

INCIDENCE OF DEEP VEIN THROMBOSIS IN HIP ARTHROPLASTY POST MULTIMODAL PROPHYLAXIS

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ABSTRACT:

Background: Thromboprophylaxis following Major Orthopaedic surgery is standard practice nowadays. Also the possibility of Venous Thromboembolism following Hip Arthroplasty is well recognized. Pharmacological and Mechanical agents can be used in conjunction for effective thromboprophylaxis.

Aim: To assess the incidence of Deep Vein Thrombosis (DVT) in patients undergoing Hip Hemiarthroplasty and Total Hip Arthroplasty surgeries with Thromboprophylaxis.

Patients and Methods: This was a prospective study conducted in Mahatma Gandhi Medical College and Research Institute, Pondicherry between 2019 to 2020. Patients already on anticoagulants were excluded. 28 patients who underwent hip arthroplasty both Total Hip Arthroplasty and Bipolar Hemiarthroplasty for various aetiologies participated in the study. Preoperative screening was done using Ultrasound Colour Doppler. All patients were put on Intermittent Pneumatic Compression device for five to seven days and administered Tab. Aspirin 325 twice daily from POD1 to six weeks. After six weeks Ultrasound Colour Doppler was repeated to look for DVT.

Results: The mean age of the patients - 60.85 years. There were 16 males and 12 females among which 14 underwent Hemiarthroplasty, 11 underwent Total Hip Arthroplasty and 3 underwent Revision Total Hip Arthroplasty. 17.9% of the patients had diabetes, 25% had hypertension. 17.9% of the patients had smoking and alcoholic habits. At the end of six weeks there was no evidence of DVT among the 28 patients.

Conclusion: The Multimodal prophylaxis with Aspirin and Intermittent Pneumatic Compression pump administered to low risk patients following Hip Arthroplasty is efficacious, cost effective, does not require blood monitoring and in short term follow up there was no evidence of Deep Vein Thrombosis.

INTRODUCTION :

Thromboprophylaxis following Major Orthopaedic surgery is standard practice nowadays, as the possibility of Venous Thromboembolism after Total Hip Arthroplasty and Hemiarthroplasty is well recognized¹. Both of these significant orthopaedic procedures carry a substantial risk of thrombosis and the most common medical complication of Hip

Arthroplasty is Venous Thromboembolism². Hence, these operations have become prominent models for evaluating Thromboembolic prophylaxis. The abundant research explaining the occurrence of Venous Thromboembolism, in addition to studying the outcomes of two separate operations focus primarily on two endpoints. The first endpoint, regardless of symptoms is Subclinical Deep Vein Thrombosis tested by Regular Venography or Ultrasound Doppler review. This approach identifies more incidents and can be considered to be a better indicator of treatment efficacy. The second endpoint is the occurrence of symptomatic DVTs, where clinical examination identifies incidents. This approach is similar to actual clinical settings and focuses on Thromboembolic prophylaxis drug quality.

The most common complication of Total Hip Arthroplasty is Deep Vein Thrombosis, which is below the category of high risk and involves the highest degree of prophylaxis^{3,4,5}. The development of thrombus is associated with a triad of Venous stasis, Hypercoagulability and Endothelial injury. The use of Cemented implants have also been found to promote the incidence of DVT⁶. The incidence of post-operative Deep Vein Thrombosis in the absence of prophylactic treatment is extremely high following Hip Arthroplasty. Without either mechanical or pharmacologic prophylaxis, asymptomatic deep venous thrombosis will develop after 40% to 60% of total hip and knee arthroplasties. Clinically relevant symptomatic Venous Thromboembolism has been reported to be less common.

