



## Venous Thromboembolism in Abdominoplasty: A Prevention Protocol

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### Abstract

**Introduction:** Abdominoplasty is an accomplished cosmetic surgery, in which the risk of venous thromboembolism (VTE) must be considered, based on the predisposing factors involved and their severity. There are, to date, no well-defined protocols for VTE prophylaxis in plastic surgery. The objective of this paper is to present a protocol for the prophylaxis of VTE used in the Plastic Surgery Service of the Hospital e Maternidade Celso Pierro (HMCP) – Pontifícia Universidade Católica (PUC) de Campinas in São Paulo (SP), while also showing the incidence of VTE inpatients undergoing abdominoplasties before and after initiation of the protocol, as well as the incidence of hematomas after the total period of 6 years.

**Methods:** For the creation of this protocol, medical records of patients who underwent abdominoplasty from January 2010 to December 2015 were revised, identifying cases of VTE in this period, associated or not with the use of pharmacological prophylaxis, and those of hematoma after initiation of the protocol.

**Results:** The protocol for prophylaxis of VTE that has been used in the service since 2014 is based on the Anger Protocol and includes non-pharmacological measures and pharmacological measures. Two hundred and forty-three medical records were analyzed in this study. After initiation of the protocol, no cases of VTE were observed in the 74 patients who underwent abdominoplasty, and only one case of hematoma was observed. Before the protocol was initiated, VTE developed in 2 cases among 169 operated patients.

**Conclusion:** After adopting the VTE prophylaxis protocol, we achieved an incidence of 0% VTE in the abdominoplasties in this period, compared to an incidence of 1.18% before the protocol. The incidence of bruising after surgery was 1.35%, which is comparable to rates in the literature for surgery without the use of pharmacological prophylaxis.

**Keywords:** Abdominoplasty; Venous thromboembolism; Reconstructive surgical procedures; Chemoprevention; Surgery; Plastic.

### Introduction

Deep venous thrombosis (DVT) and pulmonary thromboembolism (PTE), which is the most severe outcome, are components of the nosological entity known as venous thromboembolism (VTE) and are relatively common complications for patients undergoing surgery. In the literature, there are few publications on the incidence of VTE in plastic surgery and suggested protocols for its prevention, with no definition of onset and duration of prophylaxis.

Thromboembolic events are largely silent clinically and difficult to diagnose, which leads to a delay in treatment and, consequently, a high mortality rate. A prevention protocol is vital in order to avoid this dreaded outcome [1]. Studies show that most plastic surgeons do not incorporate prophylactic regimens consistent with their practice (up to 25% do not perform prophylaxis inpatients undergoing abdominoplasty for fear of hemorrhagic complications) [2].

Body contour procedures, such as abdominoplasty, involve prolonged operative time under general anesthesia, extensive dissection,

and a post-operative time of reduced mobility; all of these are risk factors for a thromboembolic event. Although abdominoplasty has a low mortality rate, the main cause of death is PTE [2]. In order to stratify the risk of DVT/PTE, there are protocols that guide whether prophylaxis is necessary and which is the best therapeutic option for each case.

### Objective

The objective of this paper is to present a protocol of prophylaxis for VTE to be used in the Plastic Surgery Service of the Hospital e Maternidade Celso Pierro (HMCP) – Pontifícia Universidade Católica (PUC) de Campinas in São Paulo (SP), showing the incidence of VTE in patients undergoing abdominoplasties before and after initiation of the protocol, as well as the incidence of hematomas after a total period of 6 years.

### Methods

A retrospective study was performed at the Plastic Surgery Service of HMCP - PUC Campinas/SP, with a medical records analysis of all patients who underwent abdominoplasty (conventional and anchor/Torek) and were operated between January 2010 and December 2015. In this study, only abdominoplasties were considered, and all patients were put under general anesthesia.

From January 2010 to December 2013, 169 patients who only used non-pharmacological prophylaxis (elastic stocking, intraoperative lower limb manipulation, early ambulation) were operated on, and from January 2014 to December 2015, 74 patients who had used non-

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Based on the Anger Protocol, all patients undergoing abdominoplasty are considered at least moderate risk, with 1 point for the surgical time greater than 60 minutes, 1 point for the surgery itself, and 1 point for the required Fowler position. Therefore, all patients undergoing this procedure should receive some type of pharmacological thromboembolic prophylaxis [2, 3].

