

Abdominal Fascial Plication and the Risk of Venous Thromboembolism in Abdominoplasty Patients

A Systematic Review of the Literature

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Background: Repair of the abdominal fascia at the time of abdominoplasty is a valuable method to improve the contour of the abdomen. However, this maneuver has been linked to an increased risk of venous thromboembolism (VTE). This review was undertaken to evaluate the evidence.

Methods: An electronic literature review was conducted to identify publications on the subject of abdominal fascial repair during abdominoplasty and VTE risk. Key words included abdominoplasty, fascial plication, intra-abdominal pressure, and venous thrombosis.

Results: Three large clinical studies were identified. One retrospective study using matched comparisons reported nearly identical VTE rates for patients treated with and without abdominal fascial plication (1.5% vs 1.7%). Another retrospective study reported significantly more VTEs (2.3%) in abdominoplasty patients undergoing fascial repair compared with panniculectomy patients who did not undergo fascial plication (0.36%). The author also recommended a modified Caprini score, adding fascial repair as a risk factor. Only 1 prospective study reported a large number of consecutive plastic surgery outpatients evaluated with Doppler ultrasound. This group included 188 abdominoplasty patients, all treated with fascial plication and without muscle paralysis. Only 1 VTE was diagnosed on the day after abdominoplasty (0.5%).

Discussion: Retrospective studies are susceptible to confounders and confirmation bias. Caprini scores do not have a scientific foundation. Chemoprophylaxis increases the risk of bleeding without reducing the risk of VTE.

Conclusions: The best available evidence supports performing a fascial repair. An effective and safe alternative to Caprini scores and chemoprophylaxis is avoidance of muscle paralysis and early detection of VTEs using ultrasound screening.

Key Words: rectus, diastasis, repair, fascial, plication, venous thromboembolism, VTE, deep venous thrombosis, DVT, ultrasound, Caprini score, abdominoplasty

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Conventional wisdom holds that repair of the rectus abdominis fascia during an abdominoplasty may increase the risk of venous thromboembolism (VTE). This notion is based on first principles. Repair of a rectus abdominis diastasis is believed to increase the intra-abdominal pressure, creating a bottleneck effect on the venous circulation, leading to venous stasis.^{1–6} The limitations of treatment

recommendations made on the basis of first principles, expert opinion, or even bench research (ie, laboratory studies without clinical correlation) are well-known.^{7,8} These considerations are given the lowest level of evidence (level 5).^{7,8}

Until recently, little clinical evidence was available on this subject. Two reviews and guidelines for VTE prevention in plastic surgery, published in 2012 and 2016, did not make recommendations regarding abdominal fascial plication.^{8,9} In 2020, a large prospective study closely investigated plastic surgery outpatients, including abdominoplasty patients, with screening Doppler ultrasound examinations.¹⁰ In 2022 and 2024, 2 large clinical studies reported conflicting results regarding VTE risk with fascia repair.^{11,12} The author of the most recent study concluded that, in patients deemed to be at greater risk, one powerful way to mitigate VTE risk is to steer the patient away from plication and toward a panniculectomy.¹²

This review was undertaken to evaluate the evidence so as to best inform surgeons and patients regarding VTE risk and determine whether fascial plication does indeed increase VTE risk and should be omitted in some abdominoplasty patients.

METHODS

An electronic literature review was conducted to identify publications that evaluated abdominal fascial repair in relation to the risk of VTE. The search terms “abdominoplasty,” “rectus plication,” “fascial plication,” “abdominal wall plication,” “deep venous thrombosis,” “intra-abdominal pressure,” “venous thrombosis,” and “venous thromboembolism” were entered into the PubMed search engine of the MEDLINE database. The search included all articles published in English starting in 2000. The Web of Science and Cochrane Library databases were also searched. The quality of evidence was evaluated using the Methodological Index for Non-Randomized Studies (MINORS)¹³ scores. A study using the National Surgical Quality Improvement Program database⁶ to compare VTE risk in panniculectomy versus abdominoplasty was not included because of heterogeneous data and numerous confounders precluding isolation of risk from fascial plication. A Fisher's exact test was used to compare categorical variables.¹⁴ A *P* value <0.05 was considered significant.

