

Combining Abdominal and Cosmetic Breast Surgery Does Not Increase Short-term Complication Rates: A Comparison of Each Individual Procedure and Pretreatment Risk Stratification Tool

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Abstract

Background: Combined abdominal and breast surgery presents a convenient and relatively cost-effective approach for accomplishing both procedures.

Objectives: This study is the largest to date assessing the safety of combined procedures, and it aims to develop a simple pretreatment risk stratification method for patients who desire a combined procedure.

Methods: All women undergoing abdominoplasty, panniculectomy, augmentation mammoplasty, and/or mastopexy in the TOPS database were identified. Demographics and outcomes for combined procedures were compared to individual procedures using χ^2 and Student's t-tests. Multiple logistic regression provided adjusted odds ratios for the effect of a combined procedure on 30-day complications. Among combined procedures, a logistic regression model determined point values for pretreatment risk factors including diabetes (1 point), age over 53 (1), obesity (2), and 3+ ASA status (3), creating a 7-point pretreatment risk stratification tool.

Results: A total of 58,756 cases met inclusion criteria. Complication rates among combined procedures (9.40%) were greater than those of aesthetic breast surgery (2.66%; $P < .001$) but did not significantly differ from abdominal procedures (9.75%; $P = .530$). Nearly 77% of combined cases were classified as low-risk (0 points total) with a 9.78% complication rates. Medium-risk patients (1 to 3 points) had a 16.63% complication rate, and high-risk (4 to 7 points) 38.46%.

Conclusions: Combining abdominal and breast procedures is safe in the majority of patients and does not increase 30-day complications rates. The risk stratification tool can continue to ensure favorable outcomes for patients who may desire a combined surgery.

Level of Evidence: 4



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The popularity of both breast and abdominal plastic surgery has increased greatly over the years with more than half a million procedures in 2013 alone.¹ It is not uncommon for patients who are unhappy with the appearance of their breasts to also desire an abdominal procedure, and patients desiring an abdominal procedure may also want the appearance of their breasts changed. Consequently, requests for combining breast and abdominal procedures, so called “mommy makeovers,” are fairly common. This strategy decreases overall recovery time, may reduce costs, and eliminates the need to undergo a second surgical procedure. Although this is common practice for many surgeons, there is a paucity of published data available on the relative safety of combined procedures.

Many studies to date have demonstrated the relative safety of combined plastic surgery procedures in carefully selected patients.²⁻⁶ Only recently, however, have a few studies specifically explored cosmetic breast surgery combined with abdominal procedures.⁷⁻⁹ Stevens et al⁸ compared 151 combined procedures to 264 abdominoplasties and concluded that the addition of breast surgery did not seem to significantly increase major or minor complication rates. These findings were later corroborated in an updated cohort of 268 additional combined procedures.⁷ Stokes and Williams⁹ independently reached the same conclusion in a single surgeon, private practice experience. Most recently, Saad et al analyzed a California ambulatory surgery database and found similar complication rates following an abdominoplasty with or without breast surgery.¹⁰

These benchmark studies have guided our approach to combined procedures for years. Nonetheless, even their results are limited by sample size and single-center perspectives. The Tracking Operations and Outcomes for Plastic Surgeons (TOPS) database was established to collect high powered, multi-center samples in order to assess surgical trends and outcomes relevant to the plastic surgery community.¹¹ Using the TOPS registry, this study is the largest to date aiming to assess the safety of combined abdominal surgery, including abdominoplasty and/or panniculectomy, with cosmetic breast surgery, augmentation mammoplasty and/or mastopexy, and to develop a simple pretreatment risk stratification method for patients who desire a combined procedure.

METHODS

Data Acquisition and Patient Selection

The TOPS registry has tracked patient demographics and 30-day outcomes in plastic surgery since 2002 and currently contains over one million plastic surgery procedures logged by 684 plastic surgeons across the United States. TOPS utilizes an electronic data capture interface through which surgeons may voluntarily report patient/procedural data and surgical outcomes.¹² This research received no specific

grant from any funding agency in the public, commercial, or not-for-profit sectors.

The TOPS registry was queried in May 2014 for patients undergoing one or more cosmetic procedures without any concurrent surgical reconstruction since 2002. All patients with a male or missing gender, as well as those without a valid case-id were eliminated. The “Procedure Description” variable was queried for all patients undergoing at least one of the following: mastopexy, augmentation mammoplasty, abdominoplasty, and panniculectomy. Duplicate cases were eliminated based on case-id.

