

To Evaluate Role of Asprin Along with Mechanical Prophylaxis and Early Mobilization in Total Knee Arthroplasty for Prophylaxis of Venous Thromboembolism

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Abstract

Introduction: Venous thromboembolism (VTE) is one of the most dreaded complications following total knee arthroplasty. In spite of having a plethora of thromboprophylactic agents, search for a safe, potent and cost-effective agent is ongoing. Aspirin if proven efficient, will be cost-effective. ACCP has placed it in 1C level of evidence. Its effectiveness in combination mechanical prophylaxis and early mobilization is the genesis of this study. **Methods:** This prospective study was carried out for studying the efficacy of combination prophylaxis (soluble Aspirin, Mechanical prophylaxis and early mobilization) in preventing DVT following total knee arthroplasty as per risk stratification recommended by AAOS after taking permission from hospital ethical committee in 50 consecutive patients. Patients were followed up at 2, 6 and 12 weeks post surgery and assessed clinically as well as with color Doppler to find out evidence of DVT if any. **Results:** Effect of combination therapy in the form of aspirin, mechanical device and early mobilization was studied in mild to moderate risk patients with osteoarthritis knee undergoing total knee arthroplasty. DVT was absent in 100% of patients at 2 weeks post operatively both clinically as well as on color doppler. One patient (2%) developed distal deep vein thrombosis at 2nd follow-up. This patient was found to be a defaulter of DVT prophylaxis given to patient at the time of discharge. Moreover, 12 weeks after surgical intervention all the patients were free from deep vein thrombosis on examination with color Doppler examination (CDFI). **Conclusion:** This study supports the literature ACCP (2012) and AAOS (2013) that combination prophylaxis in the form of soluble Aspirin, mechanical agent and early mobilization for DVT in mild to moderate risk patients of osteoarthritis knee undergoing total knee arthroplasty is adequate.

Keywords: Venous thromboembolism, Knee arthroplasty, Aspirin, Mechanical prophylaxis

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Introduction

Venous thromboembolism (VTE) is one of the most frequent & serious complication in orthopaedic surgery involving lower limbs [1]. Without prophylaxis deep vein thrombosis develops in about 50% of patients undergoing hip & knee replacement surgeries [2]. About 20% of patients may develop pulmonary emboli out of which 2% cases may be fatal [1,2]. Risk of DVT especially increases in patients with total knee arthroplasty [3]. The higher incidence of DVT & subsequent PE makes it the most common cause of death after total joint replacements. Virchow's triad namely venous stasis, endothelial damage and hypercoagulability is the cause of

VTE [1]. In patients of osteoarthritis knee venous stasis may occur preoperatively & post operatively due to decreased mobilization. Endothelial damage may occur intra-operatively due to direct trauma to major vessels. Hypercoagulable state is present in response to surgical intervention. The increasing detection of VTE among Indian population, lack of awareness, underestimation of the risk, and fear of bleeding complications after chemical prophylaxis have made deep vein thrombosis (DVT) a serious problem, hence standard guidelines for thromboprophylaxis are essential for lower limb arthroplasty patients.

Elderly & obese people who have undergone hip or knee

replacement have a greater risk of developing thromboembolism as compared to the younger population group [4,5]. It is because of hypercoagulable state persists in the body after trauma or instrumentation in the skeleton which is secondary to the release of thromboplastin from marrow fat and medullary sinusoids into the systemic circulation.

Various invasive and non-invasive modalities have been used to diagnose VTE in the past but none of them have been conclusive as a single modality. Clinical judgement plus color Doppler USG is generally acceptable to an orthopaedic surgeon as it a non-invasive technique. However, Venography remains the gold standard technique with limitation of being used inpatients allergic to contrast and renal failure [6]. Pulmonary embolism is a fatal condition which may develop secondary to DVT and pulmonary angiography is the gold standard diagnostic tool.

