Abstract: Impact of Blood Thinners on Flap Failure and Hematoma Rates in Patients Undergoing Non-Breast Flap Reconstruction: Analysis of 79,915 Patients

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RECONSTRUCTIVE SESSION 2

Thromboelastography and Intraoperative Anticoagulation during Reconstructive Microsurgery

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**INTRODUCTION:** Maintaining optimal coagulation is vital for successful microvascular flap transfer. Hypercoagulate states are risk factors for pedicle thrombosis and flap loss. Therefore, identifying patients who are at risk for such events is paramount. The viscoelastic Thromboelastography (TEG) is a modern method to assess a patient’s coagulation status and in the past, has predominantly been used in critical care, cardiac or trauma surgery. The aim of our study was to evaluate its diagnostic capabilities, its role compared to classic coagulation tests, and the effect of low-dose heparin in reconstructive breast microsurgery.

**METHODS:** After approval from the institutional review board, clinic charts of our senior author were analyzed for all patients between 2012 and 2016 who underwent autologous free flap breast reconstruction and received perioperative TEG. Patient demographics, their medical history, clinical and operative details were documented. All coagulation studies, such as thrombocyte count, prothrombin time (PT), activated partial thromboplastin time (aPTT), and the numerous TEG parameters were gathered for baseline, the intraoperative, and the first two postoperative days (POD1, POD2). Statistical calculations sought to determine any risk factors associated with adverse outcomes of reconstructive microsurgery.

**RESULTS:** 100 patients were subsequently identified who underwent 172 abdominal-based free flaps for breast reconstruction. Intraoperatively, 91 patients received unfractioned heparin (UFH) as their TEG-G values were significantly more hypercoagulable at baseline and again on POD1 and POD2. Intraoperative TEG-G was indifferent and borderline hypocoagulate for both the 91 heparin and the 9 non-heparin patients. PT/aPTT showed no changes perioperatively. Thrombocytes slightly decreased due to blood dilution.

Within a mean follow-up of 17.4±11.1 months, 3 bleeding, 6 wound/infection, and 6 thrombotic complications occurred. Of the latter group, 2 resulted in flap loss (1.2%). Intraoperative bleeding was related to high aPTT (0.029). Wound complications were related to high BMI (p = 0.022) and diabetes (0.028). The 6 thrombotic events had much steeper increases of TEG-G between surgery and POD2 (p = 0.003). Both flap losses occurred in 2 patients with a history of abdominal surgery despite intraoperative UFH.

**CONCLUSION:** TEG is more dynamic and accurate to show the effects of intraoperative anticoagulation than conventional coagulation tests. Our applied heparin regimen was successful to avoid significant detrimental outcomes. The 2 flap losses were associated with previous abdominal surgery and scarring.

**Reference Citations:**

Impact of Blood Thinners on Flap Failure and Hematoma Rates in Patients Undergoing Non-Breast Flap Reconstruction: Analysis of 79,915 Patients

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**INTRODUCTION:** The use of antithrombotics and other blood thinners in plastic surgery
flap reconstruction remains inconsistent among practitioners. Previous animal studies have demonstrated favorable effects of antithrombotics by inhibiting anastomotic venous thrombosis and improving microcirculatory perfusion. However, these results have yet to translate into definitive clinical benefits in human studies, with the majority resulting in increased hematoma development. We aim to revisit this topic with the use of a large database and examine in-hospital complications, most notably flap failure and hematoma, in patients on various long-term blood thinners.

METHODS: Patients who underwent non-breast pedicled or free-flap reconstruction from 2013 to 2014 were identified from the Healthcare Utilization Cost Project National Inpatient Sample (NIS) Database. De-identified data on patient demographics, perioperative risk factors and incidence of complications were obtained. Outcomes of interest included flap failure and hematoma formation. Logistic regression was used to assess the adjusted effect of long-term antithrombotic/anticoagulant or aspirin use on flap failure and hematoma formation.

RESULTS: The study population included 79,915 patients. Of these patients, 3,775 (4.7%) took an anticoagulant/antithrombotic and 4,575 (5.7%) took aspirin preoperatively. Patients on either one of the blood thinners were more likely to be smokers (p<0.001), have more comorbidities (p<0.001), have peripheral vascular disorders (p<0.001), be hypertensive (p<0.001), male (p<0.001) and be obese (p<0.001). Overall rates of flap failure and hematoma formation were 2.5 percent and 2.6 percent, respectively. Unadjusted flap failure rates were 2.4 percent and 2.7 percent for anticoagulant/antithrombotics and aspirin, respectively. Unadjusted hematoma rates were 7.0 percent and 3.7 percent for anticoagulants/anticoagulants and aspirin respectively. On multivariate regression there was a significant increase in odds of hematoma formation associated with anticoagulation/antithrombotic use (OR=2.413, p<0.001); however, no difference in hematoma formation for those on aspirin therapy (OR=1.070, p=0.427). There was a non-significant reduction in flap failure rates for patients on anticoagulants/antithrombotics and aspirin respectively. On multivariate regression there was a significant increase in odds of hematoma formation associated with anticoagulation/antithrombotic use (OR=2.413, p<0.001); however, no difference in hematoma formation for those on aspirin therapy (OR=1.070, p=0.427). There was a non-significant reduction in flap failure rates for patients on anticoagulants/antithrombotics (OR=0.802, p=0.062) and no significant difference in aspirin use on flap failure rates (OR=1.146, p=0.159).

CONCLUSION: Our results show there was no significant difference in anticoagulants/antithrombotic or aspirin use in terms of flap failure with an increase in hematoma rates for the former. Additional prospective studies should clarify whether the variety of blood thinners can improve outcomes while still minimizing complication rates in flap reconstruction.

A Retrospective Review of Venous Thromboembolism in Lower Extremity Salvage: Incidence, Risk Factors and Outcomes

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INTRODUCTION: Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), is a significant cause of morbidity and mortality following surgery. However, the effects of VTE on soft tissue reconstruction of traumatic lower extremity injuries are not well reported. The purpose of this study was to investigate the incidence, risk factors and outcomes of VTE in lower extremity salvage.

METHODS: A retrospective review of lower extremity trauma patients requiring soft tissue reconstruction was performed at the LAC-USC medical center between July 2007 and December 2015. Patients who developed clinically apparent VTE during inpatient stay were identified from ultrasonography reports and provider notes. Comorbidities, injury characteristics and perioperative data were compared between patients with and without VTE. Outcomes compared included flap complications, flap loss, and amputation. The mean follow-up time was 13 (range: 0–70) months.

RESULTS: 190 patients with lower extremity injuries underwent local and free flap procedures, with 12 patients developing VTE during hospitalization (6.3%). Nine VTEs (4.7%) were diagnosed prior to soft tissue reconstruction and 3 VTEs were diagnosed post-reconstruction (1.6%).