Pretreatment Variables and Outcomes

Pretreatment variables collected by the TOPS registry included age, body mass index (BMI), active or former smoking, diabetes, inpatient/outpatient status, American Society of Anesthesiologists (ASA) class, race, and the presence of additional surgical procedures.

The primary outcome of interest was the presence of any complication within 30-days of the surgical procedure. Complications included mortality, readmission, return to operating room or emergency room, medical complications, and surgical complications. Medical complications included cardiac arrest, myocardial infarction, coma, peripheral nerve injury, stroke, ventilator use greater than 48 hours, pneumonia, unplanned intubation, sepsis, septic shock, systemic inflammatory response syndrome, acute renal insufficiency, progressive renal insufficiency, urinary tract infection, deep vein thrombosis, and pulmonary embolism. Surgical complications included seroma, hematoma, superficial or deep wound disruption, superficial incisional, deep incisional, or organ/space surgical site infection, posttreatment IV or PO antibiotic use, total or partial flap loss, implant/prosthesis loss, and blood loss requiring greater than 4 units of blood transfusion.

Statistical Analysis

Descriptive statistics were calculated for the study populations using Pearson’s χ^2 or Fisher’s exact tests for categorical variables and Student’s t-tests for continuous variables. A multiple logistic regression model was developed in order to control for the influence of potential confounding variables on the relationship between combined procedures and 30-day complication rates.

Multiple logistic regression among patients undergoing a combined procedure resulted in adjusted odds ratios for the development of any 30-day complication. All available pretreatment variables were included in this model with the exception of additional procedures due to its non-specific definition. Continuous variables were converted to binary form in order to simplify risk stratification. The BMI was divided based on the World Health Organization’s cutoff

for obesity¹³ and age via recursive partitioning. Adjusted odds ratios were converted to weighted risk coefficients, and the sum of these coefficients (maximum 7 points) defined a risk score. Patients undergoing a combined procedure with complete demographic data were stratified based on the risk score into low (0 points), medium (1 to 3 points), or high (4 to 7 points) risk.

RESULTS

Patient Demographics

A total of 58,756 females who underwent cosmetic breast and/or abdominal surgery were identified in the TOPS registry. Of these, there were a total of 44,623 aesthetic breast procedures, 10,440 abdominal procedures, and 3693 combined aesthetic breast and abdominal procedures. In general, the abdominal surgery cohort had a greater comorbidity burden than the aesthetic breast cohort, while the combined procedures cohort fell in the range between. Table 1 shows a complete record of patient demographic and clinical characteristics. On average, patients undergoing combined surgery were 40.05 years of age with a BMI of 25.54 kg/m², while those undergoing only breast

procedures tended to be younger (36.85 years, $P < .001$) and thinner (23.19 kg/m², $P < .001$), and those undergoing only abdominal procedures were older (43.25 years, $P < .001$) and heavier (26.9654 kg/m², $P < .001$). Furthermore, aesthetic breast cases underwent fewer concurrent procedures (35.81% vs 68.56%, $P < .001$), while abdominal procedures did not significantly differ.

Unadjusted Outcomes

A total of 2770 patients (4.7%) experienced at least one posttreatment complication. A complete record of complication rates is shown in Table 2. Of the 3693 patients who underwent a combined aesthetic breast and abdominal procedure, 9.40% experienced an adverse event within 30 days. Importantly, this rate did not significantly differ from those undergoing only abdominal surgery (9.75%, $P = .530$) but was significantly higher than those who underwent only aesthetic breast surgery (2.66%, $P < .001$). Furthermore, when compared to breast procedure alone, combined procedures had significantly higher rates of readmission (0.79% vs 0.19%, $P < .001$), emergency room visits (0.41% versus 0.14%, $P < .001$) and return to the operating room (1.33% versus 0.87%, $P = .006$). Incidence

Table 1. Patient Demographics in Females Undergoing Breast and/or Abdominal Procedures

