

Labiaplasty: Analysis of the National Surgical Quality Improvement Program Database

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Abstract

Background: Labiaplasty is an increasingly popular procedure performed for both cosmetic and pathologic etiologies. Questions have been raised regarding the efficacy of the procedure, especially for cosmetic etiologies.

Objectives: The aim of this study was to examine the complication profiles of labiaplasties for both cosmetic and pathologic etiologies.

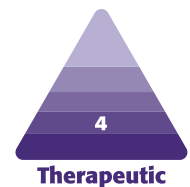
Methods: The 2005 to 2017 National Surgical Quality Improvement Program database was analyzed for patients who, according to the relevant Current Procedural Terminology code, had undergone labiaplasties. Our cohort was further separated into cosmetic and pathologic groups based on International Classification of Diseases codes. Information was collected on patient demographic characteristics, patient comorbidities, and operative variables. Outcomes of interest included surgical complications and delayed length of stay (DLOS). A univariate analysis and multivariate logistic regression were applied to determine statistically significant predictors of our outcomes of interest for both etiologies.

Results: There were 640 patients in the cosmetic cohort and 1919 patients in the pathologic cohort. There were no significant differences in rates of surgical complications between the 2 groups, but there was a statistically significant increase in length of stay for the pathologic group. Univariate analysis revealed operative time and plastic surgeon specialty to be predictive of DLOS in the cosmetic cohort. No covariates were implicated with multivariate analysis for either surgical complications or for DLOS in the cosmetic cohort.

Conclusions: Our findings suggest that cosmetic labiaplasty is a safe and efficacious procedure with low complication rates and no predictors of adverse outcomes.

Level of Evidence: 4

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Labiaplasty has emerged as an increasingly popular surgical intervention for women of all ages. In 2020, there were 13,697 reported cosmetic labiaplasties performed in the United States, a 57% increase from 2015.¹ This rapid growth has been attributed to a greater acceptance of cosmetic procedures, depictions of female nudity in the mainstream media,²⁻⁵ and growing online resources increasing patients' awareness of the procedure.^{6,7} Furthermore, more surgeons are performing labiaplasties, providing greater access to the procedure.⁸

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Patients seek labiaplasty for a variety of reasons, including appearance-related concerns, self-consciousness, negative impact on intimacy, dyspareunia, discomfort in tight pants, tugging and twisting, visibility in exercise clothing, hygiene challenges, exposure in a bathing suit, pain with pressure while cycling and horseback riding, recurrent urinary tract infections, irritation from contact, and psychological distress.⁹⁻¹² Reconstructive labiaplasty is also performed for pathologies such as vulval cysts and tumors.^{9,10} In addition, the creation of labia in transgender surgery is also categorized as a labiaplasty.

Despite clear indications for labiaplasty, historically high patient satisfaction, and low complication rates, the procedure has come under heavy scrutiny^{9,10} from both individual physicians and organizations, including international obstetrics and gynecology groups and the American College of Obstetrics and Gynecology (ACOG).¹¹⁻¹³ Some highlight the criminal implications of performing labiaplasties on minors,¹⁴ with critics claiming that labiaplasty is unsafe and exploits vulnerable women swayed by depictions of women as sexual objects, even likening the procedure to genital mutilation.^{4,6,10} Physicians and the lay press alike have advanced claims that pornography drives women to have labiaplasties, implying that their motivation is superficial, when, in fact, it plays only a minor role.⁸ Given the controversy, empirical evidence regarding the efficacy and safety of the procedure should serve as an important guide.

Most prior studies have examined patient cohorts at single institutions or private office practices, and few data exist on the risks and postoperative outcomes within insurance-based settings.^{15,16} Our objective is to provide an outcomes analysis of a large, diverse, nationally representative cohort of labiaplasty patients.

METHODS

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database¹⁷ was queried from January 2005 to December 2017 to identify patients who had undergone labiaplasty based on an assignment of Current Procedural Terminology (CPT) code 56620. Patients who underwent the procedure for cosmetic reasons were isolated based on the International Classification of Diseases (ICD)-9 and ICD-10 codes for hypertrophy of the female genitalia, which included 624.3, N90.6, N90.60, N90.69, V50.1, Z41.1, and V50.8. Additional cosmetic etiologies, including dyspareunia, were included with ICD codes N94.1, 625.0, N94.1, and N94.11. All other etiologies, including malignancies, benign tumors, and inflammatory conditions, were defined as pathologic indications for labiaplasty. Patients with repeated entries and procedures performed for gender confirmation were excluded.

