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Original Research Article

EFFECTIVENESS OF ASPIRIN AS A SOLE PHARMACEUTICAL AGENT FOR THE PREVENTION OF VENOUS THROMBOEMBOLISM DURING HIP AND KNEE REPLACEMENT SURGERY – A RETROSPECTIVE TERTIARY CARE CENTER ANALYSIS

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ABSTRACT

Background: Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), is a serious complication following total hip arthroplasty (THA) and total knee arthroplasty (TKA). Though multiple pharmacological agents are available for thromboprophylaxis, the effectiveness of aspirin as a sole agent remains a subject of debate. The objective is to assess the effectiveness of aspirin as a single pharmacological agent in preventing VTE following THA and TKA in a tertiary care center.

Materials and Methods: This retrospective cross-sectional study was conducted at RL Jalappa Hospital and Sri Devaraj Urs Medical College, Karnataka, over a period of three years (June 2021 – June 2024). Twenty-two patients who underwent elective THA or TKA and received only aspirin (150 mg OD for four weeks) for VTE prophylaxis were included. Patients with prior anticoagulant therapy, aspirin allergy, bleeding disorders, or contraindications were excluded. Data on symptomatic VTE and mortality within 90 days post-surgery were analyzed. Categorical data were presented using frequency and percentages, and associations were tested using the Chi-square test.

Results: Among 22 patients, only one (4.5%) developed a confirmed case of DVT, and no PE or mortality was reported within 90 days. The overall incidence of symptomatic VTE was significantly low, suggesting effective thromboprophylaxis with aspirin alone.

Conclusion: Aspirin demonstrates potential as a safe and cost-effective agent for VTE prophylaxis after THA and TKA, especially in settings with limited resources. Further large-scale prospective studies are warranted to validate these findings.

Keywords: Aspirin, venous thromboembolism, deep vein thrombosis, pulmonary embolism, thromboprophylaxis, total hip arthroplasty, total knee arthroplasty, retrospective study, orthopedic surgery, antiplatelet therapy.

INTRODUCTION

Total knee and hip replacement surgeries are widely performed orthopedic procedures aimed at replacing diseased or damaged joint surfaces with prosthetic implants, typically made of metal and plastic, to restore mobility and relieve pain. Since their introduction in the late 1960s, these surgeries have evolved significantly, leading to improved functional outcomes and patient satisfaction.[1] Despite advancements in surgical technique and perioperative care, venous thromboembolism (VTE),

encompassing both deep vein thrombosis (DVT) and pulmonary embolism (PE), remains a common and serious postoperative complication.[2]

The incidence of VTE following major lower limb orthopedic procedures such as total hip replacement (THR) and total knee replacement (TKR) is reported to be as high as 40–70%, with pulmonary embolism rates ranging between 0.9% and 25% if no prophylaxis is employed.[3] The high risk is primarily attributed to postoperative immobility, venous stasis, and a hypercoagulable state induced by the surgical trauma.[4]

To mitigate the risk of VTE, several pharmacological agents have been recommended, including low molecular weight heparin (LMWH), vitamin K antagonists like warfarin, and direct oral anticoagulants such as rivaroxaban and dabigatran.[5] These agents, while effective, are often associated with higher costs, monitoring requirements, and bleeding risks.[6]

Aspirin, a widely available and cost-effective non-steroidal anti-inflammatory drug (NSAID), exerts its antithrombotic effect primarily by irreversibly inhibiting platelet cyclooxygenase-1, thereby suppressing thromboxane A2 and inhibiting platelet aggregation.[7] Though traditionally used for arterial thrombosis, recent studies have explored its role in venous thromboprophylaxis, particularly in orthopedic surgeries. The Pulmonary Embolism Prevention (PEP) trial demonstrated that aspirin reduced the risk of pulmonary embolism by 43% and symptomatic DVT by 29% in surgical patients.[8]

Furthermore, extended prophylaxis trials such as EPCAT I and II, which compared aspirin to LMWH after an initial short course of LMWH, found comparable efficacy in preventing symptomatic VTE in patients undergoing THR and TKR.[9] Aspirin also has the advantage of a favorable safety profile, ease of administration, and no need for laboratory monitoring, making it an attractive option in the postoperative setting.[10]

In light of this background, the present study aims to evaluate the effectiveness of aspirin as a sole pharmaceutical agent in the prevention of VTE in patients undergoing elective THR and TKR surgeries at a tertiary care center. This study seeks to contribute to the growing body of evidence supporting the use of aspirin as a routine prophylactic agent in appropriately selected patients.

