent the fast-track pathway. During the follow-up, there was no difference between the cohorts in the incidence of postoperative complications. Both the time to normal life and length of stay significantly decreased to 0 after the introduction of fast-track pathway. Overall, 94.1% of the patients ranked the fast-track surgical pathway as 'great' or 'moderate' at the 3-month follow-up.

Conclusions: The proposed fast-track pathway is feasible for surgical treatment of gynecomastia, leading to an enhanced recovery and high patient satisfaction without increasing the rate of complications. The fast-track surgery concept with implementation of local anesthetic techniques should be given serious consideration in gynecomastia management.

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Introduction

The Fast-track surgery or Enhanced Recovery After Surgery (ERAS) pathway is a multimodal and evidence-based approach, integrating patient education, anesthesia, surgical techniques, and perioperative care regimens into an effective rehabilitation program, with the goals of reducing the physiological and psychological stresses associated with operations, thereby enhancing the recovery [1]. Recently, the fast-track programs have been widely used in many specialties and numerous major surgical procedures [2]. In plastic surgery procedures, there have been several studies demonstrating the safety and efficacy of ERAS programs in breast reconstruction [3–5].

Gynecomastia refers to the benign breast hypertrophy in men and is a common finding in young or elderly patients. If the condition has been present for more than one year, it will be unlikely to regress spontaneously or with medical therapy. Thus, surgical treatment will be required if the patient wants a cosmetic improvement [6,7]. Traditionally, the operations are performed in breast or plastic surgery department with various treatment modalities under general anesthesia. Postoperatively, patients remain in hospital to be observed and treated for any potential complications [8,9].

With the success and dissemination of the concept of the fast-track surgery, patient's desire for rapid recovery has increased. However, there are few relative protocols described for patients with gynecomastia to date. In our practice, we have optimized the conventional perioperative care regimens and developed a fast-track surgical pathway for the treatment of gynecomastia with Simon's grade I or II. The aim of the present study was to evaluate the safety and recovery profiles of our proposed fast-track pathway by comparing patients undergoing surgical treatment of gynecomastia in a fast-track pathway with those in a standard care pathway.

Materials and methods

Patients

A chart review of all surgical treatments of gynecomastia performed by the senior author (J.G.H) from October of 2017 to October of 2021 was executed. The inclusion criteria of the study were: (1) diagnosis of idiopathic gynecomastia; (2) Simon's grade I or II; (3) treatment with liposuction and pull-through technique; (4) in a standard or fast-track care pathway; (5) a minimum 12 months of follow-up. The specific fast-track pathway was shown in Table 1 and the key different points between the standard and fast-track pathway were shown in Table 2. The exclusion criteria were: (1) pathologic gynecomastia diagnosed by endocrinological testing or imaging examination; (2) Simon's grade III;

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Table 1. The specific fast-track surgical protocol for the treatment of gynecomastia with Simon's grade I or II at our hospital.

Time	Item	Contents
Preoperative	Evaluation and preparation	Minimizing organ dysfunction and comorbidities that affecting the surgery. No preoperative fasting.
	Patient education and counseling	Developing written and video material to educate patient about the surgery and the postoperative care plan.
Intraoperative	Anesthesia	Local tumescent anesthesia
	Minimally invasive surgery	Liposuction and pull-through technique
	Surgical atmosphere	Reducing anxiety by relaxed chatting or playing gentle music
Postoperative	Postoperative care regimens	Wear a pressure garment for 4-6 weeks, Effective pain relief with nonsteroidal anti-inflammatory drugs (NSAID), No drain, No bed rest, Normal oral intake, Limited upper arm activity for 2 weeks.

Table 2. The key different points between the standard and fast-track protocol.

