

# The Characteristics and Short-Term Surgical Outcomes of Adolescent Gynecomastia

Byung Seo Choi<sup>1</sup> · Sung Ryul Lee<sup>1</sup> · Geon Young Byun<sup>1</sup> · Seong Bae Hwang<sup>1</sup> · Bum Hwan Koo<sup>1</sup>



Received: 15 February 2017 / Accepted: 19 April 2017 / Published online: 27 April 2017  
© Springer Science+Business Media New York and International Society of Aesthetic Plastic Surgery 2017

## Abstract

**Background** Most adolescent gynecomastia is resolved spontaneously in 3 years. But, persistent gynecomastia could have a negative influence on psychoemotional development on adolescence. The purpose of this study is to report the characteristics of adolescent gynecomastia patients who received the surgeries, and discuss the short-term surgical outcomes.

**Methods** Of the 1454 patients who underwent gynecomastia surgery at Damsoyu hospital from January 2014 to May 2016, 71 were adolescents. Subcutaneous mastectomy with liposuction was performed for adolescent patients who had gynecomastia for more than 3 years and showed psychosocial distress. Demographic and outcome variables were retrospectively analyzed.

**Results** The mean age was  $17.5 \pm 0.77$  years old. All gynecomastia cases were bilateral. Simon's grade IIa (35 patients, 49.3%) was the most common, and grade III was not observed. Fifty-one patients (71.8%) were classified as having a glandular-type breast component. Fourteen patients (19.7%) had complications, but only 3 cases

(4.2%) required revision. Most of the patients (70 patients, 98.6%) were satisfied with the esthetic results, and the average 5-point Likert score was  $4.85 \pm 0.40$ . Recurrence was not observed. As the Simon's grade increased from I to IIA, a higher BMI, larger amounts of breast tissue, and longer operation times were observed.

**Conclusions** Gynecomastia that did not regress spontaneously was mostly the glandular type, so not only liposuction but also surgical removal of glandular tissue is necessary. Surgical treatment, selectively performed in patients who have had gynecomastia for 3 years, and have experienced psychosocial distress, could be an acceptable treatment for adolescent gynecomastia.

**Level of Evidence IV** This journal requires that authors assign a level of evidence to each article. For a full description of these evidence-based medicine ratings, please refer to the table of contents or the online instructions to authors [www.springer.com/00266](http://www.springer.com/00266).

**Keywords** Gynecomastia · Adolescent · Subcutaneous mastectomy · Liposuction

✉ Sung Ryul Lee  
kingsoss@naver.com

Byung Seo Choi  
medpro@daum.net

Geon Young Byun  
atlaso97@naver.com

Seong Bae Hwang  
breasthwang@naver.com

Bum Hwan Koo  
bumhkoo@naver.com

<sup>1</sup> Department of Surgery, Damsoyu Hospital, 213 Bongeunsa-ro, Gangnam-gu, Seoul, Korea

## Introduction

Gynecomastia is the benign enlargement of the glandular tissue of the male breast [1]. Gynecomastia is a relatively common condition and has a trimodal age distribution (neonatal, pubertal, and elderly) [2]. Of them, pubertal or adolescent gynecomastia has been reported to have an incidence rate of 3.93–64.6% [3, 4]. Most adolescent gynecomastia is a physiologic condition without pathologic causes [1]. Primary pubertal gynecomastia is usually a temporary condition and regresses spontaneously in 6 months to 3 years in about 90% of patients [1, 4]. Hence,

in the case of primary pubertal gynecomastia, observation and reassurance without specific treatments are sufficient most of time [1]. However, if it lasts more than 1 year and fibrotic conversion happens, it is not likely to regress spontaneously [1, 5]. The persistence of gynecomastia can lead to the deterioration of self-esteem, social withdrawal, body-image disturbance, depression, anxiety, and lessened quality of life, which can adversely affect crucial socio-emotional development tasks in adolescence [6]. Therefore, in cases of persistent breast enlargement associated with psychosocial distress, surgical treatment could be considered.

The purpose of this study is to report the characteristics of adolescent gynecomastia patients who received surgical treatments at our hospital, and discuss the short-term surgical outcomes of these patients.

## Materials and Methods

Of the 1454 patients who underwent gynecomastia surgery at Damsuyu hospital from January 2014 to May 2016, 71 (4.9%) were adolescents (under 19 years old). This is a retrospective study of adolescent patients who received subcutaneous mastectomy as a treatment for gynecomastia in a single institution. Surgical indications for adolescent gynecomastia in our institution are those with persistent gynecomastia lasting more than 3 years with accompanying psychosocial distress. When a patient tries to avoid social situations (tendency toward isolation, avoidance of activities that would require exposure of their body or give up certain activities due to gynecomastia) or changes posture to hide gynecomastia, he was diagnosed with psychosocial distress [7, 8]. For the patients with enlarged breasts, a physical examination was conducted, and gynecomastia was diagnosed if the rubbery or firm, mobile mound of tissue was palpated under the areola. If the disk was not palpated and distinctive mammary gland was not observed during breast ultrasonography, we classified the patients with pseudogynecomastia, and the first recommendation we gave to them was to lose weight instead of receiving an operation. Accordingly, those types were excluded from this study. Even when the indication for surgical treatment for gynecomastia was met, weight reduction was recommended first for overweight or obese patients.

Before surgery, detailed medical history taking (including survey for hypogonadism) was conducted. Also, a physical examination (including the genitourinary examination to identify signs of hypogonadism and testicular tumors) was conducted carefully. If a secondary cause was suspected, additional tests were scheduled to identify the accurate cause.

