Deep Venous Thrombosis of Lower Limb after Thoracolumbar Surgery:
(A Prospective Cohort Study)

Abstract

Background: Spinal cord surgery, particularly thoracolumbar surgery, is associated with deep vein thrombosis (DVT). Therefore, this study aimed to evaluate the incidence rate of deep vein thrombosis after thoracolumbar surgery using Doppler sonography.

Methods: This prospective cohort study was conducted on 51 patients with spinal cord and thoracolumbar surgeries from January 2021 to October 2021. All the patients were evaluated for DVT by Doppler sonography one day before and one month after surgery. The elastic stockings were worn by all the cases, and low molecular weight Heparin (LMWH) was started after surgery and continued for two weeks.

Results: According to preoperative results, no evidence of DVT was present. Based on Doppler sonography results, the incidence rate of DVT was 3.92% one month after surgery. Clinical thrombosis was not detected in any of the patients.

Conclusion: According to the results, the DVT incidence rate was 3.9% in patients with Thoracolumbar Surgery. Prophylaxis needs to be seriously considered because DVT is a life-threatening issue.

Keywords: Deep venous thrombosis, Spine, Spinal cord, Operative surgical procedures

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Introduction

The prevention of Deep Venous Thrombosis (DVT) is one of the most important challenges in orthopaedic surgery [1,2]. DVT is observed after 20% of general surgery cases and 70% of orthopaedic surgical cases [3]. There are several causes of DVT, which can be influenced by genetic and acquired factors [4, 5]. The prevalence of DVT has been 14 to15% in general surgery wards and 60 to 80% in ICU wards due to spinal cord injuries [6, 7].

DVT can be life-threatening by creating lung embolism and lead to venous flow abnormality in the lower limbs for a long time. These patients are often asymptomatic for spinal cord and thoracolumbar surgeries but are prone to venous thromboembolism [8]. Thoracolumbar and lumbar surgeries are two common locations for surgery. DVT is a unique complication of spinal cord surgery, which may cause high morbidity and mortality[9, 10]. Due to the large number of Thoracolumbar operations, the DVT incidence must be estimated to plan prevention measures. This study aimed to evaluate the prevalence rate of venous thrombosis before and after thoracolumbar surgeries by Doppler sonography, as well as the role of oral anticoagulant therapy and the surgery type.

Methods

A total of 67 patients underwent thoracolumbar surgeries at Rasoul Akram teaching hospital, Iran, from January 2021 to October 2021, of whom 51 patients met the inclusion criteria (Figure 1). The study was approved by the ethics committee of the Iran University of Medical Science (IUMS) (code: IR.IUMS.FMD.REC.1399.433).

The study included all thoracolumbar surgeries over 15 years old, willing to participate, and without coagulation disorders. People with a platelet count under 100000, chronic kidney failure, and liver failure were excluded, DVT prophylaxis included wearing elastic stockings as well as 40-60 mg of LMWH (Enoxaparin) daily for two weeks, and the early ambulation of every patient was encouraged.

All data were measured and extracted by the investigator in the form of a checklist. The demographic (age, gender, type of diagnosis, co-morbidities, BMI, marital status, and educational level) and radiographic and clinical information (co-morbidities, anticoagulation drug consumption, duration of drug consumption, and sonography results were recorded. Doppler sonography was performed on all patients one day before and one month after surgery.

The statistical analyses were conducted using SPSS software version 16. The categorical variables were expressed by mean ± standard deviations or counts (%). A Shapiro-Wilk test was used to assess the normality of continuous variables, while median and interquartile range (IQR) was applied to examine non-normality. The Chi-square test was used to compare categorical variables. P value<0.05 was considered statistically significant.

Results

A total of 51 thoracolumbar surgery cases were included in the study, and 16 patients were excluded due to lack of participation, unwillingness to participate, or coagulation disorders. The participants were comprised of 23 (45.1%) female and 23 (54.9%) male cases. The Median age was 35 years old, and the standard deviation of age and BMI was 39.36±14.42 years and 25.08±3.76 kg/m2, respectively (range of 15 to 79 years). The Mean BMI was 25.08±3.76 (in the range of 15.36 and 39.57 kg/m2), 80.39% had less than the twelfth grade (Table 1).

Clinical assessment:

A total of 21.6% had hypertension, 13.7% had diabetes, and the mean duration for having a disease was 5.67±11.6 years (Table 2).

The incidence rate of DVT before and one month after surgery

All patients were assessed by Doppler sonography regarding DVT. Sonography results for all patients were negative one day before surgery and positive for two of them (one man and one woman) (3.92%). The patients had not been exercising and were not consuming their anticoagulants consistently after surgery. The BMI for these two cases was over 25kg/m2.

Discussion

There are different ways to prevent DVT after surgery in spinal cord surgeries. The risk factors of VTE (Venous thromboembolism) are common in spinal cord degenerative patients, and DVT happens in 15% of post-spinal cord surgery. The DVT incidence is not accurately assessed after spinal cord surgeries, despite being a common complication. Hence, this study aimed to determine the prevalence rate of DVT after Thoracolumbar surgeries in a one-month follow-up, using Doppler sonography in Rasoul Akram teaching hospital in Tehran, Iran. The study included 51 patients who were assessed one month after surgery. Most of them were male with a mean age of 39.36 years, and the BMI was reported in a normal range. According to Doppler sonography, the DVT incidence was 3.9 after the one-month follow-up. There was no evidence of DVT before surgery, which is consistent with other studies [11, 12, 13].