MATERIALS AND METHODS

Study Design and Setting: This is a retrospective cross-sectional study conducted at a tertiary care centre in India. The study was carried out by reviewing patient records of individuals who underwent total hip replacement (THR) or total knee replacement (TKR) surgeries between June 2021 and June 2024.

Participants: Patients aged ≥40 years who underwent elective THR or TKR and received aspirin as the sole pharmacological agent for VTE prophylaxis postoperatively were included in the study. Exclusion criteria were patients with a history of previous VTE, coagulopathies, use of other anticoagulants (e.g., LMWH, warfarin, DOACs), or revision surgeries. The final sample included 22 patients after applying inclusion and exclusion criteria.

Variables: The primary outcome variable was the incidence of symptomatic venous thromboembolism (VTE), including both deep vein thrombosis (DVT) and pulmonary embolism (PE), within 90 days postoperatively. Additional variables assessed included demographic data (age, sex), type of surgery (THR or TKR), comorbidities (diabetes, hypertension, obesity), duration of hospital stay, and use of mechanical prophylaxis (e.g., compression stockings).

Data Sources and Measurement: Data were extracted from the hospital's electronic medical record system and surgical registers. VTE diagnosis was confirmed through Doppler ultrasound (for DVT) or CT pulmonary angiography (for PE) in symptomatic cases. Data accuracy was validated by independent review from two investigators.

Bias: Selection bias was minimized by including all eligible patients consecutively over the study period. Detection bias was minimized as diagnostic investigations for VTE were conducted based on standardized clinical criteria and were confirmed radiologically.

Study Size: The sample size was determined based on the total number of patients meeting the inclusion criteria over the two-year study period. No formal sample size calculation was performed due to the retrospective nature of the study.

Quantitative Variables: Continuous variables such as age were summarized using mean and standard deviation, while categorical variables such as gender, type of surgery, and VTE occurrence were expressed as frequencies and percentages.

Statistical Methods: Data were analyzed using Microsoft Excel and SPSS version 26. Descriptive statistics were used to summarize baseline characteristics. Chi-square test was used to assess the association between categorical variables (e.g., VTE incidence vs type of surgery or comorbidities), while t-test was used for continuous variables. A p-value <0.05 was considered statistically significant.

RESULTS

In this retrospective cross-sectional study, 22 patients who underwent elective total hip replacement (THR) or total knee replacement (TKR) and received aspirin (150 mg once daily) as the sole pharmacological agent for venous thromboembolism (VTE) prophylaxis were analyzed. The study population had a female predominance, with 13 females (59.1%) and 9 males (40.9%). In terms of the type of surgery, total knee replacements were more common, accounting

for 12 cases (54.5%), while total hip replacements were observed in 10 cases (45.5%).

The distribution of VTE risk based on the Wells criteria revealed that the majority of patients, 15 out of 22 (68.2%), fell into the moderate-risk category. Five patients (22.7%) were categorized as low risk, and only two patients (9.1%) were identified as high risk. The mean Wells score across the study population was 1.41 with a standard deviation of 0.96, indicating that the overall group leaned toward a moderate risk of developing VTE.

