

Is Venous Thromboembolism Prophylaxis Needed in Patients Undergoing Knee Arthroscopy? A Prospective Observational Study

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ABSTRACT

Background: Although rare, deep vein thrombosis is a potentially life-threatening complication of knee arthroscopy. There are scanty literature analysing deep vein thrombosis after arthroscopy in Nepal. This study aimed to identify the prevalence of deep vein thrombosis in patients undergoing knee arthroscopy without chemoprophylaxis postoperatively at 2 weeks and 6 weeks, respectively. The study also aimed to estimate the risk of deep vein thrombosis in these patients by using Caprini Risk Assessment Model.

Methods: This prospective observational study was conducted at AKB center, B&B Hospital, Gwarko, Lalitpur, over a period of 16 months. All patients who underwent arthroscopy knee surgeries fulfilling the inclusion criteria were included in the study. The primary outcome measure was the prevalence of deep vein thrombosis as diagnosed by compression color-coded ultrasonography of the popliteal vein and calf vein at 2 weeks and 6 weeks postoperatively. The secondary outcome measure was the prevalence of deep vein thrombosis in the risk groups according to Caprini Risk Assessment Model.

Results: Out of 612 patients who underwent arthroscopic knee surgeries during the study period, 2 patients (0.33%) developed deep vein thrombosis at 6 weeks follow-up as diagnosed with ultrasonography of the popliteal and calf veins. The prevalence rate in high-risk group was 0.33% (1 in 307) and in very high-risk group was 5.88% (1 in 17).

Conclusions: There was a low prevalence of deep vein thrombosis without chemoprophylaxis following knee arthroscopy in our study. There was higher prevalence of deep vein thrombosis in very high-risk group patients, so close monitoring of such patients during follow-up is recommended.

Keywords: Caprini Risk Assessment Model; deep vein thrombosis; knee arthroscopy; prevalence.

INTRODUCTION

Venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is one of the dreaded complications of orthopaedic surgery.¹ The incidence of DVT following knee arthroscopy without chemoprophylaxis ranges from 1.5 to 41.2%.² This disparity is because of some studies including symptomatic DVT only and others including asymptomatic DVT as well. Furthermore, the prevalence of DVT in lower limb surgery is relatively lower in Asians than in the Western population.³⁻⁶ There are clear guidelines on prophylaxis to prevent DVT following major orthopaedic surgeries, however, these are currently lacking in case of knee arthroscopy.^{7,8} Identifying the rate of postoperative DVT is important before routine chemoprophylaxis is implemented. Hence, this study was conducted to identify the prevalence of DVT

in patients undergoing knee arthroscopy without chemoprophylaxis, so that we have an insight as to whether routine use of chemoprophylactic agents in knee arthroscopy is justified or not.

METHODS

This prospective observational study was conducted at AKB center for Arthroscopy, Sports injury and Regenerative medicine, B&B Hospital, Gwarko, Lalitpur, over a period of 16 months from September 2021 to December 2022. Ethical clearance was obtained from the Institutional Review Committee (IRC) of B&B hospital (B&BIRC-22-48). All patients of age ≥ 16 years undergoing arthroscopic knee procedures were included in the study (convenience sampling). Patients with a past history of VTE, ultrasonographic diagnosis of DVT

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during preoperative screening USG, those undergoing anticoagulant therapy, and those not giving consent were excluded.

The minimum sample size was calculated as 385 using prevalence rate of 50% for maximum number of sample size, but all 612 patients fulfilling inclusion criteria were included in the study.

Surgery: All routine blood investigations, X-ray and MRI of the involved knee were done prior to the surgery. An informed and written consent for the study was taken from each patient after explaining the procedure, complications, and possible outcomes. After adequate and appropriate anesthesia, preoperative USG of the popliteal and calf vein of the involved limb was performed in operation theater. Any patients with DVT identified at this time were excluded from the study and surgery was postponed for further fitness. A pneumatic tourniquet was applied to the upper thigh and inflated as per the operative procedure. The appropriate demographic and perioperative data were recorded as per the pro forma.

The patients were categorized into one of three risk groups based on the total risk factor score on Caprini RAM.⁹ The reliability of this scoring method has been reported in a previous study.¹⁰

1. Intermediate risk group - total risk factor scores of 2
2. High risk group - total risk factor scores of 3-4
3. Very high-risk group - total risk factor scores of ≥ 5

There were no low-risk groups (score 0-1) because arthroscopic surgery in itself is a risk factor worth 2 points.

Postoperative period: Physiotherapy, including active motion exercises and thigh muscle strengthening, was started on the first postoperative day. There were no limitations on motion or ambulatory status, regardless of concomitant procedures. Thromboprophylaxis was not given, and compression stockings were not used, either during the hospital stay or after discharge.

