

Optimal Type of Chemical Anticoagulant among Adult Patients with Acute Spine Trauma

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INTRODUCTION: With over 40,000 annual spine trauma admissions, the United States has one of the highest spine trauma incidences in the world. These patients are likely to experience long-term immobilization, and in addition to other risk factors, are at heightened risk of developing venous thromboembolic events. Many different classes of chemical anticoagulants are currently in use to prevent thromboembolic events, and while some guidelines and recommendations exist, these are mostly tailored towards elective spine procedures which are significantly different from acute traumatic spine injuries. Additionally, newer classes of chemical anticoagulants, the direct oral anticoagulants have recently emerged and have been suggested to have better efficacy than other existing classes of anticoagulants. We conducted this meta-analysis to put together the available evidence regarding chemical anticoagulation in spine trauma patients. To the best of our knowledge, ours is one of the first meta-analyses to include both operative and non-operative and both with and without accompanying spinal cord injury; and also include evidence about direct oral anticoagulants.

METHODS: We carried out a systematic search of Medline, EMBASE, Web of Science Core Collection, and Cochrane Central Register of Controlled Trials from the inception of the journals/databases to March, 2023. Controlled vocabulary terms were identified as well as key terms and synonyms; and search results were limited to only English language papers. We developed a search for human studies examining efficacy of chemical anticoagulants for acute spinal trauma in adults. Terms included were spinal injuries, fractures, trauma, heparin etc.

We identified articles from our literature search that did a comparison between different chemical anticoagulant classes or between no anticoagulant use and any chemical anticoagulant in patients who had acute spine trauma as methods to prevent thromboembolic complications following operative and non-operative acute spinal trauma with or without spinal cord injury. Three reviewers performed abstract screenings, full text review and data extraction; and all conflicts were resolved by consensus. Outcomes of interest were defined as deep venous thrombosis (DVT), pulmonary embolism (PE), major bleeding and mortality.

RESULTS SECTION: Seven studies, comprising a total of 763 patients made a comparison of no chemical anticoagulant with any chemical anticoagulant. The included studies reported DVT as the sole outcome measure and results reveal a protective effect of chemical anticoagulant use compared to no anticoagulant use (odds ratio 0.40 (0.23 – 0.70)), p-value 0.0013.

For a comparison of unfractionated heparin and low molecular weight heparin, four studies comprising 27,835 patients, reported VTE as an outcome. Five studies comprising 27,816 patients reported DVT and PE as outcomes while three studies reported major bleeding as an outcome. Results indicate that LMWH may be protective compared to UH for VTE, DVT and PE with odds ratios 0.77 (0.66 – 0.89) p-value 0.0005, 0.78 (0.66 – 0.93) p-value 0.0050 and 0.66 (0.51 – 0.85) p-value 0.0013 respectively. While there is lower odds of major bleeding for LMWH compared with UH (odds ratio 0.52 (0.22 – 1.24) p-value 0.1397), this association is not statistically-significant.

There were two studies that compared administration of DOACs compared with LMWH, with a total of about 1866 patients in the studies. There was an odds ratio of 0.31 (0.17 – 0.56), p-value 0.0001 for DVT outcome, indicating that DOACs may be more effective in preventing DVTs than LMWH. For other outcomes (PE, Major bleeding and mortality), the associations were non-significant.

DISCUSSION: The current available evidence suggests that spine trauma patients, both operative and non-operative would benefit from chemical anticoagulant administration following trauma. Low molecular weight heparins have better efficacy compared to unfractionated heparin with no significant differences in their risk profiles. Lastly, emerging evidence indicates that direct oral anticoagulants may ultimately lower the odds of DVTs among this subset of patients compared to low molecular weight heparins without a significant increase in risk.

SIGNIFICANCE/CLINICAL RELEVANCE: Available evidence suggests that direct oral anticoagulants may be more efficacious at preventing DVTs in acute spine trauma patients than LMWHs, which in turn, may be more beneficial for this subset of patients than unfractionated heparins