

Speed Session
Monday January 26, 2015
11:45am-12:45pm
Grand Ballroom EFG

11:45 AM - 11:47 AM

The "Octopus" Lymphaticovenular Anastomosis - Evolving Beyond the Standard Supermicrosurgical Technique

University of Iowa Hospitals and Clinics, Iowa City, IA, USA

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Purpose:

Supermicrosurgical lymphaticovenular anastomosis (LVA) is becoming increasingly performed at major lymphedema centers around the world. Success rates climbed as surgeons accumulated experiences. However, several technical issues remain unresolved. Among these, the lymphatic-to-vein size mismatch and number mismatch proved to be particularly problematic. The focus of our study was to assess the feasibility and effectiveness of a modified anastomotic technique, the "octopus" technique, to address the above problems.

Methods:

We are conducting an observational case series of 6 patients (age 41 - 56) who underwent LVA for treatment of secondary lymphedema. All patients developed lymphedema secondary to cancer treatment. One had lower extremity and five had upper extremity diseases. All patients had disease severity staged at least Campisi stage III or higher, and Lymphographic Dermal Backflow stage III or higher. In all cases the issues of size and number mismatches were encountered and were resolved with the "octopus" technique. The technique is similar to what was originally described by Campisi, et al. Using 12-0 Nylon, multiple smaller lymphatic vessels (0.2 - 0.8 mm) were intussuscepted into a larger vein (0.8 - 2.1 mm), simultaneously addressing the problems of size and number mismatches. Patients were followed at 1, 3, and 6 months postoperatively with patient self-assessments, volumetric measurements, and indocyanine green (ICG) lymphography.

Results:

A total of 62 LVAs were constructed, with a mean of 8.2 LVAs per limb. Anastomotic patency was confirmed in all cases intraoperative assessments. All patients responded favorably to the surgery. None developed postoperative complications. All reported improvements of lymphedema symptoms and limb function. All already have demonstrable volumetric reduction. Three have demonstrated severity-downstaging on the ICG lymphography. Our study is currently ongoing, and, at the time of ASRM Conference, we expect to have at least a 7-month follow-up period and possibly recruit six additional patients to the series.

Conclusions:

Our preliminary findings suggest the "octopus" LVA technique being technically easier than the standard supermicrosurgical technique and effective in the situations of lymphatic-to-vein size/number mismatches. The above technical characteristics allow surgeons to construct higher numbers of LVAs, potentially leading to superior surgical outcomes.

11:47 AM - 11:49 AM

Manson's Point: A Facial Landmark to Identify the Facial Artery

Michael Sosin, Baltimore, MD, USA

Daniel Calva, MD¹; Karan Chopra, MD²; Michael Sosin, MD³; Carla De La Cruz¹; Branko Bojovic¹; Eduardo D. Rodriguez, MD, DDS⁴; Paul N. Manson²; Michael R. Christy¹; (1)R Adams Cowley Shock Trauma Center, (2)Johns Hopkins Hospital, (3)MedStar Georgetown University Hospital, (4)New York University Langone Medical Center

Background: The anatomy of the facial artery, its tortuosity, and branch patterns are well documented. To date, a reliable method of identifying the facial artery, based on surface landmarks, has not been described. The purpose of this study is to characterize the relationship of the facial artery with several facial topographic landmarks, and to identify a location where the facial artery could predictably be identified.

Methods: Following institutional review board approval, 20 hemifacial dissections on 10 cadaveric heads were performed at the Maryland State Anatomy Board. Distances were measured with a caliper from the facial artery to the oral commissure, mandibular angle, lateral canthus, and Manson's point (Figure 1). Distances were then measured and confirmed clinically using Doppler examination in 20 hemifaces of 10 healthy volunteers. Univariate statistical analysis was performed on all measurements from our landmarks.

Results: Cadaveric measurements demonstrated that the facial artery is located 19 mm +/- 5.5 from the oral commissure, 31 mm +/- 6.8 from the mandibular angle, 92 mm +/- 8.0 from the lateral canthus. Doppler examination on healthy volunteers (5 male, 5 female) demonstrated measurements of 18 mm +/- 4.0, 50 mm +/- 6.4, and 79 mm +/- 8.2, respectively. Manson's point identifies the facial artery with 100% accuracy and precision, within a 3 mm radius in both cadaveric specimens and living human subjects (Table 1).

Conclusions: The identification of the facial artery is critical for the craniofacial surgeon in order to avoid inadvertent injury, plan for local flaps, and in preparation of a recipient vessel for

free tissue microvascular reconstruction. Manson's point and several other anatomical landmarks can aid the surgeon in consistently indentifying the facial artery.

Figure 1. Cadaveric head photographs with three-dimensional (3D) computed tomography (CT) scan overlay. The facial artery is superimposed to scale along its course. The facial landmarks and lines A, B, C, and OT are drawn to demonstrate vectors of measurement.



Table 1. Quantitative statistics with all standard deviations for measurements performed for all distances measured to the facial artery from the various surface landmarks in the cadaver dissections. In healthy volunteers, the distances from anatomical landmarks to where a strong, clear, and triphasic Doppler signal was appreciated are also depicted.

Cadaver Subject	Age	Sex	§Lateral Canthus to Facial Artery (mm)		¶Oral Commissure to Facial Artery (mm)		†Mandibular Angle to Facial Artery (mm)		Manson's Point Distance to Facial Artery (mm)	
			R	L	R	L	R	L	R	L
1	66	F	95	90	15	20	25	35	3.0	2.0
2	99	F	90	90	15	18	27	28	4.0	4.0
3	68	M	80	100	16	15	26	35	5.0	5.0
4	80	M	103	85	13	15	40	40	4.0	3.0
5	80	F	85	85	14	12	32	31	3.0	3.0
6	90	F	100	94	17	22	30	24	3.0	1.0
7	98	F	103	103	22	23	35	45	2.0	2.0
8	84	M	93	84	20	20	25	20	3.0	1.0
9	76	F	85	75	24	30	20	25	1.0	5.0
10	75	F	97	95	25	32	35	34	4.0	1.0
Mean	81.6		91.6		19.4		30.6		2.95	
Standard Deviation	11.3		8.08		5.49		6.80		1.36	

