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Gender-Affirming Mastectomy Trends and Surgical Outcomes in Adolescents

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Abstract

Background: There are over 150,000 transgender adolescents in the United States, yet research on outcomes following gender-affirming mastectomy in this age group is limited. We evaluated gender-affirming mastectomy incidence, as well as postoperative complications, including regret, in adolescents within our integrated health care system.

Methods: Gender-affirming mastectomies performed from January 1, 2013 - July 31, 2020 in adolescents 12-17 years of age at the time of referral were identified. The incidence of gender-affirming mastectomy was calculated by dividing the number of patients undergoing these procedures by the number of adolescents assigned female at birth ages 12-17 within our system at the beginning of each year and amount of follow-up time within that year. Demographic information, clinical characteristics (comorbidities, mental health history, testosterone use), surgical technique, and complications, including mention of regret, of patients who underwent surgery were summarized. Patients with and without complications were compared to evaluate for differences in demographic or clinical characteristics using chi-squared tests.

Results: The incidence of gender-affirming mastectomy increased 13-fold (3.7 to 47.7 per 100,000 person-years) during the study period. Of the 209 patients who underwent surgery, the median age at referral was 16 years (range 12-17) and the most common technique was double-incision (85%). For patients with greater than 1-year follow-up (n=137, 65.6%), at least one complication was found in 7.3% (n=10), which included hematoma (3.6%), infection (2.9%), hypertrophic scars requiring steroid injection (2.9%), seroma (0.7%), and suture granuloma

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(0.7%); 10.9 % underwent revision (n=15). There were no statistically significant differences in patient demographics and clinical characteristics between those with and without complications (p>0.05). Two patients (0.95%) had documented postoperative regret but neither underwent reversal surgery at follow-up of 3 and 7 years postoperatively.

Conclusion: Between 2013-2020, we observed a marked increase in gender-affirming mastectomies in adolescents. The prevalence of surgical complications was low and of over 200 adolescents who underwent surgery, only two expressed regret, neither of which underwent a reversal operation. Our study provides useful and positive guidance for adolescent patients, their families, and providers regarding favorable outcomes with gender-affirming mastectomy.

Keywords

gender-affirming; mastectomy; adolescents; complications; regret; revisions; top surgery; incidence

Introduction

In a 2017 demographic survey, over 150,000 adolescents (0.7% of youth) ages 13 to 17 identified as transgender.[1] Many professional organizations currently provide guidelines and support for gender-affirming healthcare based on existing scientific evidence.[2] These organizations include the World Professional Association for Transgender Health (WPATH),[3] the American Medical Association,[4] Endocrine Society,[5] American Academy of Pediatrics,[6] American Psychiatric Association,[7] American Psychological Association,[8] Society for Adolescent Health and Medicine,[9] and American Academy of Family Physicians.[10] Despite the growing scientific evidence and support by trans-competent medical experts, there has been a recent wave of state legislation seeking to criminalize health care for transgender adolescents.[11]

Gender-affirming mastectomy, also known as “top surgery,” is the most prevalent surgery requested when considering all transgender adolescents,[12] whereas “bottom surgery,” which affects genitalia and fertility, is relatively more complex and mostly performed after age 18. For many transgender adolescents, hormonal therapy and mental health evaluations may be the first steps in their treatment. In Handler’s study of adolescents at our center, referrals consisted of requests for cross-sex hormones and/or blockers (34%), gender-affirming surgery (32%), and mental health (27%).[12] Indeed, transmasculine adolescents who start treatment with puberty suppression and/or mental health support may subsequently request surgery at a later time if gender dysphoria persists, as is the case when the blockers are initiated after there has already been some breast development. However, many transgender individuals (including transgender nonconforming persons, whom we will collectively refer as “transgender”) lack affordable care and access to trans-competent gender-affirmative health care.[13-15] The barriers to their healthcare, such as state legislation, access to transgender healthcare, limited access to insurance, and difficulty with insurance approval leading to increased costs, are numerous and complicated.[15-17] Transgender adolescents suffer from mental health issues of depression, anxiety, and suicidal ideation.[18-20] They often have poorer health outcomes that stem from factors such as lack of family and community support, homelessness, poverty, discrimination, and negative health

care experiences.[21-23] One study reported that 51% of transmasculine adults bind their chest daily despite 97% who experience back pain, chest pain, skin infection, and even rib fractures.[24] Even when hormonal therapy and chest binding are available, gender dysphoria can still lead to self-harm in adolescents.[25]

