

# Assessment of deep vein thrombosis risk in after general surgery in non-cancer patients

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**Abstract.** Aim: The aim of the study was to investigate the incidence of deep vein thrombosis of lower limbs in non-cancer patients that underwent general surgery and to assess the possible association between several variables and the onset of deep vein thrombosis. Material and methods: We included patients that underwent general surgery, in a Surgery Department, between 2013-2014. The following data were recorded: age, gender, body mass index and presence of overweight/obesity (BMI > 25 kg/m<sup>2</sup>), type of anesthesia, surgery duration (under/over 45 minutes), the presence of varicose vein of lower limbs, heart failure with bilateral leg edema. Patients received low dose (prophylactic dose) of low-molecular-weight heparin, as indicated as their physician. Patients were examined with Doppler ultrasonography prior of surgery and at three months. Results: From the 56 patients included in the study, 2 developed deep vein thrombosis at three months after their surgery. Patients with deep vein thrombosis were younger, had varicose veins in a higher percentage than patients without deep vein thrombosis. The percentage of patients with high risk of deep vein thrombosis was lower in those that did not develop deep vein thrombosis, but without statistical significance. Conclusions: The incidence of deep vein thrombosis of lower limbs in non-cancer patients that underwent general surgery was low, in the presence of pharmacologic thromboprophylaxis. Varicose veins can be an important risk factor for deep vein thrombosis in patients undergoing surgery.

**Key Words:** deep vein thrombosis, incidence, risk factors, general surgery

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## Introduction

Thromboembolic accidents represent a daily practice common disease in patients who have inadequate perioperative prophylaxis before undergoing general surgery. Their incidence is highly correlated by the number and intensity of existing risk factors. Deep vein thrombosis takes the third place in cardiovascular death etiologies (Adelborg et al 2015) and represents an important life quality disrupter by means of its long term effects: chronic pulmonary hypertension and postthrombotic syndrome, which appear at 1 to 2 years after the event, with a 15%-50% frequency (Winter et al 2017) Therefore, the efforts in preventing this pathology would have an enormous impact in global morbidity and mortality. Venous thromboembolism occurrence in surgical patients is influenced by preexistent and surgical intervention-related risk factors. The risk has a cumulative character, and thus it involves a mandatory systematic investigation. Without prophylaxis, the risk ranges between 15% and 60%, considering the surgical intervention's features (Bates et al 2012). The concept of preoperative risk factors systematic inventorying in guiding prophylactic decisions comes from earlier times. This approach has been empirical considered correct for many years and eventually Venous thromboembolism risk scores, were validated by extended studies (Bahl et al 2010; Pannucci et al 2010). These risks ranking patient's classification designs consist in

a list which includes associated diseases, protocols, interventions, genetical and clinical factors, for each being associated a score, depending the risk they could be attributed. Summing the scoring at the end of completing the form results in a risk score, which includes the patient in a specific category. A complete patient's examination is necessary for counting this risk level, depending on which prophylaxis type, duration, intensity and risk-benefit ratio are considered. If some recommendations are quite well applied in one risk group, they might not be the most opportune option in individual situations, therefore the therapy must be a personalized one. Most of the thromboembolic events occur after the hospital discharge. By respecting the guides which offer precise recommendations related to the calculated risk class by means of scoring charts, clinicians might extend prophylaxis interval in high risk patients (Cronin et al 2019). The aim of the study was to investigate the incidence of deep vein thrombosis of lower limbs in non-cancer patients that underwent general surgery and to assess the possible association between several variables and the onset of deep vein thrombosis.