	Combined Procedures	Breast		Abdomen	
	(n = 3693)	(n = 44,623)	P-value	(n = .440)	P-value
Age, years	40.05 ± 9.24	36.85 ± 12.02	< .001	43.25 ± 9.24	< .001
Body mass index (BMI), kg/m ²	25.54 ± 4.19	23.19 ± 4.25	< .001	26.96 ± 5.13	< .001
Diabetes	1.62%	0.85%	< .001	2.25%	.051
Smoking			< .001		< .001
Never Smoker	83.54%	82.07%		85.66%	
Former Smoker	8.68%	6.71%		8.80%	
Current Smoker	7.78%	11.23%		5.54%	
Outpatient Procedure	93.13%	97.78%	< .001	90.94%	< .001
ASA class 3 or 4	0.73%	0.84%	.540	1.78%	< .001
Race			< .001		< .001
White	76.36%	79.58%		68.86%	
Black of African-American	3.09%	2.86%		6.01%	
Asian	1.46%	2.37%		1.74%	
Hispanic or Latino	9.04%	7.28%		11.16%	
Other/Unknown	10.05%	7.91%		12.23%	
Additional Procedures	68.56%	35.81%	< .001	65.37%	.597

Table 2. Complication Rates in Females Undergoing Breast and/or Abdominal Procedures

	Combined Procedures	Breast		Abdomen	
	(n = 3693)	(n = 44,623)	P-value	(n = 10,440)	P-value
Mortality	0.00%	0.01%	1.000	0.07%	.201
Any Complication	9.91%	3.01%	< .001	10.14%	.686
Medical Complication					
Cardiac Arrest requiring CPR	0.00%	0.01%	1.000	0.00%	1.000
Myocardial Infarction	0.00%	0.00%	1.000	0.00%	–
Coma > 24 hours	0.00%	0.00%	–	0.01%	1.000
Peripheral Nerve Injury	0.00%	0.00%	–	0.00%	
Stroke	0.00%	0.00%	–	0.01%	1.000
On ventilator > 48 hrs	0.00%	0.00%	–	0.01%	1.000
Pneumonia	0.00%	0.01%	1.000	0.07%	.201
Unplanned intubation	0.00%	0.00%	–	0.03%	.572
Sepsis	0.00%	0.00%	–	0.00%	–
Septic Shock	0.00%	0.00%	–	0.00%	–
Systemic Inflammatory Response Syndrome (SIRS)	0.00%	0.01%	1.000	0.00%	–
Acute Renal Insufficiency	0.00%	0.00%	–	0.01%	1.000
Progressive Renal Insufficiency	0.00%	0.00%	–	0.00%	–
Urinary Tract Infection	0.03%	0.01%	.214	0.02%	1.000
Deep Vein Thrombosis	0.22%	0.01%	< .001	0.16%	.504
Pulmonary Embolism	0.08%	0.01%	.019	0.30%	.019
Surgical Complications					
Seroma	2.84%	0.26%	< .001	3.59%	.031
Hematoma	1.22%	0.86%	.028	0.72%	.003
Wound Disruption Superficial	2.55%	0.68%	< .001	2.32%	.436
Wound Disruption Deep/Fascia	0.32%	0.11%	< .001	0.47%	.250
Superficial Incisional Surgical Site Infection	0.73%	0.22%	< .001	0.79%	.746
Deep Incisional Surgical Site Infection	0.41%	0.14%	< .001	0.55%	.305
Organ/Space Surgical Site Infection	0.03%	0.01%	.429	0.02%	1.000
Infection Requiring Intravenous Antibiotics	0.38%	0.15%	.001	0.42%	.729

(Continued)

Table 2. (Continued)

	Combined Procedures	Breast		Abdomen	
	(n = 3693)	(n = 44,623)	P-value	(n = 10,440)	P-value
Infection Requiring Oral Antibiotics	2.41%	0.70%	< .001	2.63%	.460
Total Flap Loss (>90%)	0.00%	0.01%	1.000	0.01%	1.000
Partial Flap Loss (10% - 90%)	0.08%	0.07%	.749	0.18%	.229
Implant/Prosthesis Loss	0.08%	0.21%	.122	-	-
Transfusion, > 4 U RBC	0.00%	0.00%	-	0.01%	1.000
Return to Emergency Room	0.41%	0.14%	< .001	0.57%	.226
Readmission	0.79%	0.19%	< .001	0.88%	.586
Return to Operating Room	1.33%	0.87%	.006	1.01%	.106