Compared to adults, research on gender-affirming surgery in adolescents is more limited. The incidence of referrals or requests for gender-affirming mastectomy in adolescents has risen exponentially over the past decade.[12, 26, 27] Although studies have evaluated the increase in gender-affirming surgery in adults,[28, 29] we know of none that report the incidence of gender-affirming mastectomy in adolescents. Similarly, complications of gender-affirming mastectomy have been described in adults,[30-32] whereas studies in adolescents are limited to self-reported outcomes.[33, 34] A few small case series indicated that adolescents who underwent gender-affirming surgeries, including mastectomy, have improvement in their gender dysphoria which resulted in improved psychological well-being comparable to that of the general population.[33-38] We sought to confirm our favorable clinical experience and hypothesized that the incidence of gender-affirming mastectomies in our adolescent population increased over time, and that the prevalence of postoperative complications, including regret, was low.

Methods

We conducted a retrospective cohort study of adolescents who underwent gender-affirming mastectomy within Kaiser Permanente Northern California (KPNC), a large integrated health care system. This study was approved, and informed consent was waived by the Institutional Review Board at KPNC. Clinicians at KPNC provide care in accordance with the WPATH guidelines,[3] which state that gender-affirming mastectomy may be advised for patients <18 years preferably after living in the desired gender role for at least one year without hormone therapy as an absolute requirement. Adolescents with gender dysphoria can be referred to the KPNC Multi-specialty Transitions (MST) Department by their pediatrician, endocrinologist, therapist, parents, or self, if ≥ 13 years of age. The MST Department comprises a multidisciplinary team of gender specialists in the fields of primary care, mental health, nursing, social work, gynecology, and surgical specialties. Transgender patients are tracked and followed through the MST Department.

Puberty suppression with hormones is complex and is managed through a multidisciplinary pediatric clinic for transgender care within the MST Department: The Proud Clinic. Patients seeking pubertal blockers or hormones are evaluated and treated by this multidisciplinary clinic. If gender dysphoria persists after puberty blockers and/or hormone therapy, adolescent patients seeking gender-affirming chest surgery are triaged and scheduled for an evaluation with a gender therapist who is a licensed mental health provider (psychologist, marriage and family therapist, or clinical social worker) with a specialization in gender health. One of the roles of the gender therapist is to assess the patient for clinically significant gender dysphoria. The therapist works with the family to develop an understanding and acceptance of the youth's gender identity and helps facilitate family communication to enable appropriate informed consent for treatment. They discuss treatment goals and assess patient and family readiness for a referral to a plastic surgeon.

During the plastic surgery consultation, both the adolescent and legal guardian meet with the surgeon and readiness for surgery is determined. Surgical techniques are explained, and informed consent is thoroughly reviewed.

We identified all patients < 18 years of age at the time of referral who underwent gender-affirming mastectomy from January 1, 2013-July 31, 2020 using our institutional database in the MST department. Demographic and clinical characteristics were extracted from the electronic health record (EHR) (Epic, Verona, WI, USA). Demographic variables included age at the time of referral, gender identity (i.e., male, nonbinary, other), and race/ethnicity. Clinical variables at the time of surgery included body mass index (BMI), American Society of Anesthesiologists (ASA) physical status classification, mental health history (depression, anxiety, and eating disorder), and social history (tobacco, alcohol, and drug use). Since smoking cessation was a requirement prior to surgery, tobacco use was classified as “no” or “quit.” Testosterone use within 30 days prior to and after surgery were determined from the medication list in the EHR. All surgeries were performed on an outpatient basis by KPNC plastic surgeons. Operative notes were reviewed, and surgical techniques were categorized into four types: double-incision, keyhole/infra-areolar, circumareolar/periareolar, and buttonhole.[39] The double-incision technique is ideal for candidates who present with large breast volume, skin excess and/or poor skin elasticity, and involves elliptical excision of skin excess above the inframammary crease, wide exposure for removal of breast tissue, and nipple areolar skin graft. In contrast, the keyhole/infra-areolar technique with minimal incisions is suitable for candidates with small breast volumes, good skin elasticity, and no skin excess. It utilizes a semicircular infra-areolar incision with no skin removal, preserving a small amount of breast tissue deep to the nipple areolar complex; tissue is removed utilizing liposuction and direct excision with assistance of a lighted retractor. Also suitable for smaller breast volume candidates, the circumareolar/periareolar technique utilizes two concentric, circular incisions through which breast tissue may be removed, and some skin excess may be reduced. The buttonhole technique involves incision design that is similar to the double-incision technique, but the nipple areolar complex is preserved on an inferior dermal pedicle. The pedicle size must be small in relation to the chest size in order to avoid chest fullness.