Follow-up: The patients were followed up in OPD at 2 weeks and 6 weeks postoperatively. At each follow-up, the patients were examined for clinical signs of DVT (Calf pain and swelling), and USG of the calf and popliteal vein was performed. Additionally, the patients

were instructed to contact the hospital if one of these signs or symptoms developed before a follow-up visit. The standard ultrasound criteria for DVT were used, i.e., complete non-compressibility of a vein, no venous flow, or visualization of an echogenic thrombus mass in the normally anechoic vein. The veins were also examined with Doppler to evaluate respiratory variation and compression augmentation. USG was performed by the senior author involved in the study after completing an online certificate course.

The data collected was recorded in the pro forma and entered in Microsoft Excel 2019. Demographic and clinical details included in the pro forma were gender, age, caste, height, weight, Body mass index (BMI), smoking history, type of anesthesia, ASA grading, surgical procedure, tourniquet time, Caprini RAM total risk score and USG finding of popliteal and calf vein, preoperatively, at 2 weeks and at 6 weeks follow-up, respectively. Statistical analysis was performed using IBM SPSS statistics version 28. Continuous data were reported as mean \pm S.D., and categorical data were reported as number (percentage).

RESULTS

Out of 612 patients who underwent arthroscopic knee surgeries during the study period, 2 patients (0.33%) (-0.0012 to 0.0078, 95% CI) developed DVT at 6 weeks follow-up as diagnosed with USG of the popliteal vein. The prevalence rate in the high-risk group was 0.33% (1 in 307) and in the very high-risk group was 5.88% (1 in 17) (Table 1).

Table 1. Prevalence of DVT according to risk groups.

Risk groups	Total no. of patients	Patients diagnosed with DVT	Prevalence rate (percentage)
Intermediate risk group	288	0	0%
High risk group	307	1	0.33%
Very high risk group	17	1	5.88%

There were 401 (65.52%) males and 211 (34.48%) females. The mean age was 33.96 ± 12.43 years (range 16 to 70 years), and the mean BMI was 24.99 ± 3.84 kg/cm². The majority of the patients were of Brahmin (33.5%) and Chhetri ethnicity (19.12%). Most of the patients were non-smokers (523 patients, 85.46%). ASA grade was I in

498 patients (81.37%), II in 112 patients (18.3%), and III in two patients (0.33%). The mean tourniquet time was 81.83 ± 30.70 minutes. (Table 2)

Table 2. Demographic data and clinical details for patients in this study.

Variables		Frequency (Percentage)	
Gender	Male	401 (65.52%)	
	Female	211 (34.48%)	
Age (Mean \pm S.D.) in years		33.96 \pm 12.43	
Height (Mean \pm S.D.) in centimetres		164.75 \pm 8.90	
Weight (Mean \pm S.D.) in kilograms		67.78 \pm 11.60	
BMI (Mean \pm S.D.) in kg/cm ²		24.99 \pm 3.84	
Smoking history	Smoker	89 (14.54%)	
	Non-smoker	523 (85.46%)	
ASA grading	ASA I	498 (81.37%)	
	ASA II	112 (18.3%)	
	ASA III	2 (0.33%)	
Type of anaesthesia	Spinal anaesthesia	585 (95.59%)	
	General anaesthesia	27 (4.41%)	
Tourniquet time group	≤ 90 minutes	408 (66.67%)	
	> 90 minutes	204 (33.33%)	
USG of popliteal and calf veins	Preoperative	Normal	612 (100%)
		Abnormal	0 (0%)
	At 2 weeks	Normal	612 (100%)
		Abnormal	0 (0%)
	At 6 weeks	Normal	610 (99.67%)
		Abnormal	2 (0.33%)

According to Caprini RAM risk stratification, 288 patients (47.06%) had moderate risk of VTE, 307 patients (50.16%) had high risk of VTE, and 17 patients (2.78%) had very high risk of VTE (Figure 3).

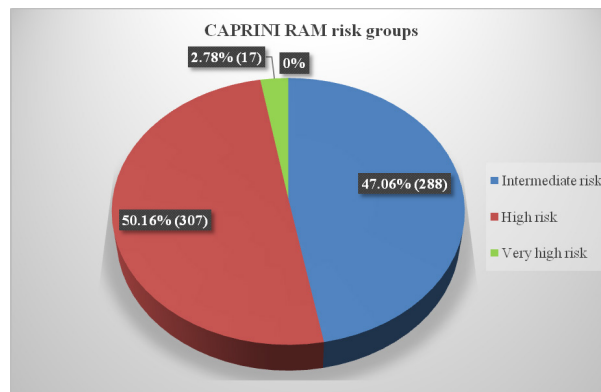


Figure 3. Caprini RAM risk groups.

