

Recommendations from the ICM-VTE: Hand & Wrist

The ICM-VTE Hand & Wrist Delegates*

Question: 1 - Concerning VTE risk, which surgeries can be considered major, and which surgeries can be considered non-major in hand surgery?

Response/Recommendation: Surgeries involving general anesthesia for >90 minutes, surgeries requiring bedrest or limited ambulation postoperatively, and surgeries involving replantation or free vascularized tissue transfer should be considered major in Hand Surgery.

Strength of Recommendation: Consensus.

Delegates vote: Agree 90.48% Disagree 4.76% Abstain 4.76% (Strong Consensus)

Rationale: Risk factors for venous thromboembolism (VTE) following hand surgery are poorly studied. This is partly due to the very low incidence of these adverse events, which was determined to be 0.0018% by Hastie et al., in a sample of 3,357 consecutive upper extremity surgeries¹. As a result, it is extremely challenging to stratify procedures into high- or low-risk categories for VTE.

Some studies of VTE risk following surgical procedures have included hand and wrist surgery in their samples. A study by Keller et al., of VTE following endoprosthesis surgeries included 183,420 upper extremity surgeries and reported a 0.4% incidence of VTE (2.69 times lower than that of lower extremity endoprosthesis surgery), but this study did not differentiate between hand, wrist, elbow, and shoulder procedures². Similarly, studies investigating VTE prophylaxis following free tissue transfer have included upper extremity tissue transfers. Ricci et al., recommended subcutaneous heparin VTE prophylaxis following upper extremity free flaps, but based this recommendation on expert opinion given the lack of available evidence³. A National Surgical Quality Improvement Program (NSQIP) database study of VTE following plastic surgery analyzed 19,276 plastic surgery cases performed under general anesthesia and found a VTE incidence of 1.3% in cases lasting over 5 hours. In cases lasting less than 5 hours, VTE incidence was less than 0.36%. There were no hand surgical procedures that resulted in >2 VTE within this sample, although the total number of hand surgical cases that were complicated by VTE was not reported⁴. Consensus guidelines from the British Society for Surgery of the Hand (BSSH) cur-

rently recommend mechanical VTE prophylaxis for cases under general anesthesia lasting >90 minutes and/or in patients with at least one VTE risk factor, and recommend the consideration of pharmacological prophylaxis in patients undergoing >90 minutes of general anesthesia with more than one risk factor, or prolonged immobility⁵.

Given the lack of evidence differentiating high- and low-risk hand surgeries, further study in this topic is needed, and current recommendations are based on a consensus of opinion among experts.

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Question: 2 - Is routine VTE prophylaxis required for patients undergoing wrist surgery?

Response/recommendation: Routine venous thromboembolism (VTE) prophylaxis is not required for patients undergoing wrist surgery. It should be considered in patients with strong family history of VTE or patients who are unable to ambulate perioperatively.

Strength of Recommendation: Limited.

Delegates vote: Agree 95.45% Disagree 0.00% Abstain 4.55% (Strong Consensus)

Rationale: There are limited data regarding the rate of VTE following surgical procedures on the wrist. Multiple

*A list of the ICM-VTE Hand & Wrist Delegates members is included in a note at the end of the article.

Disclosure: The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (<http://links.lww.com/JBJS/G801>).

studies evaluating overall complication rates following surgical procedures on the wrist report no VTE complications. A meta-analysis by Stone et al., evaluating 3,628 patients who had anticoagulant or antiplatelet therapy continued or withheld for hand and wrist surgery demonstrated no VTE in either group, although the overall quality of evidence was low⁶. A review by Hastie et al., of 3,357 consecutive upper extremity surgeries at a single hospital from 2009–2012 found only a single VTE, which was a case of bilateral pulmonary embolism (PE) following carpal tunnel release in 77-year-old female with multiple DVT in the past⁷. A study by Ahsan et al., evaluated a total of 11,002 wrist arthroscopies and also reported no VTE⁸. Similarly, a review by Greene et al., found no occurrences of VTE following elbow or wrist arthroscopy⁹.

There have been isolated case reports of VTE following bilateral upper extremity surgery. Igeta et al., reported PE in an 80-year-old woman following fixation of bilateral open distal radius fractures, in the setting of immobility for 9 days following admission¹⁰. Kim et al., reported PE following bilateral carpal tunnel release in a patient with a history of prior PE, for which she was on warfarin. Of note, the warfarin had been discontinued for the surgery¹¹. Watanabe et al., reported on two cases of PE following upper extremity surgery— one following a bilateral distal radius fracture in a patient who was on bedrest for 4 days prior to surgery, and one involving the subclavian vein in a patient with an extremity immobilized for a groin flap¹².

In patients with no major risk factors and no prolonged immobilization, routine VTE prophylaxis is not required for wrist surgery. In patients with risk factors for VTE, including prolonged immobilization, VTE prophylaxis should be considered.

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Question: 3 - Is routine VTE prophylaxis required for patients undergoing finger surgery?

Response/Recommendation: Thromboprophylaxis is not routinely required for patients undergoing finger or thumb surgery. In patients undergoing digit replantation or microvas-

cular surgery with extended operative time, venous thromboembolism (VTE) prophylaxis may be indicated.

Strength of Recommendation: Limited.