The DVT incidence was 0.3% after spinal cord surgery by Mo Lee et al. [13]. Doppler sonography was used in 315 patients, and four patients were found with positive DVT, of whom only one patient had clinical symptoms. In the present study, most patients were men, and the mean age was 40 years old. There were only two cases with positive Doppler sonography without any clinical symptoms.

Park et al. (2019) evaluated the VTE incidence after spinal cord surgery and its related risk factors in South Korea, which was 2.09% similar to the present results [14].

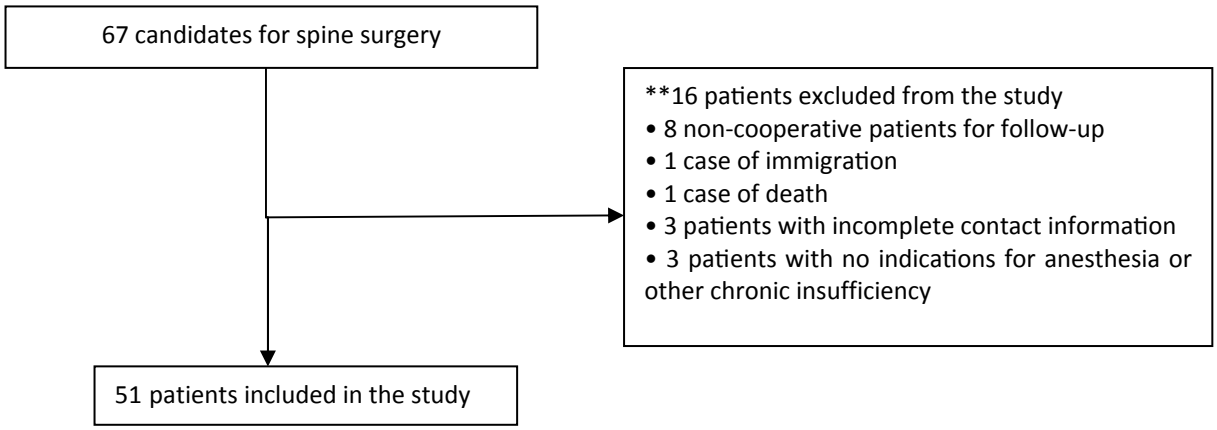

Figure 1: Flow chart of participants

Table 1: The demographic characteristics of patients	
Variable	51 patients
Age (year)	39.36±14.42
Gender • Male • Female	 25(54.9%) 23(45.1%)
BMI (kg/m2)	25.08±3.76
Educational Level • Illiterate or elementary • <Diploma • Bachelor • >Bachelor	 20(39.21%) 21(41.17%) 7(13.73%) 3(5.89%)

Table 2: Data of patients underlying diseases	
Variable	51 patients
Diabetes (yes) (n %)	7(13.7%)
Hypertesion (yes) (n %)	11(21.6%)
Dyslipidemia (Yes) (n %)	6(11.8%)
CVD (Yes) (n %)	6(11.8%)
History of anticoagulant use (Yes) (n %)	6(11.8%)
The duration of drug use (Year)	11.07±5.1
The duration of the disease (Year)	11.6±5.67

Oda et al. (2000) found no case with clinical symptoms of DVT and embolism in 134 patients with Cervical, Thoracic, and Lumbar spinal cord surgery on a similar subject of DVT. According to the sonographic results, 17 patients (15.5%) had evidence of DVT, cervical, thoracic, and lumbar surgeries, which may explain their high incidence rate. In addition, the results indicated that thrombosis was significantly related to age [15], whereas there was a low incidence of thrombosis among Thoracolumbar patients, preventing comparison of the incidence with clinical and demographic variables. Moreover, no

evidence of DVT existed before surgery, so predicting factors for thrombosis could not be assessed. Schulte et al. (2013) evaluated the hospital records of 1485 patients after spinal cord surgery with an incidence rate of 1.1% for VTA. The DVT rate was 7%, and the PE (pulmonary embolism) was 0.4% (12). Wang et al. (2020) evaluated the prevalence and predicting factors of DVT before and after surgery in thoracolumbar fractures due to high-energy injuries and indicated that the incidence rate of DVT before surgery was 14.45% (429/62). One of the patients (0.23%) was proximal DVT, and 61 (14.22%) was distal DVT [16]. According to the study, DVT incidence was higher than in because of the targeted population.

One of the important limitations of this study was the small sample size, which can be justified by the COVID-19 pandemic and the number of elective surgeries decreased during the pandemic. The younger age of the patients might have been a reason for the low DVT incidence. There was no use of venography, which is considered the gold standard for the DVT detection. The important strength of this study was its prospective design and the use of Doppler sonography to evaluate DVT in all patients.

Conclusion

According to the results, DVT is expected in 3.9% of cases one month post-surgery Doppler sonography after thoracolumbar surgery. DVT has the potential to be life-threatening, and anticoagulation should be administered appropriately during such operations. Prospective studies with a larger sample size can help evaluate this issue.

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