7:30 AM - 7:35 AM

RM112 Does Anticoagulation Improve Free Tissue Transfer Outcomes in Hypercoagulable Patients? a Systematic Review of the Literature

Albany Medical Center, Albany
Presenter: **Vasanth S Kotamarti, MD**
Vasanth S Kotamarti, MD, Eric Shiah, BA, Kristen M Rezak, MD, FACS and Ashit Patel, MBChB, FACS
Albany Medical Center, Albany, NY

Background: Advances in microsurgery have increased the success rates for free tissue transfers. With improved outcomes and expertise, surgeons have expanded the pool of free flap candidates. Several authors have assessed methods for free flaps in hypercoagulable patients. Thrombophilias are relatively common problems with potentially catastrophic results for patients undergoing free tissue transfer. Consequently, some authors have attempted novel anticoagulation protocols to improve outcomes in these patients. Our aim was to assess the published literature on free tissue transfer in the hypercoagulable population in order to develop evidence-based recommendations for management of these patients.

Methods: A systematic review of the literature was performed in June 2018 using the Pubmed, Ebsco, and Cochrane databases. Two independent researchers performed the search and screened articles while a third independent researcher acted as a tie-breaker. Studies assessing outcomes of anticoagulation regimens on free tissue transfer performed in patients with established hypercoagulability diagnoses were included. Exclusion criteria included review articles, case reports, and studies lacking detailed discussion of anticoagulation regimens and surgical outcomes.

Results: Following the search, 64 articles were read in their entirety, and five articles were included for analysis. In total free tissue transfers were performed in 385 patients, 123 of whom had established thrombophilic histories or diagnoses. Diagnoses included history of thromboembolism, factor V Leiden, antiphospholipid syndrome, and methylenetetrahydrofluororeductase mutation. Anticoagulation regimens often included intraoperative continuous heparin with-or-without additional bolus with postoperative continuous heparin with transition to an outpatient anticoagulation therapy. Hypercoagulable patients demonstrated propensity for intraoperative and late postoperative thromboses, as well as increased risk for arterial thromboses. Worsened flap success and salvage were observed with postoperative thromboses as opposed to intraoperative thromboses. Anticoagulation increased risk for hematoma formation as well.

Conclusion: Successful microvascular free tissue transfer is possible in many hypercoagulable patients. More aggressive anticoagulation initiated intraoperatively may be required to prevent thrombotic complications as salvage after postoperative thrombosis is relatively poor. The benefits of a free flap must be weighed against the risk of bleeding in each patient prior when developing a reconstructive plan.

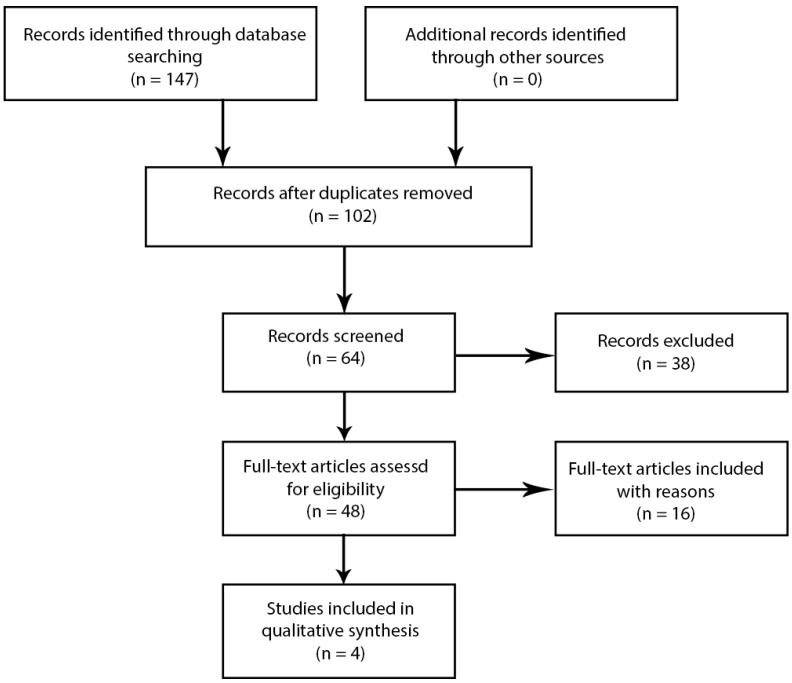


Figure 1

First author	Title	Hypercoagulable patients	Level of Evidence
Defazio et al.	Lower extremity flap salvage in thrombophilic patients: managing expectations in the setting of microvascular thrombosis	25	III
Nelson et al.	Prevention of thrombosis in hypercoagulable patients undergoing microsurgery: a novel anticoagulation protocol	23	III
Senchenkov et al.	Management of perioperative microvascular thrombotic complications - the use of multiagent anticoagulation algorithm in 395 consecutive free flaps	9*	III
Wang et al.	Free tissue transfer in the hypercoagulable patient: A review of 58 flaps	41	IV

*Patients with established hypercoagulable histories.

Table 1

7:35 AM - 7:40 AM

RM113 Implementation of an Interdisciplinary Pathway for Microsurgical Breast Reconstruction: Enhanced Recovery, Efficiency and Education at an Academic Medical Center

University of California, San Francisco , San Francisco

Presenter: **Eric D. Wang, MD**

Eric D. Wang, MD(1), Rachel Lentz, MD(1), Walter C Lin, MD(2), J. Matthew Aldrich, MD(3) and Hani Sbitany, MD(1)

(1)Plastic and Reconstructive Surgery, University of California, San Francisco, San Francisco, CA, (2)University of California, San Francisco, SAN FRANCISCO, CA, (3)University of California, San Francisco, San Francisco, CA