Human Subject	Age	Sex	§Lateral Canthus to Facial Artery Doppler signal (mm)		¶Oral Commissure to Facial Artery Doppler signal (mm)		†Mandibular Angle to Facial Artery Doppler signal (mm)		Manson's Point Doppler confirmation	
			R	L	R	L	R	L	R	L
1	36	F	81	80	18	15	54	53	100%	100%
2	30	F	77	82	17	17	61	52	100%	100%
3	47	F	76	80	12	11	51	46	2mm off	100%
4	25	F	80	72	13	16	40	40	100%	100%
5	31	F	66	65	18	20	51	57	100%	100%
6	37	M	74	92	20	21	39	39	100%	100%
7	27	M	86	83	12	11	50	50	100%	100%
8	29	M	79	75	23	22	58	54	100%	100%
9	42	M	94	96	20	23	54	50	100%	100%
10	48	M	73	76	21	21	49	45	100%	100%
Mean	35.2		79.4		17.6		49.7			
Standard Deviation	8.2		8.19		4.05		6.40			

§Measurement was obtained along a vector (line B) from the lateral canthus to the mid-point of the mandibular angle to the menton.

¶Measurement was obtained along the 'OT vector' from the oral commissure to the tragus.

†Measurement was obtained along a vector (line A) from the angle of the mandible to the menton.

11:49 AM - 11:51 AM

Influence of Using a Single Facial Vein as Outflow in Full Face Transplantation: A Three-Dimensional Computed Tomographic Study

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BACKGROUND: The technical success of facial transplantation requires adequate perfusion of the full face graft and typically, the vascular supply have been based on bilateral neck vessels. However, reexploration due to venous congestion has been observed in 2 out of the 28 face transplant performed worldwide and due to the extend of the underlying cause of the facial defect or prior surgeries, bilateral pedicles may not be available in the recipient for anastomosis in every case. In that regards, research studies have suggested that one facial artery might be enough to perfuse the whole face allograft, however it still remain uncertain if a single vein could perfuse the entire face.

The purpose of this study is to evaluate the contribution of a single unilateral facial vein in the venous outflow of total face allograft using three-dimensional computed tomographic imaging techniques to further elucidate the mechanisms of venous complications following total face transplant.

METHODS: Four fresh adult cadavers underwent anatomical dissection and angiographic studies. Full-face soft tissue flaps were harvested in all specimens and a single facial vein was identified and injected distally to the submandibular gland with radiopaque contrast (barium sulfate/gelatin mixture). Following vascular injections, three-dimensional computed tomographic venographies of the faces were performed.

Images were viewed using TeraRecon Software allowing analysis of the venous anatomy and perfusion in different facial subunits by observing radiopaque filling venous patterns.

RESULTS: Three-dimensional computed tomographic venographies demonstrated a venous network with different degree of perfusion in subunits of the face in relation to the facial vein injection side: 100% of ipsilateral and contralateral forehead units, 100% of ipsilateral and 75% of contralateral periorbicular units, 100% of ipsilateral and 25% of contralateral cheek units, 100% of ipsilateral and 75% of contralateral nose units, 100% of ipsilateral and 75% of contralateral upper lip units, 100% of ipsilateral and 25% of contralateral lower lip units and 50% of ipsilateral and 25% of contralateral chin units.

CONCLUSION: Venographies of the full-face grafts revealed better perfusion in the ipsilateral hemiface from the facial vein in comparison with the contralateral hemiface (Figure). A significant reduction in perfusion was observed mostly in the contralateral cheek unit and contralateral lower face including lower lip and chin units. These findings suggest the importance of including the submental vein for the perfusion of the contralateral lower face and the benefit of using bilateral venous anastomosis as outflow in full-face transplantation.



11:51 AM - 11:53 AM

Profunda Artery Perforator Flap Perforasome Territories: Implications of Vascular Anatomy For Optimal Flap Design in Reconstructive Microsurgery

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Background

Recently the profunda artery perforator (PAP) flap has been incorporated into the armamentarium for autologous breast reconstruction. Anatomical dissections have identified consistent musculocutaneous perforators originating from the adductor magnus. The donor site has a low associated morbidity and the scar can be concealed within the gluteal fold. This study aims to delineate the perforasome of the PAP flap and correlate the vascular territories with the anatomical location of the fasciocutaneous perforators. Implications for both regional and free flap reconstruction and flap designs will be discussed.

Materials and Methods

This study involves 20 flaps raised using fresh cadaveric specimens and raised from mid lateral thigh and incorporating the posterior thigh skin and inferior gluteal area. The perforators supply the PAP flap will be identified and documented for size, branching patterns, course and location

in relation to constant anatomical landmarks. Individual perforators will be injected with Omnipaque contrast medium and imaged using high resolution computed tomographic angiography to assess filling patterns and vascular territories of individual PAP flap perforasomes. Results will be analysed with three dimensional volume rendering and measuring regions of interest within the overall skin integument.

Results

Preliminary data identified a total perfusion area of 125-200cm². Patterns of vascular perfusion varied according to anatomical location and providing further information to the potential limits of flap perfusion which can be translated to modifications of flap design to incorporate more autologous tissue when required. Dominant linking vessels from the perforator were evident on CT angiography and these patterns will be mapped to identify the perfusion roadmap, which will be correlated to the anatomical location.

Conclusions

As we continue to discover and develop new flaps and new indications for soft tissue coverage with autologous reconstruction, a comprehensive analysis of perforasome territories will help contribute to further modifications in design and flap harvest applicable to free flap and regional reconstruction. The PAP flap has been a recent contribution to breast reconstruction and we explore how to optimize autologous tissue harvest.