Outcomes included the incidence of gender-affirming mastectomy and the prevalence of complications following it. Surgical complications and revisions were evaluated through chart review. Since most plastic surgeons at our institution offer major revisions one year after surgery, we only included patients who had follow-up of at least one year for the evaluation of complications and revisions. Complications were defined as either hematoma, wound infection, seroma, hypertrophic scar requiring steroid injection, or suture granuloma. The types of revisions were documented and included minor procedures performed under local anesthesia and surgery under general anesthesia. For the entire cohort of 209 patients, manual chart review was performed to search for satisfaction versus regret/dissatisfaction within both postoperative surgical and mental health provider records. After review of notes, an additional search function of key words within the chart was completed to identify notes that may express patient regret not captured with initial review of notes. The key words used were “regret” and multiple synonyms captured by the EHR including “dissatisfaction,”

"dissatisfied," "unsatisfied," "unhappy"; versus "satisfaction," "satisfied," and "happy." Outcomes were then categorized as satisfaction, regret, or not documented.

The incidence of gender-affirming mastectomy was estimated by dividing the number of patients receiving gender-affirming mastectomies in a year by the product of the number of patients assigned female at birth ages 12-17 who had Kaiser membership at the beginning of each year times the amount of time within that year. Between 2013 to 2019, there was a full 1-year period, whereas for 2020, the time period was 7 months. Due to the COVID-19 pandemic in 2020, elective surgeries were limited from mid-March to mid-May to conserve resources and limit exposure. Post-operative follow-up was censored at the last clinical encounter or KPNC health plan discontinuation. For the overall cohort and among patients with and without complications, frequencies and proportions were calculated for each categorical clinical and demographic variable and mean and standard deviation (SD) for normally distributed continuous variables and median and interquartile range (IQR) for non-normally distributed continuous variables. Associations between clinical and demographic characteristics and complications were assessed using chi-squared tests. Hypothesis tests were two-sided and considered significant at $p<0.05$. All statistical analyses were performed with SAS software version 9.4 for Windows (Cary, NC, USA).

Results

A total of 209 patients underwent gender-affirming mastectomy between January 1, 2013 and July 31, 2020. The incidence increased 13-fold (3.7 to 47.7 per 100,000 person-years) (Figure 1).

The median age at the time of referral was 16 years (IQR=2) and ranged from 12-17 years (Figure 2). Patients had a median post-operative follow-up length of 2.1 years (IQR 1.69). Most patients were Caucasian (68%) followed by Hispanic/Latinx (15%), Asian/Pacific Islander (5%), Black (3%), and other (8%). Twelve percent (n=23) had MediCal insurance. The majority of patients identified as male (87%) and the remaining were nonbinary (10%) or other/questioning (3%). Fifty-two percent of patients had a normal or underweight BMI whereas the remaining were overweight or obese (BMI>25). The mean weight of breast tissue removed was 445 ± 338 gm for the left breast and 448 ± 358 gm for the right breast. The weight of breast tissue removed increased with increasing BMI class ($p<0.001$). Many patients experienced mental health issues preoperatively including depression (60%), anxiety (61%), or an eating disorder (5%). A small number of patients reported substance use: drugs (8%), former tobacco use (4%), or alcohol (2%). The majority of patients received testosterone preoperatively (88%) and postoperatively (84%). Most surgeries (85%) were completed using the double-incision technique whereas 1% utilized buttonhole and 14% utilized limited-incision techniques, keyhole/infra-areolar (8%), circumareolar/periareolar (6%) (Table 1).

For patients with at least 1-year postoperative follow-up (n=137), the overall prevalence was 7.3% (n=10) for complications and 10.9% (n=15) for revisions. Some patients had more than one complication and/or revision. Complications included hematoma (3.6%), wound infection (2.9%), hypertrophic scars requiring steroid injection (2.9%), seroma (0.7%), and

suture granuloma (0.7%) (Figure 3). The types of revisions consisted of scar (52%), contour (18%), nipple areolar complex (18%), combination of areas (12%), and axillary (6%) (Figure 4). Patients with complications did not differ significantly from patients without complications in terms of demographics and clinical characteristics ($p>0.05$) (Table 2).

