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# Tranexamic Acid Can Be Administered to Arthroplasty Patients Who Receive Aspirin for Venous Thromboembolic Prophylaxis

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ABSTRACT

*Background:* Venous thromboembolism (VTE) is not uncommon after total joint arthroplasty (TJA). Various prophylactic agents have been used to minimize this complication after TJA. Numerous studies have demonstrated that acetylsalicylic acid (ASA) has equivalent efficacy to other agents in preventing VTE after TJA. However, some have expressed theoretical concern that ASA may not be an adequate VTE prophylaxis in TJA patients receiving tranexamic acid (TA), which is an antifibrinolytic agent. The purpose of the study was to assess the safety and efficacy of administering systemic TA in TJA patients who also received ASA for VTE prophylaxis.

*Methods:* A retrospective study was conducted on 2835 consecutive patients (1678 receiving TA and 1157 not receiving TA) who underwent primary or revision TJA between January 2013 and June 2014 and also received aspirin for VTE prophylaxis. The incidence of symptomatic deep vein thrombosis and pulmonary embolism was evaluated.

*Results:* Blood loss and transfusion rates were significantly lower in the TA group compared to the non-TA group ($P < .0001$, $P = .017$, respectively). The incidence of VTE, bleeding events, and wound complications was similar ($P > .05$) between the groups.

*Conclusion:* In patients undergoing TJA who receive ASA for VTE prophylaxis, TA reduces bleeding and transfusions without increasing the incidence of subsequent VTE.



Venous thromboembolism (VTE) is a potentially fatal complication after total joint arthroplasty (TJA). The 3 main risk factors for VTE are hypercoagulability, endothelial injury, and venous stasis. During TJA, all these 3 elements for formation of VTE are commonly present. Warfarin or other chemical prophylactic agents have traditionally been used for prophylaxis against VTE; however, the use of warfarin results in greater bleeding and increased surgical site infection. [1] Recently, and based on emerging evidence endorsing its efficacy, acetylsalicylic acid (ASA) has been gaining popularity for VTE prophylaxis after TJA [2].

Recent evidence also has shown that tranexamic acid (TA) is very effective in reducing blood loss during TJA [3-6]. TA is a competitive inhibitor of plasminogen activation that interferes with fibrinolysis (Fig. 1) [7]. The mode of action of this agent is such that it prevents breakdown of formed clots and is not by itself a procoagulant [8]. Thus, administration of TA should not result in a higher incidence of VTE [9,10]. Aspirin, on the other hand, is a platelet aggregation agent that prevents formation of blood clots both in the venous and arterial circulation. Understanding the mode of action of aspirin and TA should provide enough confidence in that these agents should not interfere with each other and can be coadministered. The purpose of this study was to see if the use of TA increases the risk of thromboembolic disease in patients undergoing TJA with ASA as deep vein thrombosis (DVT) or pulmonary embolism (PE) prophylaxis.

## Materials and Methods

After institutional review board approval, we retrospectively reviewed our institutional prospectively collected TJA database to