Chemical and Mechanical prophylaxis are among the forms of Deep Vein Thrombosis prophylaxis used during hospitalization. Chemical prophylaxis requires Low molecular weight Heparin, Unfractionated Heparin, Vitamin K antagonist, Fondaparinux and Antiplatelet agents. Mechanical prophylaxis requires Intermittent Pneumatic compression, Venous foot pumps and Stockings with graduated compression⁷. For patients with high-risk factors for Venous Thromboembolism, Pharmacological and Mechanical prophylaxis can be used in conjunction. There has been increased use of postoperative anticoagulation medication as a method of prophylaxis with the intention of preventing VTE. However the use of these drugs is associated with an increased risk of Major bleeding, infection and death. Combined thromboprophylaxis of Aspirin and Intermittent Pneumatic Compression pump is effective, cost effective and safer form⁸.

METHODOLOGY :

This prospective study conducted in Mahatma Gandhi Medical College and Research Institute in Pondicherry between January 2019 – July 2020 included 28 patients who underwent Total Hip Arthroplasty or Hemiarthroplasty in the Department of Orthopaedics admitted through casualty or OPD. All the patients were selected for the study based on the inclusion and exclusion criteria.

Skeletally mature patients undergoing Hip Hemiarthroplasty surgery and Total hip arthroplasty surgery were included for the study. Patients with previous history of Venous thromboembolism, with Hypercoagulable state (Malignancy, Inherited hypercoagulable conditions, On Hormone replacement therapy), on anticoagulants and patients diagnosed with DVT during preoperative screening with Ultrasound Colour Doppler were excluded from the study.

The patients included in the study were screened for Deep Vein Thrombosis preoperatively with Ultrasound Colour Doppler for both lower limbs. Post operatively patients were administered T.Aspirin 325mg twice daily from 1st post-operative day and continued for 6

weeks as prophylaxis along with application of Intermittent Pneumatic Compression device for 5 to 7 days . Intermittent Pneumatic Compression device was used continuously whenever the patient was not mobilizing for at least 5 to 7 days as soon as the patient arrived to the recovery room. Patients were also administered Proton pump inhibitors (Pantoprazole) to avoid gastritis. Physiotherapy such as Quadriceps strengthening exercise, Knee mobilization exercise, Ankle Pump exercise and early ambulation were initiated from POD1. The patients were screened for Deep Vein Thrombosis postoperatively after 6 weeks with ultrasound Colour Doppler for both lower limbs.

RESULTS :

The data from the study reported No Incidence of Deep Vein Thrombosis post prophylaxis. The mean age of the patients involved in the study was 60.85 years and the average duration of the surgery was 3 hours. The mean BMI among the patients involved in our study was 24.07.

Among the 28 patients involved in the study 16 patients were females and 12 patients were males and out of which Hemiarthroplasty was carried out in 14 patients, Revision Total Hip Arthroplasty in 3 patients and total hip replacement in 11 patients. 17.9% of the patients had diabetes and 25% had hypertension. 17.9% of the patients were smokers and consumed alcohol. All these factors did not seem to influence the incidence of DVT in our study. This may be due to the prompt administration of prophylaxis.

TABLE 1 : DISTRIBUTION OF AGE

AGE	FREQUENCY	PERCENT
<50	6	21.4%
51-60	4	14.3%
61-70	8	28.6%
>71	10	35.7%
Total	28	100.0%

TABLE 2 : GENDER DISTRIBUTION

GENDER	FREQUENCY	PERCENT
F	16	57.1%
M	12	42.9%
Total	28	100.0%

TABLE 3 : TYPE OF SURGERY

PROCEDURE	FREQUENCY	PERCENT
HEMIARTHROPLASTY	14	50.0%
REVISION THR	3	10.7%
THR	11	39.3%
Total	28	100.0%

TABLE 4 : DURATION OF SURGERY

DURATION	FREQUENCY	PERCENT
<2 hrs	7	25.0%
2-3 hrs	10	35.7%
>3 hrs	11	39.3%
Total	28	100.0%

