Efficacy and Safety of High-dose Tranexamic Acid Protocol in Adult Spinal Deformity — Analysis of 100 Consecutive Cases

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Background/Introduction: Adult spinal deformity (ASD) surgery is a massive undertaking that may involve a significant amount of blood loss, especially when various osteotomy techniques are utilized. Antifibrinolytic agents such as tranexamic acid (TXA) have been used in an attempt to reduce intraoperative blood loss. However, there is no universally accepted dosing protocol for TXA in spine surgery. Moreover, there are very few reports in the literature regarding high-dose TXA use in ASD, possibly due to concerns for thromboembolic or seizure risks. This study aims to investigate the safety profile and efficacy of using a high-dose (50mg/kg loading, 5mg/kg/hr infusion) TXA protocol during ASD surgery.

Materials/Methods: Consecutive patients undergoing spinal deformity correction over a 14-month period (September 1st 2015 – November 1st 2016) at a single institution were identified. Inclusion criteria were adults (age >= 18 years) who underwent posterior spinal fusion surgery of at least 5 levels. Our standard TXA protocol is 50 mg/kg intravenous loading dose followed by a 5 mg/kg/hr infusion until skin closure. Patient demographics, estimated blood loss (EBL), post operative blood transfusion, and other procedure specific information were recorded and analyzed.

Results: A total of 100 adult patients were included in the study. Operative procedures were performed by a single surgeon. The mean age was 46.5 years, and 71% of patients were female. Average BMI was 24.7. The average fusion length was 14 levels. 46/100 patients had pelvic fixation. Posterior column osteotomies were performed on 80/100 patients; pedicle subtraction osteotomy (PSO) of patients had pelvic fixation. Posterior column osteotomies were a primary surgical procedure while the rest were revisions. 61/100 was 24.7. The average fusion length was 14 levels. 46/100 patients had operative procedures were performed by a single surgeon. The mean information were recorded and analyzed.

Discussion/Conclusion: This study demonstrates that high dose TXA is effective and safe to use in well-selected ASD patients and lays the foundation for further studies on this important topic.

A Comparison of Bleeding vs Clotting Complications after Lumbar Spine Surgery

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Background/Introduction: Unlike almost all other inpatient surgery, chemical anticoagulation after spine surgery is frequently withheld due to fear of bleeding complications. Unlike most other surgeries, bleeding complications after spine surgery can result in neurological injury. The purpose of this study was to compare the incidence of bleeding and clotting complications in patients who have undergone spinal surgery without postoperative anti-coagulation, using a large national database.

Materials/Methods: A retrospective review of the Truven Health Marketscan® Research Databases was conducted for patients undergoing lumbar spine operations between 2003 and 2014. Patients were divided into 3 groups: anterior lumbar surgery, posterior lumbar fusion, and posterior lumbar laminectomy. The ICD-9-CM diagnosis codes for epidural hematoma, hematoma, seroma, deep vein thrombosis (DVT), and pulmonary embolism (PE) were used to calculate the incidence of these complications within three months of surgery in each group. The rate of operative intervention for the bleeding complications was assessed and compared to the rate of PE. The relative risks of these complications were calculated for surgical approach and fusion vs. decompression.

Results: 379,871 patients were included in the study. Overall, 8,609 (2.3%) patients developed bleeding complications (seroma + hematoma + epidural hematoma) while 13,384 (3.5%) developed clotting complications (DVT + PE). 1222 (32%) patients underwent surgical drainage for their bleeding complication, and 1,216 (0.32%) patients developed PE. While the rates of all bleeding complications were comparable to the rates of all thrombosis complications in all subgroups, the rate of PE was 5-7 fold higher than the rate of bleeding complications requiring operative intervention in all sub groups (p<0.001) (Table 1) We observed a significantly higher risk of bleeding and thrombotic complications in posterior lumbar fusion as compared to anterior fusion (RR 1.43, 1.81 respectively). We also observed a significantly higher risk of bleeding and thrombotic complications in posterior lumbar fusion as compared to posterior decompression alone (RR 1.51, 1.48 respectively).

Discussion/Conclusion: We observed that PE rates were 5-7 fold higher than rates of bleeding complications requiring surgery. Given this large disparity in these complication rates, it may be worthwhile considering routine chemical anticoagulation after spine surgery.

Pharmacologic Prophylaxis for Venous Thromboembolism in Elective Spine Surgery

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Background/Introduction: Venous thromboembolism (VTE) is a known complication after spine surgery, but data and guidelines for prophylaxis are unclear for patients undergoing elective spine surgery. The current study examines VTE incidence, risk factors, and association of pharmacologic prophylaxis with VTE and postoperative hematoma in elective spine surgery patients.

Materials/Methods: Patients who underwent elective spine surgery, 2013-2016, were identified at a large academic medical center. A chart review was completed to examine for use of pharmacologic prophylaxis for VTE, history of prior VTE, and incidence of hematoma requiring reoperation. Additional demographic, comorbidity, intraoperative, and postoperative factors were available for each patient. The association of demographic,
comorbidity, intraoperative, and postoperative factors, including history of prior VTE and pharmacologic prophylaxis status, with VTE and postoperative hematoma requiring reoperation were tested with multivariate regression.

