



Venous Thromboembolism in Plastic Surgery Patients: Survey Results of Plastic Surgeons

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Background: Recommendations for venous thromboembolism (VTE) prophylaxis have been published in the plastic surgery literature. However, no comprehensive survey of the overall incidence of VTE among plastic surgery patients has been undertaken.

Objective: This study was performed to determine the incidence of VTE in plastic surgery patients, to delineate which procedures have the most risk for VTE, and to establish whether published guidelines are utilized by plastic surgeons.

Methods: An e-mail survey was sent to 3797 plastic surgeons based in the United States. Of those queried, 1106 (29%) completed the questionnaire. Respondents were asked to report VTE events in their patients over the last 24 months. There were 8 patient-based questions about VTE prophylaxis to determine the preferred method used.

Results: Overall, 329 VTE events were identified. The most commonly associated procedures were abdominoplasty with another procedure (87 events) and abdominoplasty alone (71 events). Whether abdominoplasty is performed alone or combined with another procedure, the survey revealed similar rates of VTE per 10,000 patients (36 events per 10,000 patients). Plastic surgeons' prophylaxis methods vary, and 38% of the respondents were not aware of the published recommendations.

Conclusions: Based on our study, abdominoplasty with or without a second procedure has the highest incidence of VTE events among plastic surgery procedures. Combining abdominoplasty with another procedure does not increase the risk for VTE. A significant number of plastic surgeons are not aware of the published recommendations, and there is no consistent VTE prophylaxis used by the plastic surgeons who responded to the survey. (Aesthetic Surg J 2006;26:522–529.)

Venous thromboembolic (VTE) events remain a significant cause of morbidity and mortality in surgical patients. The true incidence of deep vein thrombosis (DVT) and pulmonary embolus (PE) is likely underestimated, as recognition is often difficult unless clinically obvious. This complication has attracted the attention of the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO), as there are an estimated 5,000,000 DVTs and 500,000 PEs in the United States per year, leading to 50,000 to 200,000 deaths. Pulmonary embolism is the leading cause of in-hospital mortality, affecting approximately 1% of all hospitalized patients.^{1,2}

Venous thromboembolism has been studied extensively in trauma patients, as well as those undergoing general, orthopedic, and gynecologic surgery. The American College of Chest Physicians (ACCP) published levels of risk for DVT and PE in these surgical patients in 2004³ (Table 1). For example, patients at moderate risk are those having minor surgery who are 40 to 60 years old, or those who are less than 40 years old and have one risk factor for VTE. Moderate risk patients have a 2% to 4%

incidence of proximal DVT and a 1% to 2% incidence of a clinical PE, with 0.1% to 0.4% being fatal.

There are no comparable studies on the incidence of VTE in plastic surgery patients, but these numbers are worrisome and indicate a need for continued study. Equally important, there is no consistent method known to prevent DVTs and PEs while minimizing other complications in this special patient population. Aesthetic surgery is thought to have less risk for VTE, given that patients are often healthy and there are fewer risk factors associated with the procedures, such as the ability to use local anesthetics instead of general anesthesia and early patient ambulation. In one survey study of 273 American Society for Aesthetic Plastic Surgery (ASAPS) surgeons, 9937 face lifts were performed with a 0.35% incidence of DVT and a 0.14% incidence of PE, with 0.01% being fatal due to saddle emboli. Although only 44% of these cases were performed under general anesthesia, 84% of the patients who had a VTE complication had general anesthesia.⁴ Another survey of 917 ASAPS surgeons performing lipoplasty reported 95 deaths (0.02%) out of 496,245 cases, with the most common cause of death from pulmonary embolus (23%).⁵

Table 1. Thromboembolism risk in surgical patients

Risk category	DVT*		PE*	
	Calf	Proximal leg	Clinical	Fatal
Low risk				
Minor surgery <40 yrs old				
No risk factors	2%	0.4%	0.2%	<.01%
Moderate risk				
Minor surgery <40 yrs old + risk factor or 40-60 yrs old with no other risk factors	10%-20%	2%-4%	1%-2%	0.1%-0.4%
High risk				
>60 yrs old or 40-60 yrs old + risk factor	20%-40%	4%-8%	2%-4%	0.4%-1%
Highest risk				
Multiple risk factors				
Hip or knee arthroplasty				
Major trauma, hip fracture, spinal cord injury	40%-80%	10%-20%	4%-10%	0.2%-5%

Risk factors:

- Age >40 years
- Prolonged immobility or paralysis
- Prior DVT
- Cancer
- Major surgery (abdomen, pelvis, lower extremity)
- Obesity
- Varicose veins
- Heart failure
- Myocardial infarction
- Stroke
- Pelvis, hip, or leg fracture
- High-dose estrogen (questionable)
- Indwelling central venous catheter
- Nephrotic syndrome
- Inflammatory bowel disease
- Pregnancy
- Congenital or acquired thrombophilic disorder or hypercoagulable state

*Data from American College of Chest Physicians, 2004.³

Abdominoplasty seems to carry a relatively higher risk of VTE when compared to other aesthetic procedures. This may be due to increased intra-abdominal pressure from internal plication and abdominal binders, decreased ambulation due to pain, obesity, general anesthesia, and other risk factors. Grazer and Goldwyn⁶ reported a 1% incidence of PE in a survey of over 10,000 abdominoplasty cases, van Uchelen et al⁷ reported a 1.4% incidence of DVT with PE in 86 patients who had abdominoplasty, and Chauat et al⁸ retrospectively studied complications

following abdominal dermolipectomies in 258 patients and determined that 1.2% had VTE.

Other studies identify an increased risk of VTE when abdominoplasty is combined with another surgical procedure. Voss et al⁹ reported a 6.6% PE incidence in patients undergoing abdominoplasty combined with a gynecologic procedure, compared to no PEs in the group that had abdominoplasty or a gynecologic procedure alone. Savage¹¹ reported that one out of 13 patients who underwent abdominoplasty combined with a gynecologic

Table 2. Thromboembolytic risk stratification

Risk level	Definition	Prophylaxis recommended
Low risk	Uncomplicated surgery No risk factors Age <40 yrs If age >40 yrs, procedure is <30 min	Proper positioning*
Moderate risk	Age <40 yrs No risk factors Procedure time >30 min Any patient on OCP or HRT	Proper positioning Pneumatic compression devices
High risk	Age <40 yrs At least one risk factor Procedure time >30 min General anesthesia and/or have additional risk factors	Proper positioning Pneumatic compression devices +/- Hematology consult +/- Pharmacologic therapy

*Proper positioning includes knees slightly bent and no compressive garments.

OCP, Oral contraceptive pills; HRT, hormone replacement therapy.

procedure suffered a PE, and warned against combining these procedures.

This survey study was designed to glean insight into the incidence of, and prophylaxis against, VTE in plastic surgery patients. Information regarding the type of procedure and associated risk for VTE was also obtained from the survey results.

Materials and Methods

In 2002, recommendations were published for DVT and PE prophylaxis in 3 categories of patient risk: low, moderate and high¹⁰ (Table 2). To determine the incidence of VTE in plastic surgery patients and the prophylaxis policies of plastic surgeons, we surveyed 3797 plastic surgeons who were members of the American Society of Plastic Surgeons (ASPS). Each surgeon was sent an e-mail notice that linked him or her to a unique University of Wisconsin website survey. In one of the largest survey responses to date, 1106 or 29% of the ASPS members who were surveyed replied. This represents 22% of the approximately 5000 active ASPS members in the United States.

We asked the plastic surgeons to report their incidence of DVT and PE in the last 24 months. We then looked at the 2003 and 2004 ASPS Procedural Statistics (www.plasticsurgery.org) and extrapolated the incidence of DVT and PE from our survey results to estimate the incidence per 10,000 patients treated. This estimation assumes that the 22% membership response is a representative sample.

The survey also had 8 case scenarios designed to depict elective procedures on 2 low-risk patients, 3 moderate-risk patients, and 3 high-risk patients, according to the published definitions. The respondents were asked to answer how they would prophylax against VTE in each situation. Additionally, the respondents were asked if they had a policy for VTE prophylaxis and if they found the published guidelines helpful.

Results

Overall, 329 DVT or PE events were identified. The most common associated procedures are shown in Figure 1.

We used ASPS Procedural Statistics for the last 2 years and extrapolated the results to the entire ASPS membership. The incidence of VTE estimated per 10,000 patients having each of these procedures is shown in Figure 2.

Breast reconstruction was not estimated per 10,000 patients because of the inability to differentiate different types of reconstruction from the ASPS procedural statistics data. Other procedures reported consisted of head and neck reconstruction, trauma reconstruction, abdominal wall reconstruction, burn reconstruction, and other procedures that were not aesthetic and had confounding variables contributing to VTE risk.