Pre- and perioperative variables included patient demographics (age, operative year, and race), patient comorbidities (BMI, diabetes, smoking status, dyspnea, functional status, hypertension, steroid use, weight loss, bleeding disorder, wound classification, and American Society of Anesthesiologists [ASA] physical status classification), and operative variables (resident involvement, surgeon specialty, anesthesia, and operative time).¹⁸ Multiple imputation with chained equations was utilized to fill in missing values in a manner that minimized bias.¹⁸

The 2 outcomes of interest were surgical complications and delayed postoperative hospital length of stay (DLOS). Surgical complications included occurrence of superficial surgical site infection, wound dehiscence, deep wound infection, and unplanned return to the operating room within 30 days. Because labiaplasty is typically an outpatient procedure, any patient with a length of stay greater than 0 days was defined to have DLOS.

A univariate analysis of both outcomes was performed, with statistical significance defined as $P < 0.05$. Fisher's exact test was used for categorical variables. Continuous variables were identified with either a normal or non-normal distribution by the Shapiro-Wilk test. Normal continuous variables were analyzed by unpaired t test, and the Mann-Whitney test was used for non-normal continuous variables. Any variables with $P < 0.1$ in univariate analyses were subsequently included in multivariate logistic regression models for surgical complications and DLOS. Data extraction, cleaning, and univariate analysis were performed in Python (Python Software Foundation, Wilmington, DE) with the "NumPy" and "SciPy" packages. Multivariate analysis was performed with RStudio (RStudio Team, Boston, MA) with the "caret" package.

RESULTS

Among 2561 NSQIP database patients who underwent labiaplasty included in the final analysis, 640 were cosmetic and 1919 were pathologic in etiology. The most common indications for labiaplasty in the pathology cohort were malignant cancers ($n = 1123$), benign tumors or dysplasia ($n = 265$), and inflammatory conditions ($n = 160$). Two patients who underwent gender-reassignment surgery were excluded from analysis. The mean age in the cosmetic cohort was 33.6 years (range, 18-89 years), and the mean age in the pathology cohort was 55.6 years (range, 17-90 years). Descriptive analysis of the cosmetic and pathologic cohorts is presented in [Table 1](#). There were significantly more plastic surgeons in the cosmetic cohort ($n = 52$, 8.5%) compared with the pathologic cohort ($n = 17$, 0.92%) ($P < 0.00001$) ([Figure 1](#)).

The cosmetic cohort had a surgical complication rate of 2.7% ($n = 17$), of which there were 9 superficial

Table 1. Descriptive Analysis of Patient Demographics and Comorbidities

Patient demographics and comorbidities	Cosmetic etiology for labiaplasty	Pathologic etiology for labiaplasty
Age (years) ^a	33.65 [11.6]	55.6 [17.2]
Operative time (minutes) ^a	41.88 [39.7]	39.6 [35.3]
Albumin levels (g/dL)		
<3.5	43	181
>3.5	597	1740
Anesthesia		
Local	–	13
Spinal	6	32
General	552	1663
MAC/IV sedation	73	198
Epidural	–	3
Regional	6	4
Monitored	3	5
ASA classification		
1 = no disturbance	264	187
2 = mild disturbance	334	982
3 = severe disturbance	41	699
4 = life threatening	–	50
Bleeding disorder		
No	640	1895
Yes	–	26
Diabetes		
No	621	1636
Yes	19	285
Dyspnea		
None	638	1812
Present with moderate exertion	2	103
Present at rest	–	6
Functional status		
Independent	634	1875
Partially dependent	2	25
Totally dependent	1	5
Hypertension treated with medication		
No	592	1145

Patient demographics and comorbidities	Cosmetic etiology for labiaplasty	Pathologic etiology for labiaplasty
Yes	48	776
Obesity		
No	496	1177
Yes	144	744
Race		
White	436	1419
Black or African American	48	161
Native American	8	12
Asian	24	59
Resident involved in care		
No	560	196
Yes	80	1725
Smoker		
No	560	1391
Yes	80	530
Surgical specialty performing the procedure		
Gynecological surgery	580	1853
Orthopedic surgery	1	1
General surgery	7	44
Plastic surgery	52	17
Urology	–	6