DISCUSSION

Symptomatic DVT is one of the dreaded complications of orthopaedic surgical procedures, associated with increased morbidity and mortality.¹ Some form of thromboprophylaxis is routinely administered in cases of hip and knee arthroplasties because of the significant risk of DVT.¹¹ Although arthroscopic knee surgeries are amongst the most common orthopaedic operative procedures, it is generally accepted that there is a low risk of DVT associated with knee arthroscopy.^{12,13} The incidence of symptomatic DVT following knee arthroscopy has been variable, with recent studies reporting 0-4% incidence in patients without chemoprophylaxis.¹⁴⁻²⁰ Studies have also reported a low prevalence of DVT in the Asian population following lower limb surgery.³⁻⁶ Some countries practice routine use of chemoprophylactic agents following knee arthroscopy, while others recommend against such routine use except in high risk patients.^{1,21-25} This study aimed to determine the prevalence of DVT in patients undergoing knee arthroscopy without chemoprophylaxis by ultrasonography (USG) of popliteal and calf veins at 2 weeks and 6 weeks postoperatively, respectively. Thus, we tried to understand whether the routine use of chemoprophylaxis in knee arthroscopy is justified or not.

The significant finding of this study was that out of the 612 patients who underwent knee arthroscopy, only two patients developed DVT as diagnosed with USG of popliteal vein at 6 weeks follow-up visit, giving an overall prevalence rate of 0.33%. This corresponds with the overall low incidence and prevalence rates following knee arthroscopy in recent studies within the past ten years.¹⁴⁻²⁰ Furthermore, lower incidences of DVT in the Asian population in lower limb surgeries have been reported in various studies, though not specific to arthroscopic surgeries.³⁻⁵ Liu et al., in their

study, reported the prevalence of clinically significant VTE to be 0% in Asian patients undergoing anterior cruciate ligament (ACL) reconstruction without thromboprophylaxis.⁶ Adala et al. reported two patients (prevalence of 1.78%) with USG-proven DVT out of 112 patients who underwent ACL reconstruction in an Indian population.²⁶ Our study had a greater sample size and included a wide variety of arthroscopic knee procedures but still showed a low prevalence rate of DVT as in these studies.

Caprini RAM has been widely used for estimating the risk of VTE following surgical procedures, especially non-orthopaedic procedures.^{27,28} In our study, we have used the Caprini RAM risk groups to estimate the risk of DVT following knee arthroscopy. The prevalence rate in the high-risk group was 0.33% (1 in 307) and in the very high-risk group was 5.88% (1 in 17). Hence, there was a higher prevalence of DVT in the very high-risk group patients in our study. There is a paucity of literature regarding the use of Caprini RAM in knee arthroscopy as well as in Orthopaedics. Liu et al.²⁹ found in their study that the Caprini score was significantly higher in the case group than in the control group ($P < 0.001$) and concluded that Caprini RAM could effectively assess the risk of DVT in knee arthroscopy patients. This study is among the few that have used Caprini RAM to estimate the risk of DVT after knee arthroscopy, and the results show that the risk stratification groups can help us predict the risk of postoperative DVT, especially in the very high-risk group.

Considering the low prevalence of DVT in this study, the routine use of chemoprophylactic agents in knee arthroscopy is not recommended. The modern rehabilitation protocol of immediate postoperative physiotherapy and range of motion exercises, along with unrestricted ambulation as tolerated, may have contributed to the overall low prevalence of DVT. However, close monitoring of very high-risk group patients is recommended because of the higher risk of DVT in this patient group.

This study had several limitations. Our study had a short follow-up duration of 6 weeks; hence, there is a possibility that some of the late-presenting DVT patients were missed. The USG was performed by the senior author himself, leading to the possibility of reporting bias. Similarly, some of the blood investigations included in Caprini RAM (Factor V Leiden, Prothrombin 20210A, Lupus anticoagulant, Anticardiolipin antibodies, serum homocysteine) were not available, which could have resulted in selection bias. Multi-center studies

of longer duration with a greater follow-up period are recommended for better estimation of the prevalence of DVT and the identification of risk factors.

CONCLUSIONS

There was a low prevalence of DVT without chemoprophylaxis following knee arthroscopy in our study. Considering this, the routine use of chemoprophylactic agents in arthroscopic knee surgeries is not recommended. There was a higher prevalence of DVT in very high-risk group patients, so close monitoring of such patients during follow-up is recommended.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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