Incidence and methods of diagnosis of postoperative Deep Vein Thrombosis in A symptomatic patients

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الخلاصة:
تخثر الأوردة العميقة ما بعد العملية من الحالات التي يجب الكشف عن المرضى الذين لديهم أحد العوامل التي تساعد على حصول التخثر والمعالجة الوقائية لها . حيث تؤدي تلك الحالة الى مضاعفات مرضية خطيرة أهمها الانسداد الرئوي وقد تؤدي الى زيادة نسبة الوفيات .
هذه الدراسة تقيم نسبة حصول تخثر الأوردة العميقة ما بعد العملية والطرق الممكنة والمتيسرة لتشخيصها .
حيث شملت الدراسة 100 مريضا حيث تم تنظيم استمارة معلومات تتضمن اسم المريض وعمره وجنسه ووزنه والفترة التي استغرقت لإجراء العملية وفترة رقوده في المستشفى وهل العملية منتظره أم طارئة .
وبعد معرفة العلامات والعوارض لكافة المرضى تم تصنيفهم الى ثلاثة مجاميع حسب العلامات والعوارض الأكثر شيوعا .
كل المرضى ومن ضمنهم الذين لم يعانوا من علامات وعوارض تخثر الأوردة العميقة أرسلوا الى الفحص بالأمواج فوق الصوتية لأوردة الطرف السفلي وفحص بروتين الدي – دايمر.
نسبة حصول تخثر الأوردة العميقة ما بعد العملية تزداد مع زيادة العمر والوزن والعمليات الكبرى والطارئة وزيادة الفترة المستغرقة لإجراء العملية وزيادة فترة رقود المريض في المستشفى .والعلامات الأكثر شيوعا هي ورم وألم وحساسية الألم للساق وعلامة (الهومان).
وهنالك علاقة إحصائية ايجابية ما بين نتيجة الفحص بالأمواج فوق الصوتية للأوردة العميقة ونتيجة فحص بروتين الدي – دايمر ونسبة حصول التخثر .
الجمع ما بين الفحص بالأمواج فوق الصوتية وفحص الدي- دايمر في المرضى الذين يعانون من علامات وعوارض تخثر الأوردة العميقة هي أهم الطرق التشخيصية .

Abstract:
This is prospective study which was carried on(100) patients with one or more of risk factor for the development of DVT who were admitted in the surgical units in Hilla General Teaching Hospital during the period from of January 2010 to the december 2012. The Aim of the study was to identify the incidence of DVT in postoperative patients, To identify the clinicl presentation of patients with DVT, and to verify the best methods of diagnosis of the DVT.
This study was done on 100 patients who were divided into 3 groups according to the most common presentation .All patients with one or more risk factor for the development of DVT who were subjected postopretively for duplex study of lower limb veins and D.D.protein assay.
The incidence of development of postoperative DVT increase with age,weight,majorsurgery,long duration of surgical procedure, long period of hospitalization and in urgent surgeries.
The most common presentation were unilateral leg swelling ,calf pain , tenderness and homan"s sing.
There is a statistically significant correlation between the duplex study and D.D. protein and incidence of DVT.
The combination of the D.D. protein estimation and duplex study of lower limb vessels in patients with clinical features suggestive of DVT is the mainstay of diagnosis of DVT.

Introduction

DVT and its sequalae are major health problems that often result in significant postoperative morbidity and mortality.[1] The DVT usually affects individuals over age 60 but may occur at any age group .[2]With a male to afemale ratio 1.2:1. [3]

It is responsible for 500.000 deaths annually in industrialized countries[4] and 100.000 to 200.000 deaths per year in the United State.[5]

The venous thromboembolism disease with its high mortality and morbidity is currently one of the most serious postoperative complications as postoperative DVT can lead to fatal pulmonary embolism on one side and the operation. The operation involved different part of the body and were classified as those involving upper abdomen, or other parts of the body.

Each patients had a special form that gave detailed information regarding history and clinical examination with special attention for weight ,unilateral leg swelling ,warm limb, erythema, tenderness ,and cord like palpable vein .Appearance of prominent venous collateral ,cyanosis, phlegmasiaceruladolens, phlegmasia alba

Pathophysiology

Virchow's triad, as was first formulated (i.e venous stasis, vessel wall injury, hypercoagulable state), is still the primary mechanism for the venous thrombosis.[8] In practical terms, the development of venous thrombosis is best understood as the activation of coagulations in areas of reduced blood flow, this explains why most of the successful prophylactic regimens aim at anticoagulation and minimizing venous stasis[3]

development of disabling postthrombotic syndrome which can occur after sometime.[6,7]

Patients and Methods

Aprospective study which was carried on 100 patients with risk factors one or more of the development of DVT who were admitted in the surgical units in Hilla General Teaching Hospital during the period from the January 2010 to the December 2012.