ASA, American Society of Anesthesiologists; MAC, monitored anesthesia care. ^aContinuous variables presented as mean [standard deviation].

infections, 7 reoperations, 2 instances of wound dehiscence, and a DLOS rate of 2.8% (n = 18). Univariate analysis demonstrated no factors predictive of surgical complications, but DLOS was associated with longer operative time and plastic surgeon specialty (Table 2). Multivariate analysis for the cosmetic cohort did not demonstrate any factors predictive of either surgical complications or DLOS.

Compared with the cosmetic cohort, the pathologic cohort had a surgical complication rate of 4.2% (n = 80), and the complications were significantly associated with diabetes, according to univariate analysis. The pathologic cohort also had a significantly increased DLOS rate of 14.9% (n = 286), and predictors were found to be low albumin levels, ASA classification, diabetes, functional status,

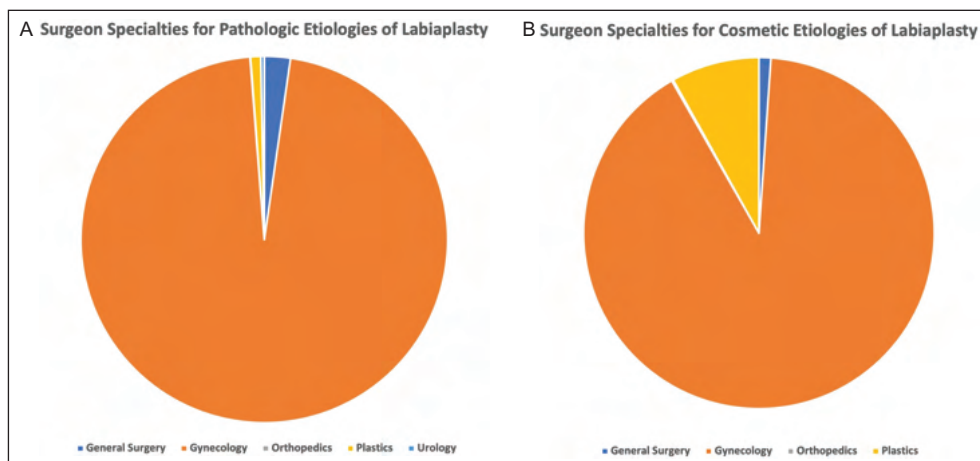


Figure 1. Visualization of surgeon specialty for labiaplasties of pathologic (A) and cosmetic (B) etiologies. (A) Gynecological surgeons performed the majority of labiaplasties with pathologic etiologies, followed by general surgeons and then plastic surgeons. (B) Gynecological surgeons performed the majority of labiaplasties with cosmetic etiologies, followed by plastic surgeons and then general surgeons. There was a significantly higher proportion of plastic surgeons who performed labiaplasties for cosmetic etiologies (B) compared with those for pathologic etiologies (A) ($P < 0.00001$).

hypertension, resident involvement, and smoking (Table 3). In multivariate analysis, diabetes and operative time were significantly associated with surgical complications, whereas operative time, age, and low albumin levels were predictive of DLOS.

DISCUSSION

With the increasing number of labiaplasties being performed, variable treatment goals include improved aesthetic appearance, reduced physical pain and discomfort, and relief of emotional distress. Studies performed with patient populations limited to a single or few surgeons performing cosmetic labiaplasty have demonstrated low complication rates.^{14,17,19-22} Less has been reported on labiaplasty performed for labial tumor resection or labia creation for transgender patients. This study represents the largest multi-institutional patient population for examining surgical complications, DLOS, and perioperative patient characteristics.

Cosmetic labiaplasty patients had a relatively younger median age of 33.6 years, similar to that reported in other cosmetic labiaplasty studies.^{23,24} No predictors of adverse surgical outcomes were identified for cosmetic labiaplasty in this study, although smoking and sexual dysfunction have previously been suggested as possible contraindications.²⁵ These findings and labiaplasty's low complication rates suggest it is a safe procedure that does not present significantly increased risk to patients with comorbidities.