TABLE 5 : DISTRIBUTION OF DIABETES

DIABETES	FREQUENCY	PERCENT
ABSENT	23	82.1%
PRESENT	5	17.9%
Total	28	100.0%

TABLE 6 : DISTRIBUTION OF HYPERTENSION

HTN	FREQUENCY	PERCENT
ABSENT	21	75.0%
PRESENT	7	25.0%
Total	28	100.0%

TABLE 7 : DISTRIBUTION OF SMOKING

SMOKING	FREQUENCY	PERCENT
NO	23	82.1%
YES	5	17.9%
Total	28	100.0%

TABLE 8 : DISTRIBUTION OF ALCOHOLICS

ALCOHOL	FREQUENCY	PERCENT
NO	23	82.1%
YES	5	17.9%
Total	28	100.0%

TABLE 9 : DISTRIBUTION OF BMI

BMI	FREQUENCY	PERCENT
<18.5	1	3.6%
18.5-25	19	67.9%
25-29.9	8	28.6%
Total	28	100.0%

CASE ILLUSTRATION:

PREOP DOPPLER

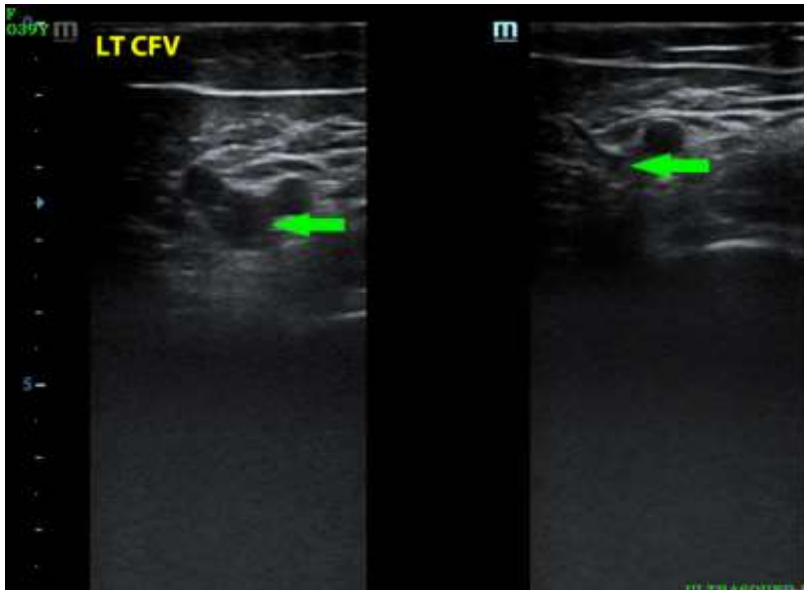


Fig 1 : On Preop Ultrasound Doppler- B mode Common Femoral vein is seen and on compression, Common Femoral vein is compressed which indicates no DVT

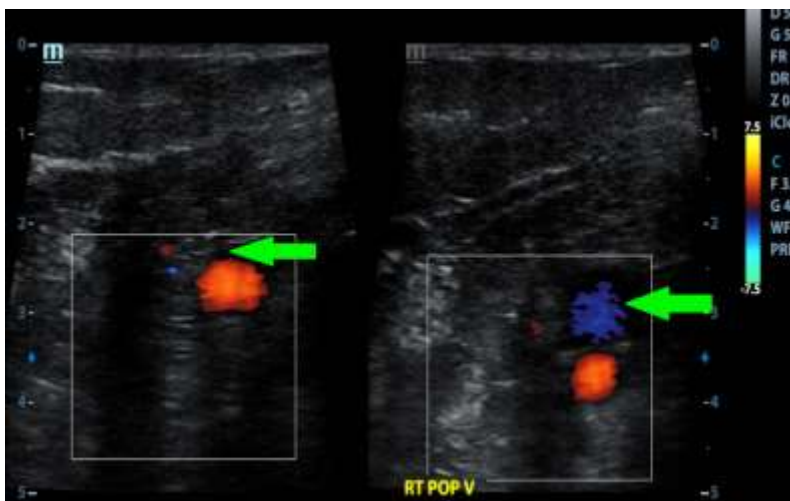


Fig 2 : Preop Colour doppler shows the Popliteal vein being compressed on compression and on release there is normal flow indicating no DVT