Background: In the changing climate of value and outcome-driven reimbursement, surgeons and hospitals are charged with efficient delivery of safe, high quality care. ÒEnhanced RecoveryÓ pathways that comprehensively address postoperative care have been shown to lower costs by promoting early discharge with improvements in patient experience and morbidity. These standardized pathways have shown early promise in reconstructive microsurgery populations. However, large teaching hospitals have constantly rotating resident physicians, most of whom are not familiar with microsurgical care. We developed, implemented, and analyzed outcomes of a standardized microsurgery enhanced recovery protocol tailored for use at an academic medical center. **Methods:** With institutional approval, we assembled an interdisciplinary working group drawn from all involved medical specialties and roles. We identified inconsistencies and inefficiencies in the care of microsurgery patients. Utilizing established quality improvement principles, our group developed a comprehensive microsurgical pathway, which we standardized across all medical center hospitals. It was implemented as an electronic checklist, provider reference guide, and order panel. In July 2014, the finalized pathway was implemented. Prospectively collected data on microsurgical breast reconstructions were analyzed as an unmatched case-control study. Outcome measures (hospital length of stay), process measures (pathway compliance rate, primary ICU provider), and balancing measures (30-day complication, reoperation, and readmission rates) were compared with historical controls. **Results:** 72 patients underwent 102 free flaps for breast reconstruction in the three years prior to pathway development. These were compared to 125 patients (181 breast flaps) receiving care utilizing the pathway, for three years following July 2014. Baseline comorbidity was similar in regard to age, BMI, ASA class, operative time, percent bilateral, and percent immediate following mastectomy. The enhanced pathway was associated with a significantly shorter hospital length of stay (4.9 vs 5.4 days, p=0.037). Major complication rates did not differ, at 3.3% and 3.9%. Process measures demonstrated that 96.2% compliance with the pathway was achieved. The primary provider in our closed-model medical-surgical ICU was a resident (rather than an attending or midlevel provider) in 83% of cases. Of these residents, 0% were surgical trainees (anesthesia, internal, emergency medicine). **Conclusion** Our comprehensive microsurgical recovery protocol was safely implemented with tangible reduction in hospital length of stay. Our case and control populations were well matched from a baseline comorbidity and surgical complexity standpoint. Pathway adherence was noted to be high among off-service critical care providers.

7:40 AM - 7:45 AM

RM114 Further Development of the Superficial Circumflex Iliac Artery Perforator (SCIP) Flap -- the Individualized Design of the Scip Flap to Achieve Primary Donor-Site Closure in the Reconstruction of Middle-Sized Defects

Shanghai Ninth People's Hospital, Shanghai

Presenter: **Shaoqing Feng, MD. PhD.**

Shaoqing Feng, MD. PhD.

Department of Plastic and Reconstructive Surgery, Shanghai Jiaotong University, Shanghai Ninth People's Hospital, Shanghai, China

Background: The superficial circumflex iliac artery perforator (SCIP) flap is a versatile flap in the field of reconstructive surgery and has a great potential to become a new workhorse flap. But the drawback of the SCIP flap is the donor site cannot be closed directly when the flap width exceeds 10cm even when the groin is flexed to reduce tension on the wound. In this article, the authors propose a further technical refinement to repair middle-sized defects (>10cm) while maintaining primary donor-site closure.

Methods: For reconstruction of the defect in the pubic region, a pedicled SCIP flap is used, whereas for the distant region, a free SCIP flap is applied. The width of each flap exceeds 10cm, and we apply the following principles for direct donor site closure: 1. The utilization of waste products: local flap derived from the dog-ears left by the partial closure of the SCIP flap donor site; 2. Sequential propeller flap: the perforator flaps based on the nearby perforators such as the deep branch of the superficial circumflex iliac artery (SCIA), the deep circumflex iliac artery (DCIA), the lumbar artery, and the lateral circumflex femoral artery (LCFA); 3. Bi-paddled KISS SCIP flap: the two skin paddles nourished by the superficial and deep branch of the SCIA respectively, achieving sufficient flap tissue amount while limiting the width of the donor site defect within 8cm. 4. The harvest of the SCIP flaps from both sides to realize the primary closure of the donor site on each side.

Results: From January of 2016 to January of 2018, these methods were used to restore post-traumatic, post-oncologic and scar removed defects in 18 cases. In each case the flap width exceeded 10cm and the mean flap width was 12.1cm. The donor site was closed primarily in all cases. No flap loss and donor site breakdown were observed in any of the cases.

Conclusion: SCIP flap enables resurface the middle-sized soft tissue defects with the width exceeds 10cm. Direct closure of the donor site can be achieved by applying the modern concepts of reconstructive surgery. These methods make further development of the SCIP flap and further popularize its application in the reconstructive surgery.

7:50 AM - 7:55 AM

RM115 Can a New, Three-Dimensional Video Microscope Replace Surgical Loupes?

Baylor College of Medicine, Houston

Presenter: **Matthew G Kaufman, MD**

Matthew G Kaufman, MD(1), Mohin A Bhadkamkar, MD(1), Iki Adachi, MD(2), Chester J Koh, MD(3), Shreeya Popat, MD(3), Jesse C Selber, MD, MPH(4), Alexander F. Mericli, M.D.(5) and William C Pederson, MD(1)

(1)Division of Plastic Surgery, Baylor College of Medicine, Houston, TX, (2)Division of Congenital Heart Surgery, Baylor College of Medicine, Houston, TX, (3)Department of Urology, Baylor College of Medicine, Houston, TX, (4)Department of Plastic Surgery, The University of Texas MD Anderson Cancer Center, Houston, TX, (5)University of Texas M.D. Anderson Cancer Center, Houston, TX

Background

Loupe and operating microscope magnification have both traditionally played critical roles in microsurgery. As a result of ergonomic and postural requirements, both have been associated with short and long term discomfort and in some cases disability. A novel FDA-approved operative "video microscope" (ORBEYE, Olympus-Sony) has the potential to obviate the need for surgical loupes or the operating microscope, offering up to 12x optical zoom, automatic calibration and focus features, easy adjustment to various operative angles, and 4K high-definition three-dimensional television displays for both surgeon and assistant. The upright posture afforded by this microscope may reduce discomfort and disability associated traditional forms of lens based magnification. This technology obviates the need for loupes, and can increase efficiency by avoiding the necessity for the surgeon to remove loupes, ready the microscope, and position it in the middle of the procedure.

Methods

Surgeons in the pediatric urology, pediatric plastic surgery, and pediatric congenital heart surgery divisions at a tertiary care children's hospital, as well as reconstructive microsurgeons at a tertiary care cancer center, used this novel microscope for various surgical procedures. Surveys were obtained that included subjective comparisons of the video microscope to surgical loupes as well as assessments of various aspects of the microscope.

Results

A total of sixteen surgeons and seven trainees used the video microscope and survey forms were completed. The microscope was rated highly with respect to picture quality and magnification range. Survery results of seven of the surgeons were compiled (Table 1). Comments highlighted the three-dimensional image quality, superior field of view, ease of adjusting the compact microscope arm, ergonomics, and role in teaching. It was also noted that the time associated with transitioning between loupes and the microscope was saved, adding to the efficiency of the operations.