Delegates vote: Agree 90.91% Disagree 4.55% Abstain 4.55% (Strong Consensus)

Rationale: Published data on VTE following surgery of the fingers and thumb are extremely limited. The available literature has focused on digit replantation, which has long operative times and may be associated with reduced post-operative ambulation. Conversely, many patients are placed on therapeutic thromboprophylaxis post-replantation to protect the replanted digit from occlusive thrombosis. Barzin et al., analyzed a national database of 15,413 replantations from 1998–2007, and found a rate of 19.55 VTE events per 1000 discharges. This rate was not higher in patients over the age of 65¹³. Leung et al., reported a fatal postoperative pulmonary embolism (PE) with lower extremity deep venous thrombosis (DVT) following a digit replantation, but were not able to identify other similar cases in the literature¹⁴. A review by Roberts et al., identified 9 cases of VTE following elbow, wrist, and hand surgery, but all of these events followed surgery proximal to the wrist¹⁵. Hastie et al., analyzed 3,357 consecutive upper extremity surgeries at a single center from 2009–2012, and found only one incidence of VTE following digit surgery. This was a case of a 46 year old male with bilateral segmental PE following a thumb metacarpophalangeal fusion, in the setting of a strong family history of VTE¹⁶.

Ultimately, the risk of VTE following non-replantation digit surgeries appears to be extremely low, and routine VTE prophylaxis does not appear to be necessary in this cohort.

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Question: 4 - Should anticoagulants be held prior to performing hand and wrist surgeries?

Response/Recommendation: Antiplatelet and anticoagulant medication do not need to be discontinued in patients undergoing hand and wrist surgeries, especially in patients at high-risk of venous thromboembolism (VTE) and those undergoing carpal tunnel surgery.

Recommendation: Moderate.

Delegates vote: Agree 90.91% Disagree 4.55% Abstain 4.55% (Strong Consensus)

Rationale: Anticoagulant and antiplatelet medications are commonly used to prevent primary or recurrent

thrombotic events¹⁷. The most common side effect of anticoagulant or antiplatelet treatment is a tendency to bleed with resultant bruising, hematoma formation, and potential wound healing problems.

The management of anticoagulation in patients undergoing surgical procedures is challenging, because interrupting anticoagulation for a procedure transiently increases the risk of thromboembolism. At the same time, surgery and invasive procedures have associated bleeding risks that are increased by the anticoagulant(s) administered. Therefore, a decision must be made based weighing the risk of bleeding and the risk of thromboembolic events¹⁸.

A recent review demonstrated that either continuation or discontinuation of antiplatelet therapy before non-cardiac surgery may make little or no difference to mortality, bleeding requiring surgical intervention or transfusion, and ischemic events¹⁹. Moreover, a recent meta-analysis concluded that interrupting anticoagulation in patients requiring invasive procedures did not result in increased thromboembolic events and protected against major bleeding²⁰. However, neither of these studies included upper limb surgery.

Hand and wrist surgeries are generally considered low bleeding risk procedures. However, it is unclear where specific hand and wrist interventions fall along the spectrum in terms of bleeding risk^{21,22}. Therefore, wide variability in daily practice continues to exist with regards to the management of antiplatelet and anticoagulant medication in patients undergoing hand or wrist surgery²³.

Nine studies²⁴⁻³² and one meta-analysis³³ examined the effect of antiplatelet and anticoagulant medications on complication rate in hand or wrist surgery. Of these nine studies, four^{26,28,29,32} were retrospective and five^{24,25,27,30,31} were prospective cohort studies. In five studies^{24,26-29} the effect of antiplatelets was investigated, while four studies^{25,30-32} looked at anticoagulants or an elevated international normalized ratio (INR). Surgery was performed without a tourniquet in one study²⁶, with tourniquet deflation and hemostasis before skin closure in one study²⁸, and according to the surgeon's preference in two studies^{24,25}. The timing of tourniquet deflation in relation to skin closure was not specified in the remaining studies.

Stone et al.³³, found in their meta-analysis that hand and wrist surgery on anticoagulated patients did not affect the risk of reoperation for bleeding. Continuing anticoagulation did not affect the risk of a postoperative hematoma or bruising within 14 days, although the quality of the evidence was very low. Similarly, antiplatelets did not affect the risk of reoperation for postoperative bleeding nor the risk of hematoma or bruising, although the quality of the evidence was low.

There are several limitations. Firstly, the studies only included surgery distal to the wrist and the vast majority were carpal tunnel releases so it remains to be seen whether these findings can be extrapolated to other procedures. Secondly, the type of anesthesia was not specified in all studies^{24,25,31,32} and it is unclear if there is an advantage using general anesthesia, a neuraxial block^{27,30} or local anesthesia^{28,30} exclusively or with

epinephrine^{26,29} with regards to postoperative bleeding complications. Thirdly, wide awake local anesthesia no tourniquet (WALANT) in minor hand surgery procedures has been shown to decrease tourniquet-associated discomfort and improve the perioperative patient experience³⁴, but only one study did not use a tourniquet²⁶. Given these findings regarding bleeding complications, definitive recommendations cannot be made whether operating with or without tourniquet should be advocated.

In orthopaedic surgery, anticoagulants are usually stopped due to the bleeding risk, and there continues to be a paucity of data regarding hand or wrist surgery. The meta-analysis by Stone et al.³³, suggests that antiplatelet and anticoagulant medication can be safely continued for patients undergoing carpal tunnel surgery and those at high-risk of VTE. For other elective hand or wrist surgery, the evidence is less convincing, however unless there is a strong perceived need to interrupt medication, then anticoagulation should probably be continued perioperatively.

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Appendix

 Supporting material provided by the authors is posted with the online version of this article as a data supplement at [jbjss.org \(http://links.lww.com/JBJS/G802\)](http://links.lww.com/JBJS/G802).

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