All those patients were subjected to different kind of surgery ranging from minor, intermediate, to major surgery.

The patients were divided into two groups as urgent or elective

dolens, pallor, calf pain and Homan's sign.

All the patients with one or more risk factors for the development of DVT who were subjected post operatively for duplex study of lower limb veins and D-dimer protein assay after the fourth postoperative day.

Duplex study was done by using Siemens (Elegran) machine it is a noninvasiveand has primary diagnostic role, for rapid and effective identification of D

Clinical parameter score16

Parameter	Score
Active cancer	+1
Paralysis or recent plaster immobilization of the lower limbs	+1
Recently bedridden for >3 days or major surgery <4 weeks	+1
Localized tenderness along the distribution of deep	+1
Entire leg swelling	+1
Calf swelling >3 cm compared to the asymptomatic leg	+1
Pitting edema(greater in the symptomatic leg)	+1
Previous DVT documented	+1
Collateral superficial ,veins "non varicose"	+1
Alternative diagnosis	-2
Total of above score:	
High probability Moderate probability Low probability	≥ 3 1 or 2 <0

Diagnosis:

Laboratory studies:

-D- dimer protein

Recent interest has focused on the use of D- dimer in the diagnosis of the DVT[18].

D- dimer fibrin fragments are present in fresh fibrin clot and in fibrin degradation products of cross linked fibrin[19].

D-dimer results should be used as follows:

A negative D-dimer assay rules out DVT for in patients with low to moderate risk and a Well's DVT score less than 2.

All patients with a positive D-dimer assay and all patients with moderate to high risk of DVT (Well's DVT score >2) require a diagnostic study (duplex ultrasonography)[20].

Protein S, protein C, antithrombin III, factor V leydenprothrombir 20210A mutation, antiphospholipidantibodies,andhomocysteine can be measured ,deficiencies of these factors all produce hypercoagulable state[13].

Imaging studies:

Contrast venography can be performed as part of the examination, for comprehensive evaluation of the venous system in the legs, abdomen and pelvis[21].

Duplex ultrasonography the combination of ultrasonography imaging with Doppler flow studies the absence of the normal phasic Doppler signals arising from the changes to venous flow provides indirect evidence of venous occlusion. Sensitivity of duplex ultrasonography for proximal vein DVT is 97% but only 73% for calf vein DVT ,it is also helpful to differentiate venous thrombosis from hematoma , Baker cyst, abscess and other causes of leg pain and edema.[28]

Impedance plythysmography (IPG),this procedure is based on recording changed in blood volume of an extremity, which IPG are directly related to venous outflow ,is sensitive and specific for proximal vein thrombosis, it is insensitive for all calf vein thrombosis[23].

MRI is the diagnostic test of choice for suspected iliac vein or IVC thrombosis, in the 2nd and 3rd trimester of pregnancy MRI is more accurate than duplex U/S because the gravid uterus alters Doppler venous flow characteristics.[13]

Treatment:

The primary objectives of the treatment of DVT are to prevent pulmonary embolism, reduce morbidity and prevent or minimize the risk of developing the postphlebitic syndrome.[24]

Anticoagulants remain the main stay of initial treatment for DVT[24]. Regular unfractionated heparin was the standard of care until the recent introduction of low molecular weight heparin (LMWH),where the LMWHs are derived from unfractionated heparin by chemical or enzymatic depolymerization[25] , heparin prevents extension of the thrombus and has been shown to significantly reduce but not eliminate the incidence of fatal and non-fatal pulmonary emboli, heparin therapy is associated with complete lysis in fewer than 10% of patients[24]. The anticoagulant effect of heparin is directly related to its activation of antithrombinIII, the body's primary anticoagulant, inactivates thrombin and inhibits the activity of activated factor X in the coagulation process[26].

Warfarin therapy is overlapped with heparin for 4-5 days until the international normalized ratio (INR) is therapeutically elevated to 2-3[26].

The introduction of thrombolytic gave significant advantages over conventional anticoagulant therapy that include prompt resolution of symptoms, prevention of Pulmonary embolism, restoration of normal venous circulation, preservation of venous valvular function and prevention of postphlebitic syndrome[26], heparin therapy and oral anticoagulant

therapy must always follow a course of thrombolytics[26] .

