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Risk-Stratified Venous Thromboembolism Prophylaxis After Total Joint Arthroplasty: Aspirin and Sequential Pneumatic Compression Devices vs Aggressive Chemoprophylaxis

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ABSTRACT

Background: Venous thromboembolism (VTE) is a major concern after total joint arthroplasty (TJA). We evaluated a risk-stratified prophylaxis protocol for patients undergoing TJA.
Methods: A total of 2611 TJA patients were retrospectively studied. Patients treated with an aggressive VTE chemoprophylaxis protocol were compared with patients treated with a risk-stratified protocol utilizing aspirin and sequential pneumatic compression devices (SPCDs) for standard-risk patients and targeted anticoagulation for high-risk patients.
Results: We found equivalence in terms of VTE prevention between the 2 cohorts. There was a decrease in adverse events and readmissions among the risk-stratified cohort, although this did not reach statistical significance. A statistically significant reduction in costs ($P < .001$) was experienced with the use of aspirin/SPCDs compared with aggressive anticoagulation agents within the risk-stratified cohort.
Conclusion: The use of aspirin/SPCDs in a risk-stratified TJA population is a safe and cost-effective method of VTE prophylaxis.

As our understanding of the risk of venous thromboembolic (VTE) disease after total joint arthroplasty (TJA) improves and the number of available prophylactic options increases, practitioners continue to debate what constitutes the optimal VTE prevention protocol. Historically, the incidence of VTE among TJA patients without prophylaxis is reported to be nearly 50% [1]. Despite advances in VTE prevention with current prophylaxis measures, an estimated 0.3%-4.3% of patients will have a clinically symptomatic deep vein thrombosis (DVT) [2,3], whereas 0.14%-1.1% [4,5] experience a symptomatic pulmonary embolism after TJA. The incidence of VTE increases the morbidity and mortality associated with TJA [6]. Furthermore, patients who sustain a VTE have longer hospital stays, increased rates of readmission, and overall higher health care costs [5,7]. The demand for total knee arthroplasty (TKA) and total hip arthroplasty (THA) is predicted to grow significantly in the coming years necessitating the optimization of prophylaxis measures to decrease the utilization of health care resources and improve the morbidity and mortality associated with TJA operations.

The choice of VTE prophylaxis is a balance between safety and efficacy. Traditionally, aggressive anticoagulation agents such as low molecular weight heparin, vitamin K antagonists, and factor Xa inhibitors have been the standard of care in the prevention of VTE disease. Despite their proven efficacy in VTE prevention, these agents are potentially associated with increased complications, including: bleeding, infection, wound problems, and need for readmission and/or reoperation [8,9]. In an effort to reduce these complications, clinicians explored the use of less aggressive means of prophylaxis. These methods include aspirin and sequential pneumatic compression devices (SPCDs). SPCDs are effective in preventing VTE regardless of the chosen pharmaceutical prophylaxis agent [10,11]. These devices are believed to decrease clot formation in the lower extremity by increasing the velocity of venous blood flow along with stimulating the release of endothelial-derived relaxing factors that may decrease clot formation [12].

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The latest American Academy of Orthopaedic Surgery (AAOS) and the American College of Chest Physicians (ACCP) VTE prevention guidelines include aspirin and SPCDs as an acceptable form of VTE prophylaxis after TJA if the patients do not have other risk factors for VTE [13,14].

Despite several studies evaluating the efficacy and safety profile of anticoagulation, there is no clear consensus on the ideal strategy for each individual patient. At our institution, we implemented a risk-stratified VTE prophylaxis protocol consistent with the guidelines from AAOS and ACCP. Our aim was to use the least aggressive, clinically effective form of VTE prophylaxis appropriate for the individual patient risk factors. Through a risk-stratification protocol, we aim to lower or maintain our incidence rates of VTEs, while minimizing the side effects of the chemoprophylaxis. Our hypothesis is that patients who undergo risk stratification to individualize their anticoagulation regimen would show no difference in the rate of VTEs while decreasing the risks associated with aggressive chemoprophylaxis.

Material and Methods

Patients

This is an institutional review board–approved study conducted at a single academic institution. Using our electronic medical record system, we identified patients who underwent TJA between the dates of October 2013 and October 2014. Our inclusion criteria for this study were any patients who had a primary, revision, or bilateral total knee or hip arthroplasty. We excluded the month of April 2014, as this period was a transition month when the postoperative venous thromboembolism prophylaxis protocol was updated to implement the risk-stratification strategy based on the presence of risk factors. A total of 2611 patients who underwent a total knee or hip arthroplasty were included in this study.