The most common types of second procedures combined with abdominoplasty in patients who had VTE

329 DVT and PE Events

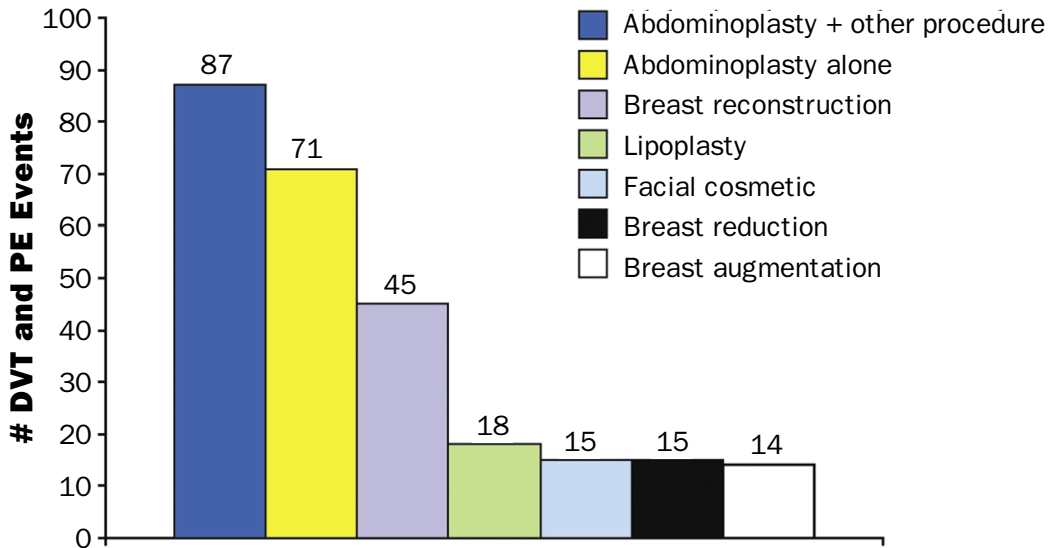


Figure 1. Number of VTE events reported per procedure type.

Events per 10,000 Patients

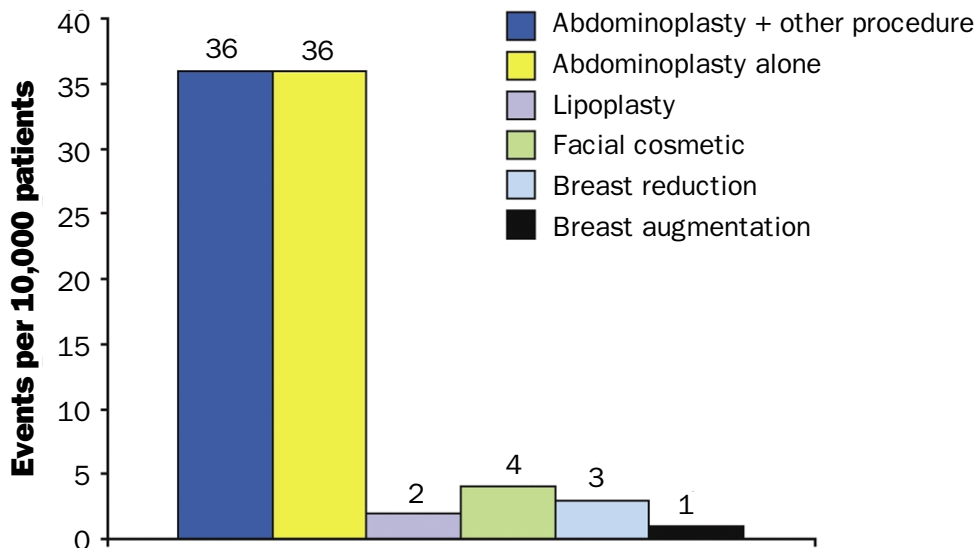


Figure 2. Number of VTE events reported per procedure type, estimated per 10,000 patients treated.

Table 3. Procedures combined with abdominoplasty in 87 patients with VTE

Second procedure	Number of patients with VTE
Breast surgery	29
Lipoplasty	25
Lipoplasty + breast surgery	9
Arm or thigh lift	6
Lipoplasty + other	2
Blepharoplasty	2
Breast surgery + other	2
Other non-plastic surgery procedure	12

were breast surgery (33%) and lipoplasty (29%) (Table 3). At least two thirds of these patients with VTE had pneumatic compression devices used during the perioperative period, and 8 patients had a personal or family history of an underlying hypercoagulable state. An analysis of patient variables associated with abdominoplasty and VTE in the patients reported by respondents is shown in Table 4.