The operation was performed after the patient, and his parents were fully informed about the benefits and risks of the operation and gave informed consent for the operation. All patients had preoperative ultrasonography of the breasts and histopathologic examination of the operative specimen. We examined the variables such as age, body mass index (BMI), degree of gynecomastia according to the Simon's classification system, component of breast according to the amount of glandular tissue, amount of removed breast tissue, amount of liposuction, operation time, postoperative hospital stay, postoperative follow-up duration, complications, and postoperative patient satisfaction. Based on BMI, adolescents were grouped into normal, overweight, and obese. Overweight was defined for the group of patients with a BMI between 85 and 95% for age. Obesity was for the group of patients with a BMI greater than 95% for age [9].

The component of breast was classified clinically as glandular or fatty glandular according to the glandular tissue amount of the operative specimen. If a discrete whitish fibrous mass was found beneath the areolar and adjacent skin, glandular type was diagnosed. When there was a discrete but small amount of fibrous glandular tissue below the areola and the rest of the excess breast tissue was composed of adipose tissue, it was considered the fatty glandular type [10] (Figure 1).

According to the Simon classification, results of the aforementioned variable were also compared for analysis.

## Surgical Procedures

Under general anesthesia, subcutaneous mastectomy with liposuction was performed (Fig. 2). The 2-cm-sized inferior periareolar incision was made, and tumescent solution (0.9% normal saline 1000 ml + 8.4% sodium bicarbonate 20 ml + 2% lidocaine 20 ml + 1:1000 epinephrine 1 ml) was instilled through the incision (without additional stab incision) into the breast evenly. After radial liposuction through the same incision, the centrally located whitish glandular mass was excised first, and then the fatty glandular tissue around the central mass was removed using a Metzenbaum scissors. To even out the subcutaneous area, additional liposuction was performed. The liposuction device used was a Liposlim<sup>®</sup> (Nanum Medical Inc., Seoul, Korea) power-assisted liposuction system. Skin removal was not performed since marked skin redundancy was not observed in any patient. Closed-suction drains were not used any patient. After hemostasis, the incision was closed via subcuticular suture with absorbable suture material (Vicryl 4-0 (Ethicon Inc., Somerville, NJ, USA)). After closing the wound, a Steri-Strip (3 M, Maplewood, MN, USA) was applied to the incision. To prevent postoperative bleeding and seroma, external compression with an elastic



**Fig. 1** Photograph of operative specimen. **a, b** Glandular type. **c** Fatty glandular type

bandage and chest binder (Doowon, Incheon, Korea) was performed (Fig. 3).

Unless a patient specifically requested admission to the hospital after surgery, every surgery was carried out in a day-surgery setting. Patients were instructed to remove the elastic bandage 24 after the operation and to keep the chest binder to maintain compression for 1 week. Patients were allowed to return to their daily activities right after the surgery, but excessive movement of the shoulder was restricted. Exercise involving shoulder muscles was recommended after 2 week from the surgery. Follow-up visits were scheduled at 1, 3, and 6 months after the operation. During the visits, surgical outcomes, complications, and recurrence were monitored, and photographs of the surgical site were taken. Patient satisfaction with the surgery was measured at the 3-month visit by using a 5-point Likert scale questionnaire (1, very dissatisfied; 2, dissatisfied; 3, neither; 4, satisfied; 5, very satisfied) [11]. After the final visit at 6 months, a telephone interview was performed annually to monitor outcomes and recurrence.

### Statistical Methods

Statistical analyses were performed with SPSS ver. 22.0 (IBM CO. Armonk, KY, USA). Categorical variables were analyzed with Fisher's exact test. Continuous variables were compared with a Kruskal–Wallis test. A *P* value below 0.05 was considered to be statistically significant.

### Results

The characteristics and operative outcomes of patients are shown in Table 1. Pre- and postoperative photographs of Simon's grade I to IIB patients are shown in Figs. 4, 5, and 6. Patients who met the surgery indication criteria included adolescents from 16 to 18 years old, and the average age was  $17.5 \pm 0.77$  years old. At the time of preoperative evaluation, no one complained of breast pain or abnormal nipple discharge. None of the patients who received the surgery had a medical or medication history that is known

