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Examination of venous thromboembolism prophylaxis in patients undergoing total knee arthroplasty

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Elective total knee arthroplasty (TKA) is the most frequently performed inpatient surgical procedure in the United States (Kantz, Ong, Lau, Mowat, & Halpern, 2007). Complications associated with TKA include deep vein thrombosis (DVT) and pulmonary embolism (PE), collectively referred to as venous thromboembolism (VTE). Various pharmacological agents exist for VTE prophylaxis. Warfarin and low-molecular-weight heparins (LMWH) were commonly used for VTE prophylaxis in the past, but with the emergence of novel anticoagulants including factor Xa inhibitors and direct thrombin inhibitors (DTIs), warfarin is used far less frequently. Aspirin is also approved for VTE prophylaxis. The purpose of this study was to determine if a superior drug or combination of drugs exists for VTE prophylaxis based on patient outcomes, cost effectiveness, and risk profile. This review of literature and meta-analysis examined the past 10 years of aspirin, warfarin, Leiden, and the novel anticoagulants for VTE prophylaxis in post-operative TKA. Studies outcome included VTE incidence, bleeding risk, and cost. Reversal agents were also examined. Findings of this author’s literature review demonstrated that currently, no one superior medication exists for prophylaxis of VTE in events in patients undergoing TKA (Calti et al., 2017). However, current research indicates that both factor Xa inhibitors and aspirin have emerged as the medications of choice. Of the two, aspirin is considered as it does not require a laboratory monitoring, it is cost effective, and it is available over the counter. It also has less risk of major bleeding compared to factor Xa inhibitors.

Literature Review

An online database search of PubMed, Dynamed, Cochrane, and Science Direct were used to select articles that were considered in this review. Search terms included warfarin, LMWH, factor Xa inhibitors, and direct thrombin inhibitors. The overall rates of DVT and PE in the THA and TKA populations were 1.2% and 0.66%, respectively. The rate of major bleeding was 0.3%, and the pooled mortality rate was 0.2%. The researchers concluded that aspirin used both alone and in combination for thromboprophylaxis resulted in a low rate of VTE and major bleeding complications.

Wilson et al. (2016) performed a systematic review of all studies investigating the efficacy of aspirin for DVT prophylaxis compared to warfarin, enoxaparin, factor Xa inhibitors, and direct thrombin inhibitors following THA and TKA.

Wilson et al. (2016) concluded that insufficient evidence existed to establish one medication as superior and that each had a unique side effect profile to be considered when choosing a prophylactic agent.

Vincent et al. (2009) performed a systematic review to determine the efficacy of aspirin in preventing VTE in patients undergoing TKA or THA.

The study concluded that although aspirin used both alone and in combination for thromboprophylaxis resulted in a low rate of VTE and major bleeding complications. This study demonstrated that aspirin can be used as a sole means of VTE prophylaxis in postoperative TKA patients.

Stewart et al. (2013) evaluated the suitability of aspirin in prevention of VTE in high-risk orthopedic surgery patients. After analysis, researchers were unable to conclude whether aspirin was a safe and effective option for VTE prophylaxis in high-risk patients undergoing TKA, or hip fracture surgery. They concluded that although the data for aspirin is limited, its simplicity and cost-effectiveness make it a reasonable option for use in high-risk patients. The availability of rivaroxaban may improve the efficacy of DVT prevention. Factor Xa inhibitors are costlier and require regular monitoring. However, the dosing regimen is simple and consists of one 81 mg tablet twice daily for six weeks postoperatively. Furthermore, in the case of overdose, a reversal agent is available. Clinicians must be prudent in analyzing each patient’s DVT risk profile to see if aspirin is the correct choice.

The researchers found that rivaroxaban was associated with a cost savings of $465.74 per patient and prevented an average of 0.0193 symptomatic VTE events per patient. Sensitivity analysis demonstrated a cost savings ranging from $295.03 to $488.68.

Mostafavi et al. (2015) examined the cost effectiveness of aspirin compared to warfarin in TKAs. The researchers used a Markov cohort cost effectiveness analysis which compared the costs, health benefits, and the costs per quality adjusted life year (QALY) for patients to 55-85 years of age. The results of their analysis revealed aspirin was more cost effective than warfarin in the majority of patients undergoing TKA. In patients with a high probability of VTE and a low probability of bleeding, however, warfarin was more cost effective.

Khoshnevis and Haddad (2017) performed a cost-effectiveness study using a decision analytic model that was developed for the purpose of analyzing various anticoagulation regimens for patients undergoing TKA from a United States payer’s perspective. The approach was to determine if a superior drug or combination of drugs exist for VTE prophylaxis based on patient outcomes, cost effectiveness, and risk profile. The researchers concluded that aspirin was more cost effective than warfarin in the majority of patients undergoing TKA.

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Evaluating the antiplatelet and anti-inflammatory properties of aspirin, the purpose of this study was to determine if a superior drug or combination of drugs exists for VTE prophylaxis based on patient outcomes, cost effectiveness, and risk profile. This review of literature and meta-analysis examined the past 10 years of aspirin, warfarin, Leiden, and the novel anticoagulants for VTE prophylaxis in post-operative TKA. Studies outcome included VTE incidence, bleeding risk, and cost. Reversal agents were also examined. Findings of this author’s literature review demonstrated that currently, no one superior medication exists for prophylaxis of VTE in events in patients undergoing TKA (Calti et al., 2017). However, current research indicates that both factor Xa inhibitors and aspirin have emerged as the medications of choice. Of the two, aspirin is considered as it does not require a laboratory monitoring, it is cost effective, and it is available over the counter. It also has less risk of major bleeding compared to factor Xa inhibitors.

Conclusion

Among the current pharmacologic options for VTE prophylaxis following TKA, does a superior drug or combination of drugs exist based on patient outcomes?

The researchers concluded that aspirin was a safe and effective option for VTE prophylaxis in patients undergoing TKA. Aspirin had the lowest DVT incidence. At six weeks, both aspirin and factor Xa inhibitors had demonstrated comparable outcomes, with only a slightly increased risk of VTE as noted above and are available for a fraction of the cost of factor Xa inhibitors. Warfarin continues to be the drug of choice in patients with mechanical heart valves requiring chemoprophylaxis.

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Which of the current pharmacologic VTE prophylaxis options demonstrates the greatest cost effectiveness with the fewest risks?

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Which of the current pharmacologic VTE prophylaxis options demonstrates the greatest cost effectiveness with the fewest risks?

Medication cost incurred by the patient is difficult to determine due to varying insurance coverage and out of pocket expenses. A website (www.goodrx.com) was utilized to obtain average cost of each medication. The following costs do not include any insurance coverage. The cost of 365 aspirin (81 mg tablets) was $5.70. The cost of 60 apixaban (5 mg tablets) was $545. Since the implementation of VTE prophylaxis, a reduction in VTE complications by 2030 (Kurtz, Ong, Lau, Mowat, & Halpern, 2007). Well

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