Conclusion

This new high-definition, three-dimensional, screen-based video microscope technology has the potential to replace the role of both loupes and the operating microscope. Potential benefits include improved surgeon ergonomics to extend the healthy lifespan of the microsurgeon, while providing shared visualization to trainees and the surgical team, enhancing educational value and surgical team dynamics.

Table 1: Survey Categories and Results (1 (poor) to 5 (excellent))

Survey Category	**Mean**	**Standard Deviation**
Picture quality	4.92	0.28
3-D view	4.85	0.38
Range of magnification	4.92	0.28
Ease of changing magnification	4.83	0.39
Range of depth in view	4.62	0.87
Size of field of view	4.77	0.44
Ease of shifting field of view	4.42	0.80
Ease of use	4.62	0.51
Ergonomics	4.85	0.38
Eye fatigue	4.69	0.48
Ability to complete procedure	4.73	0.47

7:55 AM - 8:00 AM

RM116 Use of the Keystone Perforator Flap Closure for the Anterior Lateral Thigh Free Flap Donor Site

Matthew Mino, Birmingham
Presenter: **Matthew J Mino, MD**
Matthew J Mino, MD, Joseph L Zakhary, MD, Praz Patcha, MD, Ashley Thorburn, MD and Rene P Myers, MD
University of Alabama at Birmingham, Birmingham, AL

Background

The anterior lateral thigh (ALT) flap is a workhorse of microsurgical reconstruction. However, a flap width greater than 8 cm limits primary closure, and discourages some surgeons from using this flap for larger defects to avoid a large and unsightly skin graft. ALT donor site closure can be made even more challenging when a more circular shaped flap is required. There are limited reports of local flaps utilized for ALT donor site closure, but no report of the use of a keystone style perforator flap. This study examines our initial success with this closure technique for the ALT donor site.

Methods

All patients who underwent a medial thigh based keystone perforator flap closure of their anterior lateral thigh donor site from January 2018 to July 2018 were identified. Demographic and perioperative information were reviewed along with complications.

Results

We had 5 cases of keystone perforator flaps utilized in the closure of ALT donor sites. Two were for scalp reconstruction, 2 for lower extremity reconstruction, and 1 for a neck contracture. Our median patient ages was 47 [38-71 years]. Our population was 60% male and 40% female. The median ASA class was 3 (2-4), and the median BMI was 22.6 [14.53-25.49]. We had one case of partial keystone flap dehiscence that required local wound care, and one case of a drain replacement for seroma. Our average operative time was 500 min [436-596 min]. Our average ALT flap size was 10 x 16.4 cm, and our average medial thigh based keystone perforator flap was 12 x 23 cm. Our median post-surgical hospital stay was 8 days [6-21 days].

Conclusion

We have been excited by the keystone flap closure's ability to close large and irregular ALT donor sites that would otherwise have required a skin graft. The keystone perforator flap closure allows the thigh to maintain a relatively normal appearance, reduces postoperative pain associated with not requiring skin grafting, and has not added additional time to our surgeries.

Image 1

Flap planning with adjacent keystone flap drawn out to the right of the flap

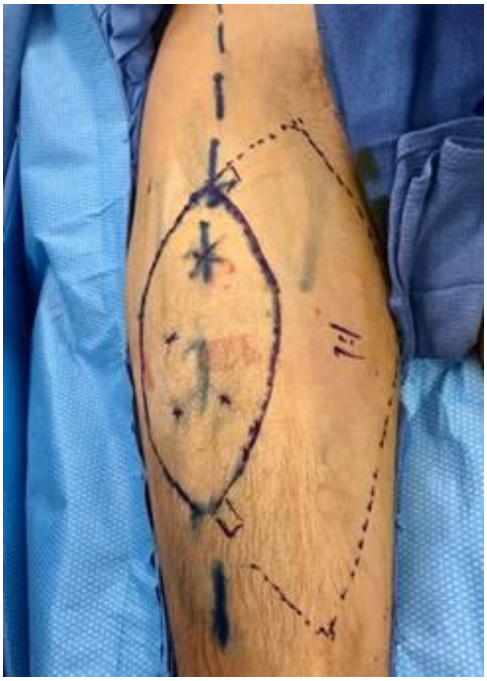
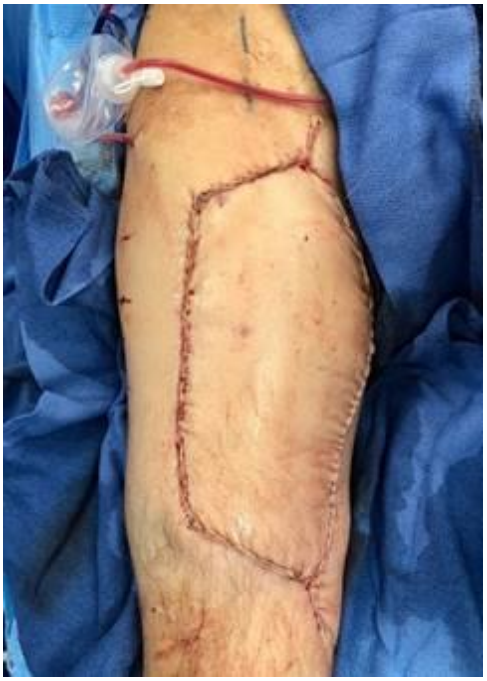


Image 2

Final closed donor site



8:00 AM - 8:05 AM

RM117 Conflicts of Interest at Plastic Surgery Conferences: Disclosure of Its Extent and Nature

Plastic & Reconstructive Surgery, Northwell Health, Zucker SOM, New Hyde Park

Presenter: **Grace Ha, BS**

Grace Ha, BS(1), Rachel Gray, BS(1), Neil Tanna, MD, MBA(1) and Armen K Kasabian, MD(2)

(1)Division of Plastic & Reconstructive Surgery, Northwell Health, Donald and Barbara Zucker School of Medicine, New Hyde Park, NY, (2)Donald and Barbara Zucker School of Medicine at Hofstra/Northwell, New Hyde Park, NY

Background

Relationships between physicians and industry are helpful for both research funding and the advancement of new ideas, however they pose the risk for potential conflicts of interest (COI). The Physician Payments Sunshine Act of 2010 established the open payments database to report the payments to health care providers by biomedical companies to encourage transparency into potential COIs. However, industry relationships can still have profound impacts on research funding, topics, and outcomes. Little research has been done regarding the role of biomedical companies at medical conferences. This study seeks to evaluate the role of industry at conferences by comparing the amount of payments received by speakers at the American Society of Aesthetic Plastic Surgeons (ASAPS), the American Society of Plastic Surgeons (ASPS), and the American Society for Reconstructive Microsurgeons (ASRM) annual conferences with that of an average plastic surgeon. This study also compares the amount of money contributed by different companies to assess for the largest contributors.