The present study followed the principles of Helsinki and all patients completed the Informed Consent Term prior to the surgical procedure.

**Results**

Until December 2013, only non-pharmacological prophylaxis of VTE (elastic stocking, intraoperative lower limb manipulation, early ambulation) was used in abdominoplasties at our plastic surgery service. As of January 2014, based on the work of Anger [3], we adopted a protocol for stratification of DVT/PTE risk.

This protocol is the most used for plastic surgery in Brazil. Patients with ≤1 point are considered to be at low risk and do not require pharmacological prophylaxis; however, patients with a score of 2 to 4 are at moderate risk and those with a score of ≥5 are at high risk [Table 1]. Drug prophylaxis is indicated for patients with a score ≥2 [Table 2].

The pharmacological therapy employed in our service consisted of the use of enoxaparin at a dose of 40 mg/day for 5 days, the first dose being performed during anesthetic induction. Starting on day 6, patients were given rivaroxaban at a dose of 10 mg/day for 10 days. From January 2010 to December 2015, 243 patients underwent abdominoplasty with general anesthesia. Of the total, 3 (1.23%) of the patients were male and 240 (98.7%) were female. From January 2010 to December 2013, 169 abdominoplasties were performed (2 male patients), and only non-pharmacological prophylaxis was performed. From January 2014 to December 2015, 74 abdominoplasties were performed (1 male patient).

It was observed that, prior to the initiation of the protocol, when only non-pharmacological prophylaxis (elastic stocking, intraoperative lower limb manipulation, early ambulation) was used, DVT

**Table 1:** Risk factors for deep venous thrombosis in plastic surgery

Clinic	Surgical Points	Surgical	Points
Age > 60 yrs	2	surgery time > 60 minutes	1
Obesity (BMI > 30)	1	Fowler's position	1
Neoplasia Present	2	Abdominal or thigh dermolipectomy	1
Smoker	1	Liposuction	1
Immobilization for 24h prior to surgery	2	Inclusion of silicone prosthesis in the gluteal region or in the leg of thigh	1
Venous insufficiency or lower limb edema	2	Associated aesthetic or combined surgeries	1
Deep venous thrombosis or previous embolism	2	Breast reconstruction with flap	1
Burns	2		
Contraceptives or estrogen replacement therapy	1		

**BMI: Body Mass Index.**

**Table 2:** Prophylactic measures according to risk classification.

	Low risk (1 point)	Moderate risk (2 to 4 points)	High risk (5 points)
Non-pharmacological measures	Intermittent pneumatic compression	Intermittent pneumatic compression	Intermittent pneumatic compression
	Manipulation of lower limbs: intra and postoperative	Manipulation of lower limbs: intra and postoperative	Manipulation of lower limbs: intra and postoperative
	Early mobilization	Early mobilization	Early mobilization
	Elastic stockings	Elastic stockings	Elastic stockings
Pharmacological measures	Graduated compression stockings or graduated compression garment	Graduated compression stockings or graduated compression garments	Graduated compression stockings or graduated compression garment
		Low Molecular weight heparin (subcutaneous)	Heparina de baixo peso molecular (via subcutanea)
		Nadroparin 0.3 ml - 1x day	Nadroparin 0.3 ml - 1x day
		Enoxaparin 40 mg - 1x day	Enoxaparin 40 mg - 1x day
		Dalteparin 2.500 UI- 1x day Start: 2 hours before surgery Post-operative: daily injections	Dalteparin 5.000 UI- 1x day Start: 2 hours before surgery Post-operative: daily injections

developed [Table 3] in 2 female patients using oral contraceptives (OAC). One case was a conventional abdominoplasty, while the other was an abdominoplasty at anchor. In both cases, the diagnosis was made with the help of ultrasonography with venous Doppler echocardiography after clinical suspicion.

After initiation of the protocol, we did not observe any cases of DVT or PTE. Only 1 case of hematoma was identified [Table 4], in which the patient presented hypovolemic shock and was surgically reopened in the immediate postoperative period. In the intraoperative period, a hematoma was observed in all areas of the detachment, in moderate quantity, and no active bleeding point was observed.