11:53 AM - 11:55 AM

Discussion

11:55 AM - 11:57 AM

Revisiting The Vascular Anatomy of The Distal Anteromedial Thigh: The Feasibility of Quickly Locating The Distal Perforator of The Descending Genicular Artery

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Heping Zheng; Fuzhou General Hospital of People's Liberation Army; Davide Lazzeri; Villa

Salara Clinic, Rome; L. Scott Levin; Hospital of the University of Pennsylvania

Background: The vascular network and the perforators of the distal anteromedial thigh and peripatellar regions vary greatly between individuals. We revisited the anatomy of the descending genicular artery (DGA) and its clinical applications and present a simple method for locating its perforators.

Methods: Forty fresh human lower limbs were dissected to define the anatomy of the branches of the DGA and their perforators and the anatomical landmarks for clinical applications. Five

patients underwent distally based DGA perforator flaps for reconstruction of soft tissue defects occurring near the knee.

Results: The OAB and its cutaneous perforators were found to be closely associated with the distal AMT fossa and the flap design. The osteoarticular branch (OAB) of the DGA was found to have one cutaneous branch in 37 thighs and two perforators in the remaining three lower limbs arising 4.0 ± 0.4 cm above the plane of the lower margin of the medial femoral condyle. A constant cutaneous perforator of the OAB was found in the distal anteromedial thigh fossa that is formed by the medial femoral condyle, the posterior margin of the vastus medialis, and the adductor magnus tendon when the knee joint is overextended. Between 2007 and 2014, five patients with knee injuries underwent reconstruction with a DGA perforator flap without presurgical imaging to confirm our anatomic results. The largest flap measured 20.1 cm \times 11 cm. All the flaps survived uneventfully with a good recovery of knee function.

Conclusion: Our studies provided evidence of the vascular supply and the clinical application of the distally-based DGA perforator flap. Based on the constant perforator arising from the OAB of the DGA that was found in the distal AMT fossa, a perforator propeller DGA flap can be easily harvested and defects around knee joint can be restored.

11:57 AM - 11:59 AM

Functional lips reconstruction using a gracilis muscle free flap

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Title:Functional lips reconstruction using a gracilis muscle free flap. Introduction: The gracilis muscle is a well-known free flap in reconstructive surgery for repairing different kind of defects, such as tongue reconstruction, muscle replacement in the upper limb, facial palsy and several soft tissue repairs. We consider that the gracilis muscle, due to its anatomic and functional features, is the ideal flap for reconstruction of the lips. Materials and methods:Our clinical experience includes 8 patients with lip cancer. Radical tumor resections and reconstructions using an innervated gracilis muscle free flap were performed in all cases. In all cases the gracilis muscle was grafted with split-thickness skin from an area with optimal color match for the lip (2 from the scalp, 6 from the supraclavicular region). Results:In all patients tumor resection was radical and surgical margins were histopathologically negative. No significant complications were observed. After 1 month, in all cases there were no problems with normal word articulation, mouth opening and eating. Static function and vermilion sensitivity were immediately restored.The skin color match was excellent. Conclusions:The lip is a dynamic unit. The innervated gracilis muscle seems ideal for lip reconstruction in that it correctly replaces all the lip layers and compensates for the lost function much better than a static technique with minimal donor site morbidity.

11:59 AM - 12:01 PM

Targeted Graft Specific Treatments Delay Acute Rejection in Vascularized Composite

Allotransplantation

United States Army Institute of Surgical Research, San Antonio, TX, USA

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Background

Vascularized composite allotransplantation (VCA) has the potential to reconstruct any wound using like for like tissue with optimal functional and esthetic results. Technical and ethical challenges have reduced the number of patients treated with this technique. The requirement for systemic immunosuppression in high doses confers morbidity and mortality to support a graft that improves quality of life, but is not life saving.

This group has showed that targeted graft specific treatments, which ameliorate the ischemia reperfusion injury (IRI) at the time of transplantation, or have direct immunomodulatory actions, can delay acute rejection (AR) in VCA grafts. Translating these results may reduce the dosing requirements for systemic therapy with concomitant reduction in toxicity and an expansion of the applicability of the technique.

Methods

Experiments were approved by the relevant Institutional Animal Care and Use Committee.

A large animal (swine) model of VCA was used comprising a gracilis musculocutaneous tissue composite. Three groups of eight experimental animals were used, there were eight controls. Following transplantation in genetically controlled donor / recipient pairs animals were monitored clinically, histologically and pathologically for signs of AR using a standardized international protocol over a 14 day survival period. Interventions assessed were hydrogen sulphide (H₂S), a normo-thermic ex vivo perfusion device and drug eluting micro-particles delivering rapamycin to the dermal layer of VCA grafts. Groups were randomized and investigators were blinded.

Results

AR was delayed by a statistically significant duration in all experimental groups. Mean time to grade 1 and grade 4 acute rejection is summarized in the following table –

	Grade 1 (time in days)	Grade 4 (time in days)
Controls	Mean 6.4	M 10.5
	SD 0.52	SD 2.6

H ₂ S	M 8.9 SD 2.3 p=0.0095	M >14
Drug Eluting Microparticles	M >14	M >14
Warm ex-vivo perfusion	M 13.71 SD 0.52 p= 0.0215	M >14

A result of >14 days occurred when AR did not occur during the survival phase.

Discussion

Ameliorating IRI at the time of allotransplantation has the effect of reducing AR in VCA grafts. Topically applied immunosuppression delays the onset of AR in VCA.

Translation of these results will establish whether, and to what extent, systemic immunosuppression toxicity can be reduced. Ongoing experiments are evaluating the ability of the warm perfusion device to extend ischemic intervals up to 24 hours, and the ability of microparticles to be re-applied at the 14 day stage and their effect on further AR.

