Original Article

Surgeon Experience and Outcomes in Microsurgical Breast Reconstruction: A 10-Year Single Surgeon Analysis

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ABSTRACT

Background Microsurgical breast reconstruction with deep inferior epigastric perforator (DIEP) flaps has become increasingly popular. While surgeons undergo rigorous training, it is believed that plastic surgeons continue to refine and enhance their performance through independent practice. This study evaluates the effect of surgeon experience on clinical outcomes in DIEP flap breast reconstruction.

Methods A retrospective review was conducted on consecutive DIEP flap procedures performed by a single surgeon from fellowship completion in 2013 to 10 years of independent professional practice in 2023. Patients were categorized into "early" and "late" groups, separated by a midpoint surgery date (July 30, 2018). Statistical analyses included student's *t*-tests, chi-squared analysis with Fisher's exact test, and multivariable regressions controlling for comorbidities.

Results The study included a total of 1,182 DIEP flaps in 632 patients, with 238 in the early group and 394 in the late group. The late group had a lower mean body mass index (28.83 vs. 29.98, $p = 0.004$), prevalence of hypertension (26.6% vs. 35.3%, $p = 0.021$), and prevalence of diabetes (7.9% vs. 14.3%, $p = 0.010$) than the early group. After controlling for potential confounders, the late group was independently associated with decreased length of stay (incidence rate ratio [IRR] = 0.611, $p < 0.001$) and fewer revision surgeries (IRR = 0.689, $p < 0.001$).

Conclusion This large, single-surgeon series demonstrates that even with extensive initial training, plastic surgeons continue to evolve their surgical outcomes through accumulated experience. These findings emphasize the importance of consistent volume over time in achieving optimal results in microsurgical breast reconstruction.

Keywords microsurgical breast reconstruction, surgeon experience, learning curve

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Breast reconstruction following mastectomy is a critical component of comprehensive care for breast cancer patients, significantly enhancing quality of life and self-image. Over the past few decades, microsurgical techniques have revolutionized the field of breast reconstruction, with the deep inferior epigastric perforator (DIEP) flap emerging as the gold standard.[1,2] First introduced in the early 1990s by Dr. Robert Allen Sr., the DIEP flap has gained widespread popularity due to its favorable outcomes and reduced donor site morbidity.[3–5] While the DIEP flap offers numerous advantages, microsurgical breast reconstruction is a technically demanding procedure that requires high levels of precision and expertise. Achieving desirable outcomes from this operation relies on a plastic surgeon's skill and expertise.

Although surgeons receive rigorous training throughout their residency and fellowship programs, plastic surgeons are believed to continue refining and improving throughout their independent practice, well beyond training. The relationship between surgical volume and clinical outcomes has been well-documented across various surgical specialties.[6–9] However, this phenomenon has been less explored within microsurgical breast reconstruction. International studies have explored the learning curve and case volume relationship for DIEP flaps with varying results. Some research indicates a significant learning curve effect, with complications decreasing as surgeon experience increases. For example, an early study in Norway found such an effect, with complications decreasing as surgeon experience increased.[10] Similarly, Hofer et al observed significantly higher complication rates in the first 30 flaps compared with subsequent cases.[11] Additionally, Varnava et al, in a retrospective analysis of 115 patients in Germany, noted a significant reduction in length of stay (LOS) over time, although they did not observe a significant change in complication rates.[12] While these studies underscore the importance of experience and surgical volume in improving outcomes, other studies suggest that well-trained surgeons can achieve high success rates from the outset of their independent practice, challenging the notion of an extensive learning curve.[13,14]

Despite these international studies, the specific learning curve for DIEP flap breast reconstruction in the United States remains understudied. To date, no large single-surgeon series has

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examined the learning curve effect in DIEP flap breast reconstruction for a plastic surgeon trained and practicing in the United States. The senior author of the study has collected an ongoing extensive database of their DIEP flap cases over the first 10 years since their microsurgical fellowship graduation, which provided a unique opportunity to assess how their operative acumen has improved over time. By analyzing a comprehensive dataset spanning this period, we seek to provide valuable insights into the learning curve and volume-outcome relationship in this complex procedure.