Analysis of the 8 case scenario responses revealed that for low-risk patients, 26% of the plastic surgeons indicated that they would not use prophylaxis, and 63% would use intermittent pneumatic compression devices (IPCDs). In the moderate-risk group, 8% of the responding surgeons would not use any prophylaxis, while 82% would use IPCDs. In the high-risk group, 17% of respondents would not perform surgery, less than 1% would not use any prophylaxis, 28% would use IPCDs alone, 57% would use pneumatics in addition to anticoagulation, and 45% of respondents would obtain a hematology consult (Table 5).

Correlation to the ASPS Task Force recommendations¹ varied between the risk groups. In the low-risk patient questions, 26% of respondents would follow recommendations, while 69% would do more than recommended. In the moderate-risk questions, 75% of respondents would follow recommendations, 7% would do more than recommended, while 14% would do less than recommended. In the high-risk group, 79% would follow the guidelines, 4% would do less than recommended, and 17% would not operate on the patient. The lowest correlation to the published recommendations was in the low-risk patient group (Figure 3).

Seventy-three percent of respondents stated that they have a personal or unit policy for DVT and PE prophylax-

is; 15% found the published guidelines to be very useful, 38% found them to be somewhat useful, and 39% of plastic surgeons were not aware of the recommendations.

Discussion

Venous thromboembolism is an often clinically silent surgical complication that carries a risk of death. Reported risk factors for DVT and PE associated with surgical procedures include obesity, immobility, oral contraceptives, hormone replacement therapy, recent prolonged travel, recent unrelated surgery such as pelvic operations or major lower extremity trauma, cancer, general anesthesia, dehydration, smoking, previous personal history or family history of VTE, known genetic thrombophilic abnormality (Factor V Leiden, antiphospholipid antibodies, Protein C or S deficiency/dysfunction, polycythemia vera, hyperhomocysteinemia, antithrombin deficiency/dysfunction), increased age, paralysis, and heart failure.¹² Elective plastic surgery patients are often healthy and do not carry multiple risk factors for VTE. There are no studies that look specifically at this patient population, but from the ACCP⁴ and others, it can be presumed that the thromboembolic rate is similar if not lower than for general, orthopedic, trauma, and gynecologic surgeries. In regard to elective plastic surgery procedures, abdominoplasty has some associated factors that may make it a higher risk procedure. For instance, many abdominoplasties are performed under general anesthesia, and the technique may increase intra-abdominal pressure from fascial plication, binders, and tissue resection. Patients may ambulate less after surgery due to discomfort, and many patients are obese.

This study suggests that abdominoplasty is associated with higher VTE risk compared to other elective plastic surgery procedures, but the risk is not increased if it is performed with another aesthetic (nonabdominal, nonpelvic) procedure. Stevens et al¹³ performed a retrospective study of 248 abdominoplasties, both alone and combined with either breast surgery, facial surgery, or both. No statistical differences in complication rates between the groups were found, including the incidence of DVT and PE. All patients received general anesthesia wore sequential compression stockings and ambulated within 1 hour of awakening from anesthesia. In addition, Dillerud¹⁴ retrospectively studied 487 patients who had abdominoplasty and lipoplasty of the flap and flanks (all less than 1500 cc) and reported only 2 thromboembolic events (0.4%).

It is not clear whether or not intra-abdominal or pelvic operations increase the risk if they are performed in con-

Table 4. Patient variables associated with abdominoplasty and VTE

Variable	Abdominoplasty alone	Abdominoplasty + other procedure
Number of VTE	71	87
Average age (y)	45	47
Average length of surgery (h)	2.5	4.0
Prophylaxis		
TEDS	At least 17%*	At least 29%
SCDs	At least 54%	At least 67%
Anticoagulation	At least 3%	At least 16%
Deaths	At least 3	At least 3

*At least is reported because not all respondents indicated the type of prophylaxis they used, or the patient’s outcome (death versus recovery). These numbers are from the respondents that specifically indicated these variables. See Table 6 for the percent response in each category.

Table 5. Percent of surgeons who chose each type of prophylaxis in the patient-based case scenario

Patient risk	No prophylaxis	IPCD alone	IPCD + anticoagulation	Hematology consult	No surgery
Low	26	63	—	—	—
Moderate	8	82	—	—	—
High	<1	28	57	45	17

IPCD, Intermittent pneumatic compression device.