Thromboprophylaxis can be achieved by various pharmacological and mechanical means. Various thromboprophylactic agents such as Warfarin, unfractionated heparin, low molecular weight heparin, factor Xa indirect inhibitor, direct factor Xa (Rivaroxaban) inhibitor and factor IIa inhibitor (dabigatran) have been used as chemoprophylaxis for VTE prevention in the past, however no uniform agreement exists in terms of its duration, type and its route of administration [7,8]. Recombinant human soluble thrombomodulin is a new and highly effective antithrombotic agent. Prophylactic placement of vena cava filters in selected high risk arthroplasty patients may prevent an embolic event [4,5,9].

Mechanical means in contrast to pharmacological measures are devoid of haemorrhagic complications. Various mechanical agents which were used include active and passive exercises, compression stockings, graduated pressure compression and intermittent compression of calf by pneumatic compression devices [4,5,9].

In the present study authors have used multiple modalities for the prophylaxis of Deep Vein Thrombosis in patients undergoing total knee arthroplasty which included early mobilization along with pharmacological and mechanical agents as per risk stratified approach. Effectiveness of the same was measured by clinical & radiological assessment (Color Doppler flow imaging).

Material and Methods

Study Design

Non randomized non controlled trial. Assuming 10% desired precision, 80% confidence level and 0.01 level of significance, the minimum sample size required for the study was 50.

Procedure

This study aimed at evaluating efficacy of use of soluble Aspirin, mechanical prophylaxis and early mobilization as a combined therapy in DVT prophylaxis in patients undergoing total knee arthroplasty as per risk stratification (only patients with mild and moderate risk of DVT were included in the study) after taking clearance from hospital ethical committee. All the patients received above mentioned standardized DVT prophylaxis regime (mobilization and soluble aspirin) starting from next day of surgery. Soluble aspirin continued up to 4 weeks post op. Pneumatic compression devices (KENDALL SCD EXPRESS Compression System) were applied in immediate post-op till patient was discharged after being mobilized.

Inclusion Criteria

- All patients above the age of 40 years who have undergone knee arthroplasty surgery.

Exclusion Criteria

- Younger patients (less than 40 years of age)
- Patients with past history of DVT
- Revision surgeries
- Patients with pre-existing Deep Vein Thrombosis.
- Patients with pre-existing coagulopathy.
- Patients taking any form of anticoagulants before surgery
- BMI > 35
- Simultaneous bilateral knee arthroplasty surgery.

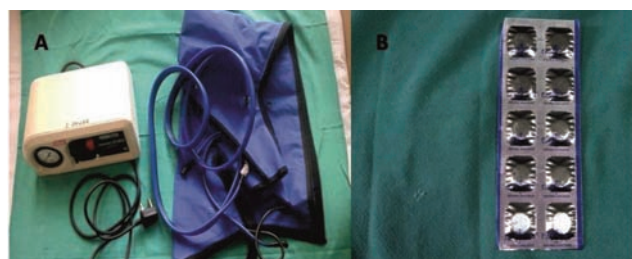


Figure 1: Pneumatic compression device (KENDALL SCD EXPRESS Compression System) (A) and Soluble aspirin tablets (B) used as thromboprophylaxis in TKR patients

Outcome Ascertainment: Follow Up

Patient follow up was done at 2 weeks, 6 weeks and 12 weeks post surgery and was evaluated for development of DVT in bilateral lower limb both clinically and using color Doppler flow imaging (GE VIVID T8, 2-4 Frequency, probe 4s). The findings were recorded in the excel sheet.

Results

In this study, 52% were male and 48% were female with average age being 64.48 +/- 15 years. Comorbidities which increase the risk of deep vein thrombosis were analysed (Table 1).

20% of the patients had Body Mass Index (BMI) in normal range, however 62% and 18% of patients were over weight and obese respectively. All patients were administered same anti DVT prophylaxis in the form of early mobilization, pneumatic compression and anticoagulants (ASPIRIN). 96% of the patients were mobilized on the day 1 of their surgery whereas the rest 4% of the patients on day 2 due to excessive pain. Risk stratification of patients for deep vein thrombosis prophylaxis were done (Table 2). Patients were assessed for DVT clinically and using CDFI at 2 weeks, 6 weeks and 12 weeks post-surgery. No patient developed DVT at 2 weeks follow up and 98% of patients didn't develop DVT at 6 weeks. Furthermore, No one had DVT at 12 weeks follow up. Only 1 patient (2%) showed presence of DVT (both calf tenderness and on CDFI) at 6 weeks, however with intervention distal DVT was absent at 12 weeks