RESULTS

No prospective randomized studies or systematic reviews of this topic were identified. Two retrospective studies, reported by Wang et al¹¹ and Restifo,¹² included a comparative group of patients who underwent panniculectomies without abdominal fascial repair. These studies benefited from having a contemporaneous control group, although the comparative cohorts differed with respect to potential confounders. Both studies compared abdominoplasty patients with panniculectomy patients. Wang et al¹¹ matched cases with controls to reduce the influence of confounders such as age, body mass index, and comorbidities. Restifo¹² applied 2 logistic regression models to control for covariates.

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TABLE 1. Published Studies of Abdominal Fascial Plication and Venous Thromboembolism Risk

Year	Authors	No. Patients	Procedure	Study Design	Comparative Group	Diagnostic Method	Anesthesia	Increased Risk	MINORS* Score
2020	Swanson	188	Abdominoplasty	Prospective	No	Ultrasound	Total IV	No	16/16
2022	Wang et al	1265	Abdominoplasty and panniculectomy	Retrospective	Yes	Clinical	General endotrachea	No	18/24
2024	Restifo	1370	Abdominoplasty and panniculectomy	Retrospective	Yes	Clinical	General endotracheal	Yes	17/24

Methodological Index for Non-Randomized Studies.¹³

Neither group used Doppler ultrasound screening to detect DVTs; both studies relied on clinical diagnosis confirmed with Doppler ultrasound.

Wang et al¹¹ did not report how many patients received chemoprophylaxis. The matched groups did not differ significantly in duration of anticoagulation—the median duration was 0 for both groups, indicating that at least half the patients in each group received no anticoagulation. By contrast, Restifo¹² prescribed 5000 units of unfractionated heparin preoperatively in almost all patients who underwent fascial plication, in addition to either rivaroxaban 10 mg orally or enoxaparin 40 mg subcutaneously for 7 days postoperatively in patients deemed to be at higher risk. Restifo¹² did not specify the risk criteria for making this risk determination. Evidently, this regimen was not prescribed for panniculectomy patients. In addition to assigning greater risk to patients treated with abdominal fascial plication, Restifo¹² added 2 points for this repair as a modification of the 2005 Caprini risk assessment.¹⁵

Wang et al¹¹ reported 8 VTEs among 547 patients who underwent rectus plication (1.5%) and 11 VTEs among 645 patients (1.7%) who did not undergo a fascial repair, finding an almost identical VTE risk. Restifo,¹² on the other hand, found that patients treated with fascial repair suffered significantly more VTEs (2.3% vs 0.36%). The MINORS scores were 18 and 17 respectively, out of a total possible score of 24 for comparative studies (Table 1).

Only one study, reported by Swanson in 2020, included Doppler ultrasound screening of consecutive patients.¹⁰ This study was also the only published prospective study. All patients were treated with fascial plication (Fig. 1). This study benefited from a sample size calculation, prospective design, consecutive patients, close follow-up, and an accurate

diagnostic tool. A limitation to this study was that there was no control group because all patients were treated with abdominal fascial plication.¹⁰ The MINORS score was 16/16, an ideal score for a non-comparative study.¹³

DISCUSSION

The subject of VTE is a very serious one because this complication can be deadly, as demonstrated in one of the studies, in whom 1 patient succumbed to a pulmonary embolism.¹² All 3 studies included patients who required hospitalization to treat a VTE.^{10–12}

