ORIGINAL ARTICLE

Frequency and Risk Factors for Deep Vein Thrombosis after Orthopaedic Surgery

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ABSTRACT

Background: Major orthopaedic surgery of lower limb presents considerable risk of deep vein thrombosis. Occurrence of deep vein thrombosis is different in different parts of the globe. In western countries it is 40-80 percent. In Asian countries it is said to be very low. Deep vein thrombosis may remain silent and can cause fatal pulmonary embolism without being clinically evident. There are definite risk factors recognized for deep vein thrombosis.

Aim: To determine the frequency and risk factors for deep vein thrombosis after orthopaedic surgery of and around hip and knee.

Study Design: This was descriptive case series

Setting: The study was conducted at Ghurki Trust Teaching Hospital, Lahore.

Duration: The study duration was one year starting from December 13, 2006.

Methods: 150 patients of either sex aged > 40 who were admitted through A & E department and OPD. They were operated on and around hip and knee. All were examined clinically for DVT preoperatively. If any doubt, color doppler was done to rule out DVT. All patients were subjected to color doppler ultrasonography on 4th to 7th post operative day. In the patients who showed a positive report, risk factors were identified.

Result: DVT was found in 12 patients out of 150 patients (8%). The risk factors found in these patients were multiple trauma, immobility more than 4 days, surgical time more than 2 hours, ischemic heart disease and hypertension.

Conclusion: Postoperative DVT in orthopaedics patients has a lower frequency and it can be lowered further if risk factors are identified and addressed properly.

Keywords: Deep Vein Thrombosis, Color Doppler Ultrasonography.

INTRODUCTION

Deep vein thrombosis is a frequent complication of various surgical procedures and becomes a cause of significant discomfort, disability and death. Deep veins of lower limbs are the most frequent site to be affected. The most fearful sequel of deep vein thrombosis is pulmonary embolism.

Major Orthopaedic surgery of lower limbs makes a patient at high risk for deep vein thrombosis and in Western countries its occurrence is reported 40% to 80%. But in Asian countries like China, Japan and Pakistan it is found 5.3%, 15.8% and 12.5% respectively. In Alaska Natives, when 67 patients were subjected to doppler ultrasonography, only one patient was found to have deep vein thrombosis. This all data above reveals that occurrence of deep vein thrombosis is not uniform throughout the world.

Clinically it presents with pain, swelling, redness, superficial dilated veins and low grade fever but 20% patients having clinical signs and symptoms of deep vein thrombosis have normal deep veins. It means only clinical picture can not be relied upon but further evaluation of the patient is necessary. This evaluation includes laboratory tests, Doppler ultrasonography and venography. Out of these, color doppler ultrasonography is non-invasive, cost effective, easily repeatable with good patient compliance and alone is sufficient to diagnose deep vein thrombosis.

There are certain mechanical and pharmacological measures which lead to low frequency of deep vein thrombosis in high risk patients. These measures include graduated compression stockings and anticoagulants as heparins and warfarin.

Risk factors for development of deep vein thrombosis involve immobility for more than 72 hours, surgery lasting more than 2 hours, malignancy, obesity and others. Identification of these risk factors is important in predicting and preventing post operative deep vein thrombosis by benefiting the patients from prophylaxis. Thus determination of frequency and identification of risk factors for deep vein thrombosis after major lower limb Orthopaedic surgery leads to its prediction and prevention. Keeping this fact in view I am interested to conduct this study.
The objectives of this study were to determine the frequency of deep vein thrombosis after orthopaedic surgery of and around hip and knee joints and to Identify the risk factors for development of deep vein thrombosis after Orthopaedic surgery of and around hip and knee joints. Where surgery of and around hip means Open fixation of pelvic fracture, total hip replacement and proximal femur fracture fixation and surgery of and around knee means fixation of distal femoral and proximal tibial fractures and total knee replacement. Deep vein thrombosis is determined by clots on Doppler ultrasonography in deep veins of pelvis and legs on 4th to 7th post operative day. Clots in popliteal veins and above will be proximal thrombi and clots in tibial veins will be distal thrombi.

MATERIAL AND METHODS

This Descriptive case series data is collected prospectively at Orthopaedic department in association with Radiology Department Ghurki Trust Teaching Hospital / Lahore Medical and Dental College, Lahore in one year starting from December 13, 2006.

Using convenience non probability sampling method 150 patients of less than forty years age undergoing orthopaedic surgery of and around hip and knee were included in the study. Patients who have varicose veins, nephrotic Syndrome, congenital or acquired thromboembolic disorder or hypercoagulable state, Pregnancy and indwelling central vein catheters had been excluded. Pre-operatively if deep vein thrombosis was suspected clinically the patient were subjected to color Doppler ultrasonography to rule out deep vein thrombosis.

