SCIENTIFIC ARTICLE

The Impact of Uninterrupted Warfarin on Hand and Wrist Surgery

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Purpose To determine the impact of uninterrupted use of warfarin on hand and wrist surgery.

Methods This single-center, prospective cohort trial enrolled adult patients undergoing hand and wrist surgery. Between May 2009 and August 2014, 47 surgical patients receiving uninterrupted warfarin (50 procedures) were enrolled and matched as a group by age and procedure type to 48 surgical patients (50 procedures) who were not prescribed warfarin. Complications, defined as bleeding, infection, or wound dehiscence requiring reoperation, were recorded for each group. Surgical outcome measures were composed of objective findings affected by surgical site bleeding (ie, ecchymosis extent, hematoma presence, 2-point discrimination) and standardized patient-rated assessments (*Quick*—Disabilities of the Arm, Shoulder, and Hand, and visual analog scales: pain and swelling). We collected data preoperatively and at 2 and 4 weeks postoperatively. Statistical analyses contrasted complications and outcomes data between patient groups.

Results One procedure (2%; 95% confidence interval, 0% to 11%) in a patient taking warfarin was complicated by hematoma requiring reoperation resulting from an elevated postoperative international normalized ratio of 5.4. There were no complications among controls (0%; 95% confidence interval, 0% to 7%). At 2 weeks postoperatively, patients receiving warfarin more frequently had hematomas (28% vs 10%) and demonstrated a greater extent of ecchymosis from the surgical incision (50 vs 19 mm). At 4 weeks, no differences existed in hematoma presence or extent of ecchymosis between groups. The incidence of transiently elevated 2-point discrimination was not different between groups (10% warfarin; 6% controls). Visual analog scores for pain and swelling were not significantly different between groups at any time. Differences in *Quick*—Disabilities of the Arm, Shoulder, and Hand scores between groups did not exceed a minimal clinically important difference.

Conclusions Uninterrupted use of warfarin in patients undergoing surgery of the hand and wrist was associated with an infrequent risk of bleeding complication requiring reoperation. Increased rates of hematoma and ecchymosis in patients taking warfarin normalized by 4 weeks postoperatively. *(J Hand Surg Am. 2015;40(11):2133–2140.*

Type of study/level of evidence Therapeutic II.

Key words Anticoagulation, hand, surgery, warfarin, wrist.

Warfarin is one of the most common anticoagulant medications used in North America, with over 23 million prescriptions annually.[1] Highly effective in preventing thromboembolic events, warfarin indirectly inhibits the activation of vitamin K–dependent factors through blockade of the enzyme vitamin K epoxide reductase.[2] Vitamin K–dependent factor inhibition reduces both clot

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formation (thrombosis) and migration (embolization).[2] In patients with nonvalvular atrial fibrillation, the rate of thromboembolism averages 4.5%/year but can be as high as 12% in patients with a previous history of cerebral embolism.[3–6] Anticoagulation therapy not only reduces the risk of stroke by 66%, it decreases the severity and improves the functional outcome if a stroke occurs.[3,7] Mechanical heart valves impart a thromboembolism risk averaging 8% each year. This risk is reduced by 75% with oral anticoagulation.[8] In patients with an acute episode of venous thromboembolism, anticoagulation therapy reduces the risk of reoccurrence by approximately 80%.[8]

Approximately 10% of patients receiving daily warfarin therapy will require an invasive surgical procedure each year.[9] Preparation for a surgical procedure is the most common reason for temporary interruption of anticoagulant medication.[10] Safe continuation of anticoagulation therapy has been documented in patients undergoing dermatologic surgery, endoscopic gastrointestinal surgery, and ophthalmologic surgery.[11–13] Anticoagulation therapy is frequently discontinued for major abdominal surgery and large joint surgery.[2] It is unclear exactly where hand and wrist surgery falls along the spectrum in terms of bleeding risk when performed while continuing anticoagulant medication. The temporary perioperative interruption of anticoagulant medications poses a substantial risk by increasing the risk of a thromboembolic event both during the period of cessation and potentially beyond.[10,14,15] In addition, the unintentional prolonged discontinuation of warfarin therapy is twice as likely in patients in whom the medication was stopped during the perioperative period.[16] Therefore, the risks of therapy continuation must be weighed against the risks of discontinuation.

This prospective cohort study was performed to assess the impact of the perioperative continuation of warfarin in patients undergoing surgery of the hand, wrist, or both. Our working hypothesis was that complications would remain rare despite the use of warfarin, considering prior trials demonstrating minimal complications after hand surgery without interrupting antiplatelet medications and 3 published investigations (2 retrospective) reporting safe continuation of perioperative warfarin for hand surgery.[17–20]

MATERIALS AND METHODS

Our institutional review board approved this prospective cohort study. From May 2009 through August 2014, all adult patients (aged 18 years or older) who underwent surgery of the hand or wrist by 1 of 5 hand fellowship–trained orthopedic surgeons at a single tertiary center were eligible for enrollment. Prospectively identified comparative groups were defined according to use of warfarin. Inclusion in the warfarin cohort required patient-reported consistent use of the anticoagulant medication warfarin with or without additional antiplatelet therapy. Patients reporting no intake of anticoagulant or antiplatelet medication were enrolled as controls. Control patients were undergoing hand and wrist surgery by the same surgeons during the study period. They were a nonconsecutive sample owing to competition with other ongoing investigations. As a group, the control patients were identical to patients taking warfarin except that they had no need for anticoagulation. We obtained written informed consent for all patients during preoperative office visits. Criteria for exclusion from both anticoagulant and control groups included a lack of English proficiency, inconsistent use of anticoagulant medication, perioperative discontinuation of an anticoagulant medication, surgery proximal to the distal radius metaphysis, and pregnancy. Patients considered to have inconsistent use of anticoagulant medications included anyone who reported taking warfarin less frequently than prescribed or missing doses at least weekly. Infrequently, patients mistakenly discontinued anticoagulant medication perioperatively, and they were excluded from the study. Patients taking daily warfarin were required to have an international normalized ratio (INR) less than 3.5 at the time of surgical indication when study enrollment was performed. Our institutional review board approval did not include reversing patients with INR values greater than 3.5 at presentation. Although the situation did not arise, we would have also excluded any patient after enrollment if they had an INR greater than 3.5 on the day of surgery. We did not study surgical procedures in the forearm or elbow because of a perceived increased risk of bleeding complications in surgeries that require dissection through muscle. Our group has routinely required discontinuation of antithrombotic medications owing to this perceived risk during forearm or elbow surgery. The use of nonsteroidal anti-inflammatory medication was not considered in patient classification or study eligibility because of widespread use universally unrelated to antithrombotic effects and difficulty patients had in accurately reporting dosage consumed.

Fifty procedures were performed on 47 patients taking warfarin during the perioperative period (Table 1). The warfarin cohort was composed of 25 men and 22 women, average age 67 years (range,