After a median follow-up of 2.1 years, no adolescents underwent a reversal operation within our system, but two adolescents (0.95%) expressed regret. One adolescent identified as nonbinary, and underwent surgery at age 16. Seven months postoperatively, the patient questioned the timing of their surgery, and expressed regret at 1.5 years throughout a follow-up period of 3.7 years. Postoperatively, the patient was in an un-affirming and unsupportive home and social environment. The second adolescent identified as nonbinary, and underwent surgery at age 16. The patient mentioned regret 11 months after surgery and expressed interest for reversal with the mental health provider but ultimately did not pursue reversal surgery (i.e., breast reconstruction) throughout a follow-up period of 6.5 years within our system. Both patients had normal BMI, well-managed psychiatric anxiety and depression, underwent the double-incision technique, and neither had a complication or desire for revision.

Discussion

In this retrospective cohort study evaluating gender-affirming surgery in adolescents within a large integrated health care system, we found that the incidence of gender-affirming mastectomy increased 13-fold from January 1, 2013- July 31, 2020. The overall prevalence of any postoperative complication was 7.3%, and the revision rate was 10.9% for those with at least one-year postoperative follow-up. No patients underwent a reversal surgery with a median follow-up of 2.1 years. Among the 209 adolescents who underwent gender-affirming mastectomy, only two expressed regret. To our knowledge, our study is the largest cohort evaluation of gender-affirming mastectomies in the adolescent population.

Several studies have discussed methods for preoperative evaluation and multidisciplinary care programs for gender-affirming surgical treatment which are similar to ours in terms of a multidisciplinary team approach.[25, 27, 40, 41] At our center, prior to meeting with a member of the plastic surgery team, adolescents and their families were well-informed and received extensive education about the risks, benefits, and outcomes. In a case series by Sood et al., they recommended “multiple preoperative consults, as needed, and support from trusted, trans-competent mental health professionals to ensure readiness and facilitate informed consent within a comprehensive care-team model.”[25] Importantly, the authors described the case of a 16 year-old patient who presented to the emergency room after attempting to remove his own breasts, thus highlighting the risks when care is not achieved in a timely manner.[25] Similarly, we believe that a multidisciplinary approach helps support adolescents and their families as they consider risks, benefits, and timing of gender-affirming mastectomy.

While there have been studies reporting the increasing incidence of gender-affirming surgeries in adults[28, 29] and referrals in adolescents,[12, 26, 27] the incidence of gender-affirming mastectomy surgeries performed within the adolescent population has not been

reported to our knowledge. We found a 13-fold increase in the incidence among our adolescent population, which is a greater increase than what was previously reported in the adult population.[28, 29] In 2013, the California Department of Managed Health Care banned insurance discrimination against transgender adolescents.[42] After the end of a ban on Medicare coverage for transgender surgery in 2014, there was a marked increase in 2016-2017 corresponding to the establishment of a more robust top surgery program within our system.[43] The decline in mastectomies in January-July 2020 was secondary to the COVID-19 pandemic, whereby non-emergent surgeries were not performed to conserve resources and limit the spread of COVID-19. In a large study with nearly 38,000 adult transgender patients in the National Inpatient Sample, Canner et al. found a 3-fold increase in patients who were seeking any gender-affirming surgery from 2000-2014.[28] However, because the study was limited to inpatient gender-affirming surgeries, it may not be inclusive of all chest and breast surgeries, which are frequently performed on an outpatient basis. Lane et al. found a 5-fold increase in mastectomies from 2009-2015 among adult transgender patients identified from an administrative claims database.[29] Within the pediatric population, Handler et al. evaluated referral trends to our MST Department from 2015-2018 and found a 5-fold increase in average monthly referrals for gender-affirming mastectomy.[12] Spack et al. also documented an increase in referrals after the expansion of a Gender Management Service clinic in Boston to include pediatric and adolescent patients, with a 4-fold annual increase in referrals.[44] We believe that greater understanding and acceptance of transgender adolescents in our society, along with growing awareness of timely care for this population, has contributed to the increase in requests for gender-affirming mastectomy. We anticipate that the number of adolescents seeking gender-affirming mastectomy may continue to increase until it reaches a steady state, at which time patients seeking surgical care, including those who have not undergone treatment with puberty blockers prior to the development of breast tissue, would ideally have reasonable and timely access to treatment. On the other hand, if puberty suppression is initiated earlier during adolescence than what our cohort has experienced, breast growth may be successfully suppressed such that fewer patients may experience gender dysphoria, and thus the requests for mastectomies could decline.