Item	Standard	Fast-track
Patient education	Regular instructions	Professional introductions of tumescent anesthesia and surgical process
Preoperative fasting	6 h	None
Anesthesia	General anesthesia	Local tumescent anesthesia
Surgical technique	Liposuction and Pull-through technique	Liposuction and Pull-through technique
Postoperative		
Bed rest	At least 6 h	No restriction
Oral intake	At least 6 h later	No restriction
Drainage	1–2 days	None
Pain control	Powerful analgesic agents	Oral nonsteroidal anti-inflammatory drugs (NSAIDs)
Length of stay	2–3 days	None

Table 3. The patient questionnaire about the fast-track surgical program at the 3-month follow-up.

1. Do patient education reduce your anxiety or fear before and after the operation?
   ≤ Poor ≤ Mild ≤ Moderate ≤ Great
2. Are you satisfied with the pain control during and after the operation?
   ≤ Poor ≤ Mild ≤ Moderate ≤ Great
3. Can you live or work normally after the operation?
   ≤ Poor ≤ Mild ≤ Moderate ≤ Great
4. Are you satisfied with the chest wall appearance after the operation?
   ≤ Poor ≤ Mild ≤ Moderate ≤ Great
5. How do you rate the overall effect of the fast-track surgical program?
   ≤ Poor ≤ Mild ≤ Moderate ≤ Great

(3) treatment with other surgical techniques; (4) do not accept the standard or fast-track care pathway.

In total, 18 patients (35 breasts) with Simon's grade I and 7 patients (14 breasts) with grade II were treated according to standard care pathway; 63 patients (125 breasts) with Simon's grade I gynecomastia and 38 patients (75 breasts) with grade II were treated according to fast-track pathway. Notably, there were four patients excluded in the analysis. It was because that they demanded the general anesthesia due to fear of surgery even though they knew the advantages of the fast-track pathway. However, no patient had to be aborted in the halfway when the fast-track pathway was chosen.

In the fast-track group, every patient completed a questionnaire about the fast-track surgical pathway at the 3-month follow-up. The content was shown in Table 3. A prospectively maintained database was analyzed with respect to demographic, treatment characteristics, complication, and recovery data. Informed consent was obtained from all the patients for using their data in accordance with the ethical standards of our institutional ethical committee.

Surgical procedures

Before the operation, the areas where liposuction will be performed are marked with the patient in the standing position. If there is excess fat in the upper outer quadrant and lateral chest wall, it will also be marked and suctioned to smooth the contour (Figure 1). A 5-mm stab incision is made at the inframammary crease along the anterior axillary line after the patient is placed in the supine position and the incision site has been anesthetized. The room temperature wetting solution (1000 ml Ringer's lactate solution mixed with 30 ml of 2 percent lidocaine, 30 ml of sodium bicarbonate and 2 ml of 1:1000 epinephrine) is infiltrated slowly (less than 100 ml/min) just deep to the skin and then within the breast tissue until the tissue turgor expand uniformly to white and show orange peel like changes.

The SAFE liposuction technique is then used in a 3-step process consisting of Separation, Aspiration, and Fat Equalization, as described previously [10]. Fat separation is initially performed without suction, using a 3.5 mm cannula through the lateral chest wall incision. For gynecomastia, it requires considerable effort to pass the cannula through the subcutaneous fibrofatty tissues. The end point of fat separation is complete loss of resistance to the cannula in the periphery and mobilization of the dense fibroglandular mass in the subareolar region. Aspiration is then performed evenly using the same 3.5-mm cannula to remove the separated fat. The inframammary fold is disrupted intentionally to smooth the transition of the breast to the abdomen. When no further fat can be removed from the subareolar area, the remaining fibrous mass can be palpated clearly and isolated from the deep facias. It is then grasped and pulled through the stab incision with a clamp. Note that a small strand of tissue is resected using scalpel each time (Figure 2]. Approximately 5 mm of subareolar fibrous tissue is preserved to maintain the vascularity of nipple-areolar complex and meanwhile avoid the possible central depression. Fat equalization is finally performed using the same 3.5-mm cannula with no suction to smooth the contour of the chest wall. A rolling pinch test is performed to verify symmetry between the two sides (Figure 3). According to standard care pathway, subcutaneous drains are placed through the lateral incisions. However, postoperative drainage is avoided in the fast-track group. A pressure garment is worn immediately after surgery and maintained for 4–6 weeks (expect for bathing) (Figures 4 and 5).