Methods

Data Collection

After obtaining Institutional Review Board approval, we conducted a retrospective review of all consecutive DIEP flap breast reconstructions performed by the senior author (NT) during the period from May 2013 to October 2023. Alternative flap types, such as profunda artery perforator, lumbar artery perforator, and transverse rectus abdominus myocutaneous flaps, were excluded from this study. Robotic-assisted DIEP flap procedures were also excluded from this analysis as they represent a distinct technique with their own unique learning curve and operative considerations.[15] Enhanced recovery after surgery (ERAS) protocols were implemented at our institution in January 2017.

Comprehensive data were collected, including patient demographics, comorbidities, operative details, and postoperative outcomes. The demographic variables of interest included age, body mass index (BMI), and smoking history. Comorbidities of interest included hypertension, diabetes, hyperlipidemia, and coronary artery disease. The surgical details of interest focused on flap type, specifically whether the reconstruction was unilateral or bilateral. Primary postoperative outcomes include LOS, complications, and the number of revision surgeries. Postoperative complications were classified as donor site complications or recipient site complications occurring within 90 days of the primary surgery. Donor site complications included seroma, hematoma, infection, and wound dehiscence occurring at the abdominal donor site. Recipient site complications included seroma, hematoma, infection, wound dehiscence, arterial insufficiency, venous congestion, flap necrosis, revision of anastomoses, and partial or total flap loss. To assess the impact of surgeon experience over time, patients were divided into two cohorts based on the midpoint date of the study period to equally divide the surgeon's first decade of independent practice. This time-based division was chosen as a practical surrogate for surgical volume and experience, consistent with prior learning curve studies in microsurgical breast reconstruction.[12,16] The "early group" included patients who underwent surgery from the start of the study period to July 30, 2018. The "late group" comprised patients who underwent surgery from July 31, 2018, to the end of the study period.

Statistical Analysis

Descriptive statistics were calculated for all variables and are presented as mean and SD.

To control for potential confounding factors, multivariable regression analyses were performed. These analyses adjusted for age, BMI, and tobacco use when comparing outcomes between the early and late groups. For binary outcomes (complications), logistic regression was used. For count data (number of revision surgeries and LOS), Poisson regression was employed. Significance was set at $p < 0.05$. Statistical analysis was performed using R version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria).

Results

A total of 1,182 DIEP flaps in 632 patients were included in our study. The early group consisted of 238 patients with 419 flaps (57 unilateral and 181 bilateral), while the late group included 394 patients with 763 flaps (25 unilateral and 369 bilateral). The mean BMI (28.83 vs. 29.98, $p = 0.004$) of patients in the late group was significantly lower than those in the early group. Additionally, a significantly lower percentage of patients in the late group had hypertension (26.6% vs. 35.3%, $p = 0.021$) and diabetes (7.9% vs. 14.3%, $p = 0.016$) compared with the early group. There were no statistically significant differences between the two groups in terms of age (50.50 vs. 52.26, $p = 0.11$), prevalence of hyperlipidemia (20.8% vs. 24.8%, $p = 0.2$), prevalence of coronary artery disease (0.8% vs. 021%, $p = 0.2$), or smoking history (28.5% vs. 29.4%, $p = 0.8$). **Table 1** summarizes the patient demographics and clinical characteristics for both early and late groups.

The length of hospital stay was significantly shorter in the late group compared with the early group (2.39 days, SD = 3.07 vs. 3.80 days, SD = 2.20, $p < 0.001$). Additionally, the number of revision surgeries was significantly lower in the late group (0.424 vs. 0.620, $p < 0.001$). Overall complication rates were lower in the late group, though this difference did not reach statistical significance (12.18% vs. 17.23%, $p = 0.077$). When complications were categorized by anatomic location, recipient site complications were lower in the late group (10.15%) compared with the early group (14.29%), though this difference did not reach statistical significance ($p = 0.12$). Donor site complications (4.62% vs. 5.84%, $p = 0.5$) showed no significant differences between the early and late groups.

A regression analysis was conducted to explore the LOS, number of revision surgeries, recipient site complications, donor site complications, and total complications between the early and late groups, adjusting for confounders such as age, BMI, and tobacco use. The analysis demonstrated a significantly lower LOS in the late group (incidence rate ratio [IRR] = 0.611, confidence interval [CI] = [0.56–0.67], $p < 0.001$) compared with the early group. Additionally, we found a significantly lower number of revision surgeries (IRR = 0.689, CI = [0.55–0.87], $p < 0.001$) in the late group. The late group was not associated with a significantly different risk of recipient site complications (IRR = 0.726, CI = [0.44–1.19], $p = 0.203$), donor site complications (IRR = 1.44, CI = [0.68–3.21], $p = 0.345$), or any complication (IRR = 0.682, CI = [0.43–1.08], $p = 0.104$). **Table 2** summarizes the multivariable regression analyses.