Table 3. Total Complication Rates Stratified by Breast or Abdominal Procedure

	Breast or Abdominal Procedure Alone	Combined Procedure ^a
Augmentation	2.14% (N = 34,164)	8.29% (N = 1629)
Mastopexy	4.55% (N = 5849)	10.89% (N = 1331)
Augmentation-Mastopexy	3.90% (N = 4610)	9.14% (N = 733)
Abdominoplasty	9.80 (N = 2367)	9.73% (N = 2487)
Panniculectomy	9.59% (N = 8073)	8.71% (N = 1206)

^aχ²-test P value for the column is not significant (P = .054 for breast procedures and P = .317).

of mortality was extremely rare and did not differ significantly across cohorts.

Table 3 stratifies total complication rates between different aesthetic breast or abdominal procedures alone and combined with one another. Across all three breast procedure and both abdominoplasty and panniculectomy, the risk for a 30-day complication did not significantly vary when combined with abdominal surgery (Table 3).

Adjusted Outcomes

After adjusting for patient comorbidities and additional procedures using multivariate logistic regression modeling, breast surgery alone was associated with lower complication rates than combined procedures (OR 0.31, 95% confidence interval [CI] 0.27-0.36, P < .001). In contrast, abdominal surgery alone did not differ significantly from combined abdominal and breast procedures (OR 0.87, 95% CI 0.75-1.01, P = .076). The full review of the adjusted odds ratios from the multiple logistic regression models is available in Table 4.

Table 4. Adjusted Odds Ratios for the Development of any 30-day Complication

Variable	OR	95% Confidence Interval		P-value
Combined Procedure	<i>Reference</i>			
Abdomen	0.87	0.75	1.01	.076
Breast	0.31	0.27	0.36	< .001
Active Smoking	1.56	1.35	1.81	< .001
Diabetes	1.27	0.94	1.73	.123
ASA 3 or 4	1.77	1.31	2.38	< .001
BMI	1.08	1.07	1.09	< .001
Age	1.01	1.01	1.02	< .001
Outpatient	0.67	0.56	0.81	< .001
Additional Procedure	1.29	1.17	1.43	< .001

Risk Stratification

Pretreatment risk factors for complication within the combined procedure cohort were converted into weighted risk coefficients based on the magnitude of their adjusted odds ratios: current smoker (0); age over 53 (1); diabetes (1); body mass index (2); and ASA 3 or 4 (3). (Table 5) Although smoking significantly increased the risk for complication within the overall cohort (Table 4), within the smaller combined procedures cohort the adjusted odds ratio (OR = .98) did not confer a clinically significant increase on risk likely because of low prevalence and significant overlap with other variables, and was assigned a weight of 0. Nearly 77% of

Table 5. Risk Factors Among Patients With Combined Procedures and Coefficients Used to Risk Stratify Patients

Risk Factor	Adjusted Odds Ratio	Weighted Coefficient
Active Smoking	1.08	Not Assigned
Age over 53	1.39	1
Diabetes	1.53	1
BMI ≥ 30	2.04	2
ASA class 3 or 4	2.37	3

patients undergoing a combined procedure were classified as low-risk (0 points), and only 0.5% high-risk (4 to 7 points). Table 6 breaks down the classification of all patients into risk categories. Low, medium and high-risk patients undergoing a combined procedure demonstrated complication rates of 9.78%, 16.63%, and 38.46%, respectively (Figure 1). The risk of a combined procedure is not significantly different than that of an abdominoplasty in the low and medium-risk cohorts ($P > .05$). There is a non-significant trend towards increased complications with a combined procedure compared to abdominal procedures in the high-risk cohort, however this sub-group is poorly powered ($\beta = .775$) to detect a significant difference.