A panniculectomy is undertaken to remove a large pannus to improve function, including mobility and hygiene. An abdominoplasty is primarily an aesthetic procedure, undertaken to improve the appearance of the abdomen. Excess skin and fat are removed, and the muscle wall is usually tightened to improve the abdominal contour, while minimizing visible scarring and leaving a natural-appearing umbilicus.¹⁶ Repair of the abdominal fascial layer greatly improves the fascial tightness in patients who have laxity from pregnancy or weight loss (Fig. 2). In addition to an improved appearance, fascial repair has been shown to benefit some patients suffering from back pain, and may improve bowel function and urinary continence.^{17,18} Patient satisfaction tends to be extremely high; 86% of patients report an improved self-esteem and 70% of patients report an enhanced quality of life.¹⁷ Abdominoplasty, usually done in combination with liposuction, is one of the most beneficial procedures that plastic surgeons can offer.¹⁷ A recommendation to deny some patients the benefits of a fascial repair¹² must be carefully considered.

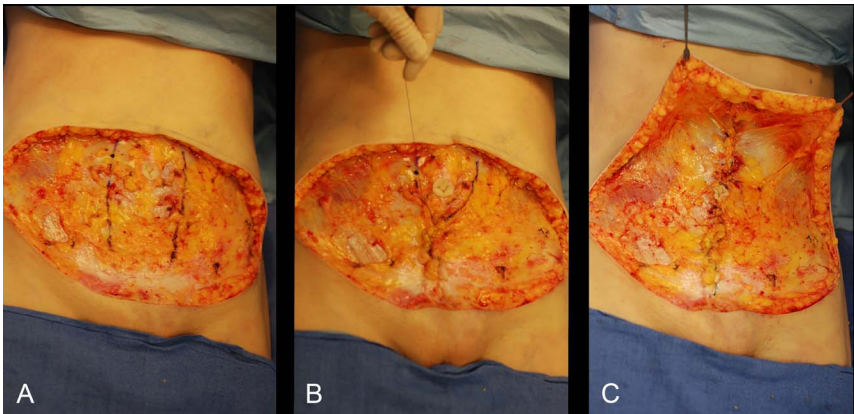


FIGURE 1. Intraoperative photographs of a 40-year-old woman undergoing an abdominoplasty. Liposuction of the abdomen has been completed. The abdominal flap has been raised, preserving the umbilicus on its pedicle. A, The midline borders of the rectus abdominus are marked. B, The rectus diastasis is repaired with 2 layers of running O-Prolene sutures (Ethicon, Bridgewater, NJ). Additional individual sutures are placed as necessary. C, The abdominal fascia is repaired, restoring the tone of the abdominal wall and correcting the rectus diastasis. This patient also underwent augmentation/mastopexy (done first) and buttock fat injection.



FIGURE 2. A, B, This 56-year-old woman is seen before and 3 months after an abdominoplasty, liposuction of the lower body, arms and axillae, and subcutaneous buttock fat injection. The lateral borders of the rectus abdominus are measured on matched photographs, demonstrating correction of the diastasis recti.

Caprini Scores

Few publications on this topic reference Caprini's original 2005 publication, which appeared in *Disease Monthly*,¹⁵ a low-impact primary care journal. The Caprini scoring system overrates several risk factors.¹⁹ A positive family history (3 points) or prothrombin G20210A mutation (3 points) are modest risk factors for VTE, raising the risk 2–3 times.^{20–22} Factor V Leiden (3 points) raises the risk 2–5 times.^{20,22} Serum homocysteine is given 3 points despite a barely measurable relative risk.²⁰ Advanced age is underrated. Three points are assigned for age >75 years despite a 90-fold increase in VTE risk between ages 45 and 80 years.²³ The Caprini scoring system does not consider the form of anesthesia (and avoiding paralysis), which is known to be an important consideration in VTE risk.⁹

Asking women about their history of miscarriages (1 point) can evoke painful memories and may be uncomfortable to discuss with their partner present if these events occurred during past relationships. Such personal questions are also unnecessary because a history of stillbirths is not a known risk factor and certainly not a modifiable one.²⁴