12:01 PM - 12:03 PM

The Profunda Artery Perforator Flap: Investigating the Perforasome Using 3D CT Angiography
 Corrine Wong, Dallas, TX, USA
 Corrine Wong, MD, MRCS; Nicholas Haddock, MD; Sumeet Teotia, MD; UT Southwestern Medical Center

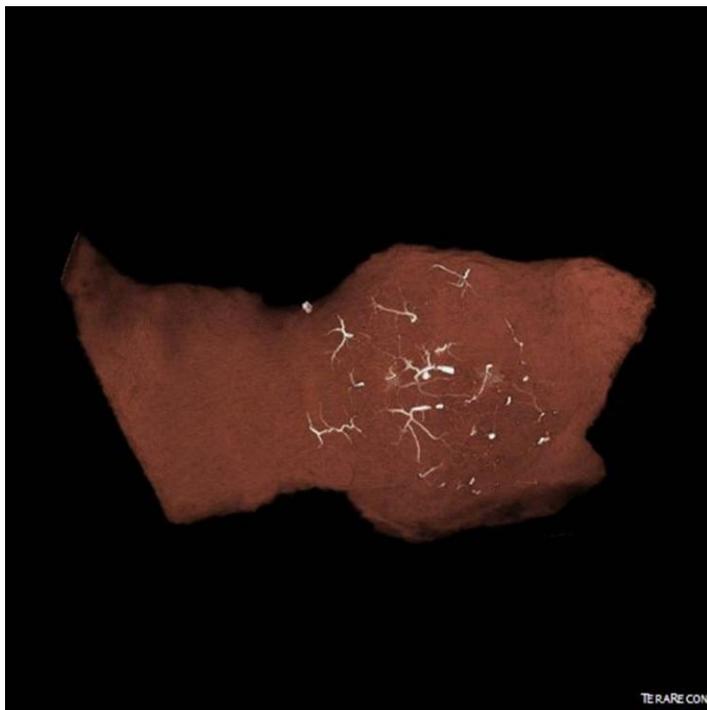
Background: The Profunda Artery Perforator (PAP) flap has been emerging as an alternative method of autologous breast reconstruction. This flap utilizes upper posterior thigh tissue. The PAP perforasome is investigated using 3D CT angiography.

Methods: Ten cadaveric thighs were dissected centered over the profunda artery perforator. A single perforator per flap was injected with contrast medium and the flap was then subjected to CT scanning using a GE Lightspeed sixteen slice scanner. The 3D images were viewed, and measurements were made using Aquarius software, including horizontal and vertical extensions of the flap as well as areas of perfusion. Clinical examples were presented.

Results: A profunda artery perforator (occasionally two) was consistently found in the upper medial thigh region, posterior to the gracilis muscle. Clinically, typically one, occasionally up to

three perforators can be harvested per flap. For consistency single perforators were injected in this series. The area of vascularity shown by the spread of contrast extends inferiorly beyond the usual lower border of the PAP flap, which is usually 7cm wide. In injected cadaveric flaps the mean horizontal dimension was 16.7cm and the mean vertical dimension was 16.5cm. The mean area perfused was 8812cm². Clinical examples demonstrate breast reconstructed patients with good volume, low complication rate.

Conclusion: The PAP flap is a vascularly sound flap, and is a good option for autologous breast reconstruction. Advantages include a reliable pedicle, no position changes required, and can result in an improved donor site contour from a thighlift. It is an excellent alternative to abdominal-based free flaps and can also be used in conjunction with other flaps for further volume enhancement.



12:03 PM - 12:05 PM

Discussion

12:05 PM - 12:07 PM

Tamoxifen (Selective Estrogen-Receptor Modulators) and Aromatase Inhibitors as Potential Perioperative Thrombotic Risk Factors in Free Flap Breast Reconstruction

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Purpose: Estrogen hormone therapy (HT) utilizing selective estrogen-receptor modulators (SERMs) and aromatase inhibitors (AIs) has become ubiquitous in the treatment of breast cancer. HT is; however, a well-established thromboembolic risk factor. Given the theoretical concern for increased microvascular thromboses, recently published level III data suggests that preoperative Tamoxifen usage nearly doubles flap-related complications. Subsequent to this data, the evidence-based proposal has been to hold Tamoxifen for at least 28 days prior to reconstruction. The purpose of this study is to two-fold 1) further evaluate Tamoxifen as a potential thrombotic risk factor 2) evaluate AIs as a potential novel risk factor.

Methods: Patients were identified via a prospectively maintained database of abdominally-based free flaps performed from January 2008 – July 2012. As per institutional protocol, patients were instructed to cease Tamoxifen two weeks prior to surgery. Patients were not advised to cease their AI regimen. Univariate statistical analyses included Fisher's exact test and the Mann-Whitney U test. A value of $p < 0.05$ denoted statistical significance.

Results: 1,347 flaps were performed on 851 patients. Those receiving HT prior to reconstruction had significantly higher rates of preoperative radiation, preoperative chemotherapy, and delayed reconstruction. Thrombotic complications and flap failure were analyzed per HT regimen. There were no statistically significant differences in thrombotic complications or flap failure in comparing those that did not receive preoperative Tamoxifen versus those that did receive Tamoxifen (Table 1), nor were there significant differences specific to those receiving Aromatase inhibitors (Table 2). A post-hoc power analysis was performed with the supposition that HT exposure results in a two-fold increase in complication rate. The study power was found to be 0.863.

Conclusions: Tamoxifen may have been previously overestimated as a microvascular thrombotic risk factor. At a minimum, this data suggests that withholding Tamoxifen for two weeks prior to surgery can mitigate thrombotic risk. Given the 14 day half-life of Tamoxifen's active metabolite, Tamoxifen may be of minimal microvascular thrombosis risk altogether. AIs were not found to increase thrombotic complications despite continued perioperative administration. Given the adequate study power (>0.800), there is a low likelihood of Type II error. We recommend withholding Tamoxifen for no longer than two weeks prior to surgery and suggest further study as an even shorter time interval may be appropriate.

Table 1.