DISCUSSION

This retrospective review of 58,756 patients, including 3693 combined procedures, is the largest to date assessing the safety of combining aesthetic breast procedures with abdominal surgery. On the whole, our complication rates are lower than those previously reported for abdominal procedures alone or combined procedures.^{7,8,14-16} Although this may be at least in part due to TOPS's voluntary data reporting, this discrepancy can be accounted for by the 30-day

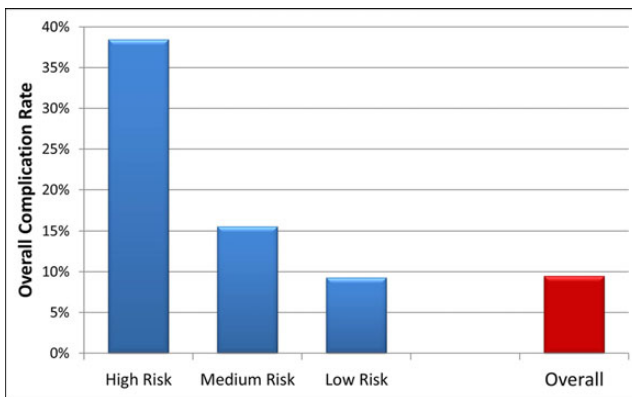


Figure 1. Complication rates among low, medium, and high-risk patients undergoing combined breast and abdominal procedures. The complication rates are 9.78%, 16.63%, and 38.46% for low, medium, and high-risk procedures, respectively. The overall complication rate for combined procedures is 9.91%.

Table 6. Complication Rates Across Risk Categories

	Sample size, n (%) ^a	Complication, %	P-value
Low Risk (0 points)			
Abdomen	3981 (62.75%)	9.44%	.924
Breast	27,502 (84.69%)	2.28%	< .001
Combined	1911 (76.96%)	9.37%	Reference
Medium Risk (1-3 points)			
Abdomen	2233 (35.20%)	13.61%	.235
Breast	4746 (14.61%)	5.60%	< .001
Combined	559 (22.51%)	15.56%	Reference
High Risk (4-7 points)			
Abdomen	130 (2.05%)	23.07%	.307
Breast	227 (0.70%)	15.42%	.046
Combined	13 (0.53%)	38.46%	Reference

^aRefers to the percentage of each procedure within a given risk category, ie, the percentage of all breast procedures that are classified as low, medium, or high-risk.

nature of TOPS outcomes data, as our results are similar to those found using other national, 30-day registries.¹⁷⁻¹⁹ A similar trend was noted in mastopexies and augmentation mammoplasties.^{12,20,21}

Importantly, like previous studies of combined breast and abdominal procedures, we found no significant difference in complication rates between abdominal surgery and combined procedures.⁷⁻¹⁰ To our knowledge, however, this is the first study to also compare combined breast and abdominal procedures to aesthetic breast surgery alone.

Our results demonstrate a nearly 4-fold increase in 30-day complications with combined procedures when compared to breast surgery alone, (Table 2) regardless of the particular breast or abdominal procedure (Table 3). This difference in complication rates can be explained by both inherent procedural and demographic differences between the cohorts. It has been hypothesized that the presence of large, poorly adhering surfaces following abdominoplasty as well as the disruption of local lymphatic structures provide a potential space and shearing force that drive elevated rates of seroma formation.²² Combined with the unique distribution of wound tension and quite simply a larger wound, it is not surprising that abdominal procedures had greater complication rates than aesthetic breast surgery.^{23,24} Furthermore, compared to the breast surgery cohort, patients undergoing an abdominal procedure on average had more comorbidities, with the exception of active smoking, and underwent more concurrent surgical procedures (Table 1). Even after controlling for this difference in demographic variables, the trend in complication rates remained the same – abdominal procedures are inherently

more prone to 30-day complications than cosmetic breast surgery (Table 4).

The question is—does combining aesthetic breast surgery with abdominal procedures result in multiplicative or additive risk? Compared to abdominal surgery alone, a combined procedure does not confer any increased risk. Compared to an augmentation mammoplasty and/or mastopexy alone, concomitant abdominal surgery increases the risk for complications, but only inasmuch as patients assume the inherently greater risk associated with an abdominal procedure instead. The calculated 30-day risk of one or more complications associated with undergoing both procedures independently would be 12.15% [$P = 1 - (1-.0975)(1-.0266)$]. These results provide further evidence for the safety of combining abdominal procedures, including abdominoplasty and panniculectomy, with aesthetic breast surgery.

The benefits of a combined procedure may not necessarily apply to every patient. Unfortunately, no study to date has promulgated guidelines as to when it may be beneficial and/or appropriate to combine aesthetic breast surgery with an abdominal procedure. Nonetheless, within our series, those patients undergoing a combined surgery were younger and had on average fewer comorbidities than their abdominal surgery counterparts, (Table 1) suggesting an intuitive predilection among plastic surgeons for selecting a healthier subset of patients as candidates for a combined procedure.