Discussion

Microsurgical breast reconstruction has significantly increased in practice over the past few decades. Among the available

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Table 1 Demographic and clinical outcome data of patients within the early and late groups

Respondent	Early group ($n = 238$)	Late group ($n = 394$)	p-Value
Number of flaps	419	763	
Unilateral	57	25	
Bilateral	181	369	
Mean patient age	52.26 (SD = 8.07)	50.50 (SD = 11.11)	0.11
Mean patient BMI	29.98 (SD = 5.28)	28.83 (SD = 5.75)	0.004[a]
Comorbidities			
Coronary artery disease	5 (2.1%)	3 (0.8%)	0.2
Diabetes	34 (14.3%)	31 (7.9%)	0.010[a]
Hyperlipidemia	59 (24.8%)	82 (20.8%)	0.2
Hypertension	84 (35.3%)	105 (26.6%)	0.021[a]
Smoking history	70 (29.4%)	109 (28.5%)	0.8
Any complication	41 (17.23%)	48 (12.18%)	0.077
Donor site complications	11 (4.62%)	22 (5.84%)	0.5
Recipient site complications	34 (14.29%)	40 (10.15%)	0.12
Length of stay	3.80 (SD = 2.20)	2.39 (SD = 3.07)	<0.001[a]
Number of revision surgeries	0.620 (SD = 0.909)	0.424 (SD = 0.540)	<0.001[a]

Abbreviations: BMI, body mass index; SD, standard deviation.
[a]represents values with statisitical significance.

techniques, the DIEP flap has become the most preferred due to its favorable morbidity and mortality profile for patients and its robust aesthetic outcomes.[5,17] However, the success of this technically demanding operation heavily relies on the surgeon's microsurgical expertise.[18] The procedure requires a specific set of advanced techniques to achieve strong results.[19] Although surgeons undergo rigorous training during medical school, residency, and often fellowship, their operative case volume is typically program-dependent and, in some cases, relatively limited. Furthermore, surgeons often face a stark transition to independent practice. Therefore, it is believed that surgeons continue to refine their operative skills and expertise through accumulated experience. This study evaluated the impact of surgeon experience on clinical outcomes in DIEP flap breast reconstruction.

Our study revealed a significant reduction in both the number of revision surgeries and the length of hospital stay in the late group. Additionally, while the difference in complication rates was not statistically significant, there was a noticeable trend toward fewer complications in the late group. These findings suggest that as the surgeon's experience increased, their technical proficiency and patient outcomes also increased. The reduced LOS between the early and late groups provides compelling evidence of improved surgical acumen over time. We interpret the shorter LOS as an indication of enhanced surgical proficiency because this metric reflects the impact of both major and minor complications, along with other factors contributing to extended hospitalizations.[20–22] The decrease in LOS is particularly meaningful as it has been associated with improved outcomes, enhanced patient satisfaction, and reduced healthcare costs.[23–25] One possible explanation for the decreased LOS in the late group is that as surgeons master the technical aspects of microsurgery, they can focus more attention on process improvement and operational efficiency.

Table 2 Comparison of clinical outcomes between patients within the early and late groups

	Unadjusted model			Adjusted model		
Characteristic	IRR/OR	95% CI	p-Value	IRR/OR	95% CI	p-Value
	Late group					
Any complication	0.649	[0.41–1.03]	0.062	0.682	[0.43–1.08]	0.104
Donor site complications	1.28	[0.63–2.77]	0.512	1.44	[0.68–3.21]	0.345
Recipient site complications	0.678	[0.42–1.11]	0.119	0.726	[0.44–1.19]	0.203
Length of stay	0.607	[0.54–0.67]	<0.001[a]	0.611	[0.56–0.67]	<0.001[a]
Number of revision surgeries	0.681	[0.55–0.85]	0.001[a]	0.689	[0.55–0.87]	<0.001[a]

Abbreviations: IRR, incidence rate ratio; OR, odds ratio.
[a]represents values with statisitical significance.