Patients were divided into 2 cohorts; those who received TJA from October 2013 to March 2014 (cohort 1) and those who received TJA from May 2014 to October 2014 (cohort 2). All patients in cohort 1 received aggressive anticoagulation regardless of the presence of risk factors. A department-wide risk-stratification protocol was adopted during the period for cohort 2. TJA patients were classified as either high or standard risk for venous thromboembolism (Fig. 1).

Risk Stratification

Medical charts of patients in cohort 2 were reviewed, and those with one or more of the following risk factors were placed in the high-risk group: history of prior DVT or pulmonary embolism, active cancer treatment, body mass index >40, or current smoker. These patients received aggressive prophylaxis with either enoxaparin (40 mg subcutaneous daily for 2-4 weeks), rivaroxaban (10 mg oral daily for 14 days), or warfarin (target international normalized ratio 2-3). Patients with no risk factors were deemed to be standard risk and placed on the aspirin and/or SPCDs protocol. Standard-risk patients were instructed to take a 325 mg enteric-coated aspirin twice daily for 28 days and discharged with an SPCD (ActiveCare + S.F.T device, Medical Compression Systems or Akiva, Israel) for their bilateral lower extremities to be worn 20 hours daily for a period of 28 days. SPCDs devices used were lightweight (1.65 lb), mobile units that could be powered with the use of a rechargeable battery or AC/DC adapter. Standard-risk patients were instructed on the use of SPCDs including an educational video on the device use before discharge from the hospital.

Postoperative Care and VTE Surveillance

Each patient, regardless of cohort, received the same perioperative care. This included taking a 325 mg enteric-coated aspirin the evening before surgery and using SPCDs on the nonoperative limb during the operation. There was no difference in the physical therapy and rehabilitation received by patients in the 2 cohorts. Standard VTE monitoring was used with no additional surveillance measures. Patients with clinical symptoms of DVT received a duplex ultrasonography, whereas those with clinical symptoms suggesting

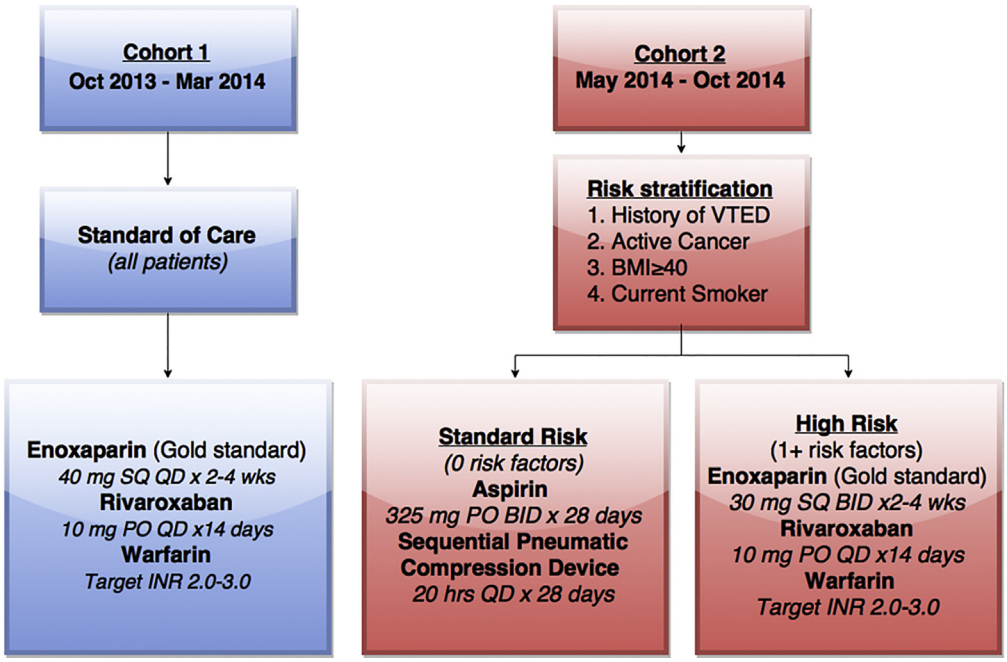

Fig. 1. Flowchart illustrating the VTE prophylaxis protocol before (cohort 1) and after (cohort 2) the implementation of a risk-stratification approach based on the presence of patient risk factors for VTE. BMI, body mass index.