

Thromboprophylaxis Impact in Patients Undergoing Major Orthopedic Surgery in Sudan

Keywords: Deep-vein thrombosis, Incidence, Orthopedic surgery, venous thromboembolism

Abstract

Background: Venous thromboembolism is an important complication of major orthopedic surgery.

Objective: To investigate the efficacy of the currently used thromboprophylaxis protocol, determine the incidence of VTE post operatively and the risk factors behind it in patients undergoing major orthopedic surgery.

Method: A retrospective descriptive study for 403 patients underwent major orthopedic surgery from July 2013 to July 2014 in main hospitals in Khartoum state where major orthopedic surgery performed. Data were collected using observation checklist and analyzed using SPSS version 22 to study the association between the type of surgery, patient's risk factors, choice and duration of thromboprophylaxis and development of VTE after major orthopedic surgery.

Results: 403 patients was incorporated the study, 2.73% were diagnosed with DVT developed within 5 days post operatively. 1.64% of the patients not received any type of thromboprophylaxis, 0.27% wore compression stocking. Pharmacological methods were used in the rest of the patients, 96.72% administered to them enoxaparine.

75.95% of the patients presented with one or more than one risk factors for VTE other than the orthopedic surgery. 4% of patients received thromboprophylaxis formore than 14 days while 96% received it for 3-5 days. The incidence of DVT was higher in diabetic patients (p- value= 0.03) and hypertensive (p- value= 0.046) who aged ≥ 60 years.

Conclusion: Results showed that VTE was a significant complication of major orthopedic surgery, despite the use of thromboprophylaxis and the incidence was 2.73% in our study.

Introduction:

Major surgical procedures put patients in a hypercoagulable state by altering hemodynamic stasis from immobility and mechanical vascular damage from the operative intervention. Orthopedic procedures such as hip fracture surgery (HFS), total hip replacement (THR) and total knee replacement (TKR) are thought to be

particularly problematic owing to the physical and mechanical impact on the venous system of the lower limb. Other types of major orthopedic surgery for spinal or upper limbs are not contributed to thrombogenic risk.^(1, 2)

The type of anesthesia used also can influence thromboembolic risk as general anesthesia increase the thromboembolic risk and in the other side inappropriate administration time of antithrombic drugs with spinal anesthesia exposed the patients to risk of hematoma.⁽³⁾

Clinical or patient independent factors that increase the risk of venous thromboembolism include a history of previous Deep Venous Thrombosis (DVT), age, use of oral contraceptives, pregnancy, and comorbidity, cancer, myocardial infarction, and stroke are associated with a high risk of venous thromboembolism. Therefore, a combination of predisposing surgical and patient risk factors for Venous Thromboembolism (VTE) may result in a higher rate of DVT in orthopedic surgery if no prophylaxis is given.^(4, 5)

Thromboprophylaxis can take the form of mechanical, pharmacologic, and/or ancillary means. Mechanical methods include anti-embolism stockings, foot impulse devices, and intermittent pneumatic compression devices (IPC). Depending on the patient medical state and presence of contraindications, pharmacological VTE prophylaxis can be applied using Low Molecular Weight Heparin (LMWH), unfractionated heparin (UFH), and other anticoagulants (such as Vitamin K antagonists (VKAs), apixaban, dabigatran, fondaparinux, and rivaroxaban). Ancillary methods include early mobilization and prevention of dehydration.

The ninth update of the American collage of chest physician ACCP guidelines in February 2012 recommends pharmacological thromboprophylaxis with an IPC device for THR or TKR, with LMWH being preferred as the first-line option over other pharmacological agents. The recently updated ACCP guidelines also recommend extending the duration of thromboprophylaxis for 28 to 35 days following THA or hip fracture surgery as the risk for venous thromboembolism persists for up to 3 months after surgery. Extended-duration thromboprophylaxis (up to 6 weeks) with low molecular weight heparin is significantly more effective in preventing venous thromboembolism in major orthopedic surgery.⁽⁶⁾

The national institute of health and care excellence NICE guidelines emphasizes mechanical intervention at admission prior to the surgery as well as pharmacological prophylaxis after THR (for 28–35 days) and TKR (for 10–14 days).

Despite the recommendations of current guidelines and availability of effective thromboprophylaxis medications, it is inadequately used in clinical practice especially in major orthopedic surgery (THA, TKA, or hip fracture surgery) even

with no presence of contraindications which contributes to observation of many cases developing DVT that necessitate a long term expensive treatment.⁽⁷⁾

Objectives: To investigate the efficacy of the currently used thromboprophylaxis protocol and determine the incidence of VTE post operatively and the risk factors behind it in patients undergoing major orthopedic surgery.

Methods:

Study design:

A retrospective descriptive study for 403 patients from July 2013 to July 2014 using records obtained from health services administrative databases.

The demographic database provides information on age, weight and sex. Procedure instruction provides information on type of surgery, type of anesthesia used and onset of thromboprophylaxis initiation.

Patient record provides information about independent risk factors, age, obesity, pregnancy, comorbidity, cancer, previous DVT, myocardial infarction and stroke.

