FREQUENCY OF DVT AFTER TOTAL KNEE REPLACEMENT IN PAKISTANI POPULATION BY EMPLOYING COLOR DUPLEX SCAN

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ABSTRACT

Objective: To determine the frequency of Deep Vein Thrombosis (DVT) by Color Duplex Scanning (CDS) after total knee replacement (TKR) in Pakistani population.

Study design: Interventional study.

Place and duration of study: Department of Orthopaedic Surgery, Combined Military Hospital Lahore, from 1st Sep 2007 to 1st Sep 2008.

Patients and Methods: Thirty five patients, both male and female, age 50 to 80 years, ASA physical status II and III scheduled for total knee replacement (TKR) were subjected to preoperative and postoperative color Doppler to determine the presence of asymptomatic DVT in both legs. None of the patients were administered anticoagulant.

Results: DVT was not detected in any case after TKR. One patient developed nonfatal pulmonary embolism on 10th postoperative day. CDS did not pick DVT in this patient.

Conclusion: CDS is a useful investigation tool to determine the presence of DVT in total knee replacements surgery. In the West all patients undergoing TKR are administered anticoagulant therapy. This practice is however, not universally accepted in Pakistan. Few studies conducted in Pakistan are equivocal. Present study was done to detect asymptomatic DVT in our patients after TKR. Our study does not show any evidence of DVT as picked up by CDS. The difference could be due to racial factor or the sample size was too small or the yield of CDS may not be very high.

Key words: DVT, TKR, Color Duplex Scan, Anticoagulant therapy.

INTRODUCTION

Thromboembolism is the most frequent complication after knee replacement in the West. Secondary DVT after knee arthroplasty is often low symptomatic or it could lead to fatal pulmonary embolism (PE)[1]. DVT and PE are considered uncommon in Asian populations and thrombo-prophylaxis is rarely done[2]. Clinical diagnosis of DVT is inaccurate[3]. Early detection of DVT and treatment with systemic anticoagulation to prevent PE are essential in the management of patients undergoing total joint arthroplasty (TJA)[4]. Therefore, accurate objective testing is required to avoid incorrectly concluding that DVT is absent and at the same time preventing exposure of the patient unnecessarily to the risks of anticoagulant therapy. The studies conducted on Asians, about the incidence of DVT after TKR and fatal complication of PE are equivocal. Various modalities have been utilized for the diagnosis of DVT, including conventional venography, CDS, magnetic resonance (MR) imaging, contrast enhanced computed tomography (CT)[5]. Venography is regarded as the reference standard for diagnosing asymptomatic DVT in studies of thromboprophylaxis. However, technical advances with CDS have made this procedure an interesting alternative in the detection of DVT after TKR. Presently CDS has become the "gold standard" in the diagnosis of DVT and with proper attention to technique, specificity of CDS is 86% and its sensitivity is approximately 97%[6]. It is non-invasive, safe, and convenient. It can be used as the initial screening test for clinically suspected DVT to be followed by other tests like venography/CT venography/MR imaging/99m Tc-apcitide in cases of equivocal results of CDS and in patients with negative CDS but clinically evident DVT[7]. Newer investigative tools are promising as well which include mutidetector row computed tomographic (MDCT) venography[8,9] 99mTc labeled molecular markers[10,11].

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This study was designed to investigate the frequency of asymptomatic DVT after TKR in Pakistani population with CDS as the screening tool.

PATIENTS AND METHODS

It is an interventional study carried out from 15th Aug 2007 to 15th Aug 2008 at Department of Orthopaedic Surgery, Combined Military Hospital Lahore Cantonment, after approval from hospital ethics committee.

During the study period all the patients of TKR who fulfilled the inclusion criteria were included in the study. Inclusion criteria were: thirty five patients, both male and female, age 50 to 80 years, ASA physical status II, III, scheduled for elective TKR due to advanced osteoarthritis/ rheumatoid arthritis of the knees, under general/ spinal anaesthesia were included in this study. Patients with previous history of DVT, thrombophilia, on anticoagulants, septic arthritis of less than one year duration were excluded from the study.

Pre-operative CDS of both legs to be operated was carried out by single radiologist one day before surgery. Informed written consent for the investigation was taken from every patient included in the study. Investigations were done free of cost under arrangement of Radiology Department of CMH Lahore. All patients were subjected to CDS using 10.0 MHz linear array probe on Toshiba Nemio SSA 550 doppler ultrasound machine. A standard recommended position was made for all patients. They were:-

1. **Supine:** In this position scanning for common femoral, proximal profunda and superficial femoral vessels was carried out down to the adductor canal.
2. **Decubitus:** In this position scanning for adductor canal, popliteal vessels to the bifurcation, posterior tibial and peroneal vessels was done.