Written informed consent, demographic information like name, age and gender, history with emphasis on the risk factors for deep vein thrombosis were taken. Physical examination with special consideration of signs of deep vein thrombosis, presence of infection and any heart pathology was done. Investigations as complete blood examination, complete urine examination, renal function tests, chest X-ray, ECG and other investigations required to diagnose basic medical problem and fitness for anaesthesia were obtained. All information about the patients were kept confidential. Peri-operative assessment was done as duration of surgery, use of tourniquet and duration of anaesthesia. Post operatively their time of immobilization was noted. These patients got neither mechanical nor pharmacological prophylaxis. All the patients were subjected to color Doppler ultrasonography before discharge on 4th to 7th post operative day. In hospital pre-discharge period, patients were continuously assessed for clinical signs and symptoms of deep vein thrombosis. If there was clinical suspicion, the patient was subjected to ultrasonography irrespective of post operative day. In the patients who showed positive report, risk factors were identified. Color Doppler Machine Nemio XG (TOSHIBA) used for color Doppler ultrasonography. All doppler USG was done by single person.

The collected data was transferred and analysed according to SPSS version 11.0. The variables to be analysed included demographic information like age and gender, risk factors for deep vein thrombosis, clinical signs and symptoms of deep vein thrombosis, presence or absence of deep vein thrombosis on doppler ultrasonography. These variables were analysed by using simple descriptive statistics, using mean and standard deviation for quantitative data like age and frequency, percentage for qualitative data like gender, risk factors, ultrasound report and clinical signs and symptoms of deep vein thrombosis. Risk factors, signs and symptoms of post-operative deep vein thrombosis and deep vein thrombosis proved on color Doppler ultrasonography were associated with demographic variables. If association became significant it was assessed by using Chi-square analysis these variables was qualitative in nature. P value ≤ 0.05 was considered significant.

RESULTS

A total of 150 patients were studied. They underwent surgery of and around knee and hip. The mean age was 61.9±10.21 (Graph 1). Out of these 150 patients, 96 were males and 54 were females. Male to female ratio was 1.7:1 (Table I). In this study of one fifty patients, 48 patients had per trochanteric femoral fracture, 27 had fracture neck of femur, 21 patients came with hip arthritis, 33 were having arthritis of the knee, 15 patients presented with supracondylar femoral fracture and 6 with pelvic fracture (Graph 4). From these one hundred and fifty patients THR was done in 27 patients, TKR in 33 patients, DHS in 48 patients, hip hemiarthroplasty with Austin Moore prosthesis in 21 patients, DCS fixation of supracondylar femoral fracture in 15 patients and 6 patients were operated with open reduction and internal fixation with plate for pelvic fractures.

Twelve patients out of 150 patients had positive report of color doppler ultrasonography (Table 3) (Graph 3). Their mean age was 71±13.34. Out of these 12 patients, 4 patients showed no clinical signs and symptoms of DVT. Three patients had pain and swelling, five patients showed swelling and redness. In these 5 patients pain was not the major concern. Homan's sign was positive in two patients.
It took more than 2 hours to be operated in 36 patients out of 150 patients and 4 patients (11.11%) had DVT out of these 36 patients. Ischemic heart disease was found in 21 patients out of 150 patients 2 patients (9.52%) out of these 21 patients had DVT. Out of 150 patients 26 were diabetics and out of these 26 diabetics only 1 patient (3.84%) had DVT. Forty two patients were hypertensive out of 150 patients and 2 patients (4.76%) out of these 42 patients got DVT. Sixteen patients out of 150 patients were having multiple trauma and 3 patients (18.75%) out of these 16 patients had DVT. Immobilization more than 4 days was found in 78 patients and 7 patients (8.97%) out of these 78 patients had DVT, Out of these 150 patients included in my study no patient was taking drugs like oral contraceptives. Out of these 12 patients who had DVT, no patient showed signs and symptoms of pulmonary embolism.

All the patients with established diagnosis were put on anticoagulation therapy. All 12 patients responded to treatment and no complication was observed.

Table 1: Distribution of sex of patients (n=150)

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>96</td>
<td>64</td>
</tr>
<tr>
<td>Female</td>
<td>54</td>
<td>36</td>
</tr>
</tbody>
</table>

Male to female ratio=1.7:1

Table 2: Distribution of Surgical procedures done in patients.