Follow up records provides information on drugs used for thromboprophylaxis, the dose, administration, duration of thromboprophylaxis and clinical monitoring for signs and symptoms of VTE.

Study area:

Main hospitals in Khartoum state where major orthopedic surgery performed: ShargAlnail Hospital, Saheron Hospital, Omdurman Military Hospital, Alribatteaching hospital and Bahri teaching hospital

Data collection and analysis:

The data were collected by using observation checklist and analyzed using the Statistical Package for the Social Sciences for Windows SPSS version 22 to study the association between the type of surgery, patient's risk factors, choice and duration of thromboprophylaxis and development of VTE after major orthopedic surgery.

Results:

The data of 403 patients were assessed; the information was collected from five hospitals in which the major orthopedic surgery performed. (Table 1)

Table 1: Distribution of study sample according to hospital

Hospital	Frequency	Percent (%)
SherqAlneel	131	32.5
Bahry	60	14.9
Alshorta	46	11.4
AlslahAltiby	118	29.3
Sahiroon	48	11.9
Total	403	100.0

The proportions of knee arthroplasty, hip arthroplasty, femur fracture and pelvic fracture repair were 28.3%, 16.9%, 42.9% and 11.9% respectively. The mean age of the patients was 55.36 ± 18.77 years. Male encountered 63 % while female were 37%. General anesthesia was administered in 9% of the patients where as 91% were treated with combined spinal – epidural anesthesia. (Table 2)

Table2: Demographic data, type of surgery, and type of anesthesia used in the patients included in the study (n=403) *:

Variable	Result
Age (year)	55.36 ± 18.77
Gender	
Male	254 (63.0%)
Female	149 (37.0%)
Type of surgery	
Hip arthroplasty	116 (28.8%)
Knee arthroplasty	114 (28.3%)
Femur fracture repair	173 (42.9%)
Type of anesthesia	
General	37 (9.2)
Combined	366 (90.8%)

*Value expressed as mean ± SD.

6 (1.64%) of the patients not received any type of thromboprophylaxis, 1(0.27%) wore compression stocking only without presence of a contraindication to the pharmacological thromboprophylaxis. Pharmacological methods were used in the rest of the patients, 354 (96.72%) patients enoxaparin was administered, tinzaparin used in 2 (0.55%), aspirin in 1 (0.27%) and 2 (0.55%) received aspirin plus enoxaparin. The dose of enoxaparin used in these cases was 40 mg/day subcutaneously (SC), tinzaparin 4500 IU administered SC per day and 100 mg aspirin orally per day.

The prophylaxis started before surgery with no available records about the exact time of administration. There were no cases reported with bleeding complications due to Thromboprophylaxis.

306 (75.95%) of the patients presented with one or more than one risk factor for VTE other than the orthopedic surgery. Additional risk factors for VTE are included in (Table 3).

Table 3: Distribution of potential risk factors other than major orthopedic surgery for venous thromboembolism

Additional risk factors	Study sample (n=403)
Age \geq 40 years	278 (69%)
Previous history of DVT	11 (2.7%)
Malignancy	0
Hormone therapy	3 (0.7%)
Pregnancy	1 (0.2%)
Comorbidity	
Diabetes mellitus	83 (20.6%)
Hypertension	118 (29.3%)
Dyslipidemia	5 (1.20%)
Stroke	5 (1.20%)
Myocardial infarction	0
Others*	12 (3.00%)

*sickle cell disease or Hyperthyroidism

Thromboprophylaxis for more than 14 days was implemented in 13 (4%) while in 349(96%) of the cases was administered for short term, most of them until patient discharged (for 3-5 days).

Of the 403 patients, 11(2.73%) were diagnosed with DVT. Majority of the patients who had DVT, it was developed within the first 5 days postoperative. The time for onset of DVT in the patients is shown in Table 4.

Table 4: Time per day for the onset of deep vein thrombosis in the study sample

Statistics of (Onset of thrombosis post operatively)	
Number of patients	11
Mean	5.8182
Median	5.0000
Std. Deviation	2.40076
Minimum	3.00
Maximum	10.00

The majority of patients (10) who developed DVT were aged \geq 60 years, one patient who is 18 years had a sickle cell disease. No significant differences were found regarding the gender or the type of the surgery in the group of patients who developed DVT (p- value $>$ 0.05).

The analysis revealed that the patients received general anesthesia (p- value =0.012) were at a greater risk for the development of DVT than those who had spinal anesthesia.

The incidence of DVT was higher in diabetic patients (p-value = 0.03) and hypertensive (p- value= 0.046). However, the incidence of thromboembolism in

patients with a previous history of DVT, stroke, hormone replacement therapy or dyslipidemia was not significantly higher than in other patients (p - value>0.05 for all).

81.8 % of the patients developing DVT received the Thromboprophylaxis for 3 days with no significance difference regarding the choice of drug. One patient not received the therapeutic dose of DVT was died as a result of thromboembolism, leading to a mortality rate of 0.24%.