	No HT agent n (%)	Tamoxifen n (%)	<i>p value</i>
Flap No.	1120 (91.6)	103 (8.4)	
<i>Outcomes</i>			
Intraoperative Arterial Thrombosis	29 (2.6)	5 (4.9)	0.2
Intraoperative Venous Thrombosis	5 (0.4)	0(0)	1
Intraoperative ANY Thrombosis	31 (2.8)	5 (4.9)	0.22
Postoperative Arterial Thrombosis	14 (1.3)	2 (1.9)	0.64
Postoperative Venous Thrombosis	14 (1.3)	1 (1)	1
Postoperative ANY Thrombosis	26 (2.3)	3 (2.9)	0.73
Any Arterial Thrombosis	43 (3.8)	7 (6.8)	0.19
Any Venous Thrombosis	19 (1.7)	1 (1)	1
Any Thrombosis	56 (5)	8 (7.8)	0.23
Flap loss (partial)	5 (0.4)	1 (1)	0.41
Flap loss (total)	6 (0.5)	0 (0)	1
Flap loss (any)	11 (1)	1 (1)	1
Flap Type			
msfTRAM	779 (69.6)	75 (72.8)	0.49
DIEP	296 (26.4)	27 (26.2)	
SIEA	33 (2.9)	1 (1)	

Table 2.

	No HT agent n (%)	Non-Tamoxifen HT (Aromatase Inhibitors) n (%)	<i>p value</i>
Flap No.	1120 (90)	124 (10)	
<i>Outcomes</i>			
Intraoperative Arterial Thrombosis	29 (2.6)	2 (1.6)	0.76
Intraoperative Venous Thrombosis	5 (0.4)	2 (1.6)	0.15
Intraoperative ANY Thrombosis	31 (2.8)	4 (3.2)	0.77
Postoperative Arterial Thrombosis	14 (1.3)	2 (1.6)	0.67
Postoperative Venous Thrombosis	14 (1.3)	1 (0.8)	1
Postoperative ANY Thrombosis	26 (2.3)	3 (2.4)	1
Any Arterial Thrombosis	43 (3.8)	4 (3.2)	1
Any Venous Thrombosis	19 (1.7)	3 (2.4)	0.48
Any Thrombosis	56 (5)	7 (5.6)	0.67
Flap loss (partial)	5 (0.4)	0 (0)	1
Flap loss (total)	6 (0.5)	1 (0.8)	0.52
Flap loss (any)	11 (1)	1 (0.8)	1
Flap Type			
msfTRAM	779 (69.6)	96 (77.4)	0.23
DIEP	296 (26.4)	26 (21)	
SIEA	33 (2.9)	2 (1.6)	

Speed Session, Monday January 26, 2014, 11:45am-12:45pm

12:07 PM - 12:09 PM

The Internal Mammary Lymph Node Flap for Treatment of Lymphedema

University of Pennsylvania, Philadelphia, PA, USA

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Introduction:

Lymphedema affects 40% of breast cancer patients after axillary lymph node dissections and 3% of patients after sentinel lymph node biopsies. Vascularized lymph node transfer has recently re-emerged as a treatment option for lymphedema, although the ideal lymph node donor site has not been identified. The internal mammary lymph nodes (IMLN) represent a potential donor site for patients with history of unilateral breast cancer and existing upper extremity lymphedema who present for delayed bilateral breast free flaps. The IMLN flap, harvested from the non-cancer side, would create minimal additional morbidity, as the internal mammary vessels would be otherwise transected for free flap surgery.

We report an anatomic study to examine 1) the number of lymph nodes that can be harvested with the internal mammary vessels and 2) surgeon's ability to quantify these nodes through inspection of the lymph node packet in the operating room.

Methods:

Ten dissections were performed in fresh female cadavers. The pectoralis major muscle was reflected and the third and fourth ribs were removed. Internal mammary vessels and the adjacent lymphatic tissue and lymph nodes were dissected. Surgeon-reported lymph node counts were recorded. Fresh tissue was examined by pathology using frozen sections to identify total number of lymph nodes. Axillary dissection examined caliber of the serratus branch artery and vein. Descriptive statistics were produced and correlations between surgeon-reported and pathology-confirmed lymph node counts were performed.

Results:

The internal mammary lymph node packets averaged 7 by 1cm in size and weighed between 1.0 and 1.8 grams. The serratus branch artery and vein were similar in size to the internal mammary artery and vein (artery 2.4mm vs. 2.7mm and vein 2.4mm vs. 2.8mm). 70% of specimens contained between 1 and 3 lymph nodes (mean 1.5 lymph nodes). Surgeon-reported lymph node counts had high correlation with number of nodes seen on frozen section (kappa 0.75).

Conclusions:

The IMLN flap provides one to three vascularized lymph nodes with adequate donor vessel caliber and minimal additional donor site morbidity. Surgeon's on-table assessment can accurately quantify the number of lymph nodes within the specimen. The serratus branch artery and vein are adequate for microvascular anastomosis, preserving latissimus-based reconstructive options. Further research is necessary to identify the minimum number of lymph nodes necessary for transfer to ensure successful lymphedema treatment. The IMLN flap may be a good treatment option for existing unilateral lymphedema when delayed bilateral free flap breast reconstruction is planned.

12:09 PM - 12:11 PM

Vascularized Axillary Lymph Node Transfer: A Novel Model in the Rat
Cleveland Clinic, Cleveland, OH, USA

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Vascularized Axillary Lymph Node Transfer: A Novel Model in the Rat

Introduction:

Vascularized lymph node transfer is a promising technique for the surgical treatment of lymphedema. To date, few experimental animal models for vascularized lymph node transfer have been described and the viability of the transferred lymph nodes after the transfer has been tested. The purpose of this study was to evaluate the feasibility of vascularized axillary lymph node transfer in the rat.

Material and methods:

Lymph node containing flaps were harvested from the axillary region in ten male Lewis rats (300-350g) based on the axillary artery and vein (Figure 1 and 2). Flaps were transferred to the ipsilateral groin and microanastomosis was performed to the femoral vessels in an end-to side fashion. Indocyanine green (ICG) was administered intravascularly via the jugular veins and ICG angiography was used to confirm flap perfusion. On postoperative day 7, the lymph node flaps were elevated to macroscopically assess their structure and vessel patency. Flap biopsies were stained with H&E to confirm the presence and viability of lymph nodes.

Results:

All animals survived and tolerated the procedure well. Immediate post-procedure ICG angiography confirmed flap perfusion. No signs of ischemia or necrosis were observed in donor extremities. One animal suffered from iatrogenic lower brachial plexus injury during harvesting of the flap and one animal developed hematoma at the recipient site that resolved spontaneously. At postoperative day 7, all flaps remained viable with patent vascular pedicles. Macroscopically and histologically, 3-4 viable lymph nodes were identified in each flap.