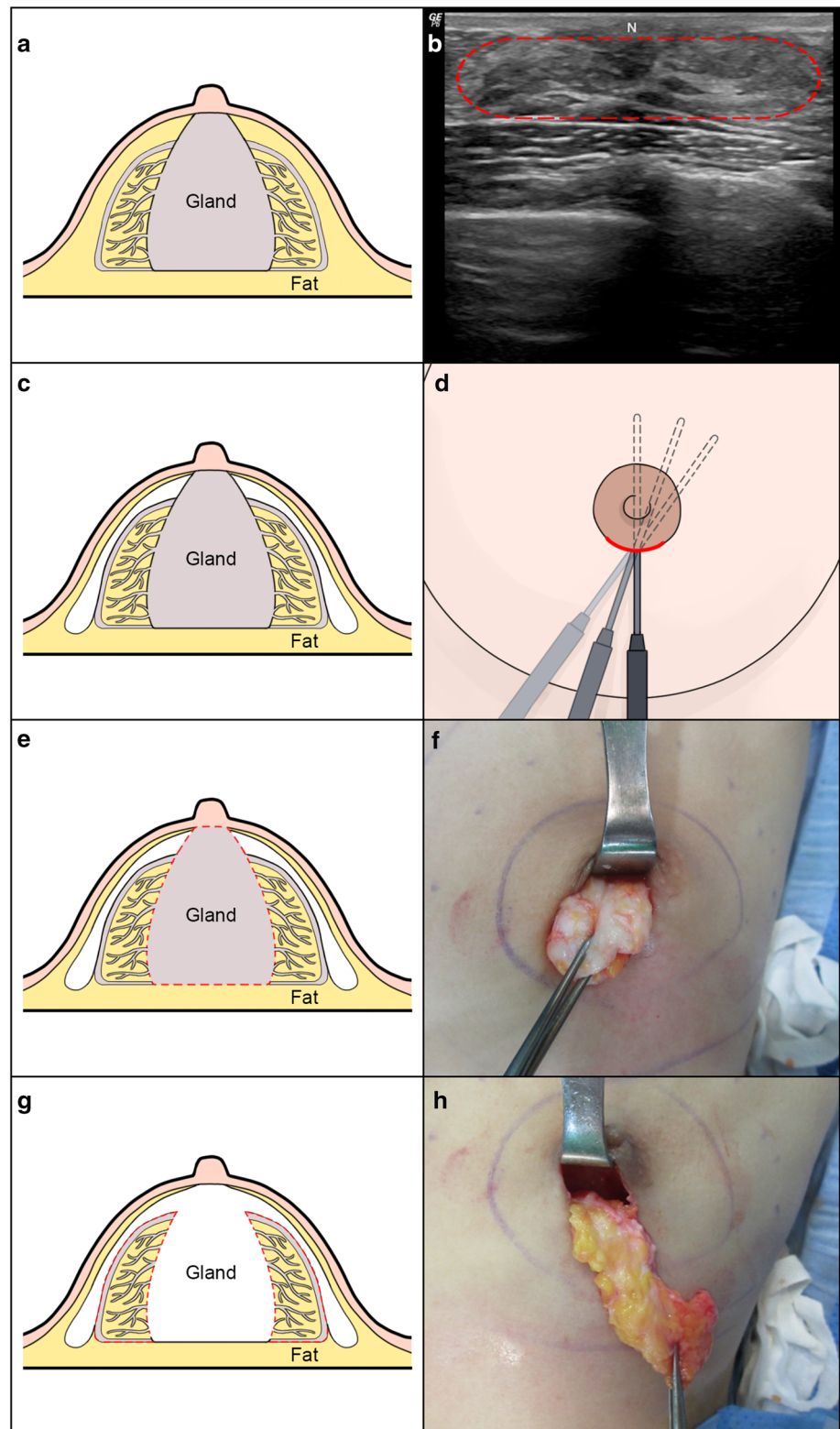
to cause gynecomastia. Also, abnormal findings that imply a secondary cause such as hypogonadism or testicular tumor were not observed during the physical examination. All gynecomastia cases were bilateral. The appearance of the breast was categorized based on the Simon's classification. Grade IIa (35 patients, 49.3%) was the most common, but grade III was not observed. Twenty-eight patients (39.4%) were either overweight or obese. Weight control was either refused or failed in most of patients (24 cases, 85.7%). Even when they successfully reduced their weight (4 cases, 14.3%), the change in the size of the breasts was not satisfactory for all patients. The causes of failure in weight management are summarized in Table 2.

Fifty-one patients (71.8%) were classified clinically as gynecomastia with glandular type. Fourteen patients (19.7%) had complications. The most common complication was hypoesthesia of the nipple–areola complex or breast skin (4 cases, 5.6%). All of the hypoesthesia cases recovered to a degree that could not be recognized by patients after 1 year. Three cases of seroma and two cases of hematoma occurred. All seromas disappeared after repeated syringe aspiration. However, two cases of hematoma required bleeding control and hematoma evacuation. One of two nipple retractions spontaneously recovered, but the remaining one required corrective surgery (Fig. 7). A hypertrophic scar improved after treatment with local triamcinolone injection and 1 case of contour irregularity was recovered to a degree that could not be recognized by the patients after 6 months. Infection or nipple–areola complex necrosis was not seen, and other serious complications were not observed. No recurrence has been reported yet. In the histopathologic results of the operative specimens, all of them were consistent with gynecomastia and malignancy or other diseases of breast were not found. Patient satisfaction using the 5-point Likert scale was  $4.85 \pm 0.40$ , and most patients (98.6%) chose either 'very satisfied (61 patients, 85.9%)' or 'satisfied (9 patients, 12.7%).'

The characteristics and operative outcomes of patients according to the Simon's classification are shown in Table 3. BMI significantly increased as the Simon's grade increased from I to IIA. Components of breasts,

**Fig. 2** Operative procedure.

**a** Schematic diagram of gynecomastia composed of gland and fatty tissue. **b** Preoperative breast ultrasound. The *red dotted line* indicates the glandular tissue. **c, d** Diagram of liposuction without additional stab incision. **e, f** Diagram of glandular tissue removal. The *red dotted line* indicates the glandular mass to be removed. **g, h** Diagram of the removal of fatty glandular tissue around the gland. The *red dotted line* indicates the fatty glandular tissue to be removed. Retromammary fat layer needs to be preserved