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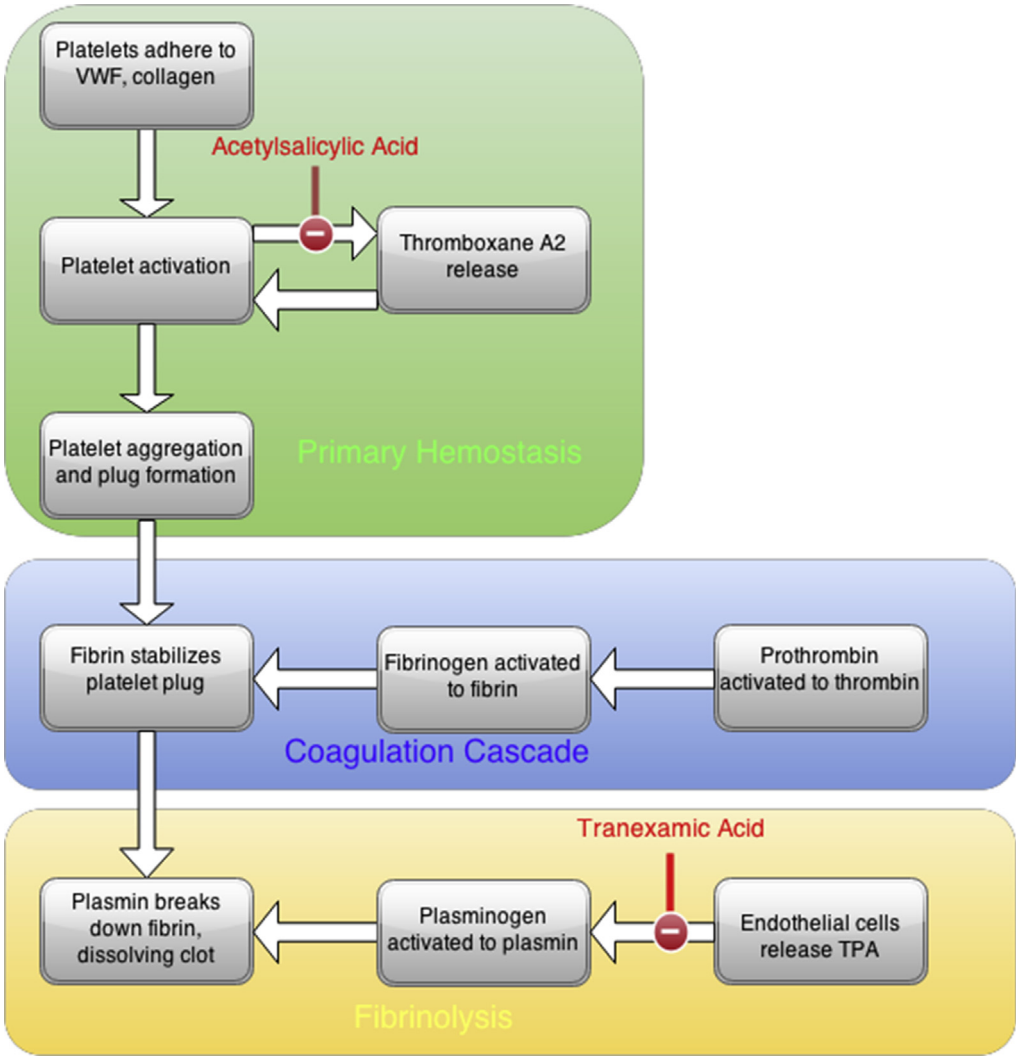


**Fig. 1.** Differing mechanisms of action for acetylsalicylic acid and tranexamic acid. VWF, Von Willebrand factor; TPA, tissue plasminogen activator.

identify 3375 patients who underwent primary or revision hip or knee arthroplasty between January 2013 and June 2014. During this period, patients received chemoprophylaxis for 4 weeks against VTE. Patients were evaluated for thromboembolic risk before surgery according to our risk assessment protocol [11]. The standard of care at our institution was ASA 325 mg bid for normal risk patients and warfarin or other potent anticoagulation for patients at high risk of VTE. In addition, intermittent pneumatic compression devices were initiated immediately after surgery and were continued during the hospital stay.

To minimize selection bias, patients who had previous events of PE (identified using *International Classification of Diseases, Ninth Revision* codes 415.11, 415.19, 416.2, and v12.55) or DVT (identified using *International Classification of Diseases, Ninth Revision* codes 453.40, 453.41, 453.42, 453.50, 453.51, 453.52, 453.6, or 453.9) were excluded from this study. Patients treated with thromboembolic prophylactic agents other than ASA (including warfarin, heparin, enoxaparin, oral factor Xa inhibitors, inferior vena cava filters, or any combination of VTE prophylactic drugs) were also excluded. After exclusions, 2835 patients receiving ASA after TJA constituted the final cohort of this study.

During the latter part of the study, patients undergoing TJA also received intravenous TA. Patients received a single dose of TA at 10 mg/kg dose approximately 20 minutes before incision. For knee arthroplasties, a tourniquet was inflated before the incision was made and released after the wound closure. TA was not administered in patients with cardiac stents and prior history of stroke.

The investigation for VTE at our institution is based on a previously published institutional protocol [12]. Patients exhibiting signs of tachypnea, dyspnea, tachycardia, new onset of arrhythmia, or chest pain are initially evaluated with pulse oximetry, electrocardiogram, chest x-ray, and a set of cardiac enzymes. Patients with desaturation <90% were treated with 2-L oxygen by nasal cannula for 10 minutes. If hypoxia persists, chest computed tomography angiography or ventilation–perfusion scan is performed. Patients with suspected PE are also investigated for DVT with ultrasound-duplex of the lower extremities.

Our institutional, prospectively collected database and electronic medical records were used to identify the following complications that occurred within the first 90 days postoperatively: symptomatic DVT or PE, local hematoma at the site of operation that required reoperation, bleeding in other organs (such as gastrointestinal or intracranial), periprosthetic joint infection, and mortality. Blood loss was calculated from the preoperative hematocrit levels, hematocrit levels 1 day after the surgery, and the volume of blood transfusion during the period between the 2 blood tests, according to a previously validated formula by Rosencher et al (Fig. 2) [13].