Deep Vein Thrombosis Following Below Knee Immobilization: The Need for Chemoprophylaxis

Alireza Manafi Rasi 1, Gholamhossein Kazemian 1, Mohammad Emami Moghadam 1, Reza Tavakoli Larestani 1, Amirhossein Fallahi 1,*, Ali Nemati 1, Maryam Nazari 2, Fateme Fallahi 3, Saeed Safari 4

1 Department of Orthopedic and Trauma Surgery, Shahid Beheshti University of Medical Sciences, Imam Hossein Hospital, Tehran, IR Iran
2 Department of Physical Medicine and Rehabilitation, Tehran University of Medical Sciences, Firuzgar Hospital, Tehran, IR Iran
3 Kashan Nursing and Midwifery College, Kashan University of Medical Sciences, Kashan, IR Iran
4 Department of Emergency Medicine, Shahid Beheshti University of Medical Sciences, Imam Hossein Hospital, Tehran, IR Iran
*Corresponding author: Amirhossein Fallahi, Department of Orthopedic and Trauma Surgery, Shahid Beheshti University of Medical Sciences, Imam Hossein Hospital, Shahid Madani Avenue, P.O. box: 161776341, Tehran, IR Iran. Tel.: +98-9102122979, Fax: +98-2177583625, E-mail: dr_ahf@yahoo.com.

ABSTRACT

Background: There is controversy regarding routine prophylaxis for deep vein thrombosis (DVT) in patients treated via a short leg cast or splint following lower extremity trauma.

Objectives: The main aim of this study is to evaluate the incidence of DVT and need for chemoprophylaxis in these patients.

Materials and Methods: Patients with ankle sprains or stable foot/ankle fractures were entered in this cross-sectional study. Serum D-dimer levels were measured 2 weeks following fixation. If the D-dimer levels were above 0.2 micrograms/ml the test was considered positive and the patient was referred for Doppler ultrasound examination (DUE) to confirm or rule out the diagnosis of DVT. Finally, the incidence of DVT was calculated and the role of predisposing factors was investigated.

Results: There were 95 patients with an average age of 38 ± 13.7 (77.9% males); 46 patients had at least one risk factor for DVT. The D-dimer test was positive in 21 (22.1%) patients. DVT was confirmed by DUE in 3 patients (3.1%). The incidence of DVT significantly increased in the presence of 3 or more risk factors (P = 0.01).

Conclusions: It seems that DVT is not a common complication of below knee fixation and chemoprophylaxis is not necessary when the patient has less than 3 predisposing factors. With 3 or more risk factors chemoprophylaxis and periodic follow-ups must be considered.

Keywords: Venous Thrombosis; Immobilization; Knee Joint; Prophylaxis; Venous Thrombosis; Immobilization; Knee Joint; Prophylaxis
1. Introduction

Diagnosis of DVT is commonly made for many emergency department visits and numerous studies have been conducted to evaluate its predisposing factors. Immobilization is one of the main predisposing factors of DVT (1). Currently many patients with stable foot/ankle fractures or ligament injuries are treated a splint or a short leg cast, which is said to predispose the affected leg to DVT due to immobilization and inactivity of the ankle pump mechanism (2). Previous studies have reported the incidence of DVT after non-surgical treatment of lower extremity injuries to be between 1.1 and 20% (2). Nonetheless, the true incidence of DVT and the need for prophylaxis is not yet clear (3). Worldwide, many centers have started using various methods of chemoprophylaxis for these patients routinely (4). Considering the large volume of patients who seek medical attention with these types of injuries, routine use of DVT chemoprophylaxis would put an unbearable financial burden on the health systems. The aim of the present study is to evaluate the incidence of DVT and the need for chemoprophylaxis in this group of patients.

2. Material and Methods

A prospective cross-sectional study was designed. Patient consent was obtained and the patients were recruited from the emergency department and orthopedic clinic where they were first visited and evaluated with complaints of foot and ankle pain. If the diagnosis of a stable fracture or ligament injury of the foot or ankle was made, a short leg splint or cast was advocated for 4-6 weeks. Inclusion criteria for selection were patients with stable foot or ankle fractures (undisplaced or minimally displaced fractures) or grade 3 lateral sprained ankle without instability and 15 years age or over. The fractures included lateral malleolus fractures with intact medial side and intact tibiofibular syndesmosis and hind/mid/forefoot fractures fulfilling radiographic criteria for nonsurgical treatment. Patients younger than 15 y/o age and those that had instability of ankle (medial side of ankle or syndesmosis injuries) or foot (displaced fractures or multiple injuries of foot) were excluded. A circular cast was applied from below the fibular head to the metatarsophalangeal joints. Between days 7 and 14, when the risk of DVT is said to be at its highest, 5 ml of blood was drawn for D-dimer level measurement by ELISA. In the patients with a positive test (D-dimer > 0.2micrograms/ml), the diagnosis of DVT was ruled in/out by Doppler ultrasound, performed by two different radiologists independently. In this study age over or equal to 40, female gender, body mass index (BMI) above 30 kg/m2, history of cardiovascular/cerebrovascular disease and 28 patients (29.5%) were smokers. Four patients were immobilized for more than 3 days and 6 patients had multiple trauma. A total 46 patients had at least one risk factor for DVT (24 patients had one risk factor, 16 patients two risk factors and 6 patients 3 risk factors). Figure 1 shows the distribution of study subjects according to the type of injury.