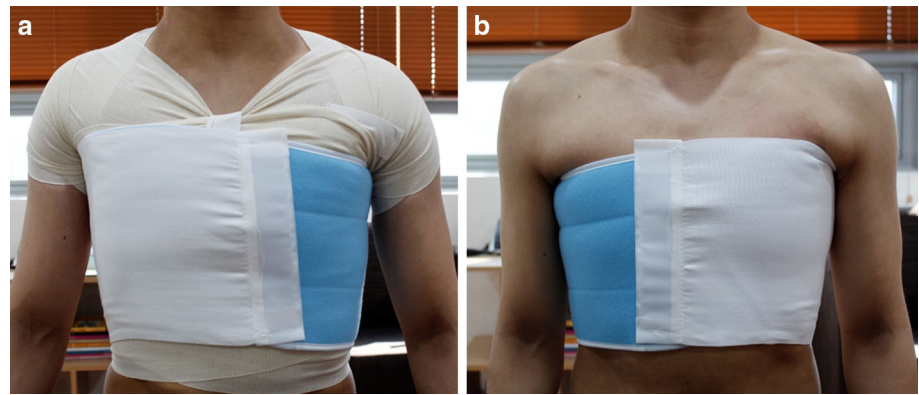


complications, postoperative hospital stay, postoperative follow-up duration, and postoperative satisfaction showed no significant differences. But, operation time increased as

the Simon's grade increased from I to IIA. The amount of removed glandular tissue and liposuction also increased with increasing Simon's grade.



**Fig. 3** Postoperative compression. **a** Elastic bandage and chest binder were worn for 24 h. **b** Chest binder was worn for 6 more days after the removal of elastic bandage

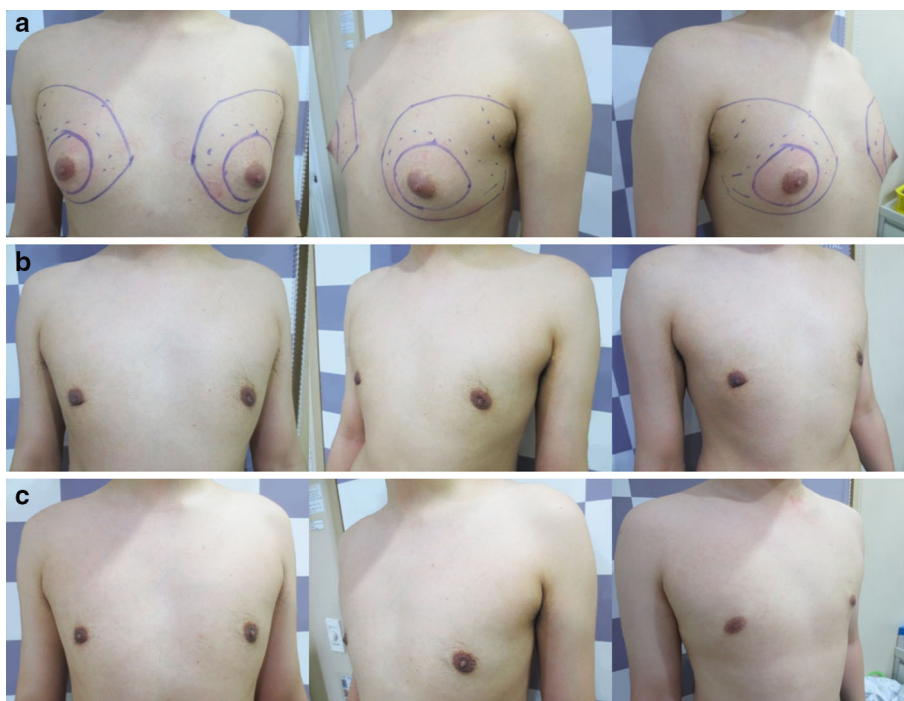


**Table 1** Characteristics and operative outcomes of patients

Patients characteristics	Total ( <i>N</i> = 71)
Age at surgery (years)	17.5 ± 0.77 (16.0–18.0)
Body mass index (Kg/m <sup>2</sup> )	25.2 ± 3.22 (19.9–33.6)
Normal (5–84 percentile)	43 (60.6)
Overweight (85–94 percentile)	15 (21.1)
Obesity (≥95 percentile)	13 (18.3)
Simon's classification	
I	24 (33.8)
IIA	35 (49.3)
IIB	12 (16.9)
III	0 (0.0)
Past medical or medication history	0 (0.0)
Component of breast	
Glandular	51 (71.8)
Fatty glandular	20 (28.2)
Weight of specimens (gram)	
Left	63.1 ± 36.8 (3.0–176.0)
Right	63.4 ± 363.6 (12.0–179.0.0)
Amount of liposuction (ml)	
Left	212.2 ± 132.6 (22.2–594.3)
Right	219.4 ± 141.6 (26.2–655.7)
Operation time (minute)	55.0 ± 23.2 (20.0–120.0)
Postoperative hospital stay (hour)	8.53 ± 5.71 (2.50–21.3)
Postoperative follow-up duration (month)	18.6 ± 8.93 (6.0–35.0)
Complications	14 (19.7)
Hypoesthesia	4 (5.6)
Seroma	3 (4.2)
Hematoma	2 (2.8)
Hypertrophic scar	2 (2.8)
Inverted nipple	2 (2.8)
Contour irregularity	1 (1.4)
Postoperative satisfaction (5-point Likert scale)	4.85 ± 0.40 (3.0–5.0)

Categorical variables are represented as number (%) and continuous variables as mean ± standard deviation and ranges

**Fig. 4** Grade I gynecomastia. **a** Preoperative photograph. **b** Results after 1 month. **c** Result after 3 months



**Fig. 5** Grade IIA gynecomastia. **a** Preoperative photograph. **b** Results after 1 month. **c** Result after 3 months



## Discussion

Gynecomastia is commonly found in male adolescents. It usually appears at the age of 13–14, with a peak incidence in 14- to 14.5-year-olds, and most of it resolves spontaneously in 3 years [1, 12]. The ages of gynecomastia patients ranged from 16 to 18 because they had at least

3 years of observation period. This seems to be the reason why our average age was different from the current literature.