## Material and methods

We included patients that underwent general surgery, in a Surgery Department, between 2013-2014. The study was approved by

Table 1. Comparison between patients with and without deep vein thrombosis

Variable	With deep vein thrombosis (2)	Without deep vein thrombosis (54)	p
Age (years)	33.5 (26)	55 (44.2; 59.2)	0.06
Gender	Men	1 (50%)	21 (38.9%)
	Women	1 (50%)	33 (61.1%)
Anesthesia	Spinal	-	13 (24.1%)
	General	2 (100%)	41 (75.9%)
Injectable anticoagulant prophylaxis	1 (50%)	35 (64.8%)	1
Surgery duration (>45minutes)	1 (50%)	32 (59.3%)	1
BMI	24.1 (17.2)	26 (24; 30)	0.7
Obesity or overweight (BMI>25 kg/m <sup>2</sup> )	1 (50%)	14 (25.9%)	1
Varicose veins	1 (50%)	10 (18.5%)	0.3
Heart failure	-	3 (5.6%)	1
Risk of deep vein thrombosis	3 (1)	3 (2; 4)	0.9
Risk of deep vein thrombosis (categories)	Low	1 (50%)	18 (33.3%)
	Moderate	-	30 (55.6%)
	High	1 (50%)	6 (11.1%)

the Hospital Ethics Committee and patients signed an informed consent form.

We excluded patients with a personal history of cancer, deep vein thrombosis/evidence of thrombophilia, autoimmune diseases, pregnancy, or an of the following comorbidities/condition in the last six months : cast immobilization, lower limb trauma in the last six months, travels over four hours, sepsis/pneumonia, myocardial infarction, stroke, any type of major surgery. Also, we did not include patients that were following long term treatment with oral anticoagulants for atrial fibrillation.

We recorded the following data: age, gender, body mass index and presence of overweight/obesity (BMI > 25 kg/m<sup>2</sup>), type of anesthesia, surgery duration (under/over 45 minutes), the presence of varicose vein of lower limbs, heart failure with bilateral leg edema. We calculated the risk of thrombosis according to the guidelines in place (Gould et al 2012).

Patients received low dose (prophylactic dose) of low-molecular-weight heparin, as indicated as their physician.

Patients were examined with Doppler ultrasonography prior of surgery and at three months. Also, we recorded if the patient presented deep vein thrombosis during this interval.

Statistical analysis was performed using the SPSS software version 20. Data were presented using absolute/relative frequency or median/25-75 percentiles, when appropriate. Differences between groups were verified with chi-square or Mann-Whitney test, when appropriate. The statistical significance was set at 0.05.

## Results

From the 56 patients included in the study, 2 developed deep vein thrombosis at three months after their surgery. The comparison between patients with or without deep vein thrombosis can be found in table 1. Patients with deep vein thrombosis had younger age, but the difference passed slightly the statistical significance threshold. They also had varicose veins in a higher percentage than patients without deep vein thrombosis, but

the difference was not statistically significant. The percentage of patients with high risk of deep vein thrombosis was lower in those that did not develop deep vein thrombosis, but the statistical significance threshold was slightly passed.

## Discussions

Our study described the incidence of deep vein thrombosis at three months after surgery in patients without cancer. Also, we evaluated the associations between several parameters and the risk of deep vein thrombosis.

The incidence of deep vein thrombosis on our study was 3.5% at three months. This number is in accordance with data from literature. Smith et al (2011) reported an incidence of 1.6%. Qu et al (2015), found an incidence of 9.2% and described that varicose veins, length of the operation over three hours, prolonged bed rest over 48 hours, open laparotomy, arterial hypertension and older age than 50, were associated with a higher risk of deep vein thrombosis.

Pharmacological and mechanical methodologies have an evidence-based efficiency and by their appliance, deep vein thrombosis has become a preventable postoperative complication. From non-pharmacological means, intermittent pneumatic compression devices reduce venous thromboembolism risk by 66% and from anticoagulants, for example low molecular weight heparin decreases up to 72% reduce venous thromboembolism risk (Roderick et al 2005; Gould et al 2012) The deficiencies of these approaches are contraindications and side effects which sometimes prohibit their utility. It is necessary a more profound reduce venous thromboembolism etiology understanding, since still a significant proportion of the causes remain unidentified. Even though we did not find a statistical significance due to the low number of patients (restrictive exclusion criteria), we observed that most patients with moderate/high risk of deep vein thrombosis received prophylactic anticoagulation, that explains the low rate of thrombosis in our study. A metanalysis from 2017

raised the problem that only cases with a risk score for deep vein thrombosis of 7 or 8 had significant risk reduction after surgery with medication. The patients with lower scores had no benefit in reduction of the risk of thrombosis (Pannucci et al 2017). Our patients had lower scores (median of 3 in both groups), but that is because of the fact that we did not include subjects with many risk factors. In the absence of thromboprophylaxis, in patients at highest risk of thrombosis, the incidence is between 40 and 80% (Bates et al 2012).