If it were a screening test, Caprini scores would have a dismal 97% false-positive rate, meaning that the vast majority of patients predicted to develop VTEs by their Caprini scores do not develop this complication.²⁵ In fact, age alone is a more reliable criterion (eg, selecting patients >50 years old) for identifying increased VTE risk than a Caprini score.²⁴ No preoperative scoring system truly predicts affected patients.²⁴ The label “validated” appears in the title of an early article supporting Caprini scores,²⁶ and has been reproduced in subsequent publications.^{5,8,9,11} The bar for validity is a low one, based on its incremental (3.0% vs 1.2%)²⁵ impact on VTE risk assessment. Validation is not an inherent study quality; it is a subjective determination best left to independent physicians to assess for themselves.²⁷ A difference in risk of this magnitude is unlikely to be clinically meaningful or truly of predictive value.²⁴

Remarkably, none of the 24 references in Caprini's 2005 publication supported the scores.¹⁵ Instead, Caprini relied on his emotion, intuition, logic, and experience in conceiving his 40-point risk score. When these factors are compared to relative risk values obtained from the medical literature, there is (unsurprisingly) no significant correlation between the Caprini score and relative risk.¹⁹ Moreover, Caprini did

not disclose his numerous financial relationships with the anticoagulant manufacturers. With such a nonscientific foundation, it is not surprising that Caprini scores have failed to perform.

Chemoprophylaxis

Restifo¹² believes the best evidence for chemoprophylaxis is the VTE Prevention Study, published in 2011, which compared a historical (control) group of patients that did not receive enoxaparin with a prospective group that were anticoagulated.²⁸ The VTE risk in both groups was the same, 1.2%. Despite the title of the study, in the 2 patient groups with Caprini scores of 7–8 ($P = 0.23$) and >8 ($P = 0.18$), there was no significant VTE risk reduction in patients receiving enoxaparin.²⁸

Subsequent studies in plastic surgery patients have also failed to demonstrate a significant benefit for chemoprophylaxis.^{9,29,30} Counterintuitively, a large study of plastic surgery patients at the University of Texas Southwestern Medical Center reported a significantly greater VTE risk in anticoagulated patients.²⁹ Shaikh et al³⁰ reported no VTEs among 36 plastic surgery patients with “super high” Caprini scores >10. A 2016 meta-analysis in plastic surgery patients failed to show a significant VTE benefit, but did show an increased bleeding risk.⁹ A very large study (approximately 354,000 outpatient abdominoplasties) reported by Keyes et al³¹ found that 89% of VTEs in abdominoplasty patients occurred in patients with Caprini scores ≤6. In other words, more VTEs occur in patients with “low risk” as opposed to high risk.³²

Importantly, Restifo¹² did not recognize chemoprophylaxis as a confounding variable in his logistic regression. It is possible to conclude that VTE is linked to chemoprophylaxis, in that almost all patients who were treated with fascial repair received preoperative heparin alone or in combination with postoperative rivaroxaban or enoxaparin. The study by Restifo¹² adds to the list of studies^{29,33} finding a paradoxical association between VTE risk and chemoprophylaxis.³⁴

Restifo's study, with its modification adding 2 points for fascial plication, is unique both in finding an increased VTE risk for fascial plication, and in finding merit for (augmented) Caprini scores as a useful predictive tool in plastic surgery patients. Neither Wang et al¹¹ nor Restifo¹² risk-stratified their patients and prescribed anticoagulation on the basis of Caprini scores.