Discussion

Search for an ideal thromboprophylactic agent post knee arthroplasty has been a matter of debate since long. Non-uniform guidelines issued by AAOS and ACCP has added more confusion to this [10,11]. Elderly patients with knee osteoarthritis are at

Table 1: Depicts co-morbidities of population in study increasing the risk of Deep Vein Thrombosis

S. No.	COMORBIDITIES	No. OF PATIENT(S)	PERCENTAGE
1	Hypertension	15	30
2	Diabetes mellitus type 2	2	4
3	Hypertension + diabetes type 2	3	6
4	Hypertension +CAD	2	4
5	Hypertension + IHD	1	2
6	Hypothyroid + Hypertension + diabetes mellitus type 2	2	4
7	Lumber Spondylosis grade 2	1	2
8	Others	3	6

Table 2: Shows risk stratification for administration of anticoagulants (Caprini Index)

RISK STRATIFICATION	NUMBER OF PATIENTS(N)	PERCENTAGE %
At mild risk	4	8%
At moderate risk	46	92%

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- Risk stratification of patients for deep vein thrombosis prophylaxis were done (Table 2).
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increased risk of developing DVT and PE in pre-op, intra-op and post-op period of total knee arthroplasty in view of meeting all criteria of Virchow's triad. Hence, the search for a safer and cost-effective thromboprophylactic agent is necessity of time [12-14]. The debate over efficacy of aspirin has been there for a while but it has stood the test of time. ACCP guidelines issued in 2012 places aspirin in 1C level of evidence in prevention of DVT, however did not comment upon combining it mechanical devices. There are also evidences that mechanical devices alone are not an effective prophylactic agent in preventing DVT post total knee arthroplasty. AAOS in 2011 guidelines supported combination of both pharmacological as well as mechanical agents for an effective DVT prophylaxis but did not specify agent and duration for this purpose [15,16]. In various studies, Color Doppler was recommended only in symptomatic DVT. Prophylactic agents used were effective in preventing fatal complications like pulmonary embolism following asymptomatic DVT.

In this study consisting of 50 patients, soluble aspirin was used as chemoprophylaxis in mild (8%) and moderate (92%) risk stratified patients. Thirty percent were hypertensive, 4% were diabetic, 4% hypothyroid with Hypertension, 6% were diabetic with hypertension and 6% were hypertensive with history of coronary artery disease or ischemic heart disease but were not on any anticoagulant for last one year. Also, the studied population did not have history of malignancy and thrombophilia in past.

DVT was assessed clinically and by colour Doppler flow imaging (CDFI) in all patients to study effectiveness of combination prophylaxis. In this study, only 1 patient developed symptomatic DVT which resolved in further follow up.

Conclusion

This study supports the literature ACCP (2012) and AAOS (2013) that prophylactic regime (early mobilization, mechanical prophylaxis and soluble aspirin) for DVT in mild to moderate risk patients of osteoarthritis knee undergoing total knee arthroplasty is adequate. Aspirin is potential thromboprophylactic agent if used along with other non-pharmacological agents in moderate risk total knee arthroplasty patient. It is cost effective and safe as compared to the other pharmacological agents. Risk of fatal bleeding is almost absent in patients receiving aspirin as DVT thromboprophylaxis. Though efficacy & potency other pharmacological agents is proven & cannot be challenged but bleeding risk & DVT prevention is almost comparable.

We recommend Aspirin usage along with mechanical prophylaxis and early mobilization in patients with moderate risk of DVT in total knee arthroplasty.