Standard care pathway

Before the operation, patients are given the regular instructions about the elective surgery and general anesthesia. The surgery is performed under general anesthesia and a 6-h preoperative

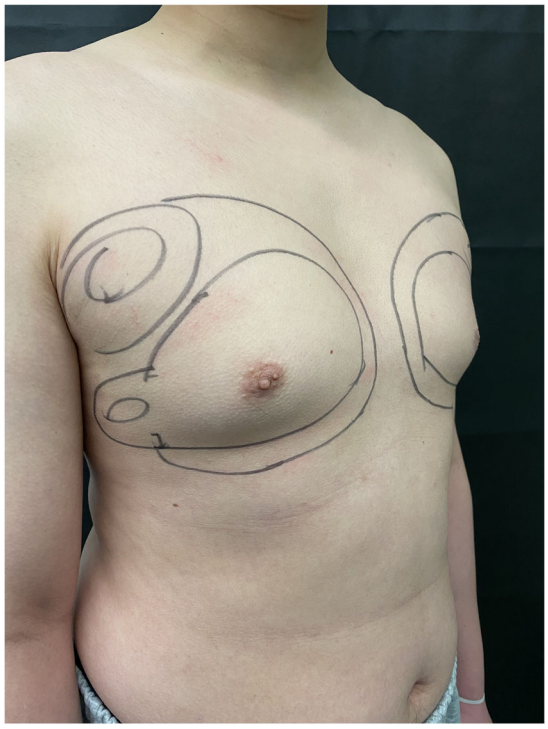

Figure 1. Preoperative markings for liposuction. The treated area was usually 2 to 3 cm beyond the breast boundary, including the excess fat area in the upper outer quadrant and lateral chest wall.

Figure 2. The subareolar fibrous mass was easily pulled out through the lateral incision only when the architectural integrity of the mass was destroyed by the back-and-forth movement of the cannula.

fasting is required. After the operation, subcutaneous drains are routinely placed and can be removed when the daily output is below 10 ml per drain. Patients are given continuous postoperative analgesia with a portable infusion pump delivering analgetic solution (0.125% ropivacaine and 0.125% bupivacaine) for 24 h.

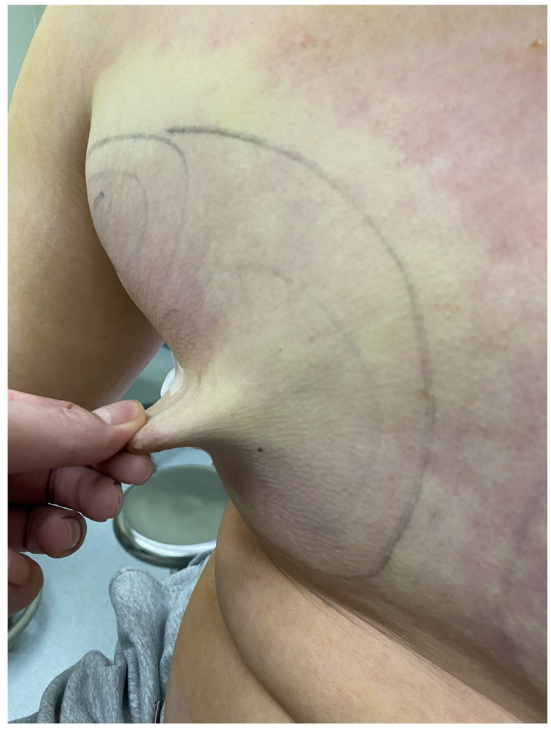

Figure 3. The immediate sitting view after the surgery. A smooth chest wall contour with a thin remaining subareolar fibrous tissue was shown.