Conclusions:

To the best of our knowledge, this is the first report describing vascularized axillary lymph node transfer in the rat. This study showed that the transfer of axillary lymph nodes based on the axillary vessels is feasible. The flap can be used without the need for donor animals and it contains a consistent number of lymph nodes. This reliable vascularized lymph node transfer can be further utilized in studies involving lymphedema, transplantation and induction of immunologic tolerance.

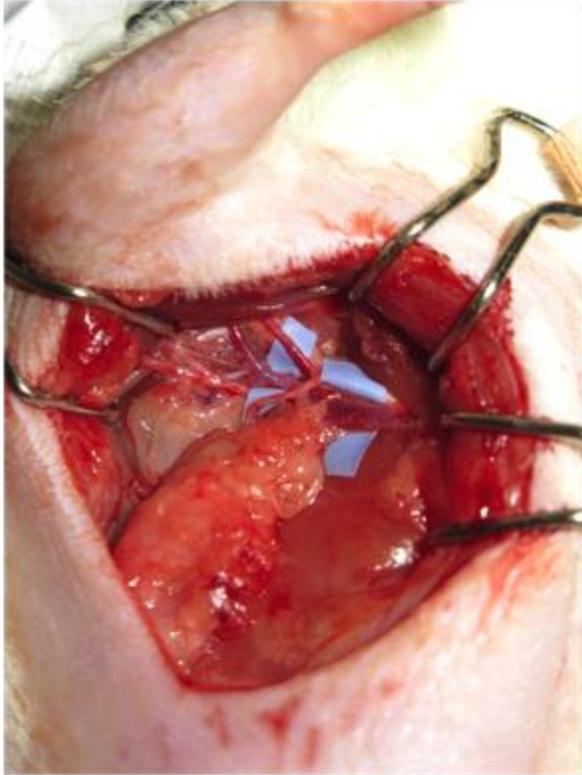


Figure 1. The view of the exposed rat axilla

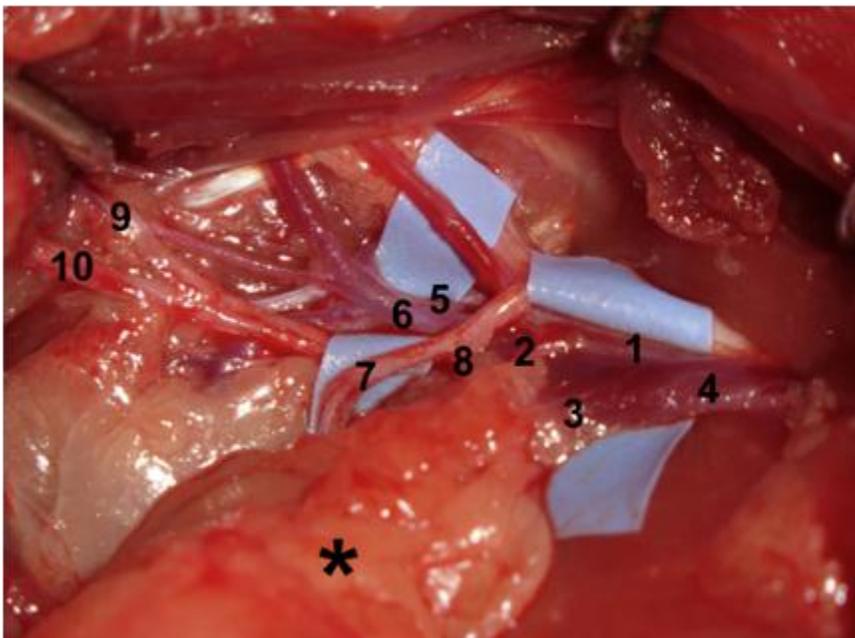


Figure 2. Neurovascular anatomic features of the rat axilla: 1, axillary artery; 2, lateral thoracic artery; 3, lateral thoracic vein; 4, axillary vein; 5, brachial artery; 6, brachial vein; 7, medial anterior thoracic nerve; 8, branch to cutaneous maximus; 9, median nerve; 10, ulnar nerve; asterisk, axillary lymph node flap

12:11 PM - 12:13 PM

Breast Reconstruction with SIEA Flaps: A Review of Our Experience with 145 Free Flaps
The University of Chicago , Chicago, IL, USA

Julie E. Park, MD; Deana Saleh Shenaq, MD; Amanda Silva, MD; Julie Mhlaba, BA; David H. Song, MD, MBA; University of Chicago Medical Center

Introduction: Refinements in microsurgical breast reconstruction have led to the advent of the SIEA flap, yet technical difficulty with anastomosis has limited its widespread acceptance. We aim to evaluate our experience with abdominal-based free flap breast reconstruction utilizing SIEA/SCIA flaps. To our knowledge, this data represents the largest reported series.

Methods: We conducted a retrospective chart review of all SIEA/SCIA free flaps performed by the senior authors between January 1, 2006 and February 6, 2014. The decision to pursue SIEA/SCIA reconstruction was based on a palpable arterial pulse regardless of arterial diameter.

Results: One hundred forty-five flaps were performed in 119 patients including 123 SIEA (85%) and 6 SCIA (4%) flaps. Ten unilateral reconstructions consisted of a SIEA hybrid flap: 7 SIEA/DIEP (5%), 6 SIEA/SIEA (4%), 2 SIEA/SCIA (1.4%), and 1 SIEA/ms-TRAM (0.6%) (Table1). Arterial donor and recipient mismatch occurred in 55 instances (38%). Forty-eight arteries (87%) were spatulated and 7 (13%) were back-cut to improve size concordance. Thirteen flaps (9%) required operative return for: hematoma (n = 2), arterial (n = 5) or venous thrombosis (n = 3), mastectomy skin necrosis (n = 2), and concomitant arterial and venous thrombosis (n = 1). Total flap loss rate was 4.1% (n = 6) and partial loss rate 1.4% (n = 2). No flaps taken back for arterial thrombosis were salvageable despite attempted correction within 24 hours (n = 5). Furthermore, 80% had arterial revisions at initial operation and none were spatulated. The majority (67%) of flaps with venous thrombosis were recoverable.