<table>
<thead>
<tr>
<th>Procedures names</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>THR</td>
<td>27</td>
<td>18</td>
</tr>
<tr>
<td>TKR</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>DHS fixation</td>
<td>48</td>
<td>32</td>
</tr>
<tr>
<td>Hemiarthroplasty hip.</td>
<td>21</td>
<td>14</td>
</tr>
<tr>
<td>DCS fixation of S/C femoral Fx.</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>ORIF of pelvic Fx.</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3: Diagnosis by color Doppler ultrasonography

<table>
<thead>
<tr>
<th>Color Doppler ultrasound report</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Negative</td>
<td>138</td>
<td>92</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: Identified risk factors in descending order

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>n/150</th>
<th>n/DVT</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple trauma</td>
<td>16</td>
<td>3</td>
<td>18.75%</td>
</tr>
<tr>
<td>Operative time more than 2 hours</td>
<td>36</td>
<td>4</td>
<td>11.11%</td>
</tr>
<tr>
<td>HTN</td>
<td>42</td>
<td>2</td>
<td>9.52%</td>
</tr>
<tr>
<td>Immobilization more than 4 days</td>
<td>78</td>
<td>7</td>
<td>8.97%</td>
</tr>
<tr>
<td>IHD</td>
<td>21</td>
<td>2</td>
<td>4.76%</td>
</tr>
<tr>
<td>DM</td>
<td>26</td>
<td>1</td>
<td>3.84%</td>
</tr>
</tbody>
</table>
DISCUSSION

In the United Kingdom, 10% of hospital deaths occur due to pulmonary embolism following lower limb DVT and the most common cause of lower limb venous thrombosis is hospital admission for medical or surgical problem.\(^1\) Its associated significant discomfort, disability, death and costs has made it a major health problem in the Western world.\(^6,10,11,12,13\)

In the Western society, DVT prophylaxis is considered as a routine because there is unacceptability high incidence of post-operative DVT is documented without prophylaxis.\(^1\) But in Asia, incidence is considered too low to use routine prophylaxis.\(^3\) As Bagaria et al (2006) has proved this idea to be true.\(^6\)

There is recent emphasis upon considering routine prophylaxis because DVT is not so rare as it is considered in Asia.\(^24,25,26\) Ištiaq (2005) has recommended prophylaxis in selected patients on basis of his work on determination of frequency.\(^6\) Nighat (2005) has highlighted the importance of anticoagulation after surgery.\(^24\) Mahmood (2005) has suggested to use anticoagulation as prophylaxis in trauma patients. Inaam-ur-Rahman (1997) reported 7% frequency of post operative DVT in his study while in my study the incidence is 8%.\(^27\) This difference of 1% can be result of improvements in ultrasound technology.

Post operative anticoagulation is not cost effective and is not without risk.\(^10,11\) There is continuous work on finding such a regimen which is safe and cheaper.\(^30\). Even in well developed countries post operative anticoagulation is taken as a big financial burden to bear.\(^12\). My study justifies the present routine of not using routine postoperative anticoagulation in my country where financial constraints are even more pronounced. Another problem with post operative anticoagulation is its time duration which is said to be from 2 weeks to 3 months and even more.\(^31,32,33\) One limitation of my study is the patients were not followed beyond one week. Clinical diagnosis of DVT is unreliable.\(^35\). My study also highlights this fact as four patients did not show any sign or symptom of DVT. Homan’s sign was negative in 83% patients. Pain was not major concern of many patients that can be attributed to post operative analgesia. These facts are well accepted in other studies as well.\(^35,36,37\)

Deep vein thrombosis is a preventable medical condition. The implementation of the risk factor assessment could potentially save lives and reduce the hospital costs of treating and managing the complications of DVT.\(^38\) The risk factors established in western population are not valuable for evaluating DVT risk in Asian patients.\(^39\) My study is consistent to these studies as maximum correlation (18%) was found with multiple trauma and only one diabetic patient had DVT out of 26 patients. The mean age of the patients who got DVT was 71±13.34. It means elderly patients are at greater risk for DVT. The same risk factor was identified by Edmonds in his study.\(^40\) Other risk factors with different magnitude of association identified in this study of 150 patients are operative time more than 2 hours, hypertension, immobility more than 4 days and ischemic heart disease (Table 4). These results are consistent to other international studies in which the similar risk
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factors were found. There is no evidence to support the other risk factors which are believed to be associated with DVT as obesity, smoking, prior orthopaedic surgery, stroke, infection, contraceptive pills, family history of DVT which were identified by other researchers. This can be due to small sample size of my study. DVT is associated with many complications and pulmonary embolism is the most dreadful. Its incidence is reported less than 0.5% in international studies. My study is consistent to these studies as no patient in my study had pulmonary embolism. I have used color doppler ultrasound to diagnose DVT. Zahid et al (2005) has reported color doppler ultrasound alone is sufficient to diagnose DVT. Sadaf et al (2005) has shown its importance in exclusion of suspected DVT in leg swelling.

CONCLUSION

Deep vein thrombosis after major lower limb orthopaedic surgery is not as common in my study as in western world and present practice of surgeons not to use post operative anticoagulation as a routine is justified. However, anticoagulation can be considered in selected patients as multiply injured patients. Benefits must be weighed against risks. Clinical diagnosis is unreliable. Color doppler ultrasonography provides good source of diagnosis of DVT. It has limitation to be observer dependent. Further studies with larger sample size are required to settle this controversial issue of difference of incidence of deep vein thrombosis. The reason of this difference also remains to be investigated.

REFERENCES

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