The presence of symptoms such as pain can also be one of the operative indications. But, pain and tenderness in gynecomastia may last less than 6 months since the manifestation [1]. There is a report that about 70% of patients

**Fig. 6** Grade IIB gynecomastia. **a** Preoperative photograph. **b** Results after 1 month. **c** Result after 3 months



**Table 2** The causes of weight management failure in overweight and obese patients

Causes	Overweight ( $N = 15$ )	Obesity ( $N = 13$ )
Refuse to lose weight		
Unbearable psychosocial distress	7 (46.7)	5 (38.5)
History of previous weight control failures	3 (20)	3 (23.0)
No change in breast size despite previous weight reduction	3 (20)	2 (15.4)
Failure of weight loss after gynecomastia diagnosis	0 (0.0)	1 (7.7)
No change in breast size despite weight reduction after gynecomastia diagnosis	2 (13.3)	2 (15.4)

Categorical variables are represented as number (%)

who received the surgeries had symptomatic gynecomastia [5]. In contrast to this, no one complained of breast pain or tenderness at the time of surgery in our study. Patients might have breast pain at the time of manifestation. However, the pain was thought to have disappeared during the observation period.

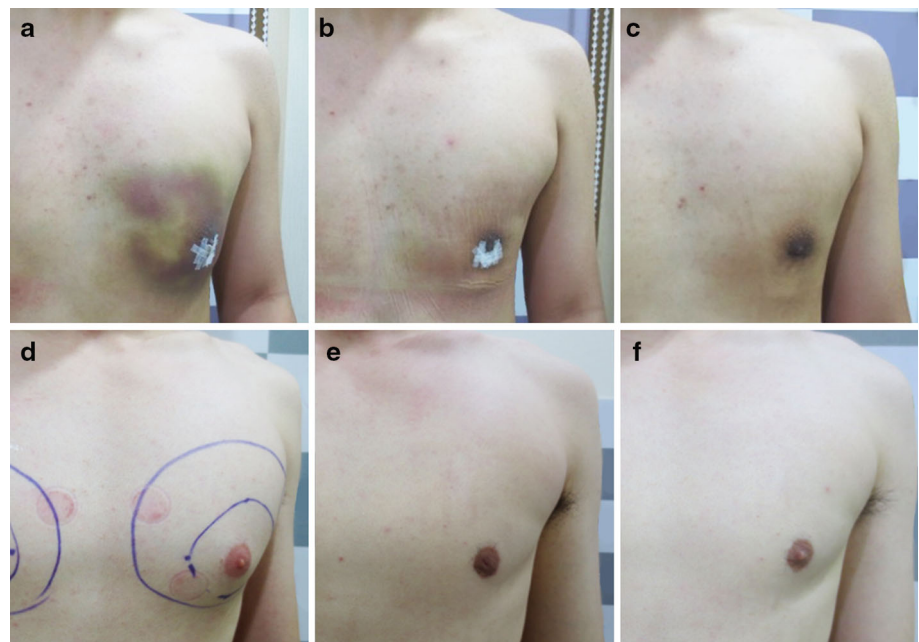
Most pubertal gynecomastia is a physiologic condition without pathologic cause [1]. Whether biochemical evaluation should be done for all adolescent gynecomastia patients is controversial. Also, many reported that detailed history taking and thorough physical examination suffice in adolescents [1, 13]. Our hospital followed this policy, and no additional testing including hormonal testing was done because there was no abnormal past medical history, symptoms, or physical examination findings. Also during the follow-up period after surgery, any symptoms or signs of diseases known to cause gynecomastia were not

detected. There is also controversy for determining the necessity of preoperative mammography or ultrasonography. The incidence of breast malignancy in gynecomastia is low, and gynecomastia does not increase the risk of breast malignancy [13]. Lapid et al. [12] reported that they did not observe any breast malignancy in tissue biopsy of gynecomastia patients under 20 years old during the 20 years of their study. However, in our hospital, preoperative breast ultrasonography is routinely performed to exclude pseudogynecomastia and confirm the presence of other neoplastic diseases. We also use the breast ultrasound to determine the presence and size of the gland. No malignant diseases or any other breast disorders were observed in preoperative ultrasound or histopathologic examination of surgical specimens in this study.

In general, gynecomastia is categorized as gynecomastia and pseudogynecomastia (subareolar fat deposition without



**Fig. 7** Postoperative complications. **a** Postoperative hematoma. **b** One month after hematoma removal. Mild contour irregularity around the left breast is observed. **c** Three months after hematoma removal. Contour irregularity improved spontaneously. **d** Grade I gynecomastia, normal nipple–areola complex was observed. **e** Unilateral nipple retraction (*left*) occurred after surgery. **f** One month after corrective surgery for nipple inversion. Nipple inversion was successfully corrected



the glandular tissue) [1]. Based on our experience, it was difficult to distinguish between gynecomastia and pseudogynecomastia only by visual inspection. Gynecomastia, which lasted several years after the onset, was asymptomatic as reported in some literature [14]. So, it was also hard to distinguish them by symptoms. We diagnosed gynecomastia by confirming the presence of glandular tissue, which is characteristic of gynecomastia with palpation or ultrasonography. In gynecomastia, a rubbery or firm disk was palpated under the nipple–areola complex, but in pseudogynecomastia such disks were not palpated. As many studies reported, we observed gynecomastia that has lasted for years has a hypoechoic mass below the areola and hyperechoic breast parenchyma around the hypoechoic mass [15, 16]. In cases of pseudogynecomastia, the lesion appeared homogeneously hypoechoic and separated from one another by a thin hyperechoic band of fibrous tissue; hence, it was distinguishable from gynecomastia (Fig. 8) [17].

