RESEARCH ARTICLE

Safety and Efficacy of Aspirin in Thromboprophylaxis After Total Hip Arthroplasty: A Retrospective Study

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Abstract

Objectives: This study aimed to evaluate the safety and efficacy of aspirin as a standalone thromboprophylaxis (TP) treatment following elective total hip arthroplasty (THA). Additionally, it compares the primary and secondary outcomes related to efficacy and safety, respectively, between aspirin and enoxaparin.

Methods: A retrospective review was conducted of 2,107 patients who underwent primary or revision total hip arthroplasty (THA) between 2011 and 2017. Low-risk patients received aspirin (325 mg twice daily for 4 weeks), while high-risk patients were administered enoxaparin (4,000 units once daily for 2 weeks). The outcomes assessed included symptomatic deep vein thrombosis (DVT) or pulmonary embolism (PE), hematoma, bleeding, infection, and 90-day mortality.

Results: The incidence of symptomatic deep vein thrombosis (DVT) requiring treatment in the aspirin group was 0.10% (2/1,905), whereas no cases were observed in the enoxaparin group. The rate of fatal pulmonary embolism (PE) was 0.05% (1/1,905) in the aspirin group, compared to 0.49% (1/202) in the enoxaparin group. Gastrointestinal (GI) bleeding occurred in 0.05% (1/1,905) of the aspirin group and 0.49% (1/202) of the enoxaparin group. The incidence of periprosthetic joint infection (PJI) was 0.15% (3/1,905) in the aspirin group, compared to 0.49% (1/202) in the enoxaparin group.

Conclusion: As a standalone TP agent, aspirin is at least as effective as potent anticoagulants for patients undergoing elective THA, with comparable safety and efficacy profiles.

Level of evidence: IV

Keywords: Aspirin, Enoxaparin, Hip arthroplasty, Thromboprophylaxis, Venous thromboembolism

Introduction

Venous thromboembolism (VTE) is a significant complication associated with total hip arthroplasty (THA).[1,2] Early reconstructive procedures performed without routine thromboprophylaxis (TP) reported an incidence of venous thrombosis as high as 50%. By 1990, the implementation of routine TP had reduced the incidence of deep vein thrombosis (DVT) following THA to 13–20%.[3-5] This underscores the critical importance of routine TP in THA. However, to date, no consensus exists regarding the optimal TP method for patients undergoing THA.[6,7]

The effectiveness of thromboprophylaxis (TP) lies in balancing the prevention of venous thromboembolism (VTE) with minimizing adverse events such as bleeding, hematoma, and infection.[6,8-11] Commonly used anticoagulants include enoxaparin, warfarin, aspirin, and newer oral anticoagulants. The first two are often considered more potent TP agents.[12-14] However, higher potency does not necessarily equate to greater efficacy or safety in VTE prevention. Enoxaparin has been associated

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with increased rates of bleeding, hematoma formation, wound complications, and subsequent infections.[12,15-17] In contrast, aspirin has demonstrated comparable efficacy to more potent anticoagulants, with significantly lower rates of adverse events.[6,18,19]

Although significant advancements have been made in arthroplasty, preventing and managing thromboembolic events (TE) remains a complex challenge. The optimal thromboprophylaxis (TP) strategy has yet to be clearly defined and continues to be a subject of debate among surgeons. In this study, we reviewed 2,107 patients to evaluate the safety and efficacy of aspirin as a standalone TP treatment following total hip arthroplasty (THA). The study aims to assess aspirin's safety and efficacy profile and compare the primary and secondary outcomes related to efficacy and safety, respectively, with those of enoxaparin.

Materials and Methods

Patients

A retrospective database review was conducted to identify all patients who underwent primary or revision total hip arthroplasty (THA) between January 2011 and December 2017 (7 years). A single surgeon performed all procedures. The inclusion criteria consisted of low-risk patients for venous thromboembolism (VTE) who were treated exclusively with aspirin following THA. High-risk patients treated with enoxaparin were included for comparison. Exclusion criteria included incomplete VTE data, intolerance or contraindications to aspirin, and patients already receiving other anticoagulants. The review divided patients into two groups: the Aspirin group and the Enoxaparin group.