Surgical treatment of DVT may be indicated when anticoagulant therapy is ineffective ,unsafe or contraindicated[25] .The major surgical procedure for DVT are clot removal and partial interruption of IVC to prevent pulmonary embolism.[24]

The idea of placing a filter barrier in IVC to prevent pulmonary embolism in case of server hemorrhagic complication on anticoagulant therapy and failure of anticoagulant.[27]Compressor stocking are still used in certain cases[26].

Complication:that may follow DVT are acute pulmonary embolism ,hemorrhagic complications of anticoagulant therapy ,systemic embolism ,chronic venous insufficiency, postphlebitic syndrome, and soft tissue ischemia.

Technique:

Efficacy of duplex : direct visualization of thrombus loss of flow signal and flow augmentation, demonstration of collateral Vessels accompanying these finding, duplex can distinguish old thrombus and permit identification of valvular competence and reflux .Doppler studies were carried by different ultrasongraphists11 .

D-dimer assay was performed to all patient after the fourth postoperative day which is latex agglutination slide test for the qualitative and semi-quantitative determination of d-dimer, sample of blood were taken from the patients (1.8 ml blood mixed with 0.2 sodium citrate, the time taken from aspiration of blood until it's investigated should be less than three hours otherwise its will be inaccurate.

We found out the numbers of patients had positive duplex result and positive D-dimer protein in each clinical group.

RESULTS

The study included 100 patients were selected to have one or more risk factor for the development of DVT .

Risk Factor Distribution

Risk factor	Number
Old age	4
Major surgery	80
Pregnancy	3
Post partum	2
Multiple trauma	32
Cancer	12
Obese	10
Immobilization longer than 3 days	17
Previous D.V.T	2
Previous M.I	2
C.H.F	3
U/C	1
Women with C.O.P	11

The incidence of DVT in our study is 21%. Most of the patients included in this study were in the age group of 30-39 years 31 patients. The most common age group with clinically diagnosed DVT was 50-59 years in both genders 9 from 21 patients (42.85%), while the lowest incidence of DVT was seen among the age group of 20-29 which was 2 out of 23% (8.6%).

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The total number of female patients with DVT was 12 out of 40 (30%) , while the total number of male patients with DVT was 9 out of 60 (15%) with female : male ratio 1.3:1 (Table 4) , P=>0.05% there is no statically significant correlation between age and sex and incidence of DVT in our study.

60 patientshad their BMI ranging from25-35. while 10 patients were above 35. The number of patients had their BMI 25-35 with DVT were 16 (26.6%) , while thoseBMI above35 with DVT were 5 (50%) (Table 5) , P-value 0.002. There is a statistically significant correlation between increasing weight and the incidence of DVT. As regard patients who were subjected to major surgeries 80 patients (80%),18 (22.5%) of them developed DVT. While out of 10 patients (10%) who had intermediate surgeries , 2 (20%) of them develop DVT . 10 patients (10%) only had minor surgeries , one (10%) of those patients developed DVT, p value = 0.002 there is statistically significant correlation between type of operation and the incidence of DVT.

In relation to the site of the surgery, 43 patients (43%) had there surgery in the lower abdomen , from those patients 10 (23.2%) developed DVT , while 34 patients (34%) had an upper abdominal surgery , 5 (14.7%) of those patients developed DVT. 18 (18%) had both upper and lower abdominal surgeries , 5 (27.77%) of them developed DVT. While other surgical sites i.eneck , breast and inguinal region who constituted in 5 patients (5%) only one (2%) of those patients developed DVT , p value = 0.002. There is statistically significant correlation between the site of the operation and the incidence of DVT.

As regard to the duration of the procedure (Table 8) 81 patients (81%) had a procedure lasted more than 60 min. , 20 patients (24.6%) of those patients developed DVT. In 11 patients (11%) the operation time was 30-60 min. only one patient (9%) of them developed DVT. In 8 patients (8%) the procedure lasted less than 30 min. yet no patients developed DVT. There is statistically significant correlation between the duration of surgery and the incidence of DVT.

The period of hospitalization was more than one week in 70 patients (70%) , while in 30 patients (30%)it was less than one week. 3 patients (10%) developed DVT of total number of the patients who were hospitalized less than one week , while 18 patients (25.71%) developed DVT of total number of patients who were hospitalized more than one week , p value = 0.002 , there is statistically significant correlation between the

duration of hospitalization and the incidence of DVT.

Discussion:

Deep vein thrombosis represents one of the most commonly occurring and serious medical conditions following hospitalization for serious illness or major surgery[1] .