Gynecomastia can also be grouped into glandular and fatty glandular according to the amount of glandular tissue [10, 18]. Although there is no accurate report of the frequency of each type, fatty glandular type is known to be the most common in gynecomastia [19]. However, the results of our institution were different from what was known. Most adolescent patients (71.8%) were classified as glandular type. We wanted to see whether there were any differences in the breast component of adult gynecomastia from those previously known. Therefore, additional studies were performed on the component of breast in adult gynecomastia patients who underwent surgery in this hospital during the same

period. The frequency of glandular type was slightly higher (53.5%) than fatty glandular type (46.5%) in adult patients. However, the frequency of glandular type was significantly higher in adolescent patients compared to adults ( $p = 0.004$ ).

There are various surgical treatment modalities for gynecomastia depending on the volume of the breast and skin redundancy. In cases of small amounts of glandular tissue with little excess skin, liposuction alone can produce satisfactory results [20]. However, in adolescent gynecomastia patients, glandular type was more common regardless of the grades. In the fatty glandular type, there were also glandular components that should be removed. If there is definite glandular tissue, combination treatment of subcutaneous mastectomy and liposuction is reported to have better surgical outcomes and satisfying results [21]. So for adolescent patients, especially when apparent glandular tissue is detected via physical examination or ultrasonography, combination treatment of subcutaneous mastectomy and liposuction should be recommended over liposuction alone.

In general, the combination of subcutaneous mastectomy and liposuction is well known to have improved cosmetic results in the treatment of gynecomastia [5, 21, 22]. In the case of large gynecomastia with excess skin, skin removal might be necessary but could lead to less optimal cosmetic results [23]. However, none of the adolescents included in this study showed marked skin redundancy (Simon's grade III). The skin of adolescents tends to have a high retractability when superficial liposuction is used. Therefore, 12 patients with grade IIB gynecomastia underwent surgeries without excision of



**Table 3** Characteristics and operative outcomes of patients according to the Simon's classification

Patients characteristics	I (N = 24)	IIA (N = 35)	IIB (N = 12)	P value
Age at the surgery (years)	17.5 ± 0.83 (16–18)	17.4 ± 0.77 (16–18)	17.6 ± 0.67 (16–18)	0.773
Body mass index (Kg/m <sup>2</sup> )	23.2 ± 1.75 (20–26)	25.5 ± 2.95 (22–34)	28.1 ± 3.82 (21–33)	<0.001
5–84 percentile (normal)	21 (87.5%)	19 (54.3%)	3 (25.0%)	
85–94 percentile (overweight)	3 (12.5%)	9 (25.7%)	3 (25.0%)	
≥95 percentile (obesity)	0 (0.0%)	7 (13.3%)	6 (50.0%)	
Component of breast				0.107
Glandular	21 (87.5%)	22 (62.9%)	8 (66.7%)	
Fatty glandular	3 (12.5%)	13 (37.1%)	4 (33.3%)	
Weight of specimens (gram)				
Left	43.1 ± 23.3 (20–110)	66.0 ± 27.4 (3–130)	93.1 ± 57.1 (22–176)	0.001
Right	41.3 ± 19.4 (12–109)	69.9 ± 31.1 (17–155)	88.8 ± 53.4 (25–179)	<0.001
Amount of liposuction (ml)				
Left	164.5 ± 119.5 (30.6–594.3)	214.2 ± 130.5 (22.2–519.2)	297.9 ± 127.5 (100.0–487.1)	0.009
Right	162.0 ± 131.3 (35.4–655.7)	230.1 ± 137.7 (26.2–536.1)	297.9 ± 136.6 (93.8–504.0)	0.009
Operation time (minute)	47.6 ± 21.2 (20–100)	53.9 ± 23.9 (20–120)	69.1 ± 19.7 (45–115)	0.033
Postoperative hospital stay (hour)	8.04 ± 5.44 (2.5–18.8)	9.34 ± 6.20 (2.83–21.3)	7.11 ± 4.65 (3.00–17.0)	0.736
Postoperative follow-up duration (month)	19.0 ± 9.64 (6–32)	17.3 ± 8.13 (6–35)	21.5 ± 9.75 (6–35)	0.400
Complications	5 (20.8%)	5 (14.3%)	4 (33.3%)	0.343
Hypoesthesia	2	1	1	
Seroma	1	2	0	
Hematoma	0	1	1	
Hypertrophic scar	1	1	0	
Inverted nipple	1	0	1	
Contour irregularity	0	0	1	
Postoperative satisfaction (Likert score)	4.92 ± 0.28 (4.0–5.0)	4.86 ± 0.36 (4.0–5.0)	4.67 ± 0.65 (3.0–5.0)	0.385