Limitations of Retrospective Studies

Both Wang et al¹¹ and Restifo¹² conducted chart reviews, with a retrospective determination of Caprini scores. It is not possible to reliably calculate Caprini scores from a chart review simply because many of the 40 factors will not be recorded in the patient's chart, leading to underestimates of the score.²⁶ This fact undermines any analysis simply because the scores are unreliable. Retrospective studies are associated with greater risk of bias, including confirmation bias. Investigators may, consciously or subconsciously, look for evidence to support their theory and fail to recognize evidence that does not. As the writer Gregg Easterbrook memorably put it, "Torture numbers, and they will confess to anything."³⁵

Because retrospective studies are subject to confirmation bias, a prospective study is preferred to minimize bias.^{10,36} The result is unknown at the beginning of the study because the data have yet to be collected. Researchers have an opportunity to be surprised by the result, which may differ from their expectations. Restifo¹² conducted a complicated statistical analysis to support adding 2 points to the Caprini score, and believes this modification makes it more accurate. For abdominoplasty patients, who routinely undergo a fascial plication, such a modification would simply increase the score by 2 points without affecting its validity, or lack thereof.²⁶ The point is moot for many surgeons who do not calculate individual Caprini scores to stratify risk, including Restifo.¹² Many plastic surgeons prescribe chemoprophylaxis based solely on the procedure (eg, all abdominoplasties or all breast microsurgical reconstruction cases).^{37–39}

Diagnostic Method

An important, and often overlooked, issue for any investigation of VTEs is the diagnostic method. The only way to reliably ascertain how many patients develop a deep venous thrombosis (DVT) is to use Doppler ultrasound screening in consecutive patients.¹⁰ Clinical examination is notoriously unreliable. Lemaine et al⁴⁰ found that none of the 4 patients who were diagnosed with VTEs on ultrasound had clinical signs, whereas 9 patients who had possible clinical signs of a VTE had no ultrasonic evidence of a DVT. These authors questioned the validity of risk assessment after learning that 96.6% of microsurgical breast reconstruction patients categorized as highest risk using Caprini scores had no ultrasonic evidence of DVTs.⁴⁰

Natural History of VTE in Plastic Surgery Patients

Recognizing the major deficiencies in our knowledge of VTEs in plastic surgery patients (frequency, timing, anatomic location, risk factors, resolution), in 2013, the author adopted ultrasound surveillance to discover more about its natural history, and to learn whether this method would prove to be a valuable screening examination. Patients were screened before surgery, the day after surgery, and about 1 week postoperatively.^{10,36} In 2020, the findings were reported in 1000 consecutive plastic surgery outpatients.¹⁰ This method casts a wide net by detecting both clinical and subclinical thromboses. Interestingly, the majority of DVTs (6/9) that were detected did not have clinical signs of a DVT,¹⁰ underscoring the value of this diagnostic device. Only 1 patient (out of 188) who underwent an abdominoplasty had ultrasonic evidence of a DVT on the day after surgery, and this patient had a previously unknown vascular anomaly causing venous compression (May-Thurner syndrome).

An almost complete absence of detectable DVTs on the day after abdominoplasty would be unexpected if intraoperative rectus plication were a factor predisposing patients to DVTs. Most DVTs were detected at the scan performed 1 week after surgery and required 5 weeks, on average, to resolve with treatment.¹⁰ This finding is possibly a clue as to why patients who receive chemoprophylaxis still develop VTEs—the course of anticoagulation is too early and too short.¹⁰ (This finding should not be a rationale for longer periods of chemoprophylaxis,

which would expose more patients who are not destined to develop a VTE to a greater bleeding risk).

In 2023, the author reported a series of 310 consecutive abdominoplasties without chemoprophylaxis who were screened using the same method,¹⁶ overlapping with data from the earlier study.¹⁰ Five VTEs were detected (1.6%). There were no abdominal hematomas. The rectus diastasis was routinely repaired. The incidence of VTEs among these patients (including subclinical DVTs) was not significantly different from Restifo's subgroup of 281 patients (0.4%) who did not undergo fascial plication ($P = 0.22$).¹⁴

Intra-abdominal Pressure

Huang et al,⁴¹ in a unique, controlled, and frequently cited study, compared intra-abdominal pressures between abdominoplasty patients and breast reduction patients, finding no significant difference in pressures before, during, or after surgery. All pressures were <20 mm Hg, considered clinically unimportant. A recent study of intraoperative intra-abdominal pressures in 46 postbariatric patients undergoing a circumferential fleur-de-lis abdominoplasty with rectus plication reported pressures <10 mm Hg and no cases of VTE.⁴²