Fig 3 : ON INTERMITTENT PNEUMATIC COMPRESSION PUMP



6th WEEK POSTOP DOPPLER

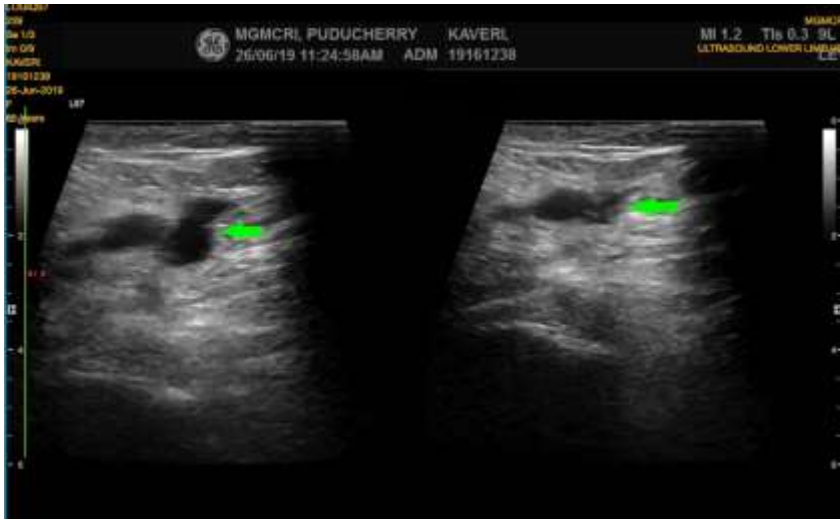


Fig 4 : On Postop Ultrasound Doppler – B mode Common Femoral vein is seen and on compression Common Femoral vein is compressed which indicates no DVT

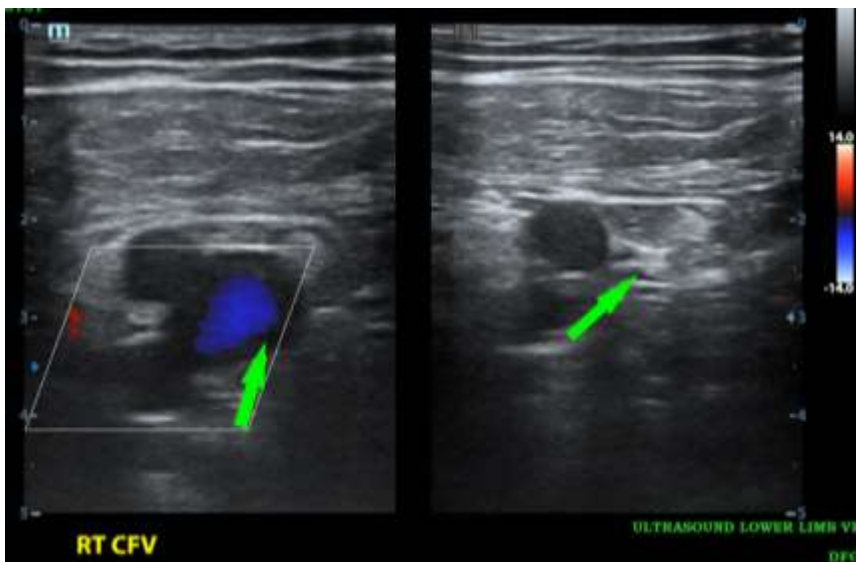


Fig 5 : Postop Ultrasound Colour Doppler shows normal flow in Common Femoral vein and on Compression the vein is compressed indicating no DVT

DISCUSSION:

The hypothesis of the present study was that a multimodal thromboprophylaxis for Venous thromboembolism would protect patients undergoing Hip Arthroplasty.

In our study of 28 Hip Arthroplasties (Low risk group) with prophylactic administration of Aspirin and Intermittent Pneumatic Compression pump we found 0% Deep Vein Thrombosis in the 6th post-operative week. Our data was obtained with use of Ultrasound Colour Doppler which has been validated as an accurate measurement for deep venous thrombosis. Complications such as Gastritis, Wound related complications and Bleeding manifestations were also not reported.