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Previous studies have demonstrated that experienced surgeons often develop more standardized and efficient approaches to complex procedures, which may contribute to improved patient outcomes.[21,26–28]

The implementation of ERAS protocols during our study period represents an important consideration in interpreting our results. ERAS protocols were introduced at our institution in January 2017, affecting the latter portion of the early cohort and the entirety of the late cohort. Enhanced recovery protocols have consistently demonstrated improvements in pain management and significant reductions in LOS for DIEP flap breast reconstruction across multiple studies.[20,24,29–31] While these protocols undoubtedly contributed to some of the observed improvements in our late group, it is important to note that the surgeon's experience with refinements and optimization of ERAS protocols may have worked synergistically with accumulated surgical experience. The successful implementation of ERAS protocols requires a multidisciplinary approach and ongoing refinement, factors that may have been enhanced by the surgeon's growing experience with the nuances of perioperative care optimization. Although it would be difficult to study the effects of surgeon experience and protocol refinements in isolation, we believe both factors work together in clinical practice to improve patient outcomes. Future studies examining learning curves in microsurgical reconstruction should carefully consider the timing and implementation of institutional protocol changes.

While our study demonstrated a statistically significant reduction in revision surgeries between the early and late groups, the clinical significance of this finding warrants careful interpretation. The mean number of revisions in both groups was less than one per patient (0.620 vs. 0.424), suggesting that many patients undergo reconstruction without any subsequent revisions. The decision to pursue revision surgery is multifactorial and influenced by both objective and subjective factors such as technical outcomes, personal preferences, patient satisfaction, and quality of life considerations.[32,33] Patients in the late group may have benefited from improved initial reconstructive outcomes, potentially reducing the perceived need for revisions—or alternatively, may have had different expectations regarding aesthetic refinements. This relatively low revision rate may reflect our surgical philosophy of achieving optimal results during the initial operation, though we acknowledge that revision rates can vary considerably depending on the interplay of the factors noted above. Furthermore, the observed difference of 0.2 revisions between groups, while statistically significant, may not represent a clinically meaningful difference for individual patients.

The findings of this study have significant implications for surgical training and continued education. While surgical residency and fellowship programs provide a foundation for surgeons, our study illustrates that refining surgical skills and acumen continues well beyond formal education. The ongoing improvement of a U.S.-trained surgeon suggests that even those with the highest level of formal training benefit from continued volume, repetition, and experience. This implies that training programs should maximize the quantity of cases that provide exposure to complex microsurgical procedures.[18,34] Moreover, these findings underscore the importance of mentorship in the early years of practice, where less experienced surgeons could benefit from the guidance of more seasoned colleagues.

This study also has critical implications for patients by highlighting the importance of surgeon experience as a key factor in achieving optimal outcomes in DIEP flap breast reconstruction. Our data suggest that patients may benefit from selecting surgeons with extensive experience in this specific procedure. Surgeons might consider discussing their experience with DIEP flaps and providing outcome data to assist patients in making informed decisions. However, numerous factors contribute to choosing the right surgeon.[35–37] While our study indicates that extensive experience can be beneficial, it does not imply that surgeons with less experience cannot achieve excellent results. The choice of surgeon should ultimately be made by the patient in consultation with their care team to ensure the best possible outcomes.

Limitations

This study has several limitations beyond its retrospective design. First, the findings are based on a single surgeon's experience, which may limit their generalizability. Future research should include multiple surgeons across different institutions to broaden the applicability of the results. Additionally, although the study controlled for BMI, age, and tobacco use, other unmeasured factors may have influenced outcomes between the early and late groups. Moreover, this study did not consider the impact of changes within the hospital environment outside of the surgeon's control. It is possible that the surrounding team's efficiency or other departmental changes contributed to the improved patient outcomes. Finally, since the study spans a decade, advancements in surgical techniques, anesthesia, and ERAS protocols may have independently influenced the outcomes.[27,38,39] Notwithstanding these limitations, the study provides valuable insights into the learning curve and volume-outcome relationship associated with DIEP flap breast reconstruction by U.S.-trained and practicing plastic surgeons.

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Statements and Additional Information

Conflict of Interest The authors declare that they have no conflict of interest.

Note This manuscript has not been presented at any meetings.