The patient underwent transfusion of packed red blood cells and presented a favorable clinical evolution, receiving discharge in 2 days.

After the treatment of cases of DVT and hematoma, all the patients were subjected to an evaluation by the hematology team that excluded hematological pathologies.

A two-proportion equality test was performed (significance level  $p < 0.05$ ), but the statistical analysis of the data showed no difference between cases of DVT and hematoma before and after the prophylaxis protocol was adopted [Figure 1].

**Table 3:** Data regarding the two cases of deep venous thrombosis that occurred before the start of pharmacological prophylaxis.

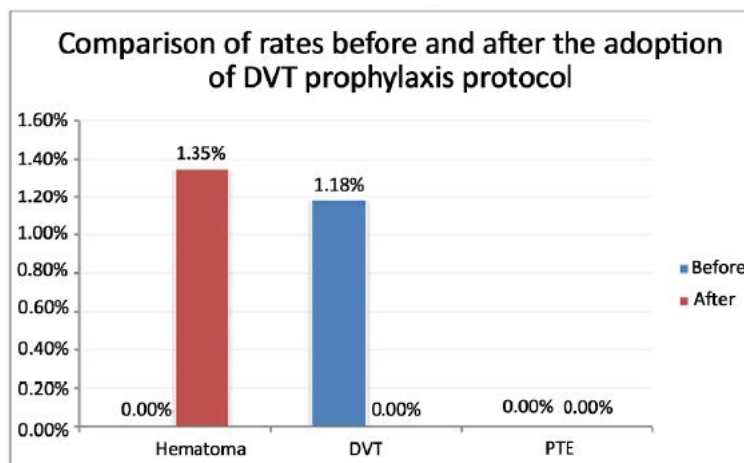
	Case 1	Case 2
ACO	Yes	Sim
Technique	Conventional	Turek
Comorbidities	None	None
BMI	29.5	27.93
Hemolysis	No	No
Location of DVT	Left Gastrocnemius Muscle Vein	Left Femoral Iliac Vein
Use of compression stockings	Yes	Yes
Bariatric surgery	No	Yes
Use of pharmacological prophylaxis PO days in which DVT was diagnosed	No	No
	30	15

ACO: Oral Contraceptive; BMI: Body Mass Index; PO: Postoperative; DVT: Deep vein thrombosis.

**Table 4:** Data referring to the case of hematoma that occurred after the beginning of the protocol.

	Single Case
ACO	No
Technique	Turek
Comorbidities	None
BMI	22.7
Hematoma	Yes
DVT	No
Use of compression stockings	Yes
Use of pharmacological prophylaxis	Yes
Bariatric surgery	Yes
PO days	Immediate

ACO: Oral Contraceptive; BMI: Body Mass Index; PO: Postoperative; DVT: Deep vein thrombosis



**Figure 1:** Rates before and after adoption of the protocol for prophylaxis of deep venous thrombosis (DVT).

## Discussion

Procedures like abdominoplasty have several factors that increase the risk of thromboembolic events, such as: 1) vessel injury, with intense dissection and rupture of superficial veins; 2) long operative time; 3) general anesthesia, with decreased peripheral vascular resistance; 4) intraoperative position of the patient that reduces the venous return of the extremities (venous stasis); 5) reduced postoperative mobility; 6) obesity; and 7) plication of the diastasis of the rectus abdominis muscle which decreases the venous return.

In addition, it has been described that abdominoplasty alone already shows an increase in the activity of the coagulation cascade (an increase in the production of thrombin in the postoperative period, which explains the state of hypercoagulability), which can be prevented with the use of prophylaxis [4, 6]. There are few studies in the literature that show the results of perioperative chemoprophylaxis in the incidence of thromboembolic events, risk of hematomas, or other adverse effects in patients undergoing plastic surgery. The timing of initiation and duration of prophylaxis remain controversial.

Studies have shown that abdominoplasty alone, when not combined with any other procedure, is associated with a rate of 0.1% to 1.1% for DVT, 0.34% to 1.1% for PTE, and 0.5 to 8% for hematoma [2, 4, 5]. When combined surgery is performed, these values increase significantly [1]. In cases of death due to PTE, specific data for abdominoplasties are not found in the literature, but a mortality rate of 0.1 to 0.8% is reported for general surgery patients.

