



Original Article

Incidence of Deep Vein Thrombosis in Major Orthopaedic Surgery

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Abstract

Background: Deep vein thrombosis (DVT) is defined as thrombosis of deep veins of the lower extremities. Incidence of DVT is high in orthopaedic cases, associated with morbidity and mortality and definite prophylactic guidelines have been formulated to prevent it. **Objective:** This prospective study was conducted to see the incidence of DVT in our patients. **Methodology:** This study was conducted in the Department of Orthopaedics at Chittagong Medical College Hospital, Chattogram, Bangladesh from May 2018 to April 2019. The reason of doing this study was to find the prevalence of DVT in periarticular hip and knee fractures and surgeries, Daily observation of the clinical signs of DVT was done post operatively until the subjects were discharged from the hospital. D-Dimer test and Doppler ultrasonography were carried out on day 2 and between days 4 and 7 after surgery. **Result:** The overall prevalence of DVT in major surgeries of lower limb in this study as detected by Doppler ultrasonography was found to be in 10 patients. **Conclusion:** Thromboprophylaxis should be given to patients undergoing major lower limb surgeries. [*Journal of Science Foundation, July 2020;18(2):67-71*]

Keywords: Deep vein thrombosis; major lower limb surgery; thromboprophylaxis; venous thromboembolism

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Introduction

Venous thromboembolism (VTE) refers to Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE). DVT is associated with relatively high mortality and morbidity. Worldwide high incidence of DVT is reported with lower limb surgeries and prophylaxis to prevent it given to patients operated for lower limb (Magetsari et al., 2014). The incidence of DVT in Asian patients with hip fractures who had undergone total hip or total knee replacements without prophylaxis is approximately 17.0 to 58.0%. These results were similar to those previously reported in European population (Toker et al., 2011). Untreated DVT can result in potentially fatal outcome, such as pulmonary embolism. In the US, the annual cost associated with diagnosis and treatment of VTE was estimated to be up to \$15.5 billion (Motohashi et al., 2012; Magetsari et al., 2014). Approximately half of all cases of deep-vein thrombosis after orthopedic surgery involve proximal leg veins. Therefore, patients undergoing major orthopedic surgery, such as knee or hip arthroplasty, are at high risk or very high risk of venous thromboembolism; hence, current management guidelines recommend that thromboprophylaxis should be used routinely in such patients (Motohashi et al., 2012).

The true incidence of VTE and its associated morbidity and mortality is difficult to determine. Often, VTE is clinically silent, signs and symptoms are non-specific, and screening tests are not always sufficiently sensitive to detect disease in asymptomatic patients. Better understanding of the natural history and the course of venous thromboembolism (VTE) and its associated risk factors has led to strategies for identifying individuals at risk of VTE in the perioperative period, together with methods of quantifying that risk, and approaches for the prevention of thrombotic episodes (Calfon et al., 2009). While many patients with a thrombosis remain asymptomatic and the thrombi resolve without causing complications, some patients will develop symptomatic DVT or pulmonary embolism, whereas others will suffer a fatal pulmonary embolism as the first manifestation of their thrombosis (Murugesan et al., 2010; Magetsari et al., 2014).

Early surgery and rehabilitation are expected to relieve pain, improve mobility, and reduce post-traumatic complications. When surgery is indicated, caution should be taken due to prevent the potential risks of complications of thromboembolism post-operatively, especially in the elderly. When comparing proximal and distal lower extremity fractures, the incidence of DVT is higher in the proximal part. The outcome of DVT varies from complete resolution without any sequel to death due to pulmonary embolism. Therefore, the need for its diagnosis and treatment has been growing rapidly in the last few decades. The incidence correlates with older age, longer operating times, and longer waiting period before fracture fixation (Toker et al., 2011; Singh et al., 2017). The diagnosis of DVT cannot be made solely on its clinical presentation. Although pain and swelling are common presenting complaints, various signs and symptoms are used only to categorize the patients as having low, moderate, or high probability of DVT. Diagnosis of DVT itself is made by Doppler ultrasonography (Murugesan et al., 2010; Lee et al., 2015). D-Dimer is formed by the sequential action of thrombin, factor XIIIa, and plasmin. It is a unique marker of fibrin degradation that is useful in some cases, especially for the exclusion of VTE. Although, orthopedic surgeons are encouraged to consider the development of DVT, there are no nationwide reports on the incidence of symptomatic DVT after major orthopedic surgery. In the present study, we aimed to use a national claim registry to evaluate the incidence and risks factor for the development of symptomatic DVT after major lower limb orthopedic surgery (Kakkar et al., 2013; Lee et al., 2015). This prospective study was conducted to see the incidence of DVT in the patients.

