EDITOR'S CHOICE

The Effect of Anticoagulant and Antiplatelet Medications on Wide-Awake Hand Surgery: An Analysis of 2,162 Cases

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Purpose The purpose of the study was to determine if perioperative prescription anticoagulant (AC) or antiplatelet (AP) medication use increases the rate of revision surgeries or complications following wide-awake hand surgery performed under local anesthesia.

Methods All patients who underwent outpatient wide-awake hand surgery under local anesthesia without a tourniquet by two fellowship-trained orthopedic hand surgeons at a single academic practice over a 3-year period were included. Prescription history was reviewed to determine if any prescriptions were filled for an AC/AP drug within 90 days of surgery. All cases requiring revision were identified. Office notes were reviewed to determine postoperative complications and/or postoperative antibiotics prescribed for infection concerns. The number of revisions, complications, and postoperative antibiotic prescriptions were compared between patients who did, and did not, use perioperative AC/AP drugs.

Results A total of 2,162 wide-awake local anesthesia surgeries were included, and there were 128 cases (5.9%) with perioperative AC/AP use. Of the 2,162 cases, 19 cases required revision surgery (18 without AC/AP use and one with AC/AP use). Postoperative wound complications occurred in 42 patients (38 without AC/AP use and four with AC/AP use). Of the wound complications, four were related to postoperative bleeding, one case of incisional bleeding, and three cases of incisional hematomas (three without AC/AP use and one with AC/AP use). None of these patients required additional intervention; their incisional bleeding or hematoma was resolved by their subsequent office visit. Sixty-five patients received postoperative antibiotics for infection concerns (59 without AC/AP use and six with AC/AP use).

Conclusions Prescription AC/AP medication use in the perioperative period for wide-awake hand surgery performed under local anesthesia was not associated with an increased risk for revision surgery or postoperative wound complications. This study demonstrates the safety of continuing patients' prescribed AC/AP medications during wide-awake hand surgery. *(J Hand Surg Am. 2024;49(10):966–970.*

Type of study/level of evidence Prognosis IV.

Key words Anticoagulant, antiplatelet, WALANT, wide-awake hand surgery.

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Historically, anticoagulant (AC) and antiplatelet (AP) medications have been held prior to surgery in order to minimize the risk of intraoperative and postoperative bleeding complications. Similarly, for hand surgery procedures, tourniquets have been applied to lessen bleeding and provide improved visibility during surgery.[1] These strategies help provide a bloodless surgical field and therefore have been thought to be beneficial.[2,3] In recent years, multiple studies have demonstrated the safety of continuing aspirin, clopidogrel, and warfarin specifically during carpal tunnel release (CTR) surgery.[4–6]

Additionally, wide-awake local anesthesia surgery has become increasingly popular among hand surgeons.[7] With this technique, the patient receives tumescent anesthesia in the surgical field with the use of lidocaine for anesthesia and epinephrine for hemostasis. The use of epinephrine mitigates the need for a tourniquet. However, the management of perioperative AC or AP medication during wide-awake local anesthesia hand surgery has not been thoroughly studied.

The purpose of this study was to evaluate the safety of continuing AC and/or AP medications during wide-awake local anesthesia hand surgery. The hypothesis was that perioperative prescription AC or AP medication use is not associated with an increased rate of revision surgeries or wound complications following wide-awake local anesthesia hand surgery.

METHODS

Institutional review board approval was obtained, with a waiver of informed consent per institution protocol. Using our surgical database, all patients of two fellowship-trained orthopedic hand surgeons from a single academic institution, who underwent outpatient hand and wrist surgery using wide-awake local anesthesia over a 3-year period (1/1/2018 through 12/31/2020), were reviewed. A wide range of procedures were performed including CTR, trigger finger release, mass excision, tendon repair, and fracture repair. All procedures were performed with 1% lidocaine with 1:100,000 epinephrine. These procedures occurred in an operating room setting in either a hospital or ambulatory surgery center; no procedures took place in an office setting. Electrocautery was routinely used to assist with hemostasis, but adjunctive hemostatic agents such as tranexamic acid were not used. As a matter of routine practice, patients were instructed to continue all medications (including AC or AP medications) throughout the perioperative period. Also, as a matter of routine practice, preoperative antibiotics were not prescribed. Surgeries performed with sedation, regional anesthesia, or general anesthesia were excluded. The patients' current prescription medications as listed in the electronic medical record were reviewed to identify patients who were actively taking AC or AP medications at the time of surgery. For the purposes of this study, aspirin (81 mg or 325 mg) was not considered a prescription AP medication.

At a minimum of 1 year after surgery from the date of surgery, the surgical database was reviewed. Patients who underwent revision surgery following their initial procedure were identified. Bleeding-related postoperative complications were captured with a key word search through all patients' postoperative office notes for the words "hematoma," "seroma," "drainage," "dehiscence," and "infection." All office notes tagged by this search were reviewed to identify true postoperative complications, defined as a clear mention of a wound complication and with an additional description of the status of the complication in the subsequent office visit (ie, "resolving infection," "resolving hematoma," "continued wound dehiscence," etc). Any postoperative visit that included an antibiotic prescription was also recorded. For patients whose initial surgery involved irrigation and debridement, postoperative discussion of infection and antibiotic prescriptions was excluded in the wound complication and antibiotic prescription groups. Additionally, patient demographics were collected.