Two publications reported increased common femoral vein diameters in breast reconstruction patients undergoing abdominal free flaps.^{38,39} The authors believe these findings support the bottleneck theory leading to venous stasis in patients who undergo plication of the rectus fascia (in this case because of flap harvesting as opposed to abdominoplasty). A limitation of these studies was the absence of a control group. Moreover, the data points do not fit the physical law relating flow velocity to vessel diameter, which is exponential rather than linear. Any percentage increase in vessel diameter must be associated with a larger percentage decrease in flow rate to maintain the same cardiac output because of the inverse squared relationship between these variables.⁴³ One case report also documented a temporary increase in the proximal femoral vein diameter and decreased flow velocity after abdominal wall plication in a breast reconstruction patient treated with a pedicled transversus abdominus flap.⁴⁴ None of the studies ultrasonically evaluating the proximal femoral vein found evidence of a DVT.^{38,39,44}

Anesthesia

An important factor in VTE risk, and one that often goes unmentioned (and is not considered in the Caprini score)¹⁵ is the type of anesthesia.^{9,10,45} Whenever possible, muscle relaxation should be avoided. This author does not use muscle relaxation during surgery. Patients breathe spontaneously using a laryngeal mask airway. The calf muscle pump is preserved, reducing VTE risk.^{9,10,45} There is no need for sequential compression devices, which have been shown to be ineffective in plastic surgery outpatients.^{10,46}

An underrecognized benefit of total intravenous anesthesia without muscle paralysis is the fact that any change in respirations that may be caused by overtightening of the fascial layer is easy to detect.⁴⁷ This valuable clinical sign is unavailable when patients are mechanically ventilated.

Patient Factors Associated With Increased VTE Risk

Numerous patient factors have been linked to an increased VTE risk. These include increased age, body mass index, smoking, hormonal supplementation, abdominoplasty, longer operations, and combining procedures.^{5,31,48–54} The only prospective study using Doppler ultrasound screening found that age, abdominoplasty, operating time, and number of procedures are all positively correlated with VTE risk in plastic surgery outpatients.¹⁰ However, on regression analysis, only age persisted as a significant risk factor ($P < 0.05$).

Most studies do not isolate other risk factors from age.⁵⁵ Older patients are more likely to undergo combined procedures with longer

operating times.¹⁰ Advanced age is known to be the most important risk factor for DVTs,^{22,56} supported by experimental data showing that the valve leaflets in the deep veins stiffen with age, causing venous valvular stasis and local hypoxia,^{56,57} believed to be the triggering event for thrombogenesis.^{56,58}

“Risk mitigation” in plastic surgery consists primarily of instructing patients to stop taking birth control pills and hormone supplementation.²⁴ Cessation of these medications comes with risks, including unplanned pregnancy and troublesome menopausal symptoms. Moreover, the best evidence does not support withholding hormones.¹⁰ Smoking and an increased body mass index are not VTE risk factors in plastic surgery outpatients.¹⁰

Bleeding Risk

Both ultrasound for DVT detection and anticoagulation for documented DVTs are approved by the US Food and Drug Administration (FDA).²⁴ By contrast, chemoprophylaxis is not FDA-approved for plastic surgery patients,^{19,24} a point that is often missing in articles on this subject.^{11,12} There is little doubt that routine anticoagulation increases the risk of bleeding.^{16,24,59} A 2021 review reported no increase in bleeding risk,⁶⁰ but a large French study (hematoma rate, 5.7%)³⁷ and a smaller randomized Brazilian study⁶¹ were excluded from the review. If these studies are added to the pooled analysis, the increased bleeding risk for anticoagulated abdominoplasty patients becomes highly significant ($P < 0.00001$).⁵⁹

Restifo¹² reported that chemoprophylaxis increased the risk of bleeding “dramatically,” to 4.4%. Seven patients required hospitalization for bleeding, 6 required blood transfusions, and 1 patient lost half of the total blood volume. This serious iatrogenic complication must be weighed against any possible benefit from chemoprophylaxis, which has not been reliably demonstrated in plastic surgery patients,²⁴ including the study by Restifo,¹² who, surprisingly, did not compare VTE rates between patients who received chemoprophylaxis and those that did not. If he had compared rates, he would likely have found a significant (paradoxical) association, in view of the fact that the group treated with fascial plication was the same group that was anticoagulated.