Only when there are no anesthesia-related vomiting or other discomforts can the patient get out of bed and have normal oral intake. Patients stay in hospital with a limited life or activity until the drains are removed (Table 2).

Fast-track pathway

Preoperatively, patients are given detailed instructions about the tumescent anesthesia and surgical course with formal written and video materials, in hope of alleviating their fear of surgery. Meanwhile, they are taught how to manage the postoperative wound nursing by themselves. There is no preoperative fasting since the local tumescent anesthesia is chosen. none of this group received any per-operative sedatives or anxiolytics. During the operation, it is also helpful to reduce the patients' anxiety by relaxed chatting or playing gentle music. Postoperative drainage is avoided to facilitate early mobilization.

After the operation, patients go home without hospitalization. Postoperative pain can be effectively treated with nonsteroidal anti-inflammatory drugs (NSAID). There is no oral intake restriction after the surgery. They can have basic life or work postoperatively with a limited upper arm activity for 2 weeks.

Statistical analysis

The two independent samples T-test or Mann–Whitney U Test was carried out comparing continuous variables between the two groups. The Pearson chi-squared test or Fisher's exact test was used to compare categorical variables. The level of significance was defined as $p < 0.05$. The calculations were performed using SPSS 13.0 software (SPSS, Chicago, IL, USA).

Results

A total of 126 patients was included in the study, of which 25 patients were treated according to standard care pathway, and

Figure 4. (Top) Preoperative appearance of a 28-year-old man with typical bilateral gynecomastia consisting of a subareolar fibroglandular tissue in association with peripheral fibrofatty hypertrophy. (Bottom) Three-month postoperative result demonstrating a smooth chest wall contour with an inconspicuous scar.

Figure 5. (Top) Preoperative appearance of a 24-year-old man with persistent bilateral gynecomastia. (Bottom) Three-month postoperative result showing an aesthetically pleasing chest wall contour and no visible scars.

101 underwent the fast-track pathway. The two groups of patients were comparable in terms of the distribution of Simon's degree, age, body mass index (BMI), duration of breast enlargement before the surgery (Table 4). Regarding the procedure performed, there was also no statistically significant difference in the weight of excised glandular tissue per breast, aspiration volume per breast, and operation time between the two groups (Table 5).

Complications using the liposuction plus pull-through technique included seroma ($n = 2$) and superficial nipple necrosis ($n = 3$) in our study (Table 5). All of them occurred in the fast-track group. However, the overall incidence of complications in the fast-track group was not significantly different when compared with the standard group (5.0% vs. 0%, $p = 0.586$). The seroma was treated successfully by repeated syringe aspiration.

Table 4. Patient characteristics in the standard and fast-track group.

Variable	Standard	Fast-track	*p* Value
Number of patients	25	101	0.088
Simen's grade I	18	63	
Simen's grade II	7	38	
Age (yr), (range)	28.4 ± 6.5, (17–40)	27.6 ± 6.1, (16–42)	0.826
Body mass index (kg/m^2), (range)	27.2 ± 3.0, (21.6–32.1)	26.5 ± 2.5, (19.7–29.5)	0.141
Duration of breast enlargement (yr), (range)	13.7 ± 6.9, (2–30)	14.1 ± 6.5, (2–30)	0.816
Follow-up (m), (range)	23.4 ± 12.5, (12–48)	16.4 ± 5.5, (12–36)	0.00

Table 5. The outcomes in the standard and fast-track group.