Methods

General payments received by physicians who were speakers at the 2017 ASAPS, ASPS, and ASRM conferences were collected from the open payments. Speakers included those listed on the conference programs as chair, instructor, lecturer, moderator, panelist, and presenter. Mean payments received at each conference were calculated and t-tests evaluated differences between the conferences and the average plastic surgeon. An ANOVA tested for differences in payments across conferences.The total amount of payments made by each company was also collected through the Open Payments Database, and z tests identified which companies paid significantly more than the others.

Results

The mean (and median) general payments made to conference speakers at ASAPS (n=75), ASPS (n=249), and ASRM (n=121) were $75,577 ($861), $27,562 ($1,021), and $16,725 ($652), respectively. These mean and median payments made to speakers were significantly different ($p<0.001$ for all) from those of the average plastic surgeon ($4,441 and $327), but not significantly different from each other ($p =0.20$). Allergan contributed significantly more than other companies to speakers at ASPS and ASAPS, while LifeCell Corporation, Zimmer Biomet Holdings, and Axogen contributed significantly more to speakers at ASRM.

Conclusion

Payments to physicians at ASAPS, ASPS, and ASRM were significantly higher than those of an average plastic surgeon. Additionally, certain companies paid significantly more than their peers at each conference. Given these findings, speakers should strive to make clear the extent and nature of their conflicts of interest when presenting at conferences.

8:10 AM - 8:15 AM

RM118 Freestyle Pedicled Perforator and Propeller Flaps: Introducing the Perforator Preserving Concept

State University of Campinas - Brazil, Campinas

Presenter: **Guilherme Cardinali Barreiro, MD, PhD**

Guilherme Cardinali Barreiro, MD, PhD(1,2), Chelsea C. Snider, MD(3) and Luiz Henrique Silva Borges, MD(4)

(1)Medical Assistance Institute for the Public Server, Sao Paulo, Brazil, (2)Plastic Surgery, State University of Campinas, Campinas, Brazil, (3)Institute for Plastic Surgery, Southern Illinois University School of Medicine, Springfield, IL, (4)State University of Campinas, Campinas, Brazil

Freestyle Pedicled Perforator and Propeller Flaps: Introducing the Perforator Preserving Concept

Background Freestyle perforator flaps have been well described for soft tissue reconstructions throughout the body. The flaps are designed according to the defect, surrounding available perforators, and excess regional tissue. Knowledge of the anatomic angiosomes and respective perforators provides a broad spectrum of available pedicled flaps for the reconstructive surgeon. We developed a perforator preserving incision concept for improved reliability and flap outcomes. We present our surgical technique, anatomic studies and clinical application of these flaps for defects of the trunk, head and neck, and limbs. **Methods** Anatomic studies were performed in 35 cadavers to identify reliable perforators based on individual angiosomes throughout the body. Freestyle fasciocutaneous perforator flap technique was developed and includes perforator-preserving incisions followed by subfascial identification of the largest perforator(s). In the clinical setting, perforator-preserving incisions were created in the perforasome watershed areas and flaps were harvested without the use of a hand-held Doppler or pre-operative imaging. Flaps were designed based on the defect size, location, and nearby available tissue. Dissection of the perforator continued in a retrograde fashion to its main vascular pedicle for optimal mobility and rotation of the flap. Flaps were rotated or tunneled for final inset, and those that extended into a tertiary angiosome were supercharged as necessary. **Results** From January 2012 to June 2015, 63 patients were reconstructed with freestyle perforator flaps without the aid of handheld Doppler or pre-operative imaging. Donor sites were primarily closed in 82.5% of the cases. Minor complication rate was 20.6%, with 10 patients (15.8%) presenting with distal flap necrosis. All healed with readvancement of the flap or conservative management. There were no complete flap losses and all defects were adequately closed with the designed flaps. **Conclusion** Understanding of the anatomic perforasomes throughout the body provides the astute reconstructive surgeon with ample reconstructive options for the use of pedicled flaps. Our perforator-preserving surgical technique provides abundant safe and reliable flap options for trunk, head and neck, and limb soft tissue reconstruction and does not require the use of handheld Doppler or pre-operative imaging.

8:15 AM - 8:20 AM

RM119 A Novel Vessel Sizer for Use with the Microvascular Coupler: An Innovative Design Associated with Improved Accuracy

The University of Texas M.D. Anderson Cancer Center, Houston

Presenter: **Alexander F. Mericli, M.D.**

Alexander F. Mericli, M.D.(1), Christina N. Canzoneri, M.D.(2), Christopher M. Stewart, M.D.(2) and Jesse C Selber, MD, MPH(3)

(1)University of Texas M.D. Anderson Cancer Center, Houston, TX, (2)The University of Texas M.D. Anderson Cancer Center, Houston, TX, (3)Department of Plastic Surgery, The University of Texas MD Anderson Cancer Center, Houston, TX

Background: Inherent to the successful use of a microvessel coupler is the accurate measurement of the vessel diameter. Inaccurate measurement leads to wasted couplers, vessel damage, longer ischemia time, and increased cost. We hypothesized that our newly designed graduated coupler sizer (GCS) is more accurate and easier to use than the conventional sizer (CS).

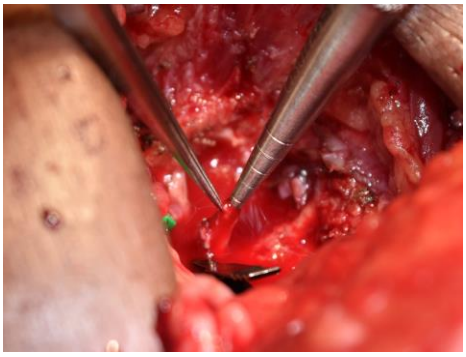
Methods: The design of the GCS is based on that of a jewelerÕs ring mandrel (Figure 1). To use the device, the surgeon intubates the vessel with the sizer, simultaneously dilating the vessel while measuring its diameter (Figure 2). This study included a case-control retrospective clinical series and a laboratory component. For the clinical series, data on patients were extracted from medical records and department databases; 116 patients who underwent a microvascular venous anastomosis using the GCS were compared with 93 in whom the CS was used. In the laboratory component, nine plastic surgeons used the GCS and the CS to estimate the diameter of 10 blood vessels in chicken thighs and then completed a survey.

