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### RESEARCH ARTICLE

#### PREVENTION OF DEEP VENOUS THROMBOSIS IN POST-OPERATIVE ARTHROPLASTY PATIENTS WITHOUT USE OF ANTICOAGULANT THERAPY

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#### Abstract

**Background:** Deep vein thrombosis (DVT) is one of the most common complications of total hip (THA) and total knee arthroplasty (TKA), mostly due to immobilisation and to some extent due to pre-existing co-morbidities along with genetic predisposition. Though the reported incidence of DVT is very high in multiple studies, fatal thromboembolism is very rarely seen in clinical setup. Hence the issue of prophylaxis for DVT remains highly debated<sup>1</sup>. The incidence of DVT is largely based on various studies in European and American populations. Asian population is genetically and socially quite different from American and European populations, so the incidence of DVT can be quite different<sup>2</sup>. We conducted a retrospective study at our centre to determine incidence of DVT after THA and TKA in Indian patients.

**Methods:** A retrospective study was conducted on 45 patients and who underwent THA and TKA respectively, without any known risk factors for thromboembolic disease. No prophylaxis was given to the patients. The patients were monitored in the post op period for any signs and symptoms of DVT along with starting of adequate physiotherapy.

**Results:** DVT was found in one patient who had undergone THA, which was confirmed on colour Doppler ultrasonography of the affected limb. No case of DVT was detected in any patient who had undergone TKA.

**Conclusion:** These results suggest that the incidence of DVT in patients is very low and is not comparable when adequate postoperative mobilisation and physiotherapy was done. We conclude that advising prophylactic anticoagulant therapy to these patients in the post op period could be successfully substituted by a simple and cost effective but adequate physiotherapy prevent DVT, in the process also bypassing the side effects of the anticoagulant therapy.

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#### Introduction:-

Total hip arthroplasty (THA) and total knee arthroplasty (TKA) have become treatments of choice for patients diagnosed with osteoarthritis of hip and knee from a number of causes, even in developing countries. Deep vein thrombosis (DVT) is considered to be one of the most significant complications after THA and TKA. The

significance of DVT lies in the possibility of pulmonary thromboembolism and occurrence of chronic venous insufficiency at a later stage.

DVT is the abnormal clotting of blood in the veins of the lower limbs. The culmination of venous stasis, hypercoagulability, and endothelial injury results into thrombus formation also called as Virchow's triad. Though Virchow's triad provides a useful understanding of DVT formation, it appears that systemic coagulation activation also has a major role. The incidence of DVT after TKA and THA without prophylaxis is 40%–84%<sup>1</sup> and 40%–70% proximal DVT 8%–24%<sup>1</sup> and 10%–20%<sup>2</sup> clinical DVT 7%–11% and 1%–3%<sup>2</sup> non-fatal symptomatic pulmonary thromboembolism 1.2%–3% and 1%–2%<sup>2</sup> and fatal pulmonary thromboembolism 0.1%–1.1% and 0.1%–1% respectively.<sup>2</sup>

As a result, the use of venous thromboembolic (DVT and PE) prophylaxis, most commonly employed is chemical prophylaxis, this has become the standard of care for patients undergoing elective Total joint arthroplasty (TJA). The risk of fatal PE following primary hip or knee replacement has been consistently reported to be between 0.1% and 0.2%, regardless of the chemo prophylactic agent employed for prophylaxis<sup>2</sup>.

Among various modalities used for diagnosing DVT, colour Doppler has the advantage of being non-invasive, low-cost, has no side effects, and is comparable to venography in sensitivity and specificity. The reported incidence of DVT is based on various studies in European and American populations. The Asian population is genetically and socially quite different from American and European populations, and the incidence of DVT can also be different<sup>2,3</sup>.