The prevalence of complications (7.3%), as well as revisions (10.9%), within our adolescent cohort were comparable to those reported in the literature for adults.[30-32, 45-49] Complication rates for gender-affirming mastectomy in adults range widely from 5-29% and are difficult to compare due to variable definitions of complications, varying lengths of follow-ups, and a variety of techniques.[30-32, 45-49] In our adolescent cohort, for those with a follow-up of at least one year, the overall prevalence of complications including all major and minor complications was 7.3% with hematoma (3.6%) as the most common. In a review of 948 adults from our center, with a mean age of 29 years and follow-up of > 30 days, Rothenberg et al. found a complication rate of 9%, with 2% requiring surgical evacuation for a hematoma and 1% requiring antibiotics for wound infection.[31] Bluebond-Langner et al. evaluated complications in 295 transgender adults who underwent mastectomy, utilizing either double-incision (63%) or circumareolar (37%) techniques.[32] They found a complication rate of 18%, consisting of hematoma (6.8%), seroma (5.1%), infection (1.7%), and partial nipple necrosis (3.1%).[32] We attribute our low rate of complications to our use of the double-incision technique which is most suitable for larger breast sizes with excess

skin, and has been shown to have the fewest complications and revisions.[31, 32, 50, 51] The prevalence of revision in our study (10.9%) was lower than that of transmasculine adults reported by both Rothenberg et al. (19.7%, mean follow-up 1.9 years) and Bluebond-Langer et al. (39.1%, mean follow-up 0.81 years). In one study evaluating chest dysphoria in 68 transmasculine youth aged 13-25 years, Olson-Kennedy et al. described the self-reported complications of loss of nipple sensation (59%), postoperative hematoma (10%), and anesthetic complications (7%) in their postsurgical cohort.[33]

Experienced gender surgeons report that "regret after gender-affirming surgery is considered a rare outcome."[52] Danker et al. utilized an anonymous survey to plastic surgeons to study how frequently they were confronted with patients seeking reversal surgery. Of an estimated number of 22,725 patients, they reported 62 patients who expressed regret or sought de-transition care, with the most common reason being a change in gender identity. In a survey of 68 patients aged 13-25 years who underwent gender-affirming mastectomy with a median follow-up of 2 years, Olson-Kennedy et al. reported a regret rate of 1.5% (n=1) in which one patient answered "sometimes" to the survey statement, "It was a good decision to undergo chest reconstruction."[34] Dhejne et al. examined the incidence and prevalence of all requests for adult surgical sex reassignment in Sweden from 1960-2010.[53] They defined a regret rate as the number of sex reassigned individuals that later applied for reversal to the original sex. In 681 patients, they found five female-to-male individuals corresponding to an overall regret rate of 2%.[53] Van de Grift et al. assessed satisfaction after any gender-affirming surgery with standardized questionnaires in 201 adult patients. They found that postoperative satisfaction was high, ranging from 94-100%, and that only 6% reported dissatisfaction or regret after 5 years from the first gender clinic contact.[54] In our cohort, two patients (0.95%) expressed regret; one inquired about reversal surgery, but neither had undergone reversal surgery within follow-up periods of 3.7 years and 6.5 years. Amongst adult transgender patients, common reasons identified for regret were reported as a change in gender identity, rejection or alienation from support system, or difficulty in romantic relationships.[52] Further studies are needed to improve insight into adolescent experiences and other potential contributors to regret, including but not limited to the un-affirming environment, minority stress, and discrimination.

Our study has several limitations. First, its retrospective design meant we were unable to measure patient satisfaction and quality-of-life outcomes. Complications and any mention of regret were obtained from provider notes, which may be variable, and thus both may be under-reported. In addition, although an integrated health care system allows for continuity of care, some members may have transferred care or changed their insurance status and thus, subsequent complications, or reversal operations, would not have been captured. Next, our study was conducted at KPNC in an insured cohort of individuals with access to gender-affirming medical and surgical care. Therefore, our outcomes may not be representative of the general population, many of whom lack similar access to care. Finally, the time to develop postoperative regret and/or dissatisfaction remains unknown and may be difficult to discern given that regret is quite rare. Currently, validated patient-reported-outcomes (PRO) for transgender patients are lacking.[55] Therefore, future studies on PRO and prospective studies evaluating long-term surgical and mental health outcomes are necessary. Continuing

to monitor for overall well-being, including patient satisfaction and/or regret, are especially imperative in this adolescent population as they continue to age.

