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Incidence and Risk Factors for Developing Deep Venous Thrombosis after Isolated Patella Fracture surgery: A Cross-Sectional Study

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Abstract

Introduction: *Deep venous thrombosis (DVT) after surgery is a common and serious complication. After searching the medical literature, there were a few studies about the incidence and related risk factors of DVT in patients who underwent isolated patella fracture surgery.*

Method: *A prospective study was performed in two years and in one center from January 2022 to December 2023. After meeting all inclusion criteria, we had 121 cases of patients who had.*

Results: *Out of 121 cases, only 6 patients (4.95 %) developed DVT after surgery. Age, hypertension, D-dimer (> 0.3 mg/L), and platelets (> 300 × 109/L) were found to be a significant risk factor for developing DVT. There was DVT located in superficial femoral common vein in 1 case (16.6%), popliteal vein in 2 cases (33.3%), and posterior tibial vein in 3 cases (50 %).*

Conclusion: *While the risk of DVT after isolated patella fractures is relatively low, it is still a potentially serious complication that warrants attention. Further research is needed to better understand the risk factors and develop effective prevention and treatment strategies for this patient population.*

Keywords: Developing Deep Venous Thrombosis, Patella Fractures, DVT

Introduction

DVT of the lower extremities is one of the common complications in hospitalized patients, and it often leads to the occurrence of pulmonary embolism, especially in patients with traumatic fractures [1].

The patella is an essential structure during knee extension, and the incidence of patellar fractures ranges from 0.13% to 0.61%, accounting for 0.5% to 1.5% of the total incidence of fractures in adults [2-3].

Authors have studied DVT after major orthopedic trauma such as hip fractures, pelvicacetabular fractures, and spinal fractures. The association between trauma and DVT is well recognized [4].

To these days, there are a few studies which conducted to know the incidence and risk factors for developing DVT in patients with isolated patella fractures. So, it is needed to perform large studies to determine the risk factors for developing DVT after patella fracture surgeries. This will ease the surgeon to recognize the high-risk patients with patella fracture who may develop DVT after surgery. From this point, we conducted a prospective study to analyze the incidence and risk factors for developing DVT after traumatic patella fracture surgeries.

Method

A prospective study was conducted from January 2022 to December 2023. We had 121 cases in one center. We took consent for all patients. Inclusion criteria were: age> 18 years, isolated patella fracture which needed surgery, and completed data. Exclusion criteria were: several fractures, bilateral patella fractures, and previous anticoagulant drug, open or pathological fractures. All patients were admitted to one department for treatment. Firstly, we administrated subcutaneous injection of low molecular weight heparin, 2500-4100 IU, once daily for all patients. We documented all patients' data: age, gender, BMI, hypertension, diabetes mellitus, smoking, alcohol consumption, previous surgeries, chronic pulmonary disease, ischemic heart disease, and previous cerebral infarction. Other risk factors are shown in Table 1.

After surgery, a close monitoring for all patients for signs and symptoms of DVT was done. We used duplex ultrasound scanning for diagnosis of DVT. Alert symptoms to perform duplex ultrasound were: lower limb pain, swelling, and superficial varicose. Conventional scanning included the common femoral vein, superficial femoral, deep femoral vein, popliteal vein, anterior tibial vein, posterior tibial vein, and common fibular vein.

At the time of diagnosis of DVT, we requested laboratory tests such as: complete blood count (CBC) for (white blood cell count, neutrophils count, hemoglobin level, hematocrit, and platelets), Glucose, total protein, albumin, triglyceride, cholesterol, and D-dimer level. All data were analyzed in SPSS 23.0 version (IBM, Armonk, New York, USA). P value < 0.05 was considered statistically important.

Results

In this research, we had a total of 121 patients who had isolated patella fractures and underwent surgery. We had three groups of age: (18- 40), (41-65), and >65 years old. The average age was 52.9 ± 12 years. There were 81 male and 40 female's patients. In this study, we had 6 patients (4.95 %) who had DVT and 4 of them were male patients. Regarding BMI, we had four groups: Underweight, normal, overweight, and obesity. In comparing between these four groups, we did not find a statistical significance for developing DVT after surgery (P value= 0.65). Out of 6 patients who had DVT, 5 of them were smoking with no statistical significance in comparing with non-smokers (P value= 0.60). Risk factors like (alcohol consumption, Diabetes Mellitus, Chronic pulmonary disease, ischemic heart disease, and Cerebral infarction) had no statistical significance in comparing between DVT and non- DVT cases in this research (Table 1).

Hypertension was found to be a significant risk factor in patients who had DVT after surgery (p value= 0.04). There was DVT located in superficial femoral common vein in 1 case (16.6%), popliteal vein in 2 cases (33.3%), and posterior tibial vein in 3 cases (50 %). We found platelets count (> 300 × 109/L) and D-dimer (> 0.3 mg/L) to be different in both groups (DVT and non-DVT cases).