While examining the leg vessels, transverse as well as longitudinal scanning was done.

Preoperative preparation of the patients included baseline haematological and biochemical tests as well as CXR and ECG. Specific investigations in addition to CDS were a long leg x-ray of the leg to be operated, to calculate the valgus angle (for distal femoral cut) and mechanical axis to assess the alignment angle needed to calculate Knee Society Knee Score. Preoperative Knee Society Knee Score and Function Score on the knee to be operated was also calculated.

On arrival in Operation Theatre, routine monitoring was applied and baseline haemodynamic parameters were recorded. Surgery was done under spinal anaesthesia or general anaesthesia. The knee was approached via anterior skin incision and medial para-patellar arthrotomy. Patella was everted laterally and knee fully flexed. Cruciate ligaments, menisci and osteophytes were excised. Femoral articular surface was prepared to receive the definitive implant with the help of different jigs. Similarly tibial plateau was prepared. Patella was resurfaced. PFC Sigma/RPF of J&J (Johnson & Johnson, Depuy Orthopaedic Inc., P O Box 988, 700 Orthopaedic Drive, Warsaw, In 46581-0988, USA), implants were used for replacement. Surgery was carried out under tourniquet at 400mmHg pressure. Postoperatively the drains were removed after 48 to 72 hours depending on the discharge collected in the Redivac drain bottle. The patients were allowed to move in bed and started knee flexion on 1st pot-operative day. After removal of drains all were managed according to the existing rehabilitation protocol for TKR at our hospital, in the form of mobilization and range of motion of knee joints under the supervision of trained physiotherapist.

CDS of the operated leg was carried out between 5th to 7th post-operative day. They were carried out by the same radiologist, hence, ruling out inter-observer difference.

Descriptive statistics in the form of frequency of DVT occurring after TKR was assessed. Statistical analyses were performed using College of physicians and Surgeons Pakistan book on Research Methodology, Biostatistics and medical Writing.

RESULTS

Total of 35 patients were included in the study. Twenty six (74%) were females and 9

(26%) were males. The median age was 63 years ranging from 50 to 80 years. Thirty one patients were from Punjab, 3 were from NWFP and 1 from Sind. Out of 26 females only 3 were professional women. Out of 9 males 5 were ex-military men (one was a sportsman), 4 were white collared retired officials. 6 patients (17%) were hypertensives and 2 (6%) were diabetics, controlled on drugs. 32 (91%) patients were administered spinal and 3 (9%) general aneasthesia. The mean duration of surgery was 50 minutes. It ranged between forty minutes to one hour. Mobility in bed was restored the same day and the patient could walk on 3rd postoperative day with support. The postoperative recovery of the patients was uneventful and they were discharged on 7th-9th postoperative day.

Pre- op and post-op CDS studies carried out on these 35 patients were negative for DVT. Based on the CDS studies the frequency of DVT was calculated to be 0%.

One patient (female - 3%) complained of shortness of breath, sinking of heart, and left sided chest pain on 10th postoperative day . Her electrocardiography, chest x-rays and cardiac enzymes excluded myocardial infarction. The diagnosis of pulmonary embolism was made by exclusion and lung perfusion scintigraphy which revealed mismatched perfusion-ventilation defects indicating significant pulmonary thrombo-embolism (Fig. 1). Her repeat CDS of pelvic and leg veins was again negative (Fig. 2). She refused to undergo venography.

Figure 1: The scan showed mismatched ventilation defects, indicating high probability of significant pulmonary thrombo-embolism.

DISCUSSION

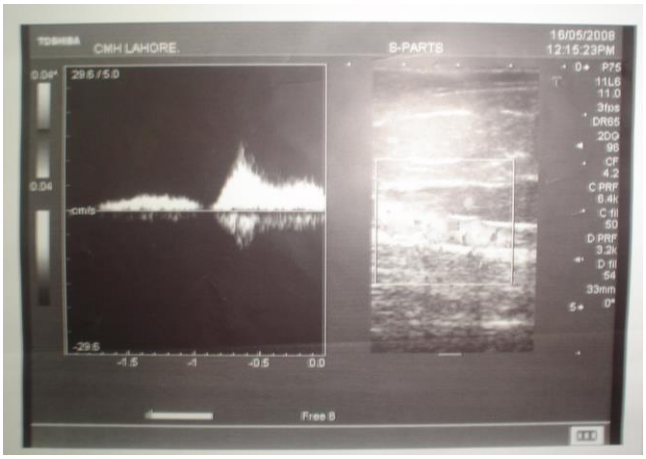

Figure 2: CDS of this patient revealed no evidence of DVT.