In conclusion, our study demonstrates the rising rate of gender-affirming mastectomy in the adolescent population within our integrated health care system. We found a low prevalence of complications and minimal short-term regret in adolescents following gender-affirming mastectomy. State legislative attempts, which do not take into account the existing guidelines for transgender care, could potentially create additional barriers to gender-affirming surgery in adolescents. However, our study provides additional guidance that gender-affirming mastectomy in adolescents is safe, successful, and increasing in need.

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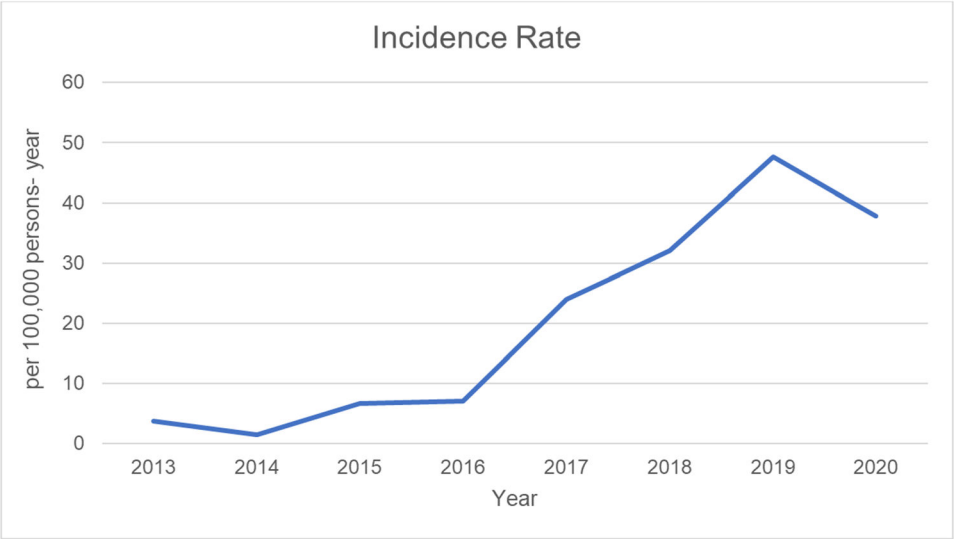

Figure 1:

The incidence of gender-affirming mastectomy between 2013-2020 estimated by dividing the number of gender-affirming mastectomies performed in a year by the product of the number of patients assigned female at birth ages 13-17 who had Kaiser membership at the beginning of each year times the amount of follow-up time in that year. In 2020, elective surgeries were limited to conserve resources and limit exposure during the COVID-19 pandemic and data was only available through July.

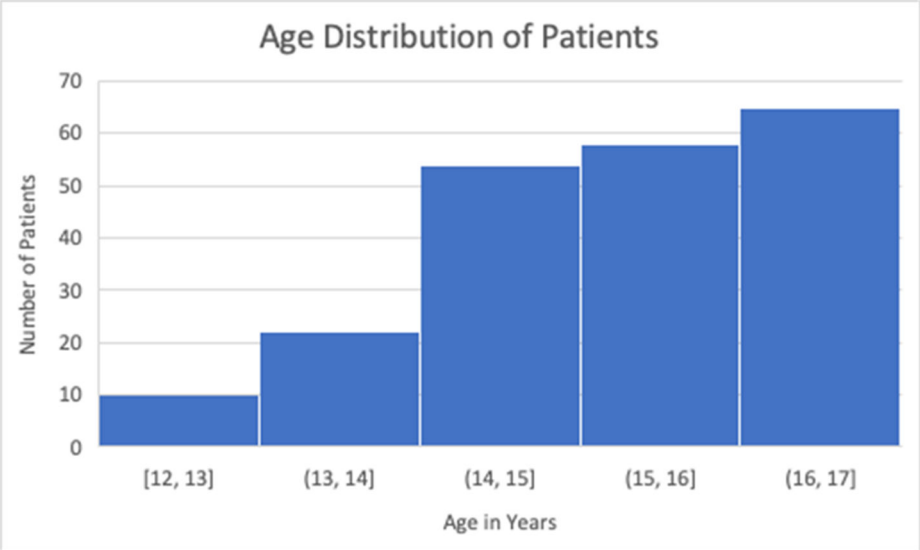

Figure 2:
Histogram distribution of the age of adolescents at the time of referral who underwent gender-affirming mastectomy between January 2013 and July 2020.