Despite several years of research in this segment, the best prophylaxis for thromboembolic disease remains under debate. The use of chemical/pharmacological prophylaxis has been used as the treatment of choice for these patients by many orthopaedic surgeon<sup>4</sup>. However, the controversy between the efficacy of chemical prophylaxis for DVT and the increased risk for bleeding in the postoperative period continues to loom around, we conducted a retrospective study at our centre to determine the incidence of DVT after THA and TKA in patients who had no known risk factors for thromboembolic disease.

### **Patients And Methods:-**

A retrospective study including 45 patients undergoing THA and TKA, respectively, was conducted at our Tertiary care hospital in November 2018 and November 2020. All patients were explained about the study and informed consent was taken. Patients who had previous history of DVT, chronic venous insufficiency, stroke, varicose veins, large malignancy, renal insufficiency, recent myocardial infarction, heart failure, who were taking oral contraceptives, or on steroidal/hormonal/ anticoagulant drugs for any medical condition, were excluded. Preoperative assessment for DVT was in these patients in the form of B/L lower limb colour Doppler ultrasonography was avoided citing exclusion of high risk cases already along with unnecessary monetary expenditure in a government setup such as ours which caters to a patient load primarily belonging to an economically weaker strata. All the patients for THA were operated on using the lateral approach and all patients for TKA were operated with a medial para patellar approach after taking an anterior midline skin incision. Patients were daily assessed for any signs and symptoms of DVT from day 1 of post-operative period along with starting of adequate physiotherapy. The most common and earliest signs and symptoms of DVT – pain, throbbing and cramping type along with swelling and redness of the affected limb, were well explained to the patient and were also looked for on daily rounds. Patients were not given any prophylaxis for DVT during the study period starting from the pre-operative period till the patient was discharged in the post-operative period. Physiotherapy was started from post-operative day – 2 when the patient resumed his full diet status. On post op day 2, the patients, both TKA and THA were mobilized bedside, ankle pump exercises involving active dorsiflexion and plantar flexion along with passive assisted knee ROM including flexion & extension exercises were taught. For THA patients from post op day 3 – walker assisted full weight bearing mobilization was started. For TKA patients, along with bedside mobilization, ankle pump on post op day 2, patients were started on static quadriceps and closed chain exercises. Walker assisted partial weight bearing mobilization was started on post op day 3. All this while, these patients were monitored for any signs and symptoms of DVT till the patient was able to mobilize with no support.

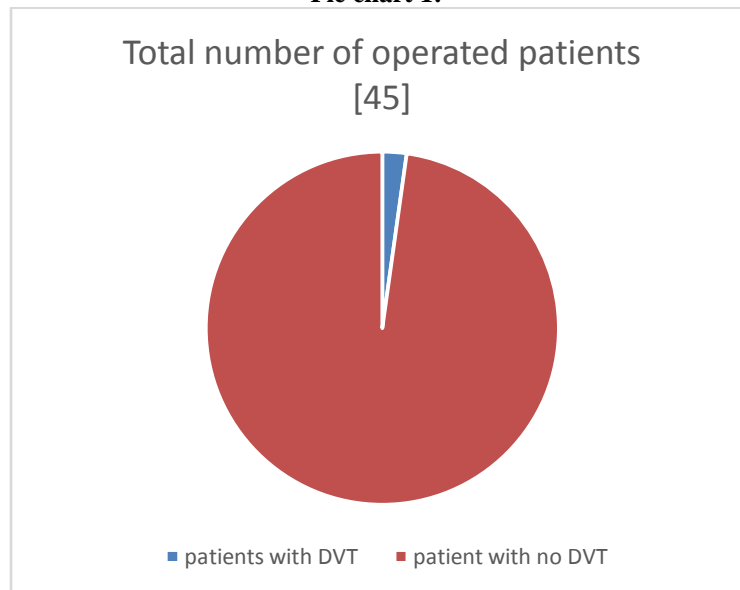
### **Results:-**

The average age of patients undergoing THA was 54 years and for TKA it was 66 years, the details of the demographic being illustrated in table 1. The most common diagnosis in patients undergoing THA was arthritis