Conclusions: Our data suggests that although SIEA/SCIA breast reconstruction can be reliably performed, flaps exhibiting post-operative arterial thrombosis with revision at initial surgery are unlikely salvageable upon re-operation. Spatulation did not correlate with increased thrombosis rate; in fact, we advocate for donor artery manipulation via back cuts or spatulation to manage size mismatch. To facilitate inset and maximize pedicle length, harvesting the contralateral abdomen is essential, as is fully opening the cribiform fascia to expose the SIEA at its origin.

TABLE 1

Characteristics	Mean (Range +/- Standard Deviation)
Patient (n = 119)	
Age (years)	50 (29 – 80)
BMI	29.3 (20 – 50)
Flap (n = 145)	
Weight (grams)	810 (191 – 1699)
Pedicle Length (cm)	5.5 (1 – 10)

Arterial Diameter (mm)	1.17 (0.5 – 4)
Venous Diameter (mm)	2.85 (0.5 – 5)
Ischemia time (minutes)	61 (21 – 148)
Abdominal Donor Site	n (percentage)
Contralateral	123 (85%)
Ipsilateral	16 (11%)
Bilateral	6 (4%)

12:13 PM - 12:15 PM

Discussion

12:15 PM - 12:17 PM

Delay in Detection of Ischemia in Free Muscle Flaps Can be Reduced Using Microdialysis

Institute of Clinical Medicine, Aarhus University, Aarhus, , Denmark

Andreas Rauff-Mortensen, medical, student¹; Mette Marie Berggren-Olsen, MD²; Hans Kirkegaard, DMSc, PhD, MD³; Hanne Birke-Sorensen, MD, PhD¹; (1)Aarhus University, (2)Sygehus Lillebaelt, (3)Aarhus University Hospital

Introduction

Microdialysis (MD) is one of the methods used clinically for detection of ischemia. When monitoring for ischemia, high sensitivity is important, but rapid response is also an issue. MD is proven reliable, but has the disadvantage of delay, as 1-2 hours will pass in most clinical settings before the information is available. This delay is partly due to a very slow flow rate.

Objective

The aim of this study was to evaluate whether an increase in the MD perfusion rate from the classic 0.3 µl/min to 1.0 µl/min, could reduce the delay in detection of ischemia, without a reduction in sensitivity.

Methods and material

In 8 pigs two symmetric pure muscle flaps were dissected – each based on one vascular pedicle. In each muscle 2 MD catheters were placed. The 2 MD catheters were allocated to perfusion rate of 0.3 or 1.0 µl/min and the 2 muscle flaps were allocated to arterial or venous ischemia (AI or VI). After baseline monitoring AI or VI was introduced by application of vessel clamps, and these clamps were removed again 3 hours later to end the period of ischemia. MD sampling was performed throughout the experiment, and the dialysates were analysed regarding the content of glucose, lactate, pyruvate and glycerol. The lactate / Pyruvate ratio (L/P ratio) was calculated. The ischemic cut-off values were set to: $C_{\text{Glucose}} < 0.2 \text{ mmol/L}$, $C_{\text{Lactate}} > 7 \text{ mmol/L}$ and L/P ratio > 50 for the 0.3 as well as the 1.0 catheter.

Results

Induction of ischemia caused significant response in the ischemic markers (C_{Glucose} , C_{Lactate} and the L/P ratio) in the 0.3 as well as the 1.0 catheters. Ischemic trends were seen in all the classic 0.3 catheters within 60 minutes and in all the 1.0 catheters within 20 min. The ischemic cut-off values were reached within 75 minutes in all the classic 0.3 catheters after induction of AI. In the 1.0 catheters 100 % cut-off values were reached within 40 minutes. For the VI cases the corresponding times were 135 and 150 minutes.

Conclusion

When using MD for detection of ischemia the delay in detection of arterial ischemia can be significantly reduced by increasing the perfusion rate from 0.3 to 1.0 $\mu\text{l}/\text{min}$. It is important from a practical point of view that there is no need to adjust the ischemic cut-off values when the perfusion rate is shifted. The cut-off values can be preserved.

12:17 PM - 12:19 PM

Functioning lymphatics transfer for treatment of severe leg lymphedema

The University of Tokyo, Tokyo, , Japan

Isao Koshima; Kensuke Tashiro; Mitsunobu Harima; Takumi Yamamoto; Mitsunaga Narushima;

The University of Tokyo Hospital

[Introduction]

The goal of surgical treatment is freedom from physio-compression for lymphedema patients. Multiple lymphaticovenular anastomosis (mLVA) can reduce the incidence of phlegmone and end up with minor infection to reduce or stop physio-compression therapy. We already established mLVA in the early stage or single prophylactic LVA prevents development of edema after lymphadenectomy. However, mLVA is still ineffective for severe cases. Since 2004, functioning lymphatics transfers have been attempted with mLVA and other surgical techniques for severe edema resisted to LVA. Since 1999, we have demonstrated our techniques in many live surgical courses in the world, the results of new combined surgical technique for severe edema will be summarized in this meeting.

[Materials and method]

Since 1990, we carried out LVA for 1305 cases. After 2004, 73 patients treated with combined functioning lymphatics transfer, mLVA and other minor surgeries for severe edema were followed. The age of patients was 13 to 81, the arm was 2 cases lower limbs was 71 cases. In the patients with unilateral leg edema, lymphatics on the 1st web space were harvested from the contralateral normal dorsal foot. In the patients with bilateral leg edema, functioning lymphatics (lymphnodes) were obtained from lateral thoracic region.

[Results]

Seventy three patients were followed from four month to 7 years after surgery. Among them, 34 cases showed remarkable improvement and some need not compression. Thirty-three cases were effective, 8 cases were constant or worse. There was a tendency that the effect relates to the number of transplanted tissues and that of mLVA. Generation of smooth muscle cells within lymphatics seems to relate the postoperative improvement.