Methodology

This study was conducted in Department of Orthopaedics, Chittagong Medical College Hospital from May 2018 to April 2019. All the patients who were operated for major lower limb injuries were included in the study. Patients who had evidence of DVT before surgery and patients younger than 15 years were excluded from the study. Patients with conservative treatment or those who declined radiology or laboratory examination were also excluded from the study. A detailed history, clinical and radiological examination was carried out in all the patients. Daily observation for the clinical signs of DVT was carried out post-operatively, including Homan's sign, pain, oedema and skin discoloration of the lower extremity until the patients were discharged from the hospital. Laboratory investigation was carried out on all patients which included: Complete hemogram, erythrocyte sedimentation rate, blood urea, serum creatinine, Sr. electrolytes, random blood sugar, coagulation profile (prothrombin time/ activated partial thromboplastin

time/international normalized ratio), Chest X-ray and electrocardiogram. Venous Doppler B/L lower limbs to look for evidence of deep venous thrombosis. A pre-operative assessment for DVT was done in patients by Doppler ultrasonography. The assessment included examination of the bilateral common femoral, superficial femoralpopliteal, anterior tibial vein, posterior tibial vein. Postoperatively, Doppler was done on 3 occasions, on day 5, 3 weeks, 3 month. D-Dimer test was carried out on Day 2 and between Days 4 and 7 after surgery.

Results

A total of 152 patients underwent lower limb surgery in our unit, 33 of which were below 15 years of age and 7 had evidence of DVT on pre-operative assessment. They were excluded from the study. A total of 112 patients were included in the study. 68 (60.71%) were males and 44 (39.29%) were females (Table 1).

Table 1: Incidence of DVT as Per Age and Sex of Patients

Age Group	Patients			Evidence of DVT as per age and sex of patients									
	Male	Female	Total	5 Days			3 Weeks			3 Months			
				M	F	T	M	F	T	M	F	T	
15 to 24 Years	07	03	10	-	-	-	-	-	-	-	-	-	-
25 to 34 Years	10	08	18	-	-	-	-	1	-	1	-	-	-
35 to 44 Years	15	09	24	-	1	-	1	-	-	-	1	-	-
45 to 54 Years	12	11	23	-	-	-	-	-	-	1	-	-	-
55 to 64 Years	11	07	18	-	1	-	-	1	-	-	-	-	-
>65 Years	13	06	19	-	-	-	-	-	-	1	1	-	-
Total	68	44	112	-	2	2	1	2	3	3	2	5	

The average age of our patients was 52.04 years, males 49.11 years and females 56.86 years. On 5th day 02 patients had evidence of DVT on ultrasonography Doppler, both of which were females. We had 03 positive Doppler at 3rd week out of which 02 were females. At 3 months, 05 patients had a positive scan for DVT with 02 being females and 03 males. The overall prevalence of DVT in major surgeries of lower limb in our study as detected by Doppler ultrasonography was found to be in 10 patients (8.92%). 06 out of 10 (60%) patients who developed DVT were females. Out of 112 patients, only 08 (7.14%) had symptoms. Two of our patient expired due to a massive pulmonary embolism within 3 weeks of their surgery which was confirmed by elevated D dimer levels and computed tomography chest. There was an increased risk for DVT in those who had higher D-Dimer test, longer duration of surgery, and presence of clinical symptoms in the occurrence of thrombosis. With the increase in the age group, the incidence of development of DVT is increased. A total of 37 patients were operated for hip, while 30, 10, and 35 patients were operated for thigh, knee and leg and ankle, respectively. 06 patients (60%) had thrombus proximal to knee, 03 (30%) had it below the knee whereas 1 (10%) had it proximal to inguinal region.