References

1 Tanna N, Sultan DL, Minasian RA, et al. Contemporary microsurgical breast reconstruction: abdominally based flaps. Plast Reconstr Surg 2024;154 (01):199e–214e

2 Healy C, Allen RJ Sr. The evolution of perforator flap breast reconstruction: twenty years after the first DIEP flap. J Reconstr Microsurg 2014;30(02):121–125

3 Allen RJ, Treece P. Deep inferior epigastric perforator flap for breast reconstruction. Ann Plast Surg 1994;32(01):32–38

4 Zhang A, Dayicioglu D. Outcomes of 270 consecutive deep inferior epigastric perforator flaps for breast reconstruction. Ann Plast Surg 2018;80 (Suppl 6): S388–S394

5 Santosa KB, Qi J, Kim HM, Hamill JB, Wilkins EG, Pusic AL. Long-term patient-reported outcomes in postmastectomy breast reconstruction. JAMA Surg 2018;153(10):891–899

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6 Birkmeyer JD, Siewers AE, Finlayson EVA, et al. Hospital volume and surgical mortality in the United States. N Engl J Med 2002;346(15):1128–1137

7 Tanna N, Clayton JL, Roostaeian J, Perry AD, Crisera CA. The volume-outcome relationship for immediate breast reconstruction. Plast Reconstr Surg 2012;129 (01):19–24

8 Mahmoudi E, Lu Y, Chang S-C, et al. The associations of hospital volume, surgeon volume, and surgeon experience with complications and 30-day rehospitalization after free tissue transfer: a national population study. Plast Reconstr Surg 2017;140(02):403–411

9 Akita S, Kumamaru H, Motomura H, Mitsukawa N, Morimoto N, Sakuraba M. The volume-outcome relationship in free-flap reconstruction: a nationwide study based on the clinical database. J Plast Reconstr Aesthet Surg 2023;85: 500–507

10 Busic V, Das-Gupta R, Mesic H, Begic A. The deep inferior epigastric perforator flap for breast reconstruction, the learning curve explored. J Plast Reconstr Aesthet Surg 2006;59(06):580–584

11 Hofer SOP, Damen THC, Mureau MAM, Rakhorst HA, Roche NA. A critical review of perioperative complications in 175 free deep inferior epigastric perforator flap breast reconstructions. Ann Plast Surg 2007;59(02):137–142

12 Varnava C, Wiebringhaus P, Hirsch T, Dermietzel A, Kueckelhaus M. Breast reconstruction with DIEP Flap: the learning curve at a breast reconstruction center and a single-surgeon study. J Clin Med 2023;12(08):2894

13 Anderson BR, Wallace AS, Hill KD, et al. Association of surgeon age and experience with congenital heart surgery outcomes. Circ Cardiovasc Qual Outcomes 2017;10 (07):e003533

14 Kelz RR, Sellers MM, Niknam BA, et al. A national comparison of operative outcomes of new and experienced surgeons. Ann Surg 2021;273(02):280–288

15 Choe J, Aiello C, Yom J, et al. Embracing Robotics in Microsurgery: Robotic-Assisted Deep Inferior Epigastric Perforator Flap Breast Reconstruction. J Reconstr Microsurg 2025;41(05):450–458

16 Acosta R, Smit JM, Audolfsson T, et al. A clinical review of 9 years of free perforator flap breast reconstructions: an analysis of 675 flaps and the influence of new techniques on clinical practice. J Reconstr Microsurg 2011;27(02):91–98

17 Tønseth KA, Hokland BM, Tindholdt TT, Åbyholm FE, Stavem K. Quality of life, patient satisfaction and cosmetic outcome after breast reconstruction using DIEP flap or expandable breast implant. J Plast Reconstr Aesthet Surg 2008;61 (10):1188–1194

18 Lascar I, Totir D, Cinca A, et al. Training program and learning curve in experimental microsurgery during the residency in plastic surgery. Microsurgery 2007;27(04):263–267

19 Selber JC, Chang EI, Liu J, et al. Tracking the learning curve in microsurgical skill acquisition. Plast Reconstr Surg 2012;130(04):550e–557e

20 Araya S, Webster TK, Egleston B, et al. Significant reduction in length of stay in deep inferior epigastric perforator flap breast reconstruction with implementation of multimodal ERAS protocol. Ann Plast Surg 2023;91(01):90–95