[Conclusion]

Combined surgical treatment using mLVA and functioning lymphatics is a new strategy for severe leg edema.

12:19 PM - 12:21 PM

Patient Satisfaction and Quality of Life Associated with Breast Reconstruction: A Systematic Review and Meta-Analysis

Johns Hopkins University School of Medicine, Baltimore, MD, USA

Carisa M. Cooney, MPH; Isabel Wiener Stensmann; Anne Tong, MBBS; Li Xie, ScM; Stella Seal, MLS; Anas Abdullah, MBBS; Pablo A. Baltodano, MD; Dennis G. Foster; Gedge D. Rosson, MD; Johns Hopkins University School of Medicine

BACKGROUND: Patient-reported outcomes measures (PROM), including the BREAST-Q, represent a critical component of patient care optimization programs and may be tied soon to Medicare reimbursement rates. However, no published study has systematically evaluated the impact of using the BREAST-Q in breast reconstruction research. We conducted the current study to systematically assess and meta-analyze BREAST-Q use by researchers investigating patient satisfaction and quality of life (QOL) associated with breast reconstruction.

METHODS: A search of PubMed, Embase, CINAHL, Cochrane, Web of Science, Scopus, and Google Scholar through March 7, 2014 and reference review of relevant articles yielded 276 unique publications. Three authors independently reviewed these articles and included all studies that used the BREAST-Q to assess pre- and/or post-breast reconstruction satisfaction and QOL. Homogeneity of BREAST-Q use among included articles was systematically assessed. Articles reporting BREAST-Q scores for any domain among homogenous populations were pooled and meta-analyzed.

RESULTS: Twenty-one studies used the BREAST-Q to assess patient satisfaction associated with breast reconstruction. Of those, 13 presented data in a manner compatible with meta-analysis. Due to the heterogeneity among studies, only one question was meta-analyzable: comparison of post-operative satisfaction and QOL between silicone and saline implant recipients. Patients reconstructed with silicone implants were significantly more satisfied per the Satisfaction with Breasts domain [silicone (n=370), saline (n=416); pooled means=61.42 (SD±17.79) and 54.78 (SD±19.04), respectively (p<0.0001)] and Satisfaction with Outcome [silicone (n=203), saline (n=110); pooled means=79.27 (SD±18.33) and 73.36 (SD±20.19), respectively (p=0.0114)] than patients reconstructed with saline implants. This association prevailed even though silicone implant patients (n=203) were significantly less satisfied than saline implant patients (n=110) regarding information provided by their care-givers [pooled means=72.4 (SD±16.82) and 77.82 (SD±15.09), respectively] (p<0.0001). Finally, both groups

demonstrated similarly low scores for Sexual Well-being [pooled means: silicone=53.84 (SD±20.29), saline=54.0 (SD±18.88)]. No included study used the BREAST-Q Preoperative Reconstruction Module to account for impact of potential baseline differences on post-operative BREAST-Q scores.

CONCLUSIONS: Our systematic review revealed that 38% of published BREAST-Q articles used or reported this PROM's results sub-optimally. Meta-analysis was only possible for 6 (29%) studies, and demonstrated higher Satisfaction with Breasts and overall Outcome for patients undergoing silicone rather than saline implant reconstructions. Future study designs should include the Preoperative BREAST-Q to control for baseline differences to reach reliable conclusions about post-reconstruction satisfaction and QOL. Authors may consider publishing data with means and standard deviations, enabling other surgeons to determine the study's relevance to their own patient populations.

12:21 PM - 12:23 PM

Rat Model for Vascularized Lymph Node Transfer

Columbia University Medical Center, New York, NY, USA

Marc Najjar, MD; Naikhoba C.O. Munabi, BA; Yelena Akelina, DVM; Jeffrey A. Ascherman, MD; Columbia University

Title: Rat Model for Vascularized Lymph Node Transfer

Purpose:

Recently, vascularized lymph node transfer (VLNT) has been investigated as a possible surgical treatment for lymphedema. The benefits of VLNT have been difficult to ascertain, however, due to the limited number of patients who have undergone the procedure. In order to obtain a greater sense of the capabilities and limitations of VLNT, future research will benefit from an animal model. Our aim in this study was to determine the reliability of using rats as a model for VLNT.

Methods:

Twelve Sprague-Dawley rats were injected subcutaneously with isosulfan blue in the flanks and hind paws bilaterally. Dissections were performed in the inguinal and popliteal regions to identify lymph nodes and associated blood vessels. Once lymph nodes were identified, popliteal and inguinal nodes were removed unilaterally to prepare a recipient limb. In three rats, inguinal lymph nodes from the contralateral limb were harvested on the superficial epigastric vessels as a donor free flap. VLNT was performed through microsurgical anastomosis of the donor flap to the recipient limb in one of three ways: end-to-side of the popliteal vessels, end-to-side of the superficial epigastric vessels, or end-to-end of the superficial epigastric vessels. Anastomoses were evaluated for patency at one and 24 hours post-operatively.

Results:

At least one popliteal node and 2 inguinal nodes were identified bilaterally in all twelve rats with isosulfan blue staining (**Figure 1**). Although all three types of anastomoses showed initial patency, thrombosis was observed within an hour in the end-to-side anastomoses of the superficial epigastric and popliteal vessels. However, vessels remained patent at 1 and 24 hours after VLNT with end-to-end anastomoses of the superficial epigastrics (**Figure 2**).

Conclusions:

Rat hind limbs possess a reliable lymphatic anatomy and seem to be a good model for studying VLNT. The type of anastomosis used for VLNT in a rat model can impact flap durability; end-to-end anastomosis of superficial epigastric vessels is a viable option for maintaining vessel patency beyond the initial 24-hour period. Further studies using this model could determine how VLNT impacts lymphatic function in a recipient limb.



Figure 1. Blue-stained lymph nodes are easily identified through dissection after subcutaneous injection with Isosulfan blue. A representative image of a popliteal node (blue dotted line) and associated popliteal vessels (black lines) is shown.