The younger age of the patients with deep vein thrombosis shows that they probably had mutations that increased the risk. They were referred for determination of thrombophilia. The most probable cause in young adult without cancer or trauma is the presence of one or more of the following thrombophilia: factor V Leiden, prothrombin 20210 and methylenetetrahydrofolate reductase gene mutation, low protein C or S levels, high homocysteine concentration and antiphospholipid antibodies (Colucci & Tsakiris 2020). The cost of these mutations is still too high to be used as screening in all situations with an increased risk of thrombosis.

The limits of our study include: small number of patients, mainly due to restrictive exclusion criteria; the research was carried out in a single center; impossibility of genetic testing for thrombophilia; reduced sensitivity of ultrasound as screening technique in asymptomatic patients, especially for calf thrombosis.

## Conclusion

The incidence of deep vein thrombosis of lower limbs in non-cancer patients that underwent general surgery was low, in the presence of pharmacologic thromboprophylaxis. Varicose veins can be an important risk factor for deep vein thrombosis in patients undergoing surgery.

## References

- Adelborg K, Sundbøll J, Sørensen HT. Arterial cardiovascular events and mortality following venous thromboembolism. *Ann Transl Med* 2015;3(9):117.
- Bahl V, Hu H, Henke PK, et al. A validation study of a retrospective venous thromboembolism risk scoring method based on the Caprini risk assessment model. *Ann Surg* 2010;251:344–350.
- Bates SM, Jaeschke R, Stevens SM, Goodacre S, Wells PS, Stevenson MD, et al. Diagnosis of DVT: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012;141(2 Suppl):e351S-e418S.
- Colucci G, Tsakiris DA. Thrombophilia screening revisited: an issue of personalized medicine. *J Thromb Thrombolysis* 2020;49(4):618-629.
- Cronin M, Dengler N, Krauss ES, et al. Completion of the Updated Caprini Risk Assessment Model (2013 Version). *Clin Appl Thromb Hemost* 2019;25:1076029619838052.
- Gould MK, Garcia DA, Wren SM, et al. Prevention of VTE in non-orthopedic surgical patients: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012;141(2 Suppl):e227S-e277S.
- Pannucci C, Bailey S, Fisher C, et al. Validation of the Caprini risk assessment model in plastic and reconstructive surgery patients. *J Vasc Surg* 2010; 51:788–789.
- Pannucci C, Swistun L, MacDonald J, Henke P, Brooke B. Individualized Venous Thromboembolism Risk Stratification Using the 2005 Caprini Score to Identify the Benefits and Harms of Chemoprophylaxis in Surgical Patients. *Annals of Surgery* 2017;265(6):1094-1103.
- Qu H, Li Z, Zhai Z, Liu C, Wang S, Guo S, et al. Predicting of Venous Thromboembolism for Patients Undergoing Gynecological Surgery. *Medicine (Baltimore)* 2015;94(39):e1653.
- Roderick P, Ferris G, Wilson K, et al. Towards evidence-based guidelines for the prevention of venous thromboembolism: systematic reviews of mechanical methods, oral anticoagulation, dextran and regional anaesthesia as thromboprophylaxis. *Health Technol Assess* 2005;9(49):iii-78.
- Smith BR, Diniz S, Stamos M, Nguyen NT. Deep venous thrombosis after general surgical operations at a university hospital: two-year data from the ACS NSQIP. *Arch Surg* 2011;146(12):1424-7.
- Winter M-P, Scherthaner GH, Lang IM. Chronic complications of venous thromboembolism. *J Thromb Haemost* 2017;15:1531–40.

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