We preferred to use Aspirin in this study than other anticoagulants because it is less expensive, can be administered orally and less cumbersome because blood levels need not be monitored.

Many studies support the use of an anticoagulant prophylaxis following hip arthroplasty in order to reduce the incidence of DVT and the associated complications like pulmonary embolism, postphlebotic syndrome and even death. A variety of prophylactic agents have been used over the years and many have been associated with lower rates of morbidity and mortality.

The most recently revised guidelines from the American College of Chest Physicians (ACCP) and associated guidance from the American Academy of Orthopaedic Surgeons (AAOS) offer valuable recommendations. Both accept mechanical and chemical prophylaxis. Although there are many chemical agents for VTE prophylaxis, there is a difference in their efficacy and the risk of bleeding. The choice of agent therefore relies on a balance between the desire to minimise VTE and the attempt to reduce the risk of bleeding with its undesirable and occasionally fatal consequences⁹.

BMI:

In our study the mean BMI was 24.07 (range 15.30 to 28.60). But this was not similar to studies by **Lawrence D Dorr et al**⁸ where the mean BMI was 28.9 (range 16.1 to 60.6), **Vulcano et al**¹⁰ where the mean BMI was 30 (range 15-64), **J. Daniel et al**¹¹ where the mean BMI was 26.2 (range 17.6 to 43.9) in Cohort A and 26.8 (range 16.6 to 51.2) in Cohort B, **Raphael J et al**¹² the mean BMI was 29.9 in Aspirin group and 29.8 in Warfarin group, **Huang R et al**¹³ where the mean BMI of the Aspirin group patients was 29.9. The low BMI in our study might be the reason for no incidence of DVT in our study.

RISK CATEGORISATION :

We studied 28 patients who underwent Hip arthroplasty, all of them with low VTE risk. Similarly **Lawrence D Dorr et al**⁸ divided their study population into 2 groups based on risk factors for DVT - Low risk group received Aspirin with Intermittent Pneumatic Compression device as thromboprophylaxis and high risk group were managed with enoxaparin or coumadin. In a similar study by **Vulcano et al**¹⁰ which included 1569 patients who underwent THA and TKA, patients were categorised based on their risk of DVT - Low risk group received Aspirin with Intermittent Pneumatic compression pump whereas High risk group received Coumadin or LMWH postoperatively. In their study patients at a high risk of VTE were those with a history of VTE, malignancy, known hypercoagulable disorder and debilitated patients who were expected to mobilise slowly after surgery. In the study done by **Raphael R et al**¹² high risk patients were included in the warfarin group and low risk patients were included in the aspirin group. In the study done by **Huang R et al.**, Aspirin was used in patients in low risk whereas for high risk patients which included those with a history of VTE, known pro-thrombotic condition or active malignancy warfarin was given as prophylaxis. But unlike our study **Raul Carneiro Lins et al**¹⁴ gave Aspirin and Elastic compression stockings instead of Intermittent Pneumatic Compression device after 37 Total Hip Arthroplasties. They had only 2.6% incidence of DVT at the end of the study. So our prophylaxis with Aspirin and Pneumatic Compression device might help to prevent DVT even in high risk patients.

COMPLICATIONS :

