

The Effect of Tranexamic Acid on the Prevalence of Heterotopic Ossification in Elbow Trauma Surgery

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INTRODUCTION: Heterotopic ossification (HO) is a pathologic process of extra-skeletal bone formation within the surrounding muscles and soft tissue. HO can be either hereditary or acquired, with the former being by far the most common and typically seen following some sort of trauma such as fractures, dislocations, or extensive surgical procedures. Clinical symptoms of HO include a limited range of motion to the affected and adjacent joints, pain, bone deformity, and bone ankylosis in severe cases. While the exact mechanism of HO remains unclear, it is associated with several inflammatory markers. Tranexamic acid (TXA) is a synthetic lysine-analogue drug used for treatment and prevention of hemorrhage. TXA functions by competitively binding to the lysine binding site on plasminogen, inhibiting its conversion to plasmin and preventing the breakdown of fibrin clots. Some previous studies have identified a potential relationship between TXA and rates of HO formation in surgical patients, such as Liu et al (2023) who described significantly lower rates of HO in patients who received TXA while undergoing surgery for traumatic elbow injury. Conversely Avisar et al (2025) described higher rates of HO in patients who received TXA while undergoing elbow surgery, however these results were not statistically significant. This study aims to further contribute to the characterization of a potential relationship between TXA and HO.

METHODS: This is a retrospective study using patient data from Epic Systems. Patients were eligible for inclusion if they were over 18 years of age at the time of surgery, underwent surgery for a fracture and/or dislocation injury to the elbow between 01/01/2013 and 12/31/2023, and had no prior history of surgery or trauma involving the ipsilateral elbow. Proportions of patients in the treatment and control groups who were diagnosed with HO post-operatively were compared using a test of equal proportions. All data analysis was performed using R 4.4.1.

RESULTS: Out of 1,822 patient charts reviewed, 486 met all inclusion criteria. A total of 53 included patients received TXA during their surgery and were designated as the treatment group, while the remaining 433 were designated as the control group. Sixteen members (30.19%) of the treatment group were diagnosed with HO post-operatively, compared to 96 members (22.17%) of the control group. This difference was not found to be statistically significant ($p = 0.19$, 95% CI = -0.21-0.05).

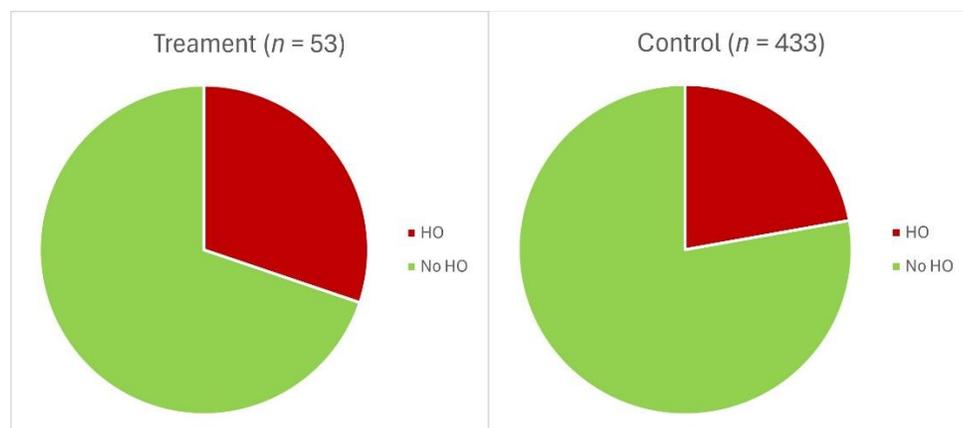


Figure 1: proportions of the treatment group ($n = 53$) with (30.19%) and without (69.81%) postoperative diagnosis of HO

Figure 2: proportions of the control group ($n = 433$) with (22.17%) and without (77.83%) postoperative diagnosis of HO

DISCUSSION: This study identified no significant relationship between the intra-operative administration of TXA and the rate of post-operative diagnosis of HO in patients undergoing surgery for traumatic fracture and/or dislocation injury to the elbow, however the rate of HO in the treatment group was higher than in the control group suggesting a potentially increased risk of HO in patients given TXA. This finding is in agreement with that of Avisar *et al.* (2025), but in contrast to that of Liu *et al.* (2023). Methodologically this study is more directly comparable to the latter, which was also a retrospective study, than to the former, which was a prospective randomized clinical trial. Interestingly, however, we identified rates of HO in our treatment group (30.19%) and control group (22.17%) that more closely matched those seen by Avisar *et al.* which were 43.5% and 16.7%, respectively than what was observed by Liu *et al.* who found HO rates of only 8.71% in the treatment group and 16.18% in the control group. These differences could potentially be due to differential application of diagnostic criteria, variation in operative technique, and/or some other, less readily apparent variable. Notable limitations to this study include non-random selection of study subjects, non-pair-matched treatment and control groups, and a relatively small sample size in the treatment group compared to similar studies.

SIGNIFICANCE/CLINICAL RELEVANCE: Intraoperative administration of TXA was not found to be significantly related to rates of postoperative HO in this study. Further characterization of a potential relationship between TXA and HO could help to inform decisions made by surgeons regarding HO prophylaxis in the future.

REFERENCES: Liu, H., Li, J., Hu, Y., Guo, J., Lou, T., Luo, G., ... & Fan, C. (2023). Association Between Tranexamic Acid Use and Heterotopic Ossification Prevalence After Elbow Trauma Surgery: A Propensity-Score-Matched Cohort Study. *JBJS*, 10-2106.
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