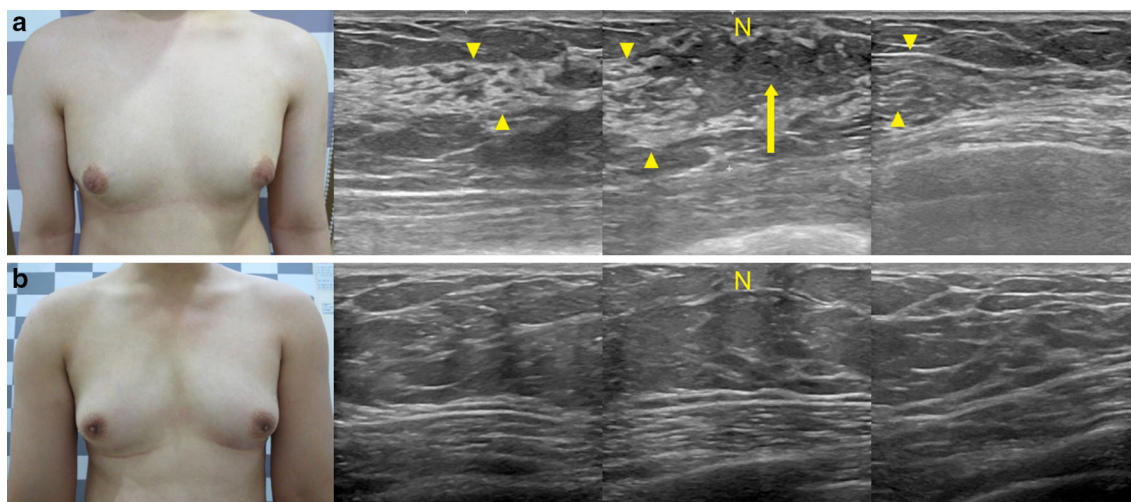
Categorical variables are represented as number (%) and continuous variables as mean ± standard deviation and ranges

skin. Cosmetic problems due to residual skin were not observed after surgery.

One report showed that as the BMI increases, the diameter of the breast tissue increases [24]. According to another report on prepubertal gynecomastia, obese patients have greater volume of breast glandular tissue than patients with normal weight [25]. Our study also shows similar results. BMI increased as the Simon's grade increases from I to IIB. The proportion of overweight and obese patients also increased with increasing Simon's grade. However, there was no difference in the component of the breast according to the Simon's grade, and the glandular type was the most frequent in all grades. Glandular tissue cannot be lost with weight reduction. Successful weight reduction is not easy to accomplish, and our results showed that even when patients successfully lose weight, the change in breast size was not satisfying because of residual glandular tissues. Therefore, if there is gynecomastia in obese

adolescents and the psychosocial distress is significant, while weight loss should be recommended first, but if it fails, it would be preferable to perform surgical treatment first rather than an additional weight reduction attempt.

The incidence of postoperative complications of gynecomastia varies from 13.5 to 46%, depending on the literature [5, 26, 27]. Overall, complications occurred in 19.7% of adolescent patients in this study, which was comparable to other studies. There is a report that the complication rate of gynecomastia increases with increase in the weight of the resected specimen [27]. Our study also showed that Simon grade IIB had the highest complication rate. However, it was not statistically significant. In our hospital, an elastic bandage and chest binder were applied after surgery to reduce the incidence of hematoma and seroma. Closed-suction drain was not inserted. There are few reports of drainless surgery in gynecomastia, but there were several papers on drainless mastectomy for breast



**Fig. 8** Photographs and ultrasonographic findings of gynecomastia and pseudogynecomastia. It was difficult to distinguish gynecomastia from pseudogynecomastia based on the appearance. **a** Gynecomastia. Ultrasonography shows hypoechoic mass (*arrow*) below nipple–

areola complex and hyperechoic breast parenchyma (*arrow head*) around it. **b** Pseudogynecomastia. Glandular tissues are not observed on ultrasound, and only fatty tissue separated by hyperechoic bands is observed

cancer [28, 29]. These reports imply that the use of drains does not have a significant influence on the rate of symptomatic seroma, complications, or revisions. Compared to other literature reports using drains in gynecomastia surgery, the incidence rate of seroma or hematoma that required surgical treatment was not higher [5, 27]. Despite the use of a relatively small incision (2-cm-sized inferior periareolar incision), there was no difficulty in resection of the tissue or hemostasis and operation time also was comparable with the literature. The hospital stay was shorter than other studies [27, 30].

There is no validated tool to evaluate the satisfaction of patients for gynecomastia surgery [11]. We used a 5-point Likert scale to evaluate patient satisfaction and found that patients were generally more than ‘satisfied.’ Gynecomastia is a benign disease that does not cause any serious problems. However, it is a common disease so further studies to develop a valid tool to evaluate satisfaction of gynecomastia surgery would be helpful.

Our study has several limitations, including its retrospective nature. The follow-up duration was relatively short. However, further study is in progress, and in the near future, long-term results will be reported.

## Conclusion

Adolescent gynecomastia that did not regress spontaneously was mostly the glandular type, so not only liposuction but also surgical removal of glandular tissue was necessary. In this study, some minor complications were observed. However, the reoperation rate was low;

recurrence or serious complications were not observed. Most of the patients were satisfied with the outcomes. Therefore, if surgical treatment is selectively performed in patients who have had gynecomastia that has not resolved spontaneously in 3 years and have experienced psychosocial distress, it could be an acceptable treatment option for adolescent gynecomastia.

## Compliance with Ethical Standards

**Conflict of interest** The author declares that they have no conflict of interest and received no financial support for this study.