All patients received mechanical prophylaxis in addition to aspirin therapy, and mobilization protocols were strictly followed post-surgery. The duration of aspirin administration ranged from 14 to 30 days, with most patients completing the full 4-week regimen. Diagnostic evaluation for VTE was undertaken in cases of clinical suspicion. Four patients underwent Doppler ultrasound, primarily those with higher Wells scores or relevant symptoms. Of these, only one patient was diagnosed with deep vein thrombosis (DVT), yielding a VTE incidence rate of 4.5%. No cases of pulmonary embolism (PE) were reported, and no mortality occurred within the 90-day postoperative observation period.

These findings suggest that aspirin, when administered as a single pharmacological agent along with mechanical prophylaxis and early mobilization, is effective in reducing the incidence of VTE after THR and TKR. The observed DVT rate of 4.5% and absence of PE or death fall well within the historical range reported in literature (1–10%) for patients receiving thromboprophylaxis. This outcome supports the continued relevance of aspirin, especially in settings where cost, accessibility, or patient-specific contraindications limit the use of low molecular weight heparin or newer oral anticoagulants. While recent guidelines increasingly recommend more aggressive pharmacological strategies, this study reinforces the potential of aspirin as a viable, safe, and economical alternative for VTE prevention in select patient populations.

Table 1: Master Table: Summary of Patient Characteristics and Outcomes (n = 22)

Parameter	Category	Count	Percentage (%)
Gender	Male	9	40.9
	Female	13	59.1
Type of Surgery	Total Knee Replacement (TKR)	12	54.5
	Total Hip Replacement (THR)	10	45.5
DVT Risk Level	Low	5	22.7
	Moderate	15	68.2
	High	2	9.1
Doppler Performed	Yes	4	18.2
	No	18	81.8
DVT Confirmed on Imaging	Yes	1	4.5
	No	21	95.5
Fatal Pulmonary Embolism (PE)	Yes	0	0
	No	22	100
All-Cause Mortality	Yes	0	0
	No	22	100
Wells Score	Mean ± SD	1.41 ± 0.96	-

DISCUSSION

The use of aspirin as a sole pharmacological agent for venous thromboembolism (VTE) prophylaxis in patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA) has garnered substantial attention in recent years due to its accessibility, affordability, and safety profile. This retrospective analysis contributes to the growing body of evidence supporting aspirin's efficacy in VTE prevention following major orthopedic procedures.

Several large-scale studies and trials have explored aspirin's potential in this domain. Anderson et al. reported that aspirin was non-inferior to low-molecular-weight heparin (LMWH) in preventing symptomatic VTE following hip or knee replacement, with fewer bleeding events observed in the aspirin group.[11] This finding has significantly influenced guidelines favoring aspirin in selected patients. Our study findings are in line with this conclusion, with minimal thromboembolic events observed among patients administered aspirin monotherapy postoperatively.

Nielen et al. analyzed national data from the Netherlands and found no statistically significant difference in postoperative VTE incidence between patients administered aspirin and those given LMWH or direct oral anticoagulants (DOACs), reinforcing aspirin's role as a reliable prophylactic agent.[12] Furthermore, aspirin use was associated with lower rates of gastrointestinal bleeding and hematoma formation. Our study's lack of significant bleeding complications further supports its favorable safety profile.

A randomized trial conducted by Parvizi et al. demonstrated that extended prophylaxis with aspirin beyond hospital discharge effectively reduced the risk of VTE in patients undergoing arthroplasty, with comparable outcomes to more potent anticoagulants.[13] These outcomes are consistent with our data, where VTE events were rare despite patients being on aspirin alone during the postoperative period. It is important to recognize that the effectiveness of aspirin may differ based on

patient-specific risk stratification. The CRISTAL trial showed that although aspirin was effective in preventing VTE, LMWH had slightly better outcomes in high-risk patients, such as those with a prior history of thromboembolism or active cancer.[14] This emphasizes the importance of individualized prophylaxis plans. Our retrospective data mostly included patients with low-to-moderate VTE risk, which may explain the low event rate seen with aspirin monotherapy.

In addition to its efficacy and safety, aspirin holds logistical and economic advantages over other anticoagulants. It is inexpensive, widely available, requires no routine monitoring, and has a well-known side effect profile.[15] These characteristics make it an appealing choice, especially in resource-constrained settings or in patients for whom the use of stronger anticoagulants is contraindicated.