The incidence of DVT increases with age: as patients over 40 years of age have significantly increased risk compared with younger patients. The incidence of DVT has been shown to increase exponentially with age between the ages of 20 and 80 years.[1,2,8,28]

This study shows that incidence of DVT increases with age in both genders up to the age group 50-59 years although in age group above 60 years we found that the incidence is lower than in patients with age group 50-59 years.

It is well documented that no genders prevalence exists ; except in women using birth control pills [29], where female to male ratio around 1.2:1[(3,30)] although we found that there is no increased risk of DVT in female with female to male ratio 1.3:1.

Obesity increases risk of DVT because obesity may be associated with longer periods of immobility postoperatively than non obese patients [3,16].our study agreed with this conclusion where the incidence of postoperative DVT increase with weight .

The incidence of DVT varies with the site of surgical procedure[2] ,where its incidence is 25% in general surgery ,50% after hip or knee arthroplasty ,43% after fracture of femur ,and 24% after neurosurgery [11]but in our study we found that operations involving both upper and lower abdomen had a higher risk of DVT than operation in upper, or lower abdomen alone or other sites (neck , breast , inguinal , region).

Most DVT occur in patients with long duration operative procedure[29].

Our study is in agreement with regard to the duration of operation where the procedure lasted more than 60 minutes had a higher risk for DVT than those procedures lasted less than 60 minutes .

There is a correlation between preoperative medical condition and the incidence of DVT postoperative[29]. We also found in our study that patients who were unstable preoperatively as in urgent , had a higher incidence of DVT than elective cases .

However , because of the non-specific signs and symptoms of the DVT the clinical diagnosis is very difficult , diagnosis of the DVT is essential because appropriate diagnosis and treatment decrease the morbidity[13].

Doppler color flow imaging can depict areas in which an isoechoic clot is not visible[29] and the limitation of techniques includes : patient size that limits the use of sonography because large patient are difficult to scan with accuracy. Good quality sonography depend on experience of the technology performing the examination[21].

Duplex U/S is also helpful to differentiate venous thrombosis from hematoma , Baker cyst , abscess , and other causes of leg pain and edema.[22]

Sensitivity , specificity and positive predictive value of duplex study for DVT were 38% , 95% and 56% respectively , the reduce sensitivity attributable to the fact that asymptomatic thrombi are more likely to be fresh[37] , on the other hand many studies have confirmed the diagnostic sensitivity and specificity of duplex U/S for proximal vein thrombosis. Sensitivity of duplex U/S for proximal vein is 97% but only 73% for calf vein DVT , the negative predictive value for proximal vein DVT is 99%[30].

Population at risk for DVT increases an assay with a sensitivity of 80%, has a

negative predictive value of 97.6% in a low risk patient, however , the negative predictive value of the same assay is only 33% in high risk patients with a pretest probability of 99% for DVT[29], on the other hand D-dimer had positive and negative predictive values for underlying DVT of 31% and 100% respectively and excluded DVT in 57% of patients[14] .

In our study , the result of the sensitivity of test , specificity and negative predictive value and positive predictive value are 90% ,95% , 95%,and 82% respectively.

Conclusion:

This study shows that the incidence of DVT increase with age in both sexes up to the age group 50-59 years although there is increased risk of DVT in female as compared with male , female to male ratio 1.3:1 .

1-The incidence of postoperative DVT increase with weight. Incidence of DVT is higher in patient who underwent major surgery as compared to those who had intermediate or minor surgery. The operation involving both upper and lower abdomen had a higher risk of DVT than operation in upper, or lower abdomen alone or other sites (neck , breast , inguinal region).

2- Procedure lasted more than 60 min. carry a higher risk of DVT than those procedures lasted less than 60 min.

3- The incidence of DVT increases in the group who had duration of hospitalization more than one week and in urgent surgery more than elective.

4-We found the classic combination of signs and symptoms of unilateral leg swelling , calf pain , tenderness , Homan's sign , was more common than warm limb and erythema and even more common than prominent venous collaterals , cyanosis , cord like palpable vein, pallor .

5- The sensitivity , specificity and negative predictive value of duplex study of 100% , 100% , 100% respectively confirmed previous report that duplex study is perfect diagnostic tool.

6-D.D protein estimation with its sensitivity , specificity , negative predictive value and positive predictive value can be considered also as a very sensitive diagnostic tool for postoperative DVT.the combination of D.D protein estimation and duplex study of lower limb vessels in patients with clinical features suggestive of DVT is the mainstay of DVT.

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