Results: In the clinical series, the ischemia time was similar for the CS and GCS groups (85 vs. 82 min; p=0.5) as was the rate of perfusion-related complications (2.2% vs. 3%; p=0.8). Use of the CS was associated with a significantly greater percentage of incorrectly measured vessels compared to when the GCS was used (7.5% vs. 1.7%; p=0.04). In the laboratory study, the overall accuracy was 89% for the GCS and 84% for the CS (p=0.001). Seven of nine plastic surgeons thought the GCS was a superior instrument compared to the CS.

Conclusion s: The GCS was more accurate than the CS. We believe the GCS is a useful microsurgical tool that can improve operative efficiency.

Figure 1.

Figure 2.



8:20 AM - 8:25 AM

RM120 Deep Inferior Epigastric Perforator Flaps: Pilot Study in Evaluating Process and Eight Critical Maneuvers for Safety and Efficiency

University of Texas Southwestern Medical Center, Dallas

Presenter: **Min-Jeong Cho, MD**

Min-Jeong Cho, MD(1), Evan S. Garfein, MD(2), Sumeet S. Teotia, MD(3) and Nicholas T. Haddock, MD(1)

(1)University of Texas Southwestern Medical Center, Dallas, TX, (2)Albert Einstein College of Medicine, Bronx, NY, (3)University of Texas Southwestern Medical Center Department of Plastic Surgery, Dallas, TX

Background

With the advances in technology and techniques, the goal of microvascular reconstruction has transitioned from flap success to minimizing complications and maximizing efficiency. While microsurgeons have been successful in minimizing complications, maximizing efficiency has been challenging due to variability in surgeons' skills, operating room (OR) staffs, and patients' anatomy. When surgeons have developed processes that lead to unusually high efficiency, these processes are difficult to communicate. How does one experienced microsurgeon differ from another? Why is one more efficient than another? We use process evaluation software (SigmaSurgical, Inc.) to segment this operation into eight critical maneuvers. In this study, we present our pilot study with data from this process analysis with data from surgeons with variable experience.

Methods

A prospective implantation of process analysis was instituted on 24 consecutive flaps. The eight critical maneuvers for a DIEP flap are: 1) skin to perforator identification; 2) perforator decision making and exposure of all relevant perforators; 3) perforator dissection; 4) pedicle dissection; 5) flap harvest; 6) preparation for microsurgery; 7) venous anastomosis; and 8) arterial anastomosis. Surgeons with variable experiences (faculty, senior resident with faculty assistance, and chief resident alone) used these eight steps to perform DIEP flap reconstruction. The outcomes and time of each critical maneuver were tracked.

Results

The critical maneuvers are divided into two segments with the first being flap harvest (steps one through five) and the second being microsurgery (steps six through eight). The total flap harvest time among the three groups was: faculty surgeons 55:37, senior resident working with faculty 1:06:46, and chief residents alone 1:43:30. The largest difference between faculty and chief resident alone was seen in perforator dissection (18:39 vs. 39:30) and pedicle dissection (16:16 vs. 32:30). Microsurgery results are less variable given at our institution this maneuver is typically performed by a senior resident and faculty together: 38:26, 38:58, and 41:30.

Conclusion

In conclusion, we share our experience using the process evaluation software for DIEP flap reconstruction. We defined eight critical maneuvers to maximize efficiency and safety. By communicating efficient processes and integrating them into the workflow of a given operation, surgeons can continue to improve throughout the arc of their careers. We believe this model can be implemented in other institutions to maximize efficiency and minimize patient morbidity. In addition, this model can be used to provide resident teaching while ensuring patient safety.

8:30 AM - 8:35 AM

RM121 Thrombocytosis Is Associated with Complications after Microvascular Free Flap Surgery: A Review of NSQIP Data

Medical University of South Carolina, Charleston

Presenter: **Sami P Tarabishy, MD**

Sami P Tarabishy, MD(1,2), Marion Tapp, BS(1,2) and Fernando Herrera, MD(1,2)

(1)Medical University of South Carolina, Charleston, SC, (2)Ralph H Johnson Veterans Administration Medical Center, Charleston, SC

Background: Microvascular free tissue transfers are commonly performed for the reconstruction of traumatic, oncologic or iatrogenic tissue defects involving the breast, face, oropharynx, and extremities. Complications, such as partial flap loss, and arterial/venous compromise can not only increase morbidity for the patient, but also tax the healthcare system with prolonged hospitalizations and the need for multiple reoperations. Thrombocytosis, both essential and reactive, can predispose patients to thrombosis and hemorrhage, and thus should intuitively have an effect on the outcome of microvascular free tissue transfers. We sought to evaluate the effect of a pre-operative thrombocytosis on outcomes after microvascular free flap surgery. **Methods:** A retrospective review of the 2013-2016 ACS NSQIP database identified 4299 total patients who had microsurgical flaps performed. Of these 4299 patients, 3744 had pre-operative platelet levels recorded in the database. 54 patients had preoperative Thrombocytosis, defined as a platelet count >450 K/CUMM, while 3690 did not. These two cohorts were compared by comorbidities including age, sex, race, diabetes status, smoking status, height and weight. We further examined outcomes between the two groups by identifying operative time, length of hospital stay, need for transfusion, DVT occurrence post operatively and the need for reoperation. Reoperation CPT codes were reviewed. CPT codes related to hematoma drainage (10140) and Vessel repair (35820 and 35761) were analyzed between the two groups. **Results:** When comparing the two cohorts, there was no statistical difference in comorbidities. We found a significant difference between the thrombocytosis and control cohort in need for transfusion (29.6% vs 12.8%, P = .0002), average length of hospital stay (8.36 vs 5.75, P = .009), and need for reoperation (27.8% vs 13.8%, P=.003). There was a trend towards increased incidence of vessel repair in the Thrombocytosis cohort; however, it was not statistically significant (16.7% vs 5.9%, P=.126). There was no difference in DVT occurrence (0% vs 0.1%, p=.46) or average operation time (535m vs 482min, p=.088). There was no correlation in regards to hematoma evacuation (16.7% vs 17.5%, P=.943). **Conclusion:** Patient's with thrombocytosis undergoing microvascular free flaps have an increased risk for blood transfusion, prolonged hospital stays, and need for reoperation.