Careful patient and technique selection are important for maximizing patient satisfaction and reducing complication rates for a procedure as delicate as labiaplasty.²⁶

Multiple labia minora classification systems (eg, Franco, Banwell) and associated techniques (eg, algorithmic approach for labiaplasty according to Franco type, per Ellsworth et al) have previously been described,^{9,27-29} and a detailed discussion is beyond the scope of this paper. A review by Oranges et al examined different labiaplasty surgical techniques (edge resection, wedge resection, de-epithelialization, W-plasty, laser labiaplasty, custom flask, fenestration, and composite reduction) and found high patient satisfaction with all procedures in over 90% of patients and a low rate of complications (6.8%), all of which eventually resolved.¹⁰ Although the complication rate reported in our study (2.7%) is lower than that reported by Oranges et al, this may be explained by their inclusion of other complications, such as urinary retention, which are not specified in the NSQIP and therefore cannot be incorporated into our analysis. Measures to reduce complication rates include preferential use of local anesthesia to limit the nausea, vomiting, pneumonia, and hyperthermia that can be associated with general anesthesia. Weight loss and exogenous estrogen cessation prior to and immediately after surgery may also minimize the risk of deep venous thromboses and pulmonary emboli. Finally, careful positioning of the patient's legs may limit potential nerve injury and compartment syndrome.¹⁶

Interestingly, in the cosmetic cohort, labiaplasty performed by plastic surgeons was predictive of DLOS, but it was not predictive of surgical complications, a seemingly paradoxical finding that could not be explained from our data. Perhaps plastic surgeons are more likely to keep patients with risk factors overnight. In addition, the overwhelming majority of surgeons performing labiaplasty were gynecologists, although the cosmetic cohort had significantly more

Table 2. Univariate Analysis of Cosmetic Etiology for Labiaplasty

Patient demographics and comorbidities	Delayed length of stay			Surgical complications		
	aOR	95% CI	P value	aOR	95% CI	P value
Age (years)	–	–	0.660	–	–	0.280
Operative time (minutes)	–	–	<0.0001	–	–	0.550
Albumin levels (g/dL)						
<3.5	1.00	0.53–1.94	1.00	0.86	0.11–6.68	1.00
>3.5	1.00	Reference	–	1.00	Reference	–
Anesthesia						
Local	6.7	0.74–60.70	0.170	7.16	0.79–65.10	0.160
Spinal	–	–	–	7.16	0.79–65.10	0.160
General	1.00	Reference	–	1.00	Reference	–
MAC/IV sedation	0.47	0.06–3.56	0.710	–	–	–
Monitored	–	–	–	–	–	–
ASA classification						
1 – No disturbance	1.00	Reference	–	1.00	Reference	–
2 – Mild disturbance	1.76	0.61–5.14	0.320	0.39	0.13–1.14	0.110
3 – Severe disturbance	2.66	0.50–14.17	0.240	1.3	0.28–6.17	0.670
Bleeding disorder						
No	1.00	Reference	–	1.00	Reference	–
Yes	–	–	–	–	–	–
Diabetes						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.97	0.25–15.65	0.420	–	–	–
Dyspnea						
None	1.00	Reference	–	1.00	Reference	–
Present with moderate exertion	–	–	–	–	–	–
Present at rest	–	–	–	–	–	–
Functional status						
Independent	1.00	Reference	–	1.00	Reference	–
Partially dependent	–	–	–	–	–	–
Totally dependent	–	–	–	–	–	–
Hypertension treated with medication						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.34	1.19–11.88	0.039	0.77	0.10–5.90	1.000
Obesity						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.33	0.47–3.81	0.570	1	0.48–2.07	1.000

Table 2. Continued

Patient demographics and comorbidities	Delayed length of stay			Surgical complications		
	aOR	95% CI	P value	aOR	95% CI	P value
Race						
White	1.00	Reference	–	1.00	Reference	–
Black or African American	3.57	0.91–13.92	0.086	2.84	0.75–10.70	0.130
Native American	17.83	3.11–102.26	0.011	–	–	–
Asian	4.86	0.97–24.28	0.091	1.85	0.23–15.10	0.440
Resident involved in care						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.18	0.33–4.15	1.000	1.79	0.40–7.93	0.750
Smoker						
No	1.00	Reference	–	1.00	Reference	–
Yes	0.87	0.20–3.86	1.000	0.93	0.21–4.15	1.000
Surgical specialty performing the procedure						
Gynecological surgery	1.00	Reference	–	1.00	Reference	–
Orthopedic surgery	–	–	–	–	–	–
General surgery	9.5	1.04–86.38	0.120	–	–	–
Plastic surgery	8.87	3.22–24.40	0.0002	–	–	–
Urology	–	–	–	–	–	–

aOR, adjusted odds ratio; ASA, American Society of Anesthesiologists; MAC, monitored anesthesia care. ‘–’ represents variables without occurrence of outcomes preventing statistical analysis.