RESULTS

A total of 2,162 wide-awake hand surgeries were performed during the study period, consisting of 1,862 unique patients. The average patient age was 61 years (range: 11−101), and 47% were men. Perioperative AC/AP use occurred in 128 cases (5.9%) and 114 patients (6.1%). The AC/AP patients were predominantly men (71 men vs 43 women) The AC/AP patients were older (average age: 74 years; range: 36−100) compared with patients not using AC/AP medications. Among AC/AP patients, 55 solely used an AP medication, 61 solely used an AC medication, and 12 used a combination of multiple AC and/or AP medications. Antiplatelet medications included clopidogrel and ticagrelor. Anticoagulant medications included apixaban, dabigatran, enoxaparin, rivaroxaban, and warfarin. Table 1 describes the study cohort.

TABLE 1. Description of Study Cohort, Medications Used, and Procedures Performed

Study Cohort Demographics		Prescription AC/AP Medication Used	N	Procedures Performed	N
Total procedures	2,162	Clopidogrel	55	TFR	498
Total unique patients	1,862	Ticagrelor	10	CTR	481
Average age (y)	61 (11–101)	Apixaban	36	De Quervain release	89
Perioperative AC/AP use	128	Dabigatran	3	Mass excision	208
Men	71	Enoxaparin	6	Fracture fixation	130
Women	43	Rivaroxaban	16	Tendon repair	66
Average age	74 (36–100)	Warfarin	14	Dupuytren release	63
AC only	55			Other*	627
AP only	61				
Multiple medications	12				

AC, anticoagulant; AP, antiplatelet; CTR, carpal tunnel release; TFR, trigger finger release.
*Other procedures included a variety of cases as follows: nailbed repairs, revision amputations, flap advancements, foreign body removals, interphalangeal joint arthrodesis, tenolysis, etc.

TABLE 2. Overall Number of Wide-Awake Local Anesthesia Cases Performed, Along With Total Revisions, Postoperative Antibiotics, and Wound Complications*

	Total Cases	Revision Surgery	Postoperative Antibiotics Prescribed	Wound Complications
All	2162	19	65	42
No perioperative AC/AP use	2034	18 (0.88%)	59 (2.9%)	38 (1.9%)
Perioperative AC/AP use	128	1 (0.78%)	6 (4.7%)	4 (3.1%)

AC, anticoagulant; AP, antiplatelet.
**P* values based on chi-square analysis compared with overall number of cases with/without AC or AP use.

Of the 2,162 cases, 19 cases (0.88%) required revision surgery (18 without AC/AP use [0.88%] and one with AC/AP use [0.78%]; Table 2). The single revision that occurred in an AC/AP patient was not due to a bleeding-related complication but due to an infection in the setting of prior fingertip necrosis in the surgical digit. Postoperative wound complications occurred in 42 cases (1.9%, 38 without AC/AP use [1.87%] and four with AC/AP use [3.1%]). Of the 42 total complications, four were directly related to postoperative bleeding, consisting of one case of incisional bleeding and three incisional hematomas (three without AC/AP use: one endoscopic CTR, one open CTR, and one mass excision; one with AC/AP use: endoscopic CTR). None of these four patients required any additional intervention (ie, return to the operating room), and the complications had been resolved by their subsequent office visit. The single patient in the AC/AP group who developed a postoperative hematoma was taking warfarin, and the international normalized ratio (INR) at the time of surgery was unknown. Finally, 65 patients received postoperative antibiotics for infection concerns (59 without AC/AP use and six with AC/AP use), although only 34 of these patients were deemed a true wound complication.

DISCUSSION

Our study found that few patients required revision surgery or incurred postoperative wound complications following wide-awake local anesthesia hand surgery regardless of anticoagulation status. Moreover, most complications and revisions consisted of superficial wound infections that infrequently required surgical debridement.

Anticoagulant/antiplatelet medications are frequently prescribed, with over 8 million Americans reporting use.[8] The most used AC/AP medication is aspirin, which more than half of Americans aged 45–74 years regularly use.[9] The safety of

uninterrupted aspirin use during hand surgery has been clearly demonstrated.[4,5] Kaltenborn et al[4] followed 497 patients undergoing 635 CTR procedures, with 90 cases performed in the setting of uninterrupted aspirin use. They found no difference in the rates of postoperative hematoma or bleeding requiring revision surgery between patients who were taking aspirin and those who were not.[4] Similarly, Boogaarts et al[5] found no adverse events in a smaller prospective study involving 30 patients taking aspirin prior to CTR. Based on this evidence, we elected to not include aspirin as an AP medication. Instead, with recent increases in patients taking newer medications such as apixaban and rivaroxaban, we focused on all AC/AP medications other than aspirin.[10]

There are limited data examining the continued use of AC/AP medication during in-hand surgery. Edmunds and Avakian[11] prospectively evaluated 107 patients undergoing hand surgery while taking warfarin (51 patients), clopidogrel (36 patients), or clopidogrel + aspirin (20 patients). All patients underwent surgery under tourniquet control. Only one patient (clopidogrel) required revision for bleeding.[11] Otherwise, six patients (five clopidogrel and one clopidogrel + aspirin) had subjectively excessive intraoperative bleeding, six patients (five warfarin and one clopidogrel + aspirin) had subjectively excessive bruising, and one patient (clopidogrel + aspirin) had postoperative bleeding.