21 Haddock NT, Tycher JT, Teotia SS. Deliberate practice in DIEP flap breast reconstruction: an immediate and sustained decrease in morbidity and operative time. Plast Reconstr Surg 2023;152(05):791e–800e

22 Reid CM, Parmeshwar N, Brandel MG, Crisera CA, Herrera FA, Suliman AS. Detailed analysis of the impact of surgeon and hospital volume in microsurgical breast reconstruction. Microsurgery 2020;40(06):670–678

23 Atamian EK, Suydam R, Hardy TN, et al. Financial implications of enhanced recovery after surgery protocols in microsurgical breast reconstruction. Ann Plast Surg 2023;90(6S, suppl 5):S607–S611

24 DelMauro MA, Chen K, Keller A. Reducing length of stay after microsurgical breast reconstruction with a standardized postoperative protocol. J Reconstr Microsurg 2019;35(08):557–567

25 Holoyda KA, Magno-Padron DA, Carter GC, Agarwal JP, Kwok AC. National trends in length of stay for microvascular breast reconstruction: an evaluation of 10,465 cases using the American College of Surgeons National Surgical Quality Improvement Program database. Plast Reconstr Surg 2022;149(02):306–313

26 Haddock NT, Facchin F, Teotia SS. A clinical practice review on process efficiency in autologous breast reconstruction. Gland Surg 2023;12(07):1007–1015

27 Haddock NT, Teotia SS. Deconstructing the reconstruction: evaluation of process and efficiency in deep inferior epigastric perforator flaps. Plast Reconstr Surg 2020;145(04):717e–724e

28 Laporta R, Longo B, Sorotos M, Farcomeni A, Amorosi V, Santanelli di Pompeo F. Time-dependent factors in DIEP flap breast reconstruction. Microsurgery 2017;37 (07):793–799

29 Haddock NT, Garza R, Boyle CE, Teotia SS. Observations from implementation of the ERAS protocol after DIEP flap breast reconstruction. J Reconstr Microsurg 2022;38(06):506–510

30 Rodnoi P, Teotia SS, Haddock NT. Economic impact of refinements in ERAS pathways in DIEP flap breast reconstruction. J Reconstr Microsurg 2022;38(07):524–529

31 Stephens KL, DeVito RG, Hollenbeck ST, Campbell CA, Stranix JT. Effect of enhanced recovery after surgery in morbidly obese patients undergoing free flap breast reconstruction. J Reconstr Microsurg 2025

32 Eom JS, Kobayashi MR, Paydar K, Wirth GA, Evans GRD. The number of operations required for completing breast reconstruction. Plast Reconstr Surg Glob Open 2014;2(10):e242

33 Smith JM, Boukovalas S, Chang EI, et al. Analysis of breast aesthetic revision procedures after unilateral abdominal-based free-flap breast reconstruction: a single-center experience with 1251 patients. Plast Reconstr Surg Glob Open 2023;11(03):e4861

34 Lester ME, Berns J, Dawson S, Newsom K, Hartman B, Hassanein AH. A novel framework for optimizing efficiency and education in microsurgical breast reconstruction. Plast Reconstr Surg Glob Open 2023;11(11):e5445

35 Galanis C, Sanchez IS, Roostaeian J, Crisera C. Factors influencing patient interest in plastic surgery and the process of selecting a surgeon. Aesthet Surg J 2013;33 (04):585–590

36 Elmer NA, Veeramani A, Hassell N, et al. In the age of social media, how does the public choose a plastic surgeon? A crowdsourcing analysis of major deciding factors. Plast Reconstr Surg 2024;153(01):194e–203e

37 Waltzman JT, Scholz T, Evans GR. What patients look for when choosing a plastic surgeon: an assessment of patient preference by conjoint analysis. Ann Plast Surg 2011;66(06):643–647

38 Pierzchajlo N, Zibitt M, Hinson C, et al. Enhanced recovery after surgery pathways for deep inferior epigastric perforator flap breast reconstruction: a systematic review and meta-analysis. J Plast Reconstr Aesthet Surg 2023;87:259–272

39 Tanna N, Clappier M, Barnett SL, et al. Streamlining and consistency in surgery: lean six sigma to improve operating room efficiency. Plast Reconstr Surg 2023;152 (03):682–690

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