Our study reported no complications such as Gastrointestinal complications, Wound related problems and Post-operative bleeding. **Raul CaneiroLins et al¹⁴** in their study of 37 Total Hip Arthroplasties with high risk also reported no complications. In a similar study by **Sarmiento et al¹⁵**, 3 patients were found to be allergic to aspirin, Gastro intestinal complications developed in 2 patients and a large hematoma developed in 3 patients. In a meta-analysis, Imperiale and Speroff reported the prevalence of major bleeding episodes after Total Hip Arthroplasty to be 0.4% in association with Aspirin, 1.3% in association with Warfarin, 1.8% in association with LMWH and 2.5% in association with Unfractionated Heparin. They found that LMWH and Warfarin were associated with high rates of clinically important bleeding. In a study by **An VV et al¹⁶**, the rate of major bleeding was 0.3%. Digiovanni et al, in their study of 863 Total Hip Arthroplasties reported wound hematoma in 1 patient following prophylactic administration of Aspirin and Intermittent Pneumatic Compression pump. In a study by **Vulcano et al¹⁰** the rate of bleeding was 0.3% in Aspirin group and 1.6% in Coumadin group, 3 patients in Aspirin group and 11 patients in Coumadin group developed Superficial wound infection whereas 1 patient in Coumadin group developed Deep wound infection. We didn't encounter any complications with regard to Aspirin which might be due to coverage with Proton Pump Inhibitors.

COMPARISON OF OUR STUDY WITH SIMILAR OTHER STUDIES :

Study	Year	Sample size	Methodology	DVT incidence	Complications
Our study	2020	28 Hip Arthroplasty	Aspirin + Intermittent Pneumatic Compression pump Diagnosis : Ultrasound Colour doppler	0%	Nil
Digiovanni et al	2000	863 Total Hip Arthroplasty	Aspirin + Intermittent Pneumatic Compression Device Diagnosis : Doppler	1.9%(17)	- 1 patient developed Wound hematoma
Westrich et al	1999	2037 Total Hip Arthroplasty	Aspirin + Intermittent Pneumatic Compression Device Diagnosis : Venogram	10.3%(210)	
SARMIENTO et al	1997	1492 Total Hip	Aspirin + Graded Elastic	1%(15)	-3 patients were allergic

		Arthroplasty(1313 Primary THA and 179 Revision THA)	Stockings(774 procedures)/ Intermittent Compression Device(718 procedures) Diagnosis : Clinically confirmed by Doppler/Venography		to aspirin -2 patients developed gastrointestinal complications
An VV et al	2016	Meta-analysis of 39 references	Aspirin as alone and in multimodal prophylaxis	1.2%	- Bleeding complications in 0.3%
Raul Carneiro et al	2017	37 Total Hip Arthroplasty	Aspirin + Elastic compression stockings Diagnosis : Ultrasound Colour Doppler	2.7%(1)	Nil
Lawrence D Dorr et al	2003	1179 (602 Total Hip Arthroplasty + 577 Total Knee Arthroplasty) (1046 – low risk group 133 – high risk group)	Low risk group – Aspirin + Intermittent Pneumatic Compression Device High risk group – Low molecular weight heparin + Intermittent Pneumatic Compression Device Diagnosis : Ultrasound Colour Doppler	Low risk group – 5.3%(55) High risk group – 8.3%(11)	Bleeding complications Low risk group – 6(5 hematoma + 1 GIT) High risk group – 1(GIT)
J.Daniel et al	2008	287 Total Hip Arthroplasties	Cohort A – Aspirin Cohort B – Aspirin + Intermittent Pneumatic Compression Device Diagnosis : Ultrasound doppler	Cohort A – 10.2% Cohort B – 4.6%	Cohort A – Minor wound ooze in 8.1% of cases. No wound dehiscence or deep infection Cohort B – Minor wound ooze in

					10.5% of cases. No wound dehiscence or deep infection
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LIMITATIONS OF THE STUDY :

- Sample size was less with a shorter duration of follow up.
- Our study was an observational study with no control group to compare.
- Patients with high predisposing risk factors for DVT such as previous history of VTE, hypercoagulable state and already on anticoagulants were not included in the study.

CONCLUSION :

- The Multimodal prophylaxis with Aspirin and Intermittent Pneumatic Compression pump administered to low risk patients following Hip Arthroplasty is efficacious, cost effective, does not require blood monitoring and in short term follow up there was no evidence of Deep Vein Thrombosis.
- There were also no Wound healing problems and Gastrointestinal complications.
- Further prospective randomized control studies with larger sample size with long term follow up will add superiority to this prophylactic method.

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