Discussion

DVT is known to occur frequently after surgery, particularly orthopedic surgery and cause pulmonary embolism, which often leads to a serious outcome. Without thromboprophylaxis, the rates of objectively confirmed DVT occurring within 7-14 days after lower extremity orthopedic surgery are around 40-60%. Most of these thrombi resolve spontaneously, but a small percentage (1-14%) will progress to symptomatic VTE. The pathogenesis of DVT is multifactorial and was described by Virchow due to three main factors known as Virchow's triad: hypercoagulability, endothelial injury, and venous stasis. In proximal femur fractures which underwent surgery, endothelial injury can occur due to direct trauma or intraoperative mechanical factors (Kesieme et al., 2011). Postoperatively, the patients were immobilized and they experienced oedema that can lead to stasis of venous blood flow. Longer duration of surgery may contribute to prolonged venous stasis and increase the risk of endothelial injury of the vessel due to operative procedures. The other factor that may contribute to DVT in proximal femur fracture is the instrumentation of medullary canal during arthroplasty procedures through activation of the clotting cascade. The combination

of these factors raised the incidence of DVT in proximal femur fracture patients who underwent surgery (Knudson et al., 2004; Kesieme et al., 2011).

Most of the DVT cases were usually clinically silent and unpredictable, the symptomatic events being merely the tip of the iceberg. Plasma D-Dimers are produced when a mass of fibrin threads in a clotting process is degraded by plasmin, so the concentrations of these substances are raised in patients with DVT. It is activated by blood coagulation that is often promoted by inflammatory responses. However, in the elderly, the baseline of D-Dimer levels may be elevated due to the aging process. It may affect the standard range of the clinical value of D-Dimer in this age group (Piovella et al., 2005; Datta et al., 2010). Recommendation from various manufacturers of the D-Dimer assay is to determine the optimal cut off values for each population of patients who were tested. High D-Dimer concentration is insufficient for making the diagnosis of DVT because it also occurs in other conditions such as malignancy, pregnancy and after operations. In some VTE cases, it is used in conjunction with physical and other supporting examinations to reduce the need for imaging due to its high negative predictive value, the reason for which remains unclear. Clinical examination alone to diagnose DVT is often unreliable, and even additionally with negative D-Dimer test, the diagnosis of DVT still cannot be excluded (Wells et al., 2003; Cheng et al., 2011). Therefore, further diagnostic procedures should be carried out for those with high index of suspicion to identify the occurrence of thrombosis.

Several limitations of the current study should be considered. First, the data were retrieved according to diagnostic codes and not on an individual patient basis. Therefore, we could not evaluate whether the DVT cases were recurrent in the same patient and year. The cause of arthroplasty, which varies between patients and might affect the incidence of DVT, could also not be evaluated. In addition, cases of bilateral surgery could not be examined. However, we believe that the current diagnosis-based results, compared to those obtained on per patient basis, allow for better assessment of the actual incidence of postoperative DVT because this information contains every case of DVT, regardless of the number of times the patient had presented.

Second, in current practice, DVT can be diagnosed using ultrasonography, venography, or CT angiography. As the sensitivity of venography is substantially higher than that of ultrasonography, the diagnostic method could affect the incidence of DVT. Unfortunately, our data do not include information regarding the diagnostic method.

Third, the comorbidity aspects of the patients were not taken into account; further study that includes the evaluation of such variables is needed.

Conclusion

Both symptomatic and subclinical thromboembolism is common in patients undergoing major orthopedic surgery. In view of the unpredictable nature of their complication, risk assessment and where appropriate thromboprophylaxis should be considered.

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