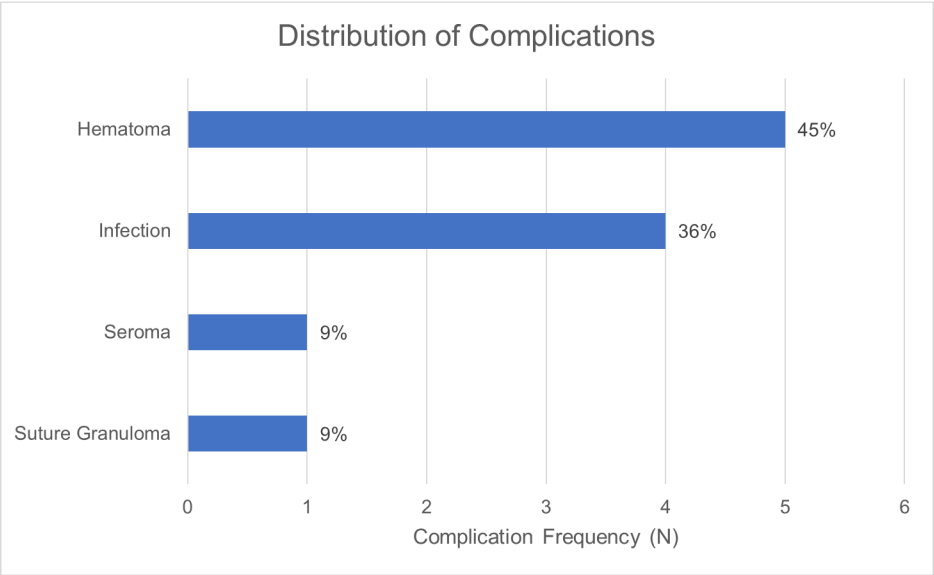

Figure 3.

Distribution of complications types among patients who underwent gender-affirming mastectomy and had at least one complication between 2013-2020. A total of 10 patients experienced 15 complications.

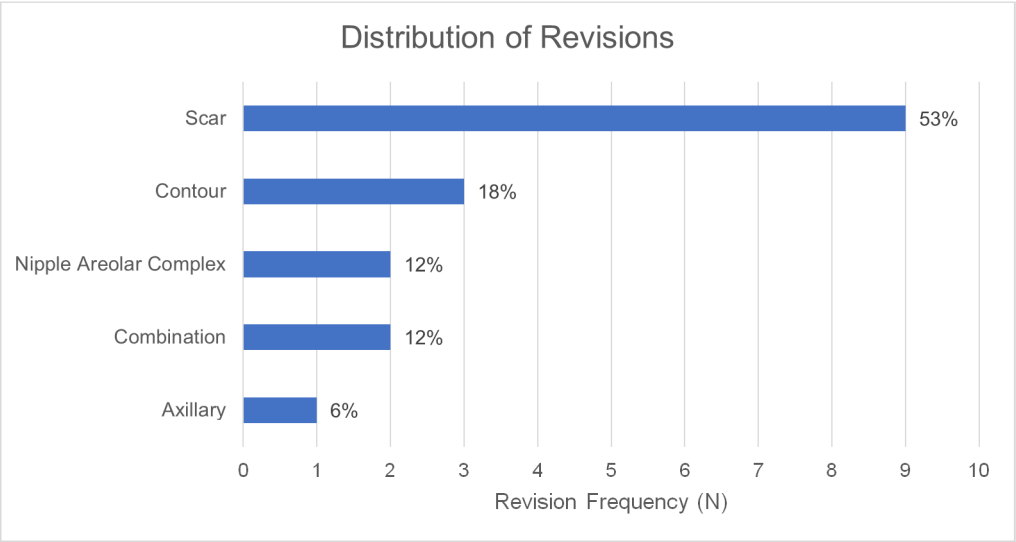

Figure 4:

Distribution of revisions among patients who underwent gender-affirming mastectomy and had at least one revision between 2013-2020 with at least one year follow-up. A total of 15 patients experienced 17 revisions.

Table 1.