Compliance with ASPS Task Force Guidelines

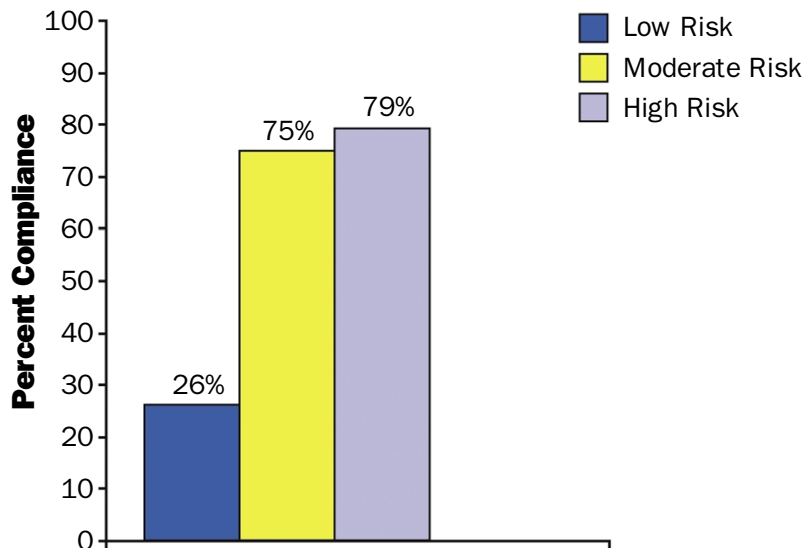


Figure 3. Correlation of respondents’ reported methods of VTE prophylaxis to published guidelines.

Table 6. Percent of surgeons that detailed information about their patient's VTE event

Information reported	Percent of surgeons reporting for abdominoplasty alone	Percent of surgeons reporting for abdominoplasty + other procedure
Age	70	74
Length of surgery	44	55
Prophylaxis used	54	74
Outcome (death versus recovery)	27	29

junction with abdominoplasty. Hester et al¹⁵ reported that obesity was significantly associated with PE following abdominoplasty, but abdominoplasty combined with an intra-abdominal or pelvic operation or another aesthetic procedure was not riskier than abdominoplasty alone. In addition, Gemperli et al¹⁶ reported only 2 minor complications (non-VTE) following 103 abdominoplasties combined with intra-abdominal or pelvic procedures. In our survey, 14% (12/87) of VTEs associated with abdominoplasty and a second procedure involved nonaesthetic procedures such as hernia repair, laparoscopic cholecystectomy, knee arthroscopy and hysterectomy.

This study has the inherent flaw of relying on recall from the survey participants. Some surgeons may not recall accurately or may feel uncomfortable reporting these potentially serious complications. It is thought that the error margin may be in favor of more VTE and fatalities than reported in this survey. One other assumption is that the 22% response rate is likely a cross-section of all plastic surgeons. There is also reporting bias, since every surgeon did not report specific details regarding their patient's VTE. Although all surgeons reported the type of procedure, we were able to report only details from those surgeons who volunteered more information (Table 6).

In 2004, a continuing medical education article was published on updated prevention of VTE in plastic surgery patients. Patients are given points for "exposing" risks and "predisposing" risks, and then categorized as low, moderate, high, and highest risk. Appropriate prophylaxis regimens are recommended based on the risk category.¹⁷ These guidelines represent a more detailed and aggressive approach than the previously published recommendations¹ to identify patients at risk, stratify their risk factors, and prophylax appropriately. Unanswered questions include whether or not to stop estrogen-containing medications, how long to avoid smoking perioperatively, how long to avoid prolonged travel before and after surgery, and how long to wait following a previous major surgery before undertaking elective procedures. Prior to

surgery, it is important to thoroughly investigate a history of symptoms that may be a result of VTE or a family history of VTE. This survey indicates that it may be prudent to treat specific procedures as a separate risk factor themselves. Based on our survey, it is important to remember that VTE may occur in cases with a short operative duration of less than 2 hours, and the diagnosis may not be made for 1 week to more than 1 month after surgery.

Conclusion

In summary, we conclude that the highest incidence of VTE in common elective plastic surgery patients occurs in those having abdominoplasty with or without another procedure. It does not appear that combining abdominoplasty with another aesthetic procedure increases the risk of VTE. Based on the survey patient scenarios, it appears that the published recommendations are not followed consistently. Fortunately, this is most evident in the low-risk patient population, for whom surgeons are often doing more than what is recommended—usually placing IPCDs on the patients. Finally, many plastic surgeons are not aware of the published recommendations. Abdominoplasty patients should be considered at high risk for VTE, independent of other associated risk factors. It may be prudent to avoid general anesthesia in these high-risk patients, if possible. Minimizing other risk factors and obtaining a complete patient history and informed consent are important steps toward minimizing this complication. Future prospective trials should be performed on plastic surgery patients to determine the actual incidence of DVT and PE in this unique patient population, as this data may help the creation of more focused guidelines for optimal, safe, VTE prophylaxis methods. ■

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