Naito et al[6] divided patients on long-term oral anticoagulation into one group (nine patients) who stopped their AC medication (fluidione or acenocoumarol) prior to CTR and one group (12 patients) who continued their AC medication. All patients underwent surgery under tourniquet control. One patient who continued their AC medication perioperatively developed a subcutaneous hematoma that resolved without surgical intervention. This is similar to our result of one wound hematoma in a patient using warfarin.

Bogunovic et al[12] prospectively evaluated patients undergoing hand and wrist surgery without interrupting their prescription AP medications and compared them with similar patients who did not take AP medications. All patients underwent surgery under tourniquet control. Of the 92 total patients on AP medications, 76 patients were taking aspirin, five were taking clopidogrel, and 11 were taking both aspirin and clopidogrel. One patient taking clopidogrel required revision for postoperative bleeding, but there were no differences in the rates of postoperative hematoma or extent of ecchymosis between the AP and control groups.

Bogunovic et al later prospectively evaluated 47 patients undergoing hand and wrist surgery without interruption of their warfarin and compared them with similar patients who did not take AC medications.[13] All patients underwent surgery under tourniquet control. At 2 weeks, they found an increased risk of hematomas and ecchymosis compared with control patients.[13] However, the hematoma and ecchymosis rates normalized to the level of the control group at 4 weeks after surgery. Only one patient required revision for postoperative bleeding.

Zimmerman et al[14] performed a retrospective database study to evaluate complications in patients with an elevated INR ($\geq$1.5) compared with those with a normal INR. Although an elevated INR was associated with a greater odds ratio for a postoperative emergency department visit, it did not result in any difference in early reoperations.

Stone et al[15] performed a systematic review and meta-analysis of nine cohort studies concerning the outcomes of hand/wrist surgery on patients receiving AC/AP medications. Based on low-quality evidence, AC/AP medications did not affect the risk of reoperation for bleeding or bruising.[15] Notably, all but one study included in this analysis focused solely on aspirin, clopidogrel, or warfarin.

This study has several strengths. First, unlike the above-reviewed studies, aspirin was excluded, and instead, the study focused on the newer AC/AP medications for which limited data exist. Second, compared with the existing studies, this study's patient numbers are relatively large. Although the occurrences of interest are too low to allow for statistical comparison, the larger numbers make it more convincing because there were no clinically meaningful differences. Third, this study evaluated patients exclusively undergoing wide-awake local anesthesia hand surgery, thereby illustrating that even without tourniquet use performing hand surgery on a patient with AC/AP medications is safe.

This study also has several limitations. First, as with all retrospective studies, the possibility exists that patient data were entered incorrectly in charts, prescription records, or surgical notes. Specifically, a complication may have been missed if the associated keywords of "infection," "hematoma," "seroma," "drainage," and "dehiscence" were not present in a patient's office note and thus not

captured in our database search. However, it was deemed unlikely that this occurred in any case where the operating surgeon was concerned about the possibility of a wound complication. Second, patients may have sought follow-up care for a wound complication with a different provider outside of our practice. Therefore, our results should be considered minimum rates because not all occurrences of interest may have been captured. Third, the level of wound drainage, dehiscence, or infection concern that is considered a true complication may vary among surgeons, as well as the threshold for bringing a patient back to the operating room for revision surgery. Fourth, it is acknowledged that postoperative antibiotics are often prescribed for suture abscesses or minor wound erythema and may not truly constitute a relevant wound complication. Thus, the number of patients receiving postoperative antibiotics may be higher than the number of cases with a true wound complication. Fifth, the exact cause of a wound complication is generally multifactorial and cannot be solely attributed to a patient's anticoagulation status in the setting of a retrospective study. Sixth, it is also acknowledged that the use of antibiotic prescriptions is an unreliable proxy for infection. More importantly, there were no cases of admissions or repeat surgeries relative to infection for either group. Finally, the extremely low bleeding-related complication rates following hand surgery performed under local anesthesia leads to difficulty in achieving adequate power to determine statistical significance of any observed differences.

This study demonstrates that prescription AC or AP use in the perioperative period is not associated with any substantial increase in risk for revision surgery, postoperative antibiotic prescription, postoperative wound complication, or postoperative bleeding for patients undergoing wide-awake hand surgery.

CONFLICTS OF INTEREST

No benefits in any form have been received or will be received related directly to this article.

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