Demographic and clinical characteristics of adolescents who underwent gender-affirming mastectomy from Jan 2013 – July 2020

	All (*n*=209)
Age at referral, median years (IQR)	16 (2)
Gender identity, No. (%)	
Male	182 (87)
Nonbinary	21 (10)
Other	6 (3)
Race/ethnicity, No. (%)	
White	143 (68)
Hispanic/Latino	32 (15)
Asian/Pacific Islander	11 (5)
Black	7 (3)
Other	16 (8)
BMI, No. (%)	
<20	23 (11)
20-24.9	86 (41)
25-29.9	71 (34)
≥30	29 (14)
ASA Classification, No. (%)	
1	107 (51)
2	102 (49)
History of depression, No. (%)	126 (60)
History of anxiety, No. (%)	128 (61)
History of eating disorder, No. (%)	11 (5)
Tobacco use, No. (%)	
No	200 (96)
Quit	9 (4)
Alcohol use, No. (%)	
No	111 (53)
Yes	4 (2)
Missing	94 (45)
Illicit drug use, No. (%)	
No	105 (50)
Yes	16 (8)
Missing	88 (42)
Testosterone use in 30 days before surgery, No. (%)	183 (88)
Testosterone use in 30 days after surgery, No. (%)	175 (84)
Surgery technique, No. (%)	
Double Incision	177 (85)
Keyhole	17 (8)

	All (*n*=209)
Circumareolar/Periareolar	13 (6)
Buttonhole	2 (1)
Weight of breast tissue removed, mean grams (SD)	
Left	445 (338)
Right	448 (358)
Satisfaction/regret, No. (%)	
Satisfaction	190 (91)
Regret	2 (1)
Not Documented	17 (8)

IQR=Interquartile Range; BMI=Body Mass Index; ASA=American Society of Anesthesiologists; SD=Standard Deviation

Table 2.

Clinical and demographic characteristics and complications of adolescents who underwent gender-affirming mastectomy between Jan 2013 – July 2020 with at least one year follow-up

	All (*n*=137)	No complications (*n*=127)	Complications (*n*=10)	
	No. (%)	No. (%)	No. (%)	*p*-value*
Age at referral				0.918
12	2 (1)	2 (2)	0 (0)	
13	6 (4)	6 (5)	0 (0)	
14	12 (9)	11 (9)	1 (10)	
15	35 (26)	33 (25)	3 (30)	
16	41 (30)	37 (29)	4 (40)	
17	41 (30)	39 (31)	2 (20)	
Gender identity				0.068
Male	121 (88)	114 (90)	7 (70)	
Non-binary	14 (10)	12 (9)	2 (20)	
Other/questioning	2 (1)	1 (1)	1 (10)	
Race/ethnicity				0.798
White	88 (64)	82 (65)	6 (60)	
Hispanic/Latino	24 (18)	22 (17)	2 (20)	
Asian/Pacific Islander	9 (7)	9 (7)	0 (0)	
African American	6 (4)	5 (4)	1 (10)	
Other	10 (7)	9 (7)	1 (10)	
BMI				0.739
<20	17 (12)	16 (13)	1 (10)	
20-24.9	52 (38)	47 (37)	5 (50)	
25-29.9	47 (34)	45 (35)	2 (20)	
≥30	21 (15)	19 (15)	2 (20)	
Surgery ASA rating				0.468
1	81 (59)	74 (58)	7 (70)	
2	56 (41)	53 (42)	3 (30)	
History of depression	83 (61)	76 (60)	7 (70)	0.527
History of anxiety	80 (58)	74 (58)	6 (60)	0.915
History of eating disorder	6 (4)	6 (5)	0 (0)	0.482
Tobacco use				0.482
No	131 (96)	121 (95)	10 (100)	
Quit	6 (4)	6 (5)	0 (0)	
Alcohol use				0.748
No	96 (70)	88 (69)	8 (80)	
Yes	2 (1)	2 (2)	0 (0)	
Missing	39 (28)	37 (29)	2 (20)	
Illicit drug use				0.237

	All (*n*=137)	No complications (*n*=127)	Complications (*n*=10)	
	No. (%)	No. (%)	No. (%)	*p*-value*
No	90 (66)	81 (64)	9 (90)	
Yes	7 (5)	7 (6)	0 (0)	
Missing	40 (29)	39 (31)	1 (10)	
Testosterone use before surgery	120 (88)	113 (89)	7 (70)	0.080
Testosterone use after surgery	126 (92)	118 (93)	8 (80)	0.148
Surgery technique				0.850
Double Incision	116 (85)	107 (84)	9 (90)	
Circumareolar/Periareolar	12 (9)	11 (8)	1 (10)	
Keyhole	9 (7)	9 (7)	0 (0)	
Satisfaction/regret				0.132
Satisfaction	127 (93)	119 (94)	8 (80)	
Regret	2 (1)	2 (2)	0 (0)	
Not Documented	8 (6)	6 (5)	2 (20)	

BMI=Body Mass Index; ASA=American Society of Anesthesiologists

*P-values from chi-square test for association between each variable and complications; Some patients had more than one complication.