High-risk patients were defined as those with a history of venous thromboembolism (VTE), chronic anticoagulant use, active cancer, thrombophilia, or classified as VTE risk class C. Contraindications to aspirin included a known allergy to aspirin, a recent history of gastrointestinal (GI) or intracranial bleeding, active peptic ulcer, thrombocytopenia, and liver disease.

Thromboprophylaxis Protocol

Aspirin (325 mg) was administered twice daily, starting on the day of surgery and continuing for 4 weeks. High-risk patients received enoxaparin sodium (4,000 units) subcutaneously once daily, initiated on the day of surgery and continued for up to 2 weeks. No additional mechanical thromboprophylaxis measures were used. Patients underwent spinal or general anesthesia, as determined by the anesthesiologist, and mobilization commenced on the first postoperative day.

Outcome Measures and Comparison

The primary efficacy measure was the occurrence of symptomatic deep vein thrombosis (DVT) or pulmonary embolism (PE) within 3, 6, or 12 weeks after surgery, requiring treatment. Secondary safety measures included hematoma, bleeding, infection, and the 90-day mortality rate. The outcomes of the Aspirin group were compared to previously published data on thromboprophylaxis (TP) following lower-limb arthroplasty. Additionally, outcomes were compared between the Aspirin and Enoxaparin groups.

Doppler sonography was used to identify the site of thrombosis in cases of deep vein thrombosis (DVT), while pulmonary computed tomography (CT) scans were utilized to diagnose pulmonary embolism (PE). Gastrointestinal bleeding was confirmed through endoscopy or colonoscopy. Infections were defined according to periprosthetic joint infection (PJI) guidelines and confirmed through arthrocentesis. The medical records of patients readmitted within 90 days were reviewed to determine the cause of readmission and identify any wound-related complications. Patients with four or more comorbidities were also noted, which may influence primary outcomes.

Results

Patient demographics are summarized in [Table 1]. A total of 2,107 patients were included, comprising 1,855 primary total hip arthroplasty (THA) cases and 252 revision cases. Of these, 202 high-risk patients received enoxaparin for thromboprophylaxis (TP), while the remaining 1,905 low-risk patients were treated with aspirin alone. Table 2 presents the primary and secondary outcomes. The mean age of patients was 64.6 years (range: 21–90), with 935 males and 1,182 females. The average body mass index (BMI) across all patients was 29.6 [Table 2].

The incidence of symptomatic deep vein thrombosis (DVT) requiring treatment was 0.10% (2/1,905) in the aspirin group, which was comparable to the enoxaparin group and consistent with rates reported in prior studies (P = 0.9). The incidence of fatal pulmonary embolism (PE) was 0.05% (1/1,905) in the aspirin group versus 0.49% (1/202) in the enoxaparin group, with a statistically significant P-value of 0.001, though the difference is clinically insignificant.

Gastrointestinal (GI) bleeding occurred in 0.05% (1/1,905) of the aspirin group and 0.49% (1/202) of the enoxaparin group (P = 0.8). The incidence of periprosthetic joint infection (PJI) was 0.15% (3/1,905) in the aspirin group and 0.49% (1/202) in the enoxaparin group (P = 0.9).

Table 1. Patient demographics

	Aspirin	Enoxaparin	P value
Age (mean)	61± 8.6	67± 5.6	0.01
Gender			
Male	789	146	0.34
Female	1116	66	

Table 1. Continued			
BMI (mean)	29.4±5.5	29.7±5.2	0.19
Charlson Comorbidity			
<4	1566	123	0.04
>4	339	79	

Table 2. Results of primary and secondary outcome

Complications	Aspirin	Enoxaparin	P value
DVT	2	0	0.9
Symptomatic PTE	0	0	1
Fatal PE	1	1	0.001
GI bleeding	1	1	0.8
PJI	3	1	0.9

Discussion

Thromboprophylaxis (TP) following total joint arthroplasty is generally categorized into mechanical and pharmacological modalities.[20,21] Mechanical methods, which are widely favored by orthopedic surgeons, include pneumatic lower limb compression, early mobilization, and active calf-foot pumping exercises.[20,22,23] Several pharmacological agents are employed for chemical TP, with aspirin, enoxaparin, and warfarin being among the most commonly used.[24,25] Although arthroplasty has significantly improved, preventing and managing thromboembolic events (TE) remains increasingly challenging. The optimal method of TP has yet to be definitively established and continues to be a topic of debate among surgical professionals.

