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## RESEARCH ARTICLE

### THROMBOPROPHYLAXIS IMPACT IN PATIENTS UNDERGOING MAJOR ORTHOPEDIC SURGERY IN SUDAN

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#### ABSTRACT

**Objective:** Venous thromboembolism is an important complication of major orthopedic surgery. The aim of present study was 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.

**Methods:** 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:** Total 403 patients were 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 for more 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  $\geq 60$  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.

**Keywords:** Deep-vein thrombosis, incidence, orthopedic surgery, venous thromboembolism.

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#### INTRODUCTION

Due to immobility and mechanical vascular damage patients with major surgical procedures be in a hypercoagulable state by altering hemodynamic stasis from the operative intervention. Owing to the physical and mechanical impact on the venous system of the lower limb, orthopedic procedures such as hip fracture surgery (HFS), total hip replacement (THR) and total knee replacement (TKR) are thought to be particularly problematic. Other types of major orthopedic surgery for spinal or upper limbs are not contributed to thrombogenic risk<sup>1,2</sup>. The thromboembolic risk influenced by type of anesthesia, 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<sup>3</sup>. High risk of venous thromboembolism increased by clinical or patient independent factors include a history of previous Deep Venous Thrombosis (DVT), age, use of oral contraceptives, pregnancy, and comorbidity, cancer, myocardial infarction, and stroke. Higher rate of DVT in orthopedic surgery if no prophylaxis is given occur when a combination of predisposing surgical and patient risk factors are available<sup>4,5</sup>. Mechanical, pharmacologic, and/or ancillary means can be used for thromboprophylaxis. Anti-embolism stockings, foot impulse devices, and intermittent pneumatic compression devices (IPC) are examples of mechanical methods. Using Low Molecular Weight Heparin (LMWH), unfractionated

heparin (UFH), and other anticoagulants (such as Vitamin K antagonists (VKAs), apixaban, dabigatran, fondaparinux, and rivaroxaban) as pharmacological VTE prophylaxis depending on patient medical state and presence of contraindications. Early mobilization and prevention of dehydration is the ancillary methods. Pharmacological thromboprophylaxis with an IPC device for THR or TKR, with LMWH being preferred as the first-line option over other pharmacological agents as recommended by the American collage of chest physician ACCP guidelines in February 2012. Extending the duration of thromboprophylaxis the recent updated ACCP guidelines for 28 to 35 days following THA or hip fracture surgery where the risk for venous thromboembolism persists for up to 3 months after surgery. Preventing venous thromboembolism in major orthopedic surgery done by using low molecular weight heparin as extended-duration thromboprophylaxis (up to 6 weeks) is effective<sup>6</sup>. The national institute of health and care excellence NICE guidelines emphasizes mechanical intervention prior to the surgery at admission 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<sup>7</sup>. The objective of current study was 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

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.

**Table 1: Distribution of study sample according to hospital**

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

## RESULTS

The data of 403 patients were assessed; the information was collected from five hospitals in which the major orthopedic surgery performed (Table 1). The percentage 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%. 9% of the patients were administered to them general anesthesia where as 91% were treated with combined spinal–epidural anesthesia (Table 2).

**Table 2: 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
<b>Gender</b>	
Male	254 (63.0%)
Female	149 (37.0%)
<b>Type of surgery</b>	
Hip arthroplasty	116 (28.8%)
Knee arthroplasty	114 (28.3%)
Femur fracture repair	173 (42.9%)
<b>Type of anesthesia</b>	
General	37 (9.2)
Combined	366 (90.8%)

\*Value expressed as mean±SD.

Six patients (1.64%) 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 patients presented with beside the orthopedic surgery one or more risk factor for VTE. Additional risk factors for VTE are included in (Table 3). 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.

**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%)
<b>Comorbidity</b>	
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

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

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).

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

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

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%.

## DISCUSSION

The incidence of thromboembolism in patients following major orthopedic surgery was 2.73%, most of them developing DVT within 5 days post operatively. Prophylaxis use decreased 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)<sup>9</sup>. The incidence of DVT in patients who did not received thromboprophylaxis was 16.66% , this rate is lower than the reported rates (40-60%)<sup>10</sup>, 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.*, 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 and PE<sup>8</sup>. 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. With regards to method and time of thromboprophylaxis initiation after major orthopedic surgery, the practice of the hospitals was inconsistent with the ACCP recommendations 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  $\geq$ 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 ( $\geq$  60 years of age) who present with comorbidity and extend the thromboprophylaxis duration in the high risk patients.

**AUTHOR'S CONTRIBUTION**

The manuscript was carried out, written, and approved in collaboration with all authors.

**CONFLICT OF INTEREST**

No conflict of interest associated with this work.

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