The average BMI was 25 ± 3.4 kg/m2 (range 18.4-38.5) and in two patients the BMI was over 30. Five patients (5.3%) had history of cardiovascular or cerebrovascular disease and 28 patients (29.5%) were smokers. Four patients were immobilized for more than 3 days and 6 patients had multiple trauma. A total 46 patients had at least one risk factor for DVT (24 patients had one risk factor, 16 patients two risk factors and 6 patients 3 risk factors). Figure 2 shows the distribution of risk factors in the study patients;

21 (22.1%) patients had positive D-dimer levels. Ultrasound confirmed DVT in only 3 out of the 21 patients (3.1% of total patients) and clinical signs and symptoms were present in only 1 patient. These 3 patients had an aver-
DVT and the Need for Prophylaxis

Manafi Rasi A et al.

with an incidence of 20% and some form of prophylaxis after lower extremity casting is an important problem. On the other hand, some investigators believe that DVT about 1.1% and that it did not need any prophylaxis (7).

The incidence of DVT in minor lower extremity injuries was 0.01% in non-weight-bearing subjects (5). Giannadakis et al., stated that the incidence of DVT in patients with isolated ankle fractures, treated in oclusive casting, was 3 (3.1% of total) and was symptomatic in only one patient. In the study on incidence of venous thrombosis, there was no significant difference between patients with one or two DVT risk factors and the rest of the patients with regards to the incidence of venous thrombosis. However, when three or more risk factors existed, the difference became significant (P = 0.01). In our study 33% of patients with multiple risk factors (three or more) developed DVT.

4. Discussion

According to the results of this study, immobilization alone is not a strong enough predisposing factor to affect the incidence of DVT in patients with a short leg splint or cast per se. However, the risk of DVT increases significantly in patients with 3 or more predisposing factors. DVT is a common problem after trauma to foot and ankle and has always been challenging to diagnose and treat (5, 6). Although the incidence of DVT after short leg casting is reported between 1.1-20% (7, 8), its occurrence after ankle fractures without any prophylaxis. After removal of the cast they noted five cases of asymptomatic DVT diagnosed by means of ultrasound (5). Giannadakis et al., stated that the incidence of DVT in minor lower extremity injuries was about 1.1% and that it did not need any prophylaxis (7).

On the other hand, some investigators believe that DVT after lower extremity casting is an important problem with an incidence of 20% and some form of prophylaxis is necessary (8). In our study no relationship was found between DVT and any one particular risk factor, however, the incidence of DVT was significantly higher in patients with three or more risk factors. Therefore, it seems necessary to consider patients with multiple risk factors for thromboprophylaxis or warn the patient at the time of treatment about the signs and symptoms of DVT and ask them to return to the clinic immediately if any of those signs and symptoms develop.

It seems that DVT is not a common complication of below knee fixation and chemoprophylaxis is not necessary when the patient has less than 3 predisposing factors. With 3 or more risk factors chemoprophylaxis and periodic follow-ups must be considered.

Acknowledgements

None declared.

Financial Disclosure

None declared.

Funding/Support

None declared.

References

1. Oger E. Incidence of venous thromboembolism: a community-based study in Western France. EPI-GETBP Study Group. Groupe d’Etude de la Thrombose de Bretagne Occidentale. Thromb Haemost. 2000;83(5):657-60.
2. Nordstrom M, Lindblad B, Bergqvist D, Kjellstrom T. A prospective study of the incidence of deep vein thrombosis within a defined urban population. J Intern Med. 1992;232(2):355-60.
3. Sookhoo NE, Eagan M, Kreenk I, Zingmond DS. Incidence and factors predicting pulmonary embolism and deep venous thrombosis following surgical treatment of ankle fractures. Foot Ankle Surg. 2011;17(4):259-62.
4. van Stralen KJ, Rosendaal FR, Doggen CJ. Minor injuries as a risk factor for venous thrombosis. Arch Intern Med. 2008;168(1):21-6.
5. Patil S, Gandhi J, Curzon I, Hui AC. Incidence of deep-vein thrombosis in patients with fractures of the ankle treated in a plaster cast. J Bone Joint Surg Br. 2007;89(10):1340-1.
6. Goel DP, Buckley R, verdries G, Abeleseth G, Ni A, Gray R. Prophylaxis of deep-vein thrombosis in fractures below the knee: a prospective randomised controlled trial. J Bone Joint Surg Br. 2009;91(3):388-94.
7. Giannadakis K, Gehling H, Sitter H, Achenbach S, Hahne H, Gotzen L. Is a general pharmacologic thromboembolism prophylaxis necessary in ambulatory treatment by plaster cast immobilization in lower limb injuries?. Unfallchirurg. 2000;103(6):475-8.
8. Jorgensen PS, Waering T, Hansen K, Paltved C, Vibbeke Berg H, Jensen N, et al. Low molecular weight heparin (Innohep) as thromboprophylaxis in outpatients with a plaster cast: a venographic controlled study. Thromb Res. 2001;105(5-6):475-80.
9. Chen L, Soares D. Fatal pulmonary embolism following ankle fracture in a 17-year-old girl. J Bone Joint Surg Br. 2006;88(3):400-4.
10. Geerts WH, Heit JA, Clagett GP, Pineo GF, Colwell CW, Anderson FA, Jr., et al. Prevention of venous thromboembolism. Chest. 2001;119(3 Suppl):1S25-75.