Table 1

Variables	DVT (n = 6) (number (%)	Non-DVT (n = 115) (number (%)	P value
Age (years)			
(18- 40)	1 (16.6 %)	30 (26 %)	0.001
(41-65)	2 (33.3 %)	65 (56.5 %)	
>65	3 (50 %)	20 (17.39 %)	
Gender			
Male	4 (66.6 %)	77 (66.9 %)	0.30
Female	2 (33.3 %)	38 (33.04 %)	0.4
BMI			0.65
Underweight	1 (16.6%)	22 (19.1 %)	
Normal	3 (50 %)	59 (51.3 %)	
Overweight	1 (16.6 %)	20 (17.39 %)	
Obesity	1 (16.6 %)	14 (12.17 %)	
Smoking	5 (83.3 %)	82 (71.3 %)	0.60
Alcohol consumption	1 (16.6 %)	9 (7.8 %)	0.055
Hypertension	2 (33.3 %)	72 (62.6 %)	0.04
Diabetes Mellitus	1 (16.6 %)	43 (37.3 %)	0.11
Chronic pulmonary disease	1 (16.6 %)	22 (19.1 %)	0.63
Ischemic heart disease	2 (33.3 %)	31 (26.9 %)	0.87
Cerebral infarction	0	5 (4.3 %)	0.114
Previous surgery	2 (33.3 %)	39 (33.1 %)	0.9
Site of fracture			0.081
Left	2 (33.3 %)	65 (56.5 %)	
Right	4 (66.6%)	50 (43.47 %)	
Tourniquet use (yes)	4 (66.6 %)	62 (53.9 %)	0.340
Hospital stays (days)	7.5 ±2	6.1±3	0.3
HCT (<lower limit)	2 (33.3 %)	43 (37.3 %)	0.067
PLT (> 300 × 109/L)	3 (50 %)	9 (7.8 %)	0.011
D-dimer (> 0.3 mg/L)	5 (83.3 %)	19 (16.5 %)	0.003

Discussion

DVT is considered one of the most common and danger complication of fractures. It affects the patients' prognosis. Nevertheless, there are many risks factors the paly a major role in developing DVT in patients with fractures. The relationship between isolated patella fracture and DVT as a complication after surgery is less studied according to the literature.

From This Point, We Conducted This Study

Studies showed that the incidence of DVT at each anatomic location of the fracture varies greatly. The results demonstrated that the incidence rate of DVT in isolated patella fractures was 4.1%. Jared A et al. studied the incidence rate of postoperative VET (venous thromboembolism) in patients with lower extremity trauma from 2008 to 2016 in the USA [5-7].

In our study, the Incidence of DVT was 4.95 %.

Chemical thromboprophylaxis has become a routine procedure after major orthopedic surgeries. However, routine use of chemical prophylaxis in isolated lower extremity fractures is controversial. According to the 9th American College of Chest Physicians Evidence-Based Clinical Practice Guideline, the use of thromboprophylaxis is recommended in high-risk situations such as patients undergoing major joint surgery in hips and knees or hip fracture surgery. However, thromboprophylaxis is not recommended in patients with isolated lower-leg injuries who need leg immobilization [8-9].

Identification of risk factors for postoperative DVT in patients who underwent patella fractures is of great significance. In our study, age (especially >65 years) and hypertension were considered a preoperative risk factors for developing DVT after surgery. The vascular system gradually aged as the age increased. Advanced age has been identified to be an independent risk factor for DVT in patients with lower extremity fractures in multiple studies. Lee SY et al. found that the relative risk of DVT was five times higher in 50-69 years old patients while 10 times higher in > 70 years old patients compared with < 49 years old patients in his study [10].

Studies have analyzed the effect of various comorbidities on the occurrence of DVT. Comorbidities such as hypertension, coronary heart disease, arrhythmia, diabetes mellitus, and chronic lung disease have been reported to be risk factors for DVT in different studies [11]. A previous study demonstrated that the lower HGB correlated with DVT [12]. This finding is confirmed in our study (Table 1).

D-dimer is a fibrin degradation marker that represents secondary fibrinolytic activity in the blood, which has clinical value in the diagnosis of thrombotic events [13, 14].

Reports have shown that D-dimer is a highly sensitive laboratory marker for DVT. In our study, we found that D-dimer (> 0.3 mg/L) is considered a sign for developing DVT in patients.

Regarding treatment of the 6 patients who developed DVT after surgery, 5 patients received low molecular weight heparin intravenously. One patient needed insertion of retrievable IVCF (inferior vena cava filters) combined with anticoagulation therapy. APTT (activated partial thromboplastin time) was used to monitor the therapeutic level of heparin.

Conclusion

DVT after isolated patella fracture is considered an important complication and should be give more attention. Clinician should identify risk factor in those patients, so they can have a good strategy to prevent DVT. Prophylaxis also may give some advantage in this point.

Conflicts of Interest

The authors declare there is no conflict of interst

Acknowledgment

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