Utilization of Tranexamic Acid in Open Reduction Internal Fixation of Acetabular and Pelvic Fractures: A Systematic Review and Meta-Analysis

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INTRODUCTION: Pelvic and acetabular fractures are caused by high-energy mechanisms of injury and have high associated morbidity and mortality due to associated risks of hemorrhage. Tranexamic acid (TXA) is an amino acid derivative that prevents clot degradation and is commonly used by orthopedic surgeons in arthroplasty and spine cases to control bleeding. However, the use of TXA in orthopedic traumatology is not standardized, and the potential benefit of TXA in pelvic and acetabular fracture fixation is not consistent across literature. The primary purpose of this study is to investigate the efficacy of TXA in reducing blood transfusion rates and perioperative blood loss in patients undergoing surgery for open pelvic and acetabular fractures. The secondary purpose is to identify whether TXA use was associated with higher rates of venous thromboembolism (VTE). We hypothesized that TXA is associated with reduced intra-operative blood loss and lower transfusion rates without any increase in the rates of VTE.

METHODS: In accordance with PRISMA guidelines, PubMed, Embase, and MEDLINE database were searched for studies published from inception to April 2024. Studies were included if they met the following criteria: clinical studies comparing outcomes between subjects undergoing open reduction and internal fixation (ORIF) for pelvic/acetabular fractures receiving TXA or not receiving TXA, level of evidence I-III, and written in English. Studies that were written in other languages, analyzed animals or cadavers, biomechanical studies, case studies, systematic reviews, meta-analyses, commentaries, abstracts, technical notes, letters to the editor, expert opinions, or unpublished data were excluded from analysis.

RESULTS: 856 unique studies were identified in the initial search, of which 10 studies evaluating a total of 1,213 patients were included in this systematic review and meta-analysis. Pooled analysis revealed a significantly lower estimated blood loss in patients who received TXA versus control patients who did not receive TXA (MD=-184.37, 95%CI= -364.32, -4.42, p=0.04, I^2=96%) (Figure 1). In addition, a significantly lower surgical time was found for the TXA cohort compared to the control cohort (MD=-15.28, 95%CI=-28.41, -2.16, p=0.02, I^2=78%) (Figure 2). Furthermore, there was no significant difference in transfusion rate (OR=0.18, 95CI%=0.03, 1.28, p=0.09, I^2=94) (Figure 3) or VTE incidence (OR=1.15, 95%CI=0.56, 2.36, p=0.71, I^2=0) (Figure 4) between cohorts.

DISCUSSION AND CONCLUSION:

The use of TXA in surgical management of pelvic and acetabular fractures results in significantly decreased operative time, significantly decreased estimated blood loss, and no apparent difference in transfusion rate without an increased risk of VTE. These finding suggest that TXA can be used safely to decrease operative time and reduce blood loss in patients with pelvic and acetabular fractures. Future studies should investigate pharmacodynamic differences of topical versus intravenous TXA administration as well as the optimal dose of TXA in the setting of pelvic and acetabular fractures.