Majority of patients with osteoarthritis of knees present to orthopaedic surgeons seeking relief of pain and associated restoration of function[12]. TKR is an extremely successful orthopaedic procedure that relieves pain, improve function, and enhance the quality of patients lives[13]. DVT and PE are known complications after TKR. PE and DVT are major causes of morbidity and mortality after major orthopaedic surgery, which can be reduced with accurate diagnosis and proper treatment[14].

The clinical diagnosis of DVT is unreliable[15]. Amongst different objective modes of diagnostic tests, phlebography of the lower limbs is regarded as the reference standard for diagnosing asymptomatic DVT[3,10]. However, the technique is invasive and not without pitfalls. Errors can occur because of improper sites of injection, temporary contracture of veins, valvular incompetence, and irregularities in the mixing of radiographic contrast material with blood. In addition extravasation of contrast material may damage local tissues, and the contrast material may irritate the vascular walls. Such problems with venography have caused many investigators to evaluate the usefulness of CDS for the detection of DVT of the lower extremity[16]. Technical advances with noninvasive CDS have made this procedure an initial screening tool[17].

In one study[17] the specificity of color doppler was determined to be 86% and sensitivity 96%. CDS is considered a safe

method for detecting asymptomatic distal DVT. It has high negative predictive value, which means that the method is highly reliable to rule out DVT[18].

In the West without prophylaxis, rates of DVT after knee arthroplasty range from 40% to 60%. However it is not regarded common in Asia and its true incidence in orthopaedic surgery is not certain in our country[3]. Even then it is not a nonexistent disease[19]. Our study was conducted to determine the frequency of DVT in legs in our patients who underwent TKR by employing CDS. It was calculated to be zero percent in our study. This evidence is somewhat similar to previous studies conducted at a private hospital[19]. These studies, however does not establish the true frequency as established in West. Our study does not support Western studies wherein the prevalence of DVT and PE is high after major orthopaedic operations[20]. One of our patients suffered with PE. In this patient we strongly suspected asymptomatic DVT to be the cause of PE but the CDS (carried twice) of the legs was negative. We considered, that this could either be due to thrombosis in any proximal vein for example pelvic vein or the patient could have suffered from fat embolism.

More than 90% of PEs originate in lower-extremity DVT. Currently, evaluation of PE and lower-extremity DVT requires 2 separate tests (ventilation-perfusion scan, computed tomographic pulmonary angiography (CTPA), or pulmonary angiography for PE and CDS, computed tomographic venography (CTV), conventional venography, or magnetic resonance venography for DVT. Combined computed tomographic pulmonary angiography and venography (CTPAV) is a new diagnostic technique that combines CTPA and CTV into a single study for the screening of PE and subdiaphragmatic DVT. CTPAV is a modified CTPA study that evaluates the subdiaphragmatic deep vein system at the time of CTPA, without additional venipuncture or contrast medium[14]. It is easy to perform, fairly easy to interpret, and requires no invasive procedure. However it is not readily available in our set-up. We did ventilation/perfusion scan in a highly suspicious post-TKR female patient with chest complaints and shortness of breath, which confirmed her clinical suspicion for PE, although CDS (twice) of the legs to detect the source was negative. In patients with symptomatic PE, systematic assessment of lower-limb deep veins has provided a wide range of DVT prevalence rates, from 10 to 93%, depending on the methodology used to diagnose DVT and on the type and size of the population samples[14,21]. Based on these two studies we presumed PE to had arisen in legs, though not picked up by conventional CDS done in our radiology department, or could have arisen in pelvic veins, or it might be a fat embolism. The lady had refused to undergo venography.

Newer methods have evolved to detect DVT in patients with PE. In one of the studies[31] (99m) Tc-apcitide scintigraphy detected acute clot formation in patients with DVT up to 17days after the onset of clinical symptoms with a sensitivity of 87% and a specificity of 100%[22]. (99m) Tc-apcitide, is a synthetic polypeptide, which binds to glycoprotein IIb/IIIa receptors expressed on activated platelets of the patient under consideration.

Our results also indicate that CDS could be used as an initial method for DVT screening.

CONCLUSION

Color Doppler is a useful investigative tool to determine the presence of asymptomatic DVT in total knee replacement surgery. Present study was done to detect asymptomatic DVT in our patients as a screening tool before and after TKR. Our study does not show any evidence of DVT as picked up by CDS. The difference could be due to racial factor, or the yield of CDS may not be very high, or the size of sample was small. In post - TKR patients, with PE if CDS is negative then it should be investigated further with other sensitive modalities. Since the number of patients was too small in our study we propose a multicentre study having a larger population. This would settle the question of incidence and thromboprophylaxis in our population.

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