followed by avascular necrosis and in TKA it was primary osteoarthritis. Combined spinal and epidural anaesthesia was given in all the patients. Proximal DVT was found in one patient; there was no case of distal DVT. One of these patients was a 62 year old male, who underwent THA for avascular necrosis of his hip. He had developed swelling of the right lower limb on the fifth postoperative day and proximal DVT was detected on colour Doppler ultrasonography he had no known risk factors and had not received any prophylaxis for DVT. Patient was started on appropriate treatment for deep DVT, with subsequent resolution. There was no pulmonary thromboembolism in any of the patients. No case of DVT was detected in any patient who had undergone TKA preoperatively or postoperatively in either the operated or the contralateral limb. Our study here hence suggests that there is an approximate chance of 2% of patients with no known risk factors who will develop DVT if no anticoagulant therapy was used [pie chart 1]. Out of the 45 patients, 1 patient [who underwent THA] developed pain and swelling of the operated lower limb [starting from the ankle] from post op day 5 which was sudden in onset and gradually progressive. Colour Doppler done on post op 6 was suggestive of DVT of the popliteal vein. An appropriate advice was taken from the cardiovascular and thoracic surgery department and the patient was started on injection low molecular weight heparin 6000 IU QID along with Tablet Aspirin 75mg OD and Tablet Atorvastatin 40mg OD with INR monitoring every 3 days maintaining it between 2-3. Along with this, basic protocol in the form of strict immobilization of the affected limb and elevation, avoiding calf massage was strictly followed to avoid further complications of a multisystem embolic phenomena. Repeat Doppler was done after 2 weeks of starting anticoagulant therapy which showed resolving thrombus and expanding calibre of the popliteal vein, following which a restricted mobilization was started for the patient which included full weight bearing walker assisted mobilization avoiding any calf muscle exercises. After the completion of 6 week anticoagulant therapy, a repeat Doppler suggested complete resolution of the thrombus and return of normal calibre of the affected vein and the patient was discharged asymptomatic.

**Table 1:-**

	THA	TKA
Male [mean age: 54]	13	12
Female [mean age: 66]	12	8

**Pie chart 1:-****Discussion:-**

DVT is the abnormal clotting of blood in the veins of the lower limbs. It is mostly precipitated by blood stasis, hypercoagulability and injury to the intimal wall of the vein which is also referred as Virchow's triad. Stasis and pooling of blood in the leg veins occurs during total hip replacement due to use of hypotensive anaesthesia, and in the immediate post-operative period due to immobilisation<sup>4,5</sup>. Surgery acts as stimulus in activating local and systemic coagulation processes, which then leads to a period of hypercoagulability. The intimal damage which

occurs from a combination of endothelial hypoxia and venous manipulation during surgery is also considered as the initiating factor. Though the Virchow's triad proves useful in understanding DVT formation, it appears that systemic coagulation activation is major actuator of DVT. Sharrock et al studied markers of thrombus formation (prothrombin and fibrinopeptide A). They discovered that thrombogenesis rises during the preparation of the femur and is most pronounced during implantation of the femoral component with cement<sup>5</sup>. In this phase thrombotic mediators are released which can potentially lead to femoral venous occlusion. The likelihood of a DVT developing during or after hip replacement is increased by pathologies which associated with increased coagulation<sup>6</sup>. A prospective study of 21,903 consecutive surgical patients identified the following as DVT risk factors: age over 50, history of varicose veins, previous myocardial infarction, cancer, atrial fibrillation, ischaemic stroke and diabetes mellitus<sup>7,8</sup>.

The study by Kim et al had found DVT in 10% of 146 Korean patients undergoing cement less THA<sup>9</sup> and Atichartakaran et al did DVT in a study of 19 Thai patients undergoing THA, there was no incidence of DVT<sup>10</sup>. Dhillon et al did a study on a multi-ethnic population undergoing THA and TKA detecting DVT in 64.3% of 14 patients undergoing THA and in 76.5% of 34 those undergoing TKA<sup>11</sup>. Fujita et al detected DVT in 22.6% of 164 patients who underwent THA and in 48.6% of 138 patients undergoing TKA<sup>11</sup>. Ko et al detected DVT in four out of 22 cases of THA and 18 out of 58 cases of TKA in Chinese patients<sup>11,12</sup>. Sudo et al described incidence of DVT in 9.1% of 33 patients undergoing THA and in 4% of 25 patients undergoing TKA<sup>12</sup>.