plastic surgeons than the pathology cohort. The comparatively few gynecological surgeons performing cosmetic labiaplasties may reflect the position of the ACOG Committee on Gynecological Practice which described cosmetic vulvovaginal procedures as “untenable” due to a lack of data on their safety and efficacy.²⁴ In contrast, this study reports a complication rate of only 2.8% in cosmetic labiaplasties, which aligns with the reported average of under 10%.^{3,14,17,19–22} Echoing Bucknor et al, we believe that increased quality of cosmetic labiaplasty training in plastic surgery will be associated with optimal outcomes, particularly with the procedure’s rising numbers.²⁵ Other surgical specialties in this study who performed labiaplasty, such as orthopedic surgeons, do not typically learn this procedure in their training, further supporting the need to educate patients on optimal surgeon selection.

The CPT billing code for labiaplasty used in this study consisted of considerable overlap for both “partial vulvectomy” and “labiaplasty” and encompassed a wide variety of procedures involving the labia for aesthetic changes, removal of malignancies, and creation of a labia from a scrotum in gender-affirming surgery. This lack of specificity in CPT

coding necessitated the use of ICD codes to ensure proper classification based on procedural etiology. The lack of one-to-one procedural correlation underlines a need to clarify the term “labiaplasty.” Furthermore, the term “labiaplasty” is used to describe a procedure performed for pathologic indications, ranging from lichen sclerosis to malignancies, as well as the revision after the initial vaginoplasty in gender-confirming surgery.³⁰ This wide range of patient demographics and indications for a “labiaplasty” poses a challenge for a homogeneous analysis such as ours and supports further classifying labiaplasties based on the etiology and indication. Labiaplasties performed for pathology require a significantly longer hospital stay and should be distinguished by different terminology from those performed for cosmetic concerns. Finally, the NSQIP database identifies patients who underwent labiaplasty for a single primary etiology, but patients often present with a combination of aesthetic and functional concerns.²⁴

This study was limited by the patient and operative information available within the NSQIP database. Subclassifications of different labiaplasty techniques, such as wedge excision or trim, which differ in risk profiles and

Table 3. Univariate Analysis of Pathologic Etiology for Labiaplasty

Patient demographics and comorbidities	Delayed length of stay			Surgical complications		
	aOR	95% CI	P value	aOR	95% CI	P value
Age (years)	–	–	<0.0001			0.410
Operative time (minutes)	–	–	<0.0001			<0.0001
Albumin levels (g/dL)						
<3.5	1.79	1.23–2.60	0.004	0.92	0.42–2.03	1.00
>3.5	1.00	Reference	–	1.00	Reference	–
Anesthesia						
Local	–	–	–	1.95	0.25–15.25	0.420
Spinal	4.81	2.37–9.74	<0.0001	2.43	0.72–8.16	0.150
General	1.00	Reference	–	1.00	Reference	–
MAC/IV sedation	0.29	0.15–0.55	<0.0001	0.99	0.47–2.09	1.000
Monitored	–	–	–	–	–	–
ASA classification						
1 – No disturbance	1.00	Reference	–	1.00	Reference	–
2 – Mild disturbance	2.62	1.31–5.27	0.004	1.12	0.49–2.53	1.000
3 – Severe disturbance	5.31	2.65–10.63	<0.0001	1.11	0.48–2.58	1.000
4 – Life threatening	7.69	3.09–19.12	<0.0001	1.64	0.41–6.59	0.440
Bleeding disorder						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.73	2.65–10.63	0.260	0.92	0.12–6.87	1.000
Diabetes						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.71	1.24–2.34	0.002	1.84	1.08–3.14	0.035
Dyspnea						
None	1.00	Reference	–	1.00	Reference	–
Present with moderate exertion	1.4	0.85–2.33	0.2	0.92	0.33–2.57	1.000
Present at rest	1.17	0.13–10.03	1.000	–	–	–
Functional status						
Independent	1.00	Reference	–	1.00	Reference	–
Partially dependent	4.63	2.08–10.31	0.0004	0.96	0.13–7.19	1.000
Totally dependent	1.47	0.16–13.23	0.540	–	–	–
Hypertension treated with medication						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.96	1.52–2.53	<0.0001	0.98	0.62–1.55	1.000