8:35 AM - 8:40 AM

RM122 Is It Worth Re-Exploring the Functioning Free Muscle Emergently When the Circulation Is Compromised? - 17 Years of Experiences in a Single Medical Center Based on the Functional Outcome

Chang Gung Memorial Hospital, Taoyuan

Presenter: **Jo-Chun Hsiao, MD**

Jo-Chun Hsiao, MD

Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, Chang Gung University, Taoyaun, Taiwan

Background

Functioning free muscle transplantation (FFMT) is a well-established reconstructive method to reestablish the function of extremities and the facial reanimation. In Chang-Gung Memorial Hospital (CGMH), we have performed more than 1000 FFMTs and achieved good clinical outcome in most cases, however, circulation compromise are still inevitable in sporadic cases. Although the salvage is usually not difficult, we would like to know the worthiness of the emergent re-exploration surgery since the functioning muscle may experience prolong circulation compromise and lead to a poor outcome.

Methods

Cases received functioning free muscle transplantation developed circulation compromised complication and received re-explorative operation within 3 days after the primary operation in CGMH from September 2001 to August 2016 were collected and reviewed retrospectively. The clinical manifestation of circulation compromise, duration of ischemia or congestion or both, re-exploration procedure, and the final functional outcome were recorded for further investigation.

Results

Among 150 cases with age between 5 to 45, 16 patients received re-exploration, resulted in 10.67% re-exploration rate. Eight cases were compromised from arterial insufficiency, while 7 from venous compromised, and 1 from both. Time of detection was 7.3 hours in arterial insufficiency cases, 9.5 hours in venous compromised cases, and 7.5 hours in the both cases. The average duration from the detection of compromising circulation to send the patient to the operation room was 90 minutes; to the salvage procedure was 119.3 minutes. All FFMTs were successfully revascularized and had no complication except one flap demonstrated a partial loss of its skin paddle, however, the outcome of the arterial insufficiency and the both group were poor, while it of the venous compromised group were acceptable.

Conclusion

Considering muscle fails to contraction after 4-6 hours ischemia, we reviewed literatures and demonstrated our strategies, including postoperative monitoring by conventional and innovated modality, timing of detection implicating decision making, treatment choices, as an algorithm to

approach this critical scenario. It is our conclusion that, if the functional result and success rate are similar with or without the revision of compromised vessels of FFMT, surgeons may follow the algorithm with conservative treatment base on our reported outcomes and understanding of cost-effectiveness analysis.

8:40 AM - 8:45 AM

RM123 Fully Automated Cost Measurement in Breast Reconstruction Using Medpather Continuous Cost Capture System

Austin Plastic and Reconstructive Surgery, Austin
Presenter: **Christine Fisher, MD**
Christine Fisher, MD
Austin Plastic and Reconstructive Surgery, Austin, TX

Background: Breast cancer treatment costs, including reconstruction, are higher than any other cancer and may reach $20.5 billion by 2020. Bundled payments have been used in other expensive conditions to reduce costs, including breast cancer radiation therapy. Establishing appropriate prospective breast reconstruction reimbursement (bundle) will require precise cost understanding, which is distinctly different from billing, charges, or collections. Costs of breast reconstruction can be estimated with time-driven activity-based costing (TDABC), but unlike standardized processes, its accuracy is poor due to the highly variable patient presentation, preference, and complex reconstructive decision making. True continuous costing (TCC) improves the accuracy of cost measurement in industries with similar variable processes. We hypothesize that the Medpather Internet of Things (IoT) true continuous cost measurement system will accurately and prospectively capture breast reconstruction care costs.

Methods: First, clinic care costs were estimated with TDABC for reconstructive methods: 1.) 2-stage implant-based reconstruction, 2.) microsurgical breast reconstruction and 3.) revision reconstruction. Next, 60 new patients, divided equally into the same groups, were prospectively tracked using the Medpather real-time locating, process, continuous cost capture, and clinic optimization system. Normalized clinic space costs and human resource costs were used. Each staff member and patient was automatically tracked as they traversed the clinic setting. Interaction times between the patient and each clinic asset were automatically captured by the system which automated process map capture and calculation of fully allocated individualized costs. These costs were then compared to TDABC estimates. Individualized cost reports were compared to actual reimbursements.

Results: Time-driven activity-based breast reconstruction care costs were calculated using standard techniques and normalized financial data for implant-based, autologous, and revision breast reconstruction. Cost measurement for each group was then measured prospectively using continuous cost measurements of interaction times and variance. TDABC underestimated the cost of care by 47.4(±21.1)% in implant-based reconstruction, 56.8(±31.2)% in autologous based reconstruction, and 51.8(±35.8)% in revision reconstruction. Prospective cost measurements were higher than those TDABC estimates due to the automated full allocation of provider and clinic time to individual patients in high variability and complex decision making encounters. Actual clinical expenditures validated automated cost capture calculations. Negative and positive margins were calculated on a per-patient basis.

Conclusion: Medpather continuous cost capture system accurately calculates breast reconstruction care costs. This system has also been implemented to capture process deviation distribution, wait times, and bottleneck measurements to optimize costs and margin.

8:50 AM - 8:55 AM

RM124 A Novel Approach to Maximizing Data Fidelity in Institutional Microsurgery Research Databases

Ohio State University, Columbus

Presenter: **Sumanas W Jordan, MD, PhD**

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Background

Microsurgery research is commonly based on data drawn from institutional databases. This data is generally assumed to be accurate, consistent, and complete. However, this has not been previously verified empirically. The objectives of this study were to evaluate data fidelity in a traditional institutional database model, and to develop a database design that maximizes data fidelity.

Methods

Part I. A model of a traditional institutional database was applied to a random cohort of 25 consecutive abdominally based microsurgical breast reconstruction patients. A set of 10 variables commonly utilized in microsurgery research (including nominal, continuous, and free-answer data types) was collected by 4 categories of personnel: attending surgeon (1), fellow/senior resident (2), junior resident (2), and medical student (2). Statistical analysis of data accuracy and consistency was performed.

Part II. Based on the results of Part I, a modified database model that takes sources of data variation into account was developed and evaluated.