Table 5. Factors influencing the development of thromboembolism in patients undergoing major orthopedic surgery:

Factor	At 95% Cl.	P- value
Type of anesthesia		
General anesthesia	-0.721-	0.012
Age≥ 60 years	-1.074-	0.040
Duration of Thromboprophylaxis < 14 days	-1.185-	0.027
Additional risk factors		
Diabetes mellitus	-0.650-	0.03
Hypertension	-0.610-	0.046

Discussion:

The incidence of thromboembolism in patients following major orthopedic surgery was 2.73%, most of them developing DVT within 5 days post operatively. The use of prophylaxis decreased the incidence but did not completely resolve the problem. In one meta-analysis, it was reported that the incidence of PE within 3 months after the procedure was 3.2% in patients receiving short-term prophylaxis (7-10 days).⁽⁹⁾ The incidence of DVT in patients who did not received thromboprophylaxis was 16.66% , this rate is lower than the reported rates (40-60%)⁽¹⁰⁾ ,the reason may was the majority of them presented with no additional risk except the risk of surgery only, and the age group was less than 40 years.

Our analysis revealed that the patients received general anesthesia (p- value =0.012) were at a greater risk for the development of DVT than those who had spinal anesthesia, this found to be complied with a meta-analysis conducted by Hu et al. (2009) of 21 randomized clinical trial and the result was that compared with general and local anesthesia for total knee replacement (TKR) or total hip replacement (THR) was associated with a reduced incidence of both DVT (OR = 0.45; 95% CI 0.24 to 0.84; ten RCTs of 910 patients) and PE (OR = 0.46; 95% CI 0.29 to 0.80; eight RCTs of 747 patients). The search encompassed a wide date range and some

included studies were performed in the 1980s when differences in surgical techniques may limit relevance to modern practice.⁽⁸⁾

Even in high risk groups, in all the hospitals included in the sample, there were no special considerations regarding method, choice of drug or the duration of thromboprophylaxis. No method for patients risk stratification was implemented to assess the cases.

The practice of the hospitals in the current study was inconsistent with the ACCP recommendations with regard to the method and time of initiation of thromboprophylaxis after major orthopedic surgery and inconsistent with regard to extend the duration of thromboprophylaxis especially in high risk patients. Most of hospitals in this study administered thromboprophylaxis for 3-5 days only.

Conclusion:

The incidence of venous thromboembolism in patients following major orthopedic surgery was 2.73%, most of them developing DVT within 5 days post operatively despite the use of mechanical interventions and pharmacological prophylaxis, venous thromboembolism is an important complication of major orthopedic surgery, and the risk is higher in: Patients who aged ≥ 60 years, Diabetic patients, hypertensive patients, patients received short term thromboprophylaxis < 14 days and Patients whose orthopedic surgery performed under general anesthesia.

Clinicians should implement to a risk stratification model and an evidence based protocol and be aware of VTE, especially in elderly patients (≥ 60 years of age) who present with comorbidity and extend the thromboprophylaxis duration in the high risk patients.

References:

1. Sors H, Meyer G., Place of aspirin in prophylaxis of venous thromboembolism, *Lancet*. Apr 15 2000;355 (9212):1288-9.
2. Prevention of pulmonary embolism and deep vein thrombosis with low dose aspirin: Pulmonary Embolism Prevention (PEP) trial, *Lancet*. Apr 15 2000; 355 (9212):1295-302.
3. David A Forsh, MD; Chief Editor: Harris Gellman, Deep Venous Thrombosis Prophylaxis in Orthopedic Surgery, <http://emedicine.medscape.com/article/1268573-overview#aw2aab6b3>
4. Ajay K. Kakkar and Sophie K. Rushton-Smith, Incidence of Venous Thromboembolism in Orthopedic Surgery, *thromboembolism in orthopedic surgery*, Liau 2013;978-1-4471-4335-2
5. Joseph A. Caprini et al, Update on Risk Factors for Venous Thromboembolism, *The American journal of medicine*, an Elsevier, May 2005, PP 3-9.

6. Gordon H. Guyatt, Elie A. Akl, Mark Crowther, David D. Gutterman, Holger J. Schünemann, Executive Summary: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines, Chest 2012;141(2)(suppl):7S-47S.
7. Farfan M, Bautista M, Bonilla G, Rojas J, Llinas A, Navas J., Worldwide adherence to ACCP guidelines for thromboprophylaxis after major orthopedic surgery: A systematic review of the literature and meta-analysis, Thrombosis Research Journal, 2016;141:163-170.
8. Hu S, Zhang ZY, Hua YQ et al, A comparison of regional and general anaesthesia for total replacement of the hip or knee: a meta-analysis, Journal of Bone & Joint Surgery - British Volume, 2009, 91:935-42
9. Douketis JD, Eikelboom JW, Quinlan DJ, Willan AR, Crowther MA, Short-duration prophylaxis against venous thromboembolism after total hip or knee replacement. A meta-analysis of prospective studies investigating symptomatic outcomes, Achieves of Internal Medicine, 2002; 162:1465-1471.
10. Shannon M. Bates, Roman Jaeschke, Scott M. Stevens et al, Diagnosis of DVT, Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines, Chestjournal, 2012 Feb; 141(2 Suppl): e351S-e418S.