**Results:** The study included 2,855 patients. Pharmacologic prophylaxis was received by 56.3% of patients, and unfractionated heparin was the most frequently used agent (96.8%). The incidence of postoperative VTE was 1.23% (35/2,855), and independent risk factors for VTE included increasing age, male gender, higher BMI, perioperative blood transfusion, urinary tract infection, longer length of stay, and history of prior VTE. Pharmacologic prophylaxis did not significantly influence the rate of VTE (RR=0.68, P=0.424), even after controlling for patient risk factors and prescribing patterns. The incidence of postoperative hematoma requiring return to the operating room was 0.4% (11/2,855). Seven of the postoperative hematomas presented with significant neurological deficits (63.6%), three presented with pain or wound drainage (27.3%), and one presented with respiratory compromise (9.1%). Among 10 patients experiencing hematoma who received prophylaxis, nine received unfractionated heparin and one received enoxaparin. Pharmacologic prophylaxis was associated with significant increase in postoperative hematoma requiring return to operating room (RR=7.37, P=0.048).

**Discussion/Conclusion:** Contrary to expected findings, pharmacologic prophylaxis for VTE after elective spine surgery was not associated with a significant reduction in VTE that we could detect. Further, there was a significant increase in postoperative hematoma requiring reoperation among patients receiving prophylaxis, leading to questions about routine use of pharmacologic VTE prophylaxis for elective spine surgery.

**Paper 04. Fever Following Lumbar Fusion Procedures**

**Background/Introduction:** Postoperative fever is a common occurrence following lumbar fusion surgery. While a postoperative fever can indicate underlying complications such as infection, it is often self-limited with no definitive cause. However, patients who develop transient postoperative fevers often undergo extensive workups, unnecessarily increasing costs and patient anxiety. In this context, this study aims to describe the incidence and timing of postoperative fever, the outcomes of fever workups, and the risk factors associated with fevers following lumbar fusion.

**Materials/Methods:** A retrospective review of a prospectively collected registry of patients undergoing transforaminal, posterior, anterior, or lateral lumbar fusion for degenerative disease was performed. For patients in whom postoperative fever (≥101.5 F) occurred, a retrospective chart review was performed. For patients in whom postoperative fever (≥101.5 F) occurred, a retrospective chart review was performed. Additionally, multivariate regression was used to identify independent risk factors for the development of postoperative fever. Further, there was a significant increase in postoperative hematoma requiring reoperation among patients receiving prophylaxis, leading to questions about routine use of pharmacologic VTE prophylaxis for elective spine surgery.

**Results:** The study included 2,855 patients. Pharmacologic prophylaxis was received by 56.3% of patients, and unfractionated heparin was the most frequently used agent (96.8%). The incidence of postoperative VTE was 1.23% (35/2,855), and independent risk factors for VTE included increasing age, male gender, higher BMI, perioperative blood transfusion, urinary tract infection, longer length of stay, and history of prior VTE. Pharmacologic prophylaxis did not significantly influence the rate of VTE (RR=0.68, P=0.424), even after controlling for patient risk factors and prescribing patterns. The incidence of postoperative hematoma requiring return to the operating room was 0.4% (11/2,855). Seven of the postoperative hematomas presented with significant neurological deficits (63.6%), three presented with pain or wound drainage (27.3%), and one presented with respiratory compromise (9.1%). Among 10 patients experiencing hematoma who received prophylaxis, nine received unfractionated heparin and one received enoxaparin. Pharmacologic prophylaxis was associated with significant increase in postoperative hematoma requiring return to operating room (RR=7.37, P=0.048).

**Discussion/Conclusion:** Contrary to expected findings, pharmacologic prophylaxis for VTE after elective spine surgery was not associated with a significant reduction in VTE that we could detect. Further, there was a significant increase in postoperative hematoma requiring reoperation among patients receiving prophylaxis, leading to questions about routine use of pharmacologic VTE prophylaxis for elective spine surgery.

**Paper 06. Outcomes of Suprafascial Vacuum Assisted Closure Device in Spine Surgical Site Infections Management**

**Background/Introduction:** Many studies reported benefits using negative pressure wound therapy (NPWT) in surgical site infections (SSIs). Surgeons utilize NPWT in different ways. Some surgeons place the VAC (vacuum assisted closure) sponge into the open wound bed and allow the device to facilitate tissue granulation until ultimate

**Discussion/Conclusion:** The results of this study suggest that inpatient fever occurs in about 1 in 8 patients following lumbar fusion surgery. In most cases for which a fever workup is performed, no cause for fever is detected. Longer operative time and increased early postoperative narcotic use may increase the risk of developing postoperative fever. Fever workups following lumbar fusion are probably most effective when pursued with the guidance of an associated postoperative symptom suggesting a potential source.