In-office Doppler Ultrasound Screening

A major benefit of Doppler ultrasound is in detecting a subclinical DVT while it is still early and distal, and before it propagates.^{10,24,62} These thromboses tend to develop about a week after surgery, and are usually small and distal—and amenable to early treatment with oral anticoagulants.^{10,24,62} This early warning system is analogous to a canary in a coal mine.⁶² This information is easily available at no risk, and may make a difference between life and death in a patient with an early and evolving DVT. It is much better to make this diagnosis on ultrasound than at autopsy. In medicine, the case for not obtaining additional information is usually a difficult one to make, especially if this valuable information may be hidden from clinical detection.

At the 2023 annual meeting of the American Society of Plastic Surgeons, the moderator of a panel on the subject of VTE challenged the use of diagnostic ultrasound in an office setting.⁶³ After all, plastic surgeons are not radiologists. Of course, plastic surgeons often read electrocardiograms without relying on a cardiologist. It is interesting to consider the appropriateness of a plastic surgeon, who is not a hematologist, prescribing (off-label) potent anticoagulants to healthy outpatients who do not have an FDA-approved indication and who urgently require a functional clotting mechanism. Are plastic surgeons best equipped to manage complications such as hemorrhage and thrombocytopenia,⁶⁴ and order reversal agents in the event of uncontrolled bleeding?

In-office ultrasound examinations are safe, highly practical, inexpensive, and free the radiologist from the burden of reading numerous negative studies. Unlike patient-administered injections at home,

compliance is almost universal,^{10,36} Any positive scans may be reviewed with a radiologist at the plastic surgeon's discretion.

A licensed sonographer is a welcome addition to any plastic surgery clinic.⁶⁵ Patients do not pay extra for the studies, which take about the same time as a Caprini evaluation (20 minutes), but provide much more direct and useful information. It is a valuable tool for discussing this complication; patients cannot later deny being properly informed.²⁴ Of course, many plastic surgeons already use ultrasound technology in their offices to evaluate breast implants.⁶⁵ It is more convenient to provide this point-of-care service in the office than referring the patient to an outside radiology clinic, which remains a viable alternative. The patient may be financially responsible for the scans, but will be pleased not to have to purchase an anticoagulant and self-administer injections.³⁶

CONCLUSIONS

It is time to free ourselves from an unscientific and ineffective risk assessment system.²⁴ The best evidence does not support using a Caprini score to predict risk, or using a modified Caprini score. The most reliable evidence¹⁰ supports performing a fascial repair, which improves the result. Unnecessarily anticoagulating patients is unapproved by the FDA. Sadly, the evidence consistently shows that chemoprophylaxis adds to the bleeding risk while doing nothing to reduce the VTE risk in plastic surgery patients. Plastic surgeons should reconsider informing patients that chemoprophylaxis reduces VTE risk.

An effective and proven alternative is ultrasound screening and early treatment of detected DVTs to reduce the risk of a dangerous VTE.^{10,24} Plastic surgeons should encourage their anesthesia providers to adopt total intravenous anesthesia and avoid muscle paralysis.⁴⁵ Our medical recommendations need to be based on the most up-to-date evidence, obtained in consecutive plastic surgery patients using the most accurate diagnostic tool (Doppler ultrasound).^{10,24} Treatment recommendations are meant to change as new information becomes available.¹⁰ This is simply the application of evidence-based medicine.⁷

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