We developed the first easy-to-use risk stratification tool for patients undergoing combined abdominal and aesthetic breast surgery by examining the adjusted effect of 5 commonly measured pretreatment variables on the incidence of 30-day complications. Many of the pretreatment variables identified in this study to increase the risk of complication, including ASA class, age, BMI and diabetes, have been previously described as risk factors across a broad range of outcomes and surgical procedures.^{17,18,25,26} Impressively, over 75% of the combined procedures within our cohort were classified into the low-risk category, and only less than 1% high-risk, (Table 6) again a testament to the prudent decision-making among plastic surgeons with regards to this elective procedure.

Overall, the incidence of a 30-day complication among combined procedures rapidly increased from 9.78% in low-risk patients to 16.63% and over 38% in medium and high-risk patients, respectively (Figure 1). Low and medium-risk patients enjoyed similar complication rates with a combined or abdominal procedure, whereas high-risk patients experienced a nearly 150% increase in complications undergoing a combined procedure (Table 6). For the low-risk patient, the benefits of a combined procedure appear to outweigh the drawbacks, sparing the patient a second surgery without increasing morbidity. For the high-risk patient, however, the danger of complication very quickly becomes prohibitive. Although the 38.5% risk of a combined procedure is similar to the 34.9% risk calculated for two independent surgeries, both of these are prohibitively high for an elective procedure.

For this small cohort we would advise against surgery altogether; at the least it would be prudent to minimize the risk for complications by deciding with the patient on the single most important procedure towards achieving her goal, and proceeding cautiously with either breast or abdominal surgery alone. The medium-risk patient again requires a careful discussion regarding her goals. Breast surgery alone carries a significantly decreased complication rate, and may perhaps be more safely combined with liposuction or other alternatives to abdominal surgery. However, when the inherently elevated risk of an abdominal procedure cannot be avoided, breast surgery may be performed concurrently without a significantly increased risk of complication, precluding the need for a second operation.

This study is not without its limitations, at least in part stemming from TOPS data collection methodologies. As we have alluded to before, TOPS captures complications for only 30-days posttreatment, likely underestimating the true total complication rate. This is particularly true for long-term breast complications including implant-related infections and/or implant loss and capsular contracture. Although the presence of additional surgical procedures is tracked in TOPS, the specific nature of the procedures is not necessarily clear. Concomitant liposuction would explain the trend towards increased procedures within the abdominal and combined cohorts; however, more data is required to test properly this hypothesis. Furthermore, at this time TOPS does not widely capture cosmetic outcomes or patient satisfaction. Despite the large volume of cases included in this analysis, the data was collected over 13 years from 2002 to 2014 and represents a relatively small proportion of all breast and abdominal procedures over this time period. There is also concern that the self-reported nature of TOPS may result in under-reporting of complication and bias our results; however, many of TOPS's 30-day complication rates have been previously shown to be similar to those reported by other studies using national registries.^{17,18,20} When compared to the validated National Surgical Quality Improvement Program (NSQIP) registry, TOPS has been shown to effectively capture outcomes, including those specifically relevant to plastic surgeons, in a broader patient population that includes both private and academic practices.¹⁹ Finally, while our risk stratification tool effectively identified at risk patients within the TOPS database, its utility in clinical practice must ultimately be judged externally with a prospective cohort of patients.

CONCLUSION

As the demand for both abdominal procedures and cosmetic breast surgery continues to increase, a combined procedure presents a convenient and relatively cost-effective approach for accomplishing both. This retrospective review comparing the safety of such combined and individual surgeries is the largest to date and the first to include patients from multiple

private and academic practices across the country. Our results add to the growing evidence supporting the safety of a combined procedure, particularly in a carefully selected patient population. Using a simple risk stratification tool to identify low and medium-risk patients based on diabetes, age, BMI, and ASA status, we can continue to ensure favorable outcomes for women who may desire a combined surgery.

Disclosures

Dr Kim receives research funding from and is on the advisory board for the Musculoskeletal Transplant Foundation. Mr Hume and Mr Simmons are employed by the American Society of Plastic Surgeons (ASPS), who developed the registry database utilized in this article, and Dr Murphy is the current president of the ASPS. The other authors have nothing to disclose.

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