Results

Part I. There were 13 unilateral and 12 bilateral cases, for a total of 346 data points collected per rater (2,422 total data points). With respect to accuracy, numerous data types demonstrated a Cohen's kappa statistic less than 0.80, falling below the threshold for acceptable accuracy for research, including perforator row (0.66), 30-day complications (0.66), flap type (0.72), and prior radiation (0.74). With respect to consistency, multiple variables demonstrated a Fleiss' kappa statistic in the range of 0.60-0.79, indicating consistency of only 35-63%, including flap type (0.61), recipient artery (0.61), 30-day complications (0.65), and perforator row (0.65).

Part II. A modified database model was developed that takes sources of data variation into account. This approach involves a single data entry step that accomplishes both required EMR documentation and database entry. It can be readily implemented using free, publicly available, HIPAA-compliant software that employs a web-based interface accessible from any computer independent of local data or program files. In a subsequent analysis of 25 consecutive autologous

breast reconstruction patients, maximal accuracy, consistency, and completeness was observed, as well as a 100% compliance rate of use by attending microsurgeons.

Conclusion

Data fidelity within a traditional database model is variable. The proposed database model minimizes the impact of sources of data variation. This model can be readily applied to other types of documentation pertinent to microsurgery research, and should be considered for use to maximize the quality of data, and therefore the quality of research, drawn from institutional databases.

8:55 AM - 9:00 AM

RM125 Portable Color-Flow Ultrasound (PCFU) Facilitates Precision Flap Planning and Perforator Selection in Reconstructive Plastic Surgery.

Tulane University, New Orleans
Presenter: **Christopher Homsy, MD**
Christopher Homsy, MD
Tulane University, New Orleans, LA

Background

Precise flap planning and perforator selection is paramount to successful perforator flap surgery. Computed tomographic angiography (CTA) can improve surgical efficiencies and is considered the gold standard for perforator mapping. CTA, however, has several drawbacks: inability to study multiple remotely-located flaps on the same patient, difficulty with correlation of perforator site emergence from fascia to skin surface topography in many flaps, and capability limitations in selecting the largest available perforator when multiple perforators are imaged. PCFU is a convenient low-cost, easily-accessible imaging modality that has proven to be pivotal in the planning of perforator flaps where anatomic variability is the rule. Our experience with PCFU has rapidly improved, allowing an individualized flap selection based on each patient's unique perforator anatomy, reconstructive requirements, and donor site characteristics.

Methods

Perforator mapping was performed using an L12-4 ultrasound probe connected to a tablet. Images were obtained with the Lumify® app (PHILIPS Ultrasound, Inc., Bothell, Wash.). Perforator characteristics were recorded (arterial diameter, emergence points from fascia, subcutaneous course, and projection onto the skin surface) using still images and real-time videos. CTAs were routinely acquired in the first 20 deep inferior epigastric perforator (DIEP) breast reconstructions allowing for direct comparison of imaging modalities. PCFU alone was used to scan for the best perforator flap in all other patients.

Results

Twenty-nine consecutive patients had 41 perforator flap reconstructions. Twenty-one patients underwent autologous breast reconstruction: 20 DIEP flaps (8 unilateral, 12 bilateral) and one Superior Gluteal Artery Perforator (SGAP) flap. Eight patients underwent other types of perforator flap reconstruction: 2 free lateral arm, 2 antero-lateral thigh (ALT), 2 gracilis musculocutaneous, 1 thoracodorsal perforator (T-DAP), and 1 tensor fascia lata perforator. In all DIEP flaps, the preoperative sonographic measurements correlated with CTA and intraoperative findings. In the non-breast reconstruction cases, PCFU allowed perforator flap design and selection based on the largest available perforator, the most appropriate flap thickness, and comparison of multiple donor sites including left versus right. Two DIEP patients required a takeback to the OR for debridement of devitalized tissue. The SGAP was aborted intraoperatively due to proximal vascular anomalies. Overall flap success rate was 97.5%.

Conclusion

PCFU is a powerful imaging modality which affords valuable information for perforator flap design. This technology can play a major role in tailoring flap selection to every patient's variable anatomy and reconstructive requirements.

9:00 AM - 9:05 AM

RM126 Assessing the Influence of Primary Vs. Covering Attending Surgeons on Free Flap Outcomes Following a Take-Back Procedure

Duke University Medical Center, Durham

Presenter: **Ruya Zhao, BS**

Ruya Zhao, BS(1), Ronnie L. Shammas, M.D.(2), Gloria Broadwater, Ph.D.(3), Christophe Hansen-Estruch, MD(4), Roger C Cason, MD(2), Jonah P. Orr, B.S.(2), Matthew Lyes, BS(4), Elliot Le, BS(4) and Scott T. Hollenbeck, M.D.(5)

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Background:

Limited evidence exists which evaluates the effects of patient handoffs on the outcomes of free flap reconstruction following take-back operations. We hypothesized that there is a significantly higher rate of flap loss when a covering vs. primary surgeon performs the take-back operation.

Methods:

We retrospectively reviewed patients who underwent free flap reconstruction and experienced a return to the operating room from 2002-2017 at Duke University Medical Center. The timing of flap loss (i.e. on a weekday vs. weekend) was compared, and logistic regression modeling was used to determine factors that predict return to the operating room.

Results:

A total of 1,177 patients were identified. 267 (22.2%) patients had unplanned returns to the operating room, and 66 (5.4%) patients experienced total flap loss. A univariate logistic regression analysis of predictors for take-backs was summarized in **Table 1**. The length of time between completion of the initial procedure and take-back to the operating room was demonstrated in **Figure 1**. We then analyzed the association between various factors and flap loss after the take back procedures **(Table 2**). A significantly higher rate of flap loss occurred when the operating surgeon during the take-back procedure differed from the primary surgeon (47% vs 20%, $p<0.0001$). Furthermore, flap loss occurred more frequently when the take-back procedure occurred on the weekend ($p=0.013$). When the take-back procedure was performed by the primary surgeon, patients had an earlier return to the operating room (5 days vs 9 days, $p=0.03$), and shorter operations (2.0 vs. 2.5 hours, $p=0.04$).

Conclusion:

Higher rates of flap loss occur when a covering surgeon performs a tack-back procedure. It is important to emphasize proper communication and patient handoffs between primary and covering surgeons to improve patient outcomes.