Variable	Standard	Fast-track	*p* Value
Glandular tissue weight per breast (g), mean (range)	14.9 ± 11.0, (1–50)	11.0 ± 10.3, (1–45)	0.818
Aspiration volume per breast (ml), mean (range)	409.6 ± 185.7, (190–900)	370 ± 154, (180–900)	0.413
Operation time (min), mean (range)	52.6 ± 12.3, (40–80)	50.2 ± 10.3, (40–90)	0.162
Complications in breasts			0.586
Hematomas	0	0	
Seromas	0	2	
Superficial nipple necrosis	0	3	
General anesthesia fee (RMB), median (interquartile range)	3616, (3350–3926)	0, (0-0)	0.00[a]
Length of stay(d), median (interquartile range)	3, (2-4)	0, (0-0)	0.00[a]
Time to normal oral intake (h), median (interquartile range)	6, (6-12)	0, (0-0)	0.00[a]
Time to drainage removal(d), median (interquartile range)	2, (1-3)	0, (0-0)	0.00[a]
Time to normal life(d), median (interquartile range)	2, (1-3)	0, (0-0)	0.00[a]

[a]Analysis of differences between the two groups was performed by Mann-Whitney *U* test.

Table 6. Patient-reported outcomes of the fast-track program at the 3-month follow-up.

Question	Great	Moderate	Mild	Poor
Q1: patient education	71 (70.3%)	23 (22.8%)	7 (6.9%)	0 (0%)
Q2: Pain control	61 (60.4%)	30 (29.7%)	10 (9.9%)	0 (0%)
Q3: Normal life and work	81 (80.2%)	20 (19.8%)	0 (0%)	0 (0%)
Q4: Chest wall appearance	90 (89.1%)	11 (10.9%)	0 (0%)	0 (0%)
Q5: Overall satisfaction	64 (63.4%)	31 (30.7%)	6 (5.9%)	0 (0%)

Three cases of superficial nipple necrosis were also healed by conservative treatment. During the follow-up, no patients required revisions for residual contour irregularities, excess skin, or insufficient excision in both of groups.

Most notably, all the patients in the fast-track group endured the local anesthesia and operations well. They went home with no drainage or hospitalization, and thus the normal life or work was not affected after the surgery. However, since the drains were routinely placed in the standard group, patients remained in the hospital (median, standard 3d vs. fast-track 0d, $p = 0.00$) and suffered a delayed normal life or work (median, standard 2d vs. fast-track 0d, $p = 0.00$) until the drains were removed after the surgery (median, standard 2d vs. fast-track 0d, $p = 0.00$). In addition, as the general anesthesia was avoided in the fast-track group, it was unnecessary to restrict the postoperative oral intake (median, standard 6 h vs. fast-track 0 h, $p = 0.00$) and the anesthesia cost was saved (median, standard RMB¥ 3616 vs. fast-track RMB¥ 0, $p = 0.00$).

In the fast-track group, patient recovery and satisfaction was also assessed *via* a questionnaire at the 3-month follow-up. Regarding the overall satisfaction of the fast-track program, 94.1% of the patients ranked it as 'great' or 'moderate' postoperatively. It was noteworthy that no patient ranked the program as poor. The details were illustrated in Table 6.

Discussion

Most patients seeking consultation for the surgical treatment of gynecomastia are found in young and middle-aged population. They have a strong desire for rapid rehabilitation as well as the minimally invasive surgery since they are busy in study or work. The present study demonstrated that the fast-track surgical pathway we proposed could well meet the demands of patients with accelerated recovery and low morbidity.

At present, the gynecomastia is treated in different disciplines with various modalities, ranging from the open approach with subcutaneous mastectomy to suction-assisted lipectomy, or combination of liposuction and fibroglandular resection utilizing a variety of incisions [11–13]. It has been reported that these techniques can improve the chest wall appearance and restore the patients' self-confidence. However, there are great differences in postoperative rehabilitation among these techniques.