During our study proximal DVT was found in only one of patient who underwent THA, and no case was found in patients undergoing TKA, which amounts to approximately 2% of the patients developing DVT who did not receive any anticoagulant therapy in our study. As thrombogenesis is a complex process, it is difficult to explain the difference in our findings and those described in literature from western countries. They could be due to the genetic differences between the populations as well as differences in diet and lifestyle. Recently, factor V Leiden has been attributed as a risk factor for thrombosis. The relative risk of thrombosis in patients with factor V Leiden has been shown to be higher, about more than 10 times greater than for those with a deficiency of protein C, protein S, or antithrombin III<sup>13</sup>. It was detected in 5.27% of white people compared with 0.45% of Asians during the screening of 4047 people in the United States. This difference in prevalence of factor V Leiden could be responsible for difference in incidence of DVT<sup>13,14</sup>. All things said and done, anticoagulant therapy, which might be used as a standardized protocol for all operated arthroplasty patients does not come without any side effects, which includes increased risk of bleeding which can manifest as melena [ blood in stool], hematemesis [ blood in vomit], haemoptysis [ blood in cough], severe bruising following trivial trauma – this particular concerns us as most of the operated arthroplasty patients are elderly who are prone to falls more so after surgery while following their physiotherapy protocol. In females there is an added disadvantage of increased bleeding [menorrhagia] during menses [when performed in pre-menopausal women]. Other adverse effects include bleeding in to joints causing sudden onset severe joint pain, dizziness, rashes, hair loss and jaundice to name a few. These adverse effects are less encountered when anticoagulants such as Enoxaparin and low molecular weight heparin [most commonly used nowadays] are used, but are not fully devoid of such complications<sup>[15]</sup>. Apart from this, continuous monitoring with INR warrants against using these drugs sparing the patient with constant pricks when cost effective and non-harmful methods of appropriate physiotherapy are available.

Getting a preoperative Doppler ultrasonography helps in preventing any false positive cases, as well as forewarns the operating surgeon about the increased risk of DVT and need for subsequent prophylaxis for the same. It had revealed DVT in one patient who had undergone hemi-arthroplasty previously. Therefore, to rule out such cases, it is prudent to get a preoperative Doppler ultrasonography to detect any pre-existing DVT, more so in patients who are undergoing a repeat procedure on the same or the opposite joint, but in resource limited institutions especially in developing countries, getting a pre-operative Doppler can become a monetary burden for the patient and does not justify its use in all low risk cases, as is the case in our study. Though our study group being small, our results suggest that incidence of DVT in Indian patients is significantly low and is not comparable with American and European counterparts. These findings become relevant in today's world of globalisation and also for other South East Asian countries that happen to share a common genetic pool and socioeconomic conditions. Although, we recommend larger multi-centric studies with a larger sample size is needed to unarguably conclude our notion that adequate physiotherapy could be just as effective as anti-coagulant therapy. There is often restricted government funding, more so in developing countries with emphasis on providing basic essential medical services to the maximum number of people. In view of this, and in an era of evidence based medicine, it is found that advising prophylaxis in patients undergoing THA and TKA is not cost effective in people who have no known risk factors for DVT.

**Conclusion:-**

These results suggest that the incidence of DVT in patients is very low and is not comparable when adequate postoperative mobilisation and physiotherapy was done. We conclude that advising prophylactic anticoagulant therapy to these patients in the post op period could be successfully substituted by a simple and cost effective but adequate physiotherapy to prevent DVT, in the process also bypassing the side effects of the anticoagulant therapy.

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