Many surgeons have adopted multimodal approaches, combining mechanical and pharmacological agents to achieve near-optimal thromboprophylaxis (TP) following arthroplasty. Several studies have demonstrated favorable outcomes,[20,26,27] while a few have raised concerns about the unjustified and excessive use of thromboprophylactic agents.[24, 28-30] Despite this, the consensus among surgeons is to implement a risk-stratified approach to TP following major arthroplasty procedures.[20,31] This study compared the outcomes of a low-profile single-agent TP regimen with those of more potent multimodal therapies.

Aspirin is a time-tested therapy for managing venous thromboembolism (VTE), and it has been used as a thromboprophylaxis (TP) agent since 1971. Numerous studies have supported the role of aspirin in VTE prevention, demonstrating its efficacy as an optimal TP agent.[32-34] Several guidelines, outlined in Table 3, endorse aspirin for TP [Table 3]. A randomized trial has affirmed aspirin's safety and non-inferiority, even for extended therapy.[32] Preliminary studies and meta-analyses have further validated aspirin as a safe option, with lower rates of adverse events such as gastrointestinal bleeding and hematoma, while also proving effective in preventing deep vein thrombosis (DVT) and pulmonary embolism (PE).[33,35,36] Our study shows that aspirin, as a solitary TP agent, is at least as effective as potent anticoagulants like enoxaparin, with results comparable to those from multimodal therapies. Various dosages of aspirin have been advocated, but we adhered to a 325 mg twice-daily regimen, which falls within the higher dose range. Despite this, our patients experienced excellent secondary outcomes, with low rates of adverse events.

Potent anticoagulants, including low molecular weight heparin (LMWH), have been associated with higher rates of gastrointestinal bleeding, hematoma formation, wound complications, and subsequent infection.[15,37] These adverse outcomes have raised concerns about the safety profile of enoxaparin sodium. However, the primary question addressed in this study is whether increased potency correlates with enhanced effectiveness. Our results indicate otherwise. Despite being classified as a potent anticoagulant, the primary outcomes in the enoxaparin group did not show a statistically significant difference compared to the aspirin group. Therefore, we conclude that aspirin is not inferior to enoxaparin in terms of efficacy and offers a superior safety profile.

A cost-effectiveness study on venous thromboembolism (VTE) prophylaxis in total joint arthroplasty (TJA) over 20 years in North America highlighted significant differences in the health economics of aspirin and enoxaparin prophylaxis.[38,39] he daily cost of enoxaparin is $8, with a total cost of $224 per patient for a single course following TJA. Given approximately 50,000 TJAs annually, this results in $11,200,000 annually. In contrast, aspirin costs $0.0006 per day, $0.0168 per course, and $840 per year for 50,000 TJAs in North America. A practice pattern survey from the American Association of Hip and Knee Surgeons (AAHKS) showed a 20% increase in aspirin prophylaxis usage, with or without mechanical augmentation, over the past two years.[40,41] This significant cost difference has led many surgeons to adopt and favor aspirin as a thromboprophylaxis (TP) agent.

Limitations

This is not a randomized controlled trial but a prospective study based on a retrospective database. The low number of patients in the enoxaparin group may have influenced the comparison of outcomes. However, our results are consistent with previously published studies using data from low molecular weight heparin (LMWH). We also encountered a loss of a few patients during follow-up.

Conclusion

Aspirin is effective for venous thromboembolism (VTE) prophylaxis in most patients undergoing total hip arthroplasty (THA). As demonstrated in this study, its safety and efficacy align with existing literature and are supported by various guidelines and clinical practice patterns. However, we recommend a risk-stratified approach to VTE prophylaxis.

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Authors who conceived and designed the analysis: Seyed Mohammad Javad Mortazavi, Omid Shahpari/ Authors who collected the data: Furqan Mohammed Yaseen Khan, Mohammad Reza Barzegar, Mohammad Ali Ghasemi, Seyyed Hossein Shafiei /Authors who contributed data or analysis tools:Seyed Mohammad Javad Mortazavi/ Authors who wrote the paper: Mohammadreza Razzaghof, Furqan Mohammed Yaseen Khan, Ahmad Abbaszadeh

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