Thromboembolic phenomena present an incidence of about 0.6% when drug prophylaxis is used. According to the literature, cases of bruising vary between 2.3 and 8% when using prophylaxis, which does not differ from the incidence of bruising in general surgery [2]. However, a meta-analysis by Koch et al. of 39 articles, including more than 16,000 patients, demonstrated that there is an increase in bleeding/bruising rates with the use of low molecular weight heparin in patients undergoing large surgeries.

Prophylaxis for VTE, recommended for at least 7 days or more after high-risk surgery, has one disadvantage, because low molecular weight heparin is administered via an injection. The new regimens with oral anticoagulants reduce hospitalization time and make prophylaxis less inconvenient and safer and Oral anticoagulants have the advantage of not requiring regular monitoring of coagulation with laboratory tests and the dose or dose range need not be altered according to the coagulation and laboratory parameters.

Rivaroxaban is approved by the United States Food and Drug Administration and the approval was based on large phase III trials showing noninferior or superior efficacy and similar or reduced rates of major, intracranial, and fatal bleeding compared with conventional anticoagulants (ie, enoxaparin and/or warfarin) [9, 10].

Single-center studies show that bleeding rates increase in surgeries with large areas of dissection and this risk can be increased with the use of chemoprophylaxis [11-13]. It is worth mentioning that this fact has not been confirmed by the recent AAPS meta-analysis and consensus conference [14].

On the other hand, in cases of hematoma or bleeding, when low molecular weight heparin is used as the antidote, protamine sulfate may be given. If these complications occur after administration of the new oral anticoagulants, there are still no specific antidotes that reverse the action of the anticoagulation effect [15]. Therefore, in our service, we initially used enoxaparin, which comes with a greater risk of bleeding/bruising, and then replaced it with the oral anticoagulant, rivaroxaban, on day 6. This method combines security with practicality.

There is a decrease in bleeding risk when the oral anticoagulant is initiated at least 12 hours after the surgical procedure and without any association with any type of NSAIDs (non steroidal anti-inflammatory drugs) [16-18].

When we considered the use of oral anticoagulants for thromboprophylaxis (rivaroxaban in the protocol of this study), 4 large clinical studies with a total of 12,000 patients showed that rivaroxaban is superior in efficacy to 40 mg subcutaneous enoxaparin [1]. Rivaroxaban is an oral anticoagulant that directly inhibits blood coagulation factor Xa and is well absorbed in the intestine. The maximum effect of rivaroxaban occurs in 4 hours and lasts up to 12 hours, but the factor Xa activity does not return to normal within 24 hours, and 1 dose per day is sufficient.

After the introduction of the protocol in our service, only 1 patient (1.35%) required a reoperation due to hematoma, which is comparable to bleeding rates when chemoprophylaxis is not performed [19].

Considering that the coagulation cascade is activated during surgery (e.g. abdominoplasty), it would be interesting to start preoperative prophylaxis to prevent its activation. Pannucci et al. [20] demonstrated that the use of prophylactic enoxaparin initiated from 6-8 hours postoperatively and maintained until hospital discharge in high-risk patients may be protective of VTE for up to 60 days.

All data presented in this study are consistent with those in the literature, including the percent of VTE before and after prophylaxis and the presence of hematoma with the use of prophylaxis (1.18% of DVT before the protocol and 0% after protocol; 1.35% hematoma after introduction of the protocol). The risk of VTE should be balanced against the increased risk of bleeding with the use of low molecular weight heparin, always remembering that bleeding is an expected and manageable complication, whereas PTE can be a fatal and an unacceptable sequel in the context of elective surgery [1, 4].

There are few studies in the literature that show the true incidence of thromboembolic events, as most are based on retrospective studies. In addition, only about one third of the cases are symptomatic, which impairs the creation of protocols and recommendations for the proper treatment of VTE [21].

This study presents several limitations; because it is a retrospective study that includes a relatively small, heterogeneous sample of patients after initiation of the protocol. However, it contributes positively to the existing literature. Larger, prospective studies are needed to conclude the efficacy, timing, and duration of chemoprophylaxis for patients undergoing plastic surgery. It can be concluded that adequate antithrombotic prophylaxis for patients undergoing abdominoplasty leads to lower morbidity/mortality and acute events, and hemorrhagic complications can be adequately managed.

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