Recently, the more frequent uses of minimal invasive surgical techniques have been introduced in the fast-track programs. When compared with open approaches, it could attenuate various inflammatory responses with subsequent faster recovery [1,14]. In our fast-track program, the combination of liposuction and the pull-through technique was used for several reasons. First, the technique was simple and effective. Second, it was no need to use additional instruments for liposuction or subareolar dense tissue removal, and thus the overall costs were reduced. Third, the drainage was unnecessary due to minimal tissue injury. Our results also demonstrated that the avoidance of drainage did not increase the rate of postoperative complications. Besides, as the drains were not placed, the time to normal life after the surgery significantly decreased. Fourth, it could be performed under local tumescent anesthesia and then patients went home immediately after the surgery.

With the liposuction plus pull-through technique, the weight of excised fibroglandular tissue per breast ranged from 1 to 50 g in our study. The results were consistent with that of similar techniques combining liposuction with pull-through technique by other groups. Lista and Ahmad previously reported that the weight of excised tissue per breast was between 5 and 70 g using the pull-through technique [15]. However, it should be noted that the cases that were diagnosed as pathologic gynecomastia were excluded in our study. Typically, the fibroglandular component of the breast tends to be more predominant in these cases.

Moreover, we also intended to penetrate the dense subareolar area by cannula to remove the infiltrated fat as much as possible and destroyed the architectural integrity of the mass during the liposuction procedure, allowing it to be pulled out in strands. Thus, a less amount of fibroglandular tissue would be left for direct excision. In addition, approximately 5 mm thickness of subareolar fibrous tissue was preserved in the operation to maintain the vascularity of nipple-areolar complex and avoid the central depression deformity. All these factors together may lead to some variations of the fibroglandular tissue amount that was excised among different studies.

Choice of anesthetic technique for operation plays an important role in a successful fast-track rehabilitation program. Traditionally, the surgical treatment of gynecomastia is performed under general anesthesia and the recovery would thus be attenuated. By contrast, the local tumescent anesthesia that caused minimal stress response was our primary choice in the fast-track program. There were no special requirements about preoperative fasting and postoperative oral intake, which may help reducing relevant adverse effects and patients' discomfort. In addition, the total costs were reduced as the general anesthesia fee was saved. However, if there are individual patients who do not accept the fast-track protocol or are scared of surgery in awake state, the general anesthesia still remains a good alternative.

To improve the patients' experience during the operation, there are several key items should be noted in the program. First, since the surgery was carried out in awake state, it became highly necessary to instruct the patients explicitly about the anesthesia and surgery, in purpose of reducing the intra-operative anxiety and improving the individual's tolerance to pain. Second, the wetting solution should be infiltrated slowly at a rate of less 100 ml/min with a total amount of 600–1000ml per site. Third, the use of minimal invasive surgical techniques can reduce various inflammatory responses and result in less pain compared with other open approachs [15]. Fourth, it was beneficial to use NSAIDs to provide early postoperative analgesia and improve the quality of care.

There are several limitations to this study that must be recognized, the most notable of which is the use of a small sample size of historical control group. The conclusions drawn based on historical controls are inherently weaker than those obtained from a randomized control study. Another factor with the potential for biases is the exclusion of patients with significant skin laxity or poor elasticity (Simon's grade III), where a more complex skin reducing procedure should be added [16–18]. Future areas of study include optimizing the existing fast-track pathway and continuously improving on it in order to achieve enhanced recovery for these patients.

Conclusions

We developed a fast-track surgical program for the treatment of gynecomastia with Simon's grade I or II, which had not been reported in the literature. Combined with a multimodal rehabilitation protocol, it was initially confirmed that the liposuction plus pull-through technique could be successfully performed under local tumescent anesthesia on an out-patient basis. Moreover, the proposed fast-track program is demonstrated to be feasible for surgical treatment of gynecomastia, leading to an enhanced recovery and high patient satisfaction without increasing the rate of complications. Therefore, the fast-track surgery concept with implementation of local anesthetic techniques should be given serious consideration in the gynecomastia management.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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