Table 1: Univariate logistic regression model for predictors of unplanned returns to the operating room

Variable	OR	95% CI	p
Flap Type			0.934
Fasciocutaneous vs Osteocutaneous	0.917	0.491-1.713	
Musculocutaneous vs Osteocutaneous	0.958	0.506-1.814	
Age	0.990	0.982-0.999	0.032
Coronary Artery Disease	0.965	0.639-1.457	0.865
Depression	0.747	0.503-1.108	0.147
DM	0.883	0.557-1.402	0.599
Doppler Monitor	1.031	0.739-1.439	0.858
EBL (Index Operation)	1.000	1-1.001	0.528
Hypercholesterolemia	1.079	0.762-1.528	0.667
Hypertension	1.298	0.979-1.721	0.070
ICU	1.654	1.251-2.189	<0.001
Length of Index Surgery	1.047	0.99-1.107	0.109
Smoking status	1.016	0.822-1.257	0.883
Vioptix Monitor	0.458	0.247-0.851	0.014

OR: Odds Ratio, CI: Confidence Interval

Figure 1: Relationship of elapsed time from the initial surgery to the take-back procedure

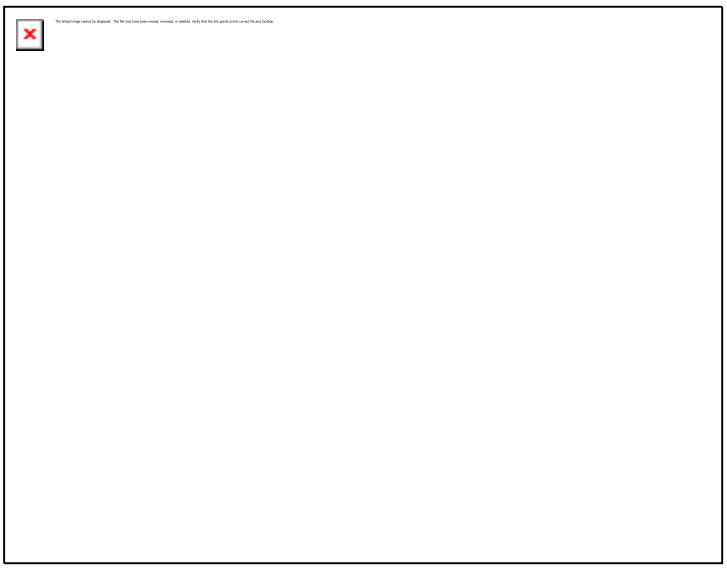

Table 2: Association of factors with flap loss among patients with unplanned return to the OR

Variable	Flap Loss (%)	p
Same Attending		
No	23 (46.9)	<.0001
Yes	43 (20.1)	
Time of Take-back		
Weekday	49 (73.13)	0.013
Weekend	18 (26.87)	0.052
ICU		
No	28 (41.79)	0.338
Yes	39 (58.21)	
Monitoring Technique		
Vioptix		
No	63 (95.45)	0.981
Yes	3 (4.55)	
Doppler		
No	19 (28.36)	0.066
Yes	48 (71.64)	
Flap Type		
Musculocutaneous	26 (38.81)	0.915
Fasciocutaneous	37 (55.22)	
Osteocutaneous	4 (5.97)	
Cause of take-back		
Infection	8 (12.50)	
Hematoma	1 (1.56)	
Arterial Thrombosis	7 (10.94)	
Venous Thrombosis	26 (40.63)	
Necrosis	22 (34.38)	
Time of Day of Take-back		
Day (6am-6pm)	50 (76.92)	
Evening (6pm-11pm)	10 (15.38)	0.899
Overnight (11pm-6am)	5 (7.69)	
Time of Day of Take-back		
Evening/Overnight	15 (23.08)	0.917
Day	50 (76.92)	
Median (IQR)EBL (Initial Surgery), ml	300 (150-500)	0.201
Median EBL (Take-back), ml	100 (50-250)	0.0003
Median Length of Initial Surgery, hrs	9.5 (7-12)	0.419
Median Length of Take-back, hrs	3.3 (2-6)	<0.0001

Median Time to Take-backs, days	6 (2-14)	0.414

9:05 AM - 9:10 AM

RM127 Perioperative Thrombocytosis and the Impact on Free Tissue Transfer Thrombosis Rates

Cooper University Hospital, Camden
Presenter: **Katherine A Rodby, MD**
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Background: As free tissue-based reconstructions become commonplace for cancer and trauma reconstruction, flap loss remains a devastating complication. Despite the frequent use of postoperative antiplatelet therapy in free tissue transfers, there are limited prospective studies evaluating its routine administration. Thrombocytosis has been linked to free flap failure in lower extremity reconstructions; however, no study has evaluated thrombocytosis across all flap types.

Methods: A retrospective chart review was performed of patients undergoing free tissue reconstruction between 2015-2017. Patient demographics, operative findings, platelet counts up to 14days from date of surgery, and outcomes were collected for statistical analysis.

Results: A total of 157 free-tissue reconstructions were performed in 110 patients (101 breast flaps, 33 head & neck(H&N) flaps, and 23 extremity flaps), where 38 flaps developed intraoperative and/or postoperative thrombosis requiring revision unrelated to technical causes. Only 15 flaps were ultimately lost (3 intraoperative, 12 postoperative), failing salvage 39% of the time, generating an overall free-tissue failure rate of 9.5%. Extremity free-tissue reconstructions were more likely to require revision at 57%, compared to 27% H&N flaps and 28% breast flaps(p=0.022). The risk of postoperative thrombosis was 81% higher when perioperative platelet count was greater than 400,000/ml (OR=1.8094). The risk of postoperative thrombosis was 15% higher for each 100,000 count increase in platelet count above 400,000/ml (OR=1.0014). Eight reconstructions requiring anastomotic revisions for vascular thrombosis had concurrent thrombocytosis (5 H&N, 3 extremity). Only 3 flaps that developed thrombosis related to thrombocytosis were salvaged, thus failing salvage in 63% of cases. Salvage failure in the setting of thrombocytosis was most common in H&N reconstruction (80%) compared to breast and extremity reconstructions (0 and 20% respectively, p=0.012)

Conclusion: Thrombocytosis is a rare but devastating cause of thrombosis in microvascular surgery, as vascular revisions in this setting have a significantly higher rate of failure. The risk of postoperative flap thrombosis is higher in patients with platelet counts over 400,000/ml; however these counts were only reached in H&N and extremity reconstructions. Platelet derangements in head and neck surgeries are more likely to hinder revision attempts, leading to flap failure. Yet in general, extremity free flaps are statistically more likely to need revisions for flap compromise than other reconstruction types. Both of these reconstruction types might benefit from routine postoperative antiplatelet therapy.