Table 3. Continued

Patient demographics and comorbidities	Delayed length of stay			Surgical complications		
	aOR	95% CI	P value	aOR	95% CI	P value
Obesity						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.21	0.94–1.56	0.150	1.18	0.75–1.85	0.480
Race						
White	1.00	Reference	–	1.00	Reference	–
Black or African American	1.35	0.88–2.09	0.180	1.11	0.50–2.47	0.830
Native American	1.29	0.28–5.91	0.670	–	–	–
Asian	1.47	0.75–2.89	0.250	–	–	–
Resident involved in care						
No	1.00	Reference	–	1.00	Reference	–
Yes	1.35	0.86–2.13	0.210	1.74	0.69–4.35	0.340
Smoker						
No	1.00	Reference	–	1.00	Reference	–
Yes	0.58	0.43–0.80	0.001	0.87	0.52–1.46	0.700
Surgical specialty performing the procedure						
Gynecological surgery	1.00	Reference	–	1.00	Reference	–
Orthopedic surgery	–	–	–	–	–	–
General surgery	–	–	–	1.69	0.51–5.57	0.430
Plastic surgery	0.78	0.18–3.39	1.000	–	–	–

aOR, adjusted odds ratio; ASA, American Society of Anesthesiologists; MAC, monitored anesthesia care. ‘–’ represents variables without occurrence of outcomes preventing statistical analysis.

complications, were unavailable. An in-depth analysis of surgical complications and DLOS for each labiaplasty technique may help further guide physician and patient decision-making. Also not listed in NSQIP was patient satisfaction, an important postoperative outcome, especially for cosmetic procedures. It may have been informative to have been able to confirm the high levels of patient satisfaction (over 90%) observed with labiaplasty.^{31,32} Our data were accessible only through 2017, and surgeons may be improving their techniques through educational opportunities, such as online videos. Furthermore, because NSQIP selects for patients submitting bills to insurance, our study excluded those undergoing cosmetic procedures in private institutions, where plastic surgeons are more likely than gynecological surgeons to perform the surgery. Cosmetic and functional concerns may also be more widely represented in private office settings, compared to pathologic etiologies, possibly contributing to the unusual number of cases performed under forms of anesthesia other than the local anesthesia or

local monitored anesthesia care commonly used in the private office settings. Finally, long-term complications could not be assessed because the NSQIP database tracks outcomes only up to 30 days postoperation. Nonetheless, this timeframe likely includes most outcomes of interest, such as infection, wound dehiscence, and reoperation.³

CONCLUSIONS

This study demonstrates that cosmetic labiaplasty is a safe surgical procedure with low rates of complications and minimal delayed postoperative hospital length of stays. We encourage changes in terminology. Reserving “labiaplasty” for the cosmetic procedure and using different terms for excision performed for labia pathology and for labia creation for gender confirmation would improve our understanding of true associated risks, complications, and outcomes of each independent classification of these 3 unique labia procedures.

Disclosures

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Cartilage Curvature Reshaping: A Quantitative Assessment

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Objectives

Authors sought to quantify the straightening effect of mattress suturing on the convexity rabbit ears.



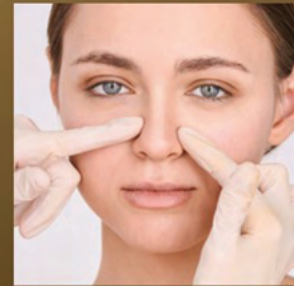
Methods

The mattress suture was placed on the left ear. The ROC, FOD, SOD were then compared.



Conclusions

This method allows comparisons for the straightening of curved cartilage in surgeries.



Cartilage Curvature Reshaping: A Quantitative Assessment

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