Despite these advantages, several studies have also indicated that aspirin should not be universally applied. Anderson and colleagues cautioned that in high-risk patients, aspirin alone may not be sufficient, and combining mechanical prophylaxis or selecting a more potent agent may yield better outcomes.[16] Our study reinforces this principle, suggesting that patient selection is crucial for aspirin's success as monotherapy.

Furthermore, research by Bala et al. proposed an algorithmic approach to VTE prophylaxis, incorporating aspirin as the first-line agent in low-risk patients while reserving LMWH or DOACs for high-risk groups.[17] This stratified strategy aligns well with our findings and supports the integration of aspirin into VTE prevention protocols under appropriate circumstances.

Recent orthopaedic consensus guidelines have begun to include aspirin as a viable option for VTE prophylaxis, particularly after short-stay arthroplasty procedures or in enhanced recovery pathways.[18] As same-day surgeries and early discharge protocols become more common, the simplicity of aspirin further strengthens its candidacy.

The ongoing PEPPER trial (Pulmonary Embolism Prevention after Hip and Knee Replacement) is expected to shed more definitive light on aspirin's comparative efficacy against rivaroxaban and warfarin in a randomized design. Interim results suggest non-inferiority, which may consolidate aspirin's role in the orthopedic setting.[19]

Lastly, patient adherence and satisfaction with aspirin are generally higher than with injectable anticoagulants. This improved compliance may also contribute to its effectiveness in real-world settings, where nonadherence is a significant barrier to VTE prevention.[20]

In conclusion, our study, in agreement with existing literature, demonstrates that aspirin is an effective, safe, and practical choice for VTE prophylaxis following knee and hip replacement surgeries in appropriately selected patients. While it may not be the best option for high-risk populations, its advantages in safety, cost, and convenience justify its inclusion in prophylactic protocols in low to moderate-risk cases. However, further high-quality, randomized, multi-center trials are warranted to confirm these observations and help refine prophylaxis guidelines.

Limitations

This study, though informative, has several limitations that must be acknowledged. Firstly, it is a retrospective analysis, which inherently limits the ability to establish causality between aspirin use and the prevention of venous thromboembolism (VTE). The data collection was dependent on existing hospital records, which may be incomplete, inconsistent, or subject to documentation bias. Patients who may have developed VTE outside the study hospital or presented elsewhere could have been missed, potentially underestimating the true incidence.

Secondly, the sample size of 22 patients is relatively small. While calculated based on prior incidence rates, this small cohort restricts the statistical power of the study and limits the generalizability of the findings to the wider population undergoing total hip or knee arthroplasty. Rare complications and subtle differences in efficacy between various prophylactic strategies may not be detectable in such a limited sample.

Additionally, the absence of a control group using alternative anticoagulants such as low molecular weight heparin or direct oral anticoagulants precludes a direct comparison of effectiveness and safety. The outcomes were also not stratified by specific risk factors like BMI, comorbidities, or surgical duration, which may influence VTE risk and prophylaxis efficacy.

Lastly, the follow-up period was limited to 90 days post-surgery. While this timeframe captures most early postoperative thromboembolic events, late-onset complications might be missed. The reliance on symptomatic presentation for VTE detection also excludes cases of asymptomatic VTE, which may have clinical relevance.

Future studies should focus on prospective, randomized controlled designs with larger, diverse populations, longer follow-up periods, and include comparison arms to validate these findings more robustly.

CONCLUSION

Aspirin, as a sole pharmacological agent, appears to be effective and safe for venous thromboembolism (VTE) prophylaxis following total hip and knee arthroplasty, with a low incidence of symptomatic VTE observed in this study. Its affordability, ease of administration, and favorable safety profile make it a viable alternative, particularly in resource-limited settings. However, larger prospective studies are needed to confirm these findings and guide broader clinical adoption.

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