Conflict of Interest: All authors declare no COI

Ethics: There is no ethical violation as it is based on voluntary anonymous interviews

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References

1. Mitchel RN. Hemodynamic disorders, thromboembolism and shock. In: Kumar V, Abbas AK, Aster JC, Perkins JA, Robbins SL. Robbins Basic Pathology. 10th edition. Philadelphia, PA: Elsevier; 2018; 31-44.
2. Leizorovicz A, Turpie AG, Cohen AT, Pellois A, Diebolt P, Darmon JY. Epidemiology of

- post-operative venous thromboembolism in Asian countries. *International Journal of Angiology*. 2004;13:101-8.
3. Lachiewicz PF. American Academy of Orthopaedic Surgeons clinical guideline on prevention of pulmonary embolism in patients undergoing total hip or knee arthroplasty. *Instructional Course Lectures*. Feb 2007; 58:795-804.
 4. Gali JC, Camargo DB. Thromboprophylaxis for total knee arthroplasty. *Revista Brasileira de Ortopedia*. 2019; 54 (1): 1-5.
 5. Chan NC, Bhandari M. Thromboprophylaxis after hip or knee arthroplasty. *JAMA*. 2022; 328(8): 712-713.
 6. Callaghan JJ, Warth LC, Hoballah JJ, Liu SS, Wells CW. Evaluation of deep venous thrombosis prophylaxis in low-risk patients undergoing total knee arthroplasty. *The Journal of Arthroplasty*. 2008;23:20-4
 7. Toker S, Hak DJ, Morgan SJ. Deep Vein Thrombosis Prophylaxis in Trauma Patients. *Thrombosis*. 2011;2011:505373 Burnett RS, Clohisy JC, Wright RW, McDonald DJ, Shively RA, Givens SA et al. Failure of the American College of Chest Physicians-1A protocol for Lovenox in clinical outcomes for thromboembolic prophylaxis. *Journal of Arthroplasty*. 2007;22:317-24.
 8. Jacobs JJ, Mont MA, Bozic KJ., Della Valle CJ, Goodman SB, Lewis CG et al. American Academy of Orthopaedic Surgeons Clinical Practice Guideline on Preventing Venous thromboembolism. *Journal of Bone and Joint Surgery*.2012;94:746-747
 9. George MJ. Methods of DVT Prophylaxis after Total Knee Arthroplasty [Internet]. *Primary Total Knee Arthroplasty*. In Tech; 2018. Available from: <http://dx.doi.org/10.5772/intechopen.73645>.
 10. Geerts WH, Bergqvist D, Pineo GF et al. Prevention of venous thromboembolism. American College of Chest Physicians evidence based clinical practice guidelines (8th edition), *Chest* 133:381S, 2008.
 11. Mont M, Jacobs J. AAOS clinical practice guideline: preventing venous thromboembolic disease in patients undergoing elective hip and knee arthroplasty. *Journal of American Academy of Orthopaedic surgeons*. 19: 777, 2011.
 12. Matzko C, Berliner ZP, Husk G et al. Equivalent VTE rates after total joint arthroplasty using thromboprophylaxis with aspirin versus potent anticoagulants: retrospective analysis of 4562 cases across a diverse healthcare system. *Arthroplasty*. 2021; 3(45): 1-7.
 13. Kim K, Kim DK, Song SJ, Hong SJ, Bae DK. Pneumatic compression device does not show effective thromboprophylaxis following total knee arthroplasty in a low incidence population. *Orthopaedics & Traumatology: Surgery & Research*. February 2019; 105 (1): 71-75.
 14. Pretorius J, Nemat N, Azeem I, Shaju T, Nadeem S, Hammad Y. Is aspirin still relevant as a single pharmacological agent for venous thromboembolism prophylaxis post hip and knee arthroplasty surgery: A retrospective review. *SICOT-J*. 2022; 8: 28-33.
 15. Woller SC, Bertin KC, Stevens SM, Jones JPA. A prospective comparison of warfarin to aspirin for thromboprophylaxis in total hip and total knee arthroplasty. *Journal of Arthroplasty*. 2012 Jan;27(1):1-9
 16. Anderson DR, Dunbar M, Murnaghan J, Kahn SR, Gross P, Forsythe M et al. Aspirin or Rivaroxaban for VTE prophylaxis after hip or knee arthroplasty. *The New England Journal of Medicine*. February 2018; 378(8): 699-707.