## References

- Braunstein GD (2007) Clinical practice, gynecomastia. *N Engl J Med* 357:1229–1237
- Johnson RE, Murad MH (2009) Gynecomastia: pathophysiology, evaluation, and management. *Mayo Clin Proc* 84:1010–1015
- Kumanov P, Deepinder F, Robeva R, Tomova A, Li J, Agarwal A (2007) Relationship of adolescent gynecomastia with varicocele and somatometric parameters: a cross-sectional study in 6200 healthy boys. *J Adolesc Health* 41:126–131
- Nydick M, Bustos J, Dale JH Jr, Rawson RW (1961) Gynecomastia in adolescent boys. *JAMA* 178:449–454
- Fischer S, Hirsch T, Hirche C, Kiefer J, Kueckelhaus M, Germann G, Reichenberger MA (2014) Surgical treatment of primary gynecomastia in children and adolescents. *Pediatr Surg Int* 30:641–647
- Rew L, Young C, Harrison T, Caridi R (2015) A systematic review of literature on psychosocial aspects of gynecomastia in adolescents and young men. *J Adolesc* 43:206–212
- Davanco RA, Sabino Neto M, Garcia EB, Matsuoka PK, Huijsmans JP, Ferreira LM (2009) Quality of life in the surgical treatment of gynecomastia. *Aesthetic Plast Surg* 33:514–517
- Kinsella C Jr, Landfair A, Rottgers SA, Cray JJ, Weidman C, Deleyiannis FW, Grunwaldt L, Losee JE (2012) The

- psychological burden of idiopathic adolescent gynecomastia. *Plast Reconstr Surg* 129:1–7
9. Kumar S, Kelly AS (2017) Review of childhood obesity: from epidemiology, etiology, and comorbidities to clinical assessment and treatment. *Mayo Clin Proc* 92:251–265
  10. Webster JP (1946) Mastectomy for gynecomastia through a semicircular intra-areolar incision. *Ann Surg* 124:557–575
  11. Ridha H, Colville RJ, Vesely MJ (2009) How happy are patients with their gynaecomastia reduction surgery? *J Plast Reconstr Aesthet Surg* 62:1473–1478
  12. Lapid O, Jolink F, Meijer SL (2015) Pathological findings in gynecomastia: analysis of 5113 breasts. *Ann Plast Surg* 74:163–166
  13. Narula HS, Carlson HE (2014) Gynaecomastia—pathophysiology, diagnosis and treatment. *Nat Rev Endocrinol* 10:684–698
  14. Laituri CA, Garey CL, Ostlie DJ, St Peter SD, Gittes GK, Snyder CL (2010) Treatment of adolescent gynecomastia. *J Pediatr Surg* 45:650–654
  15. Ng AM, Dissanayake D, Metcalf C, Wylie E (2014) Clinical and imaging features of male breast disease, with pathological correlation: a pictorial essay. *J Med Imaging Radiat Oncol* 58:189–198
  16. Wigley KD, Thomas JL, Bernardino ME, Rosenbaum JL (1981) Sonography of gynecomastia. *AJR Am J Roentgenol* 136:927–930
  17. Draghi F, Tarantino CC, Madonia L, Ferrozzi G (2011) Ultrasonography of the male breast. *J Ultrasound* 14:122–129
  18. Rahmani S, Turton P, Shaaban A, Dall B (2011) Overview of gynecomastia in the modern era and the leeds gynaecomastia investigation algorithm. *Breast J* 17:246–255
  19. Wiesman IM, Lehman JA, Parker MG, Tantri MD, Wagner DS, Pedersen JC (2004) Gynecomastia: an outcome analysis. *Ann Plast Surg* 53:97–101
  20. Brown RH, Chang DK, Siy R, Friedman J (2015) Trends in the surgical correction of gynecomastia. *Semin Plast Surg* 29:122–130
  21. Kim DH, Byun IH, Lee WJ, Rah DK, Kim JY, Lee DW (2016) Surgical management of gynecomastia: subcutaneous mastectomy and liposuction. *Aesthet Plast Surg* 40:877–884
  22. Fagerlund A, Lewin R, Rufolo G, Elander A, Santanelli di Pompeo F, Selvaggi G (2015) Gynecomastia: a systematic review. *J Plast Surg Hand Surg* 49:311–318
  23. Cordova A, Moschella F (2008) Algorithm for clinical evaluation and surgical treatment of gynaecomastia. *J Plast Reconstr Aesthet Surg* 61:41–49
  24. Niewoehner CB, Nuttal FQ (1984) Gynecomastia in a hospitalized male population. *Am J Med* 77:633–638
  25. Einav-Bachar R, Phillip M, Aurbach-Klipper Y, Lazar L (2004) Prepubertal gynaecomastia: aetiology, course and outcome. *Clin Endocrinol (Oxf)* 61:55–60
  26. Steele SR, Martin MJ, Place RJ (2002) Gynecomastia: complications of the subcutaneous mastectomy. *Am Surg* 68:210–213
  27. Handschin AE, Bietry D, Husler R, Banic A, Constantinescu M (2008) Surgical management of gynecomastia—a 10-year analysis. *World J Surg* 32:38–44
  28. Ebner FK, Friedl TW, Degregorio N, Reich A, Janni W, Rempfen A (2013) Does non-placement of a drain in breast surgery increase the rate of complications and revisions? *Geburtshilfe Frauenheilkd* 73:1128–1134
  29. Taylor JC, Rai S, Hoar F, Brown H, Vishwanath L (2013) Breast cancer surgery without suction drainage: the impact of adopting a ‘no drains’ policy on symptomatic seroma formation rates. *Eur J Surg Oncol* 39:334–338
  30. Innocenti A, Melita D, Mori F, Ciancio F, Innocenti M (2017) Management of gynecomastia in patients with different body types: considerations on 312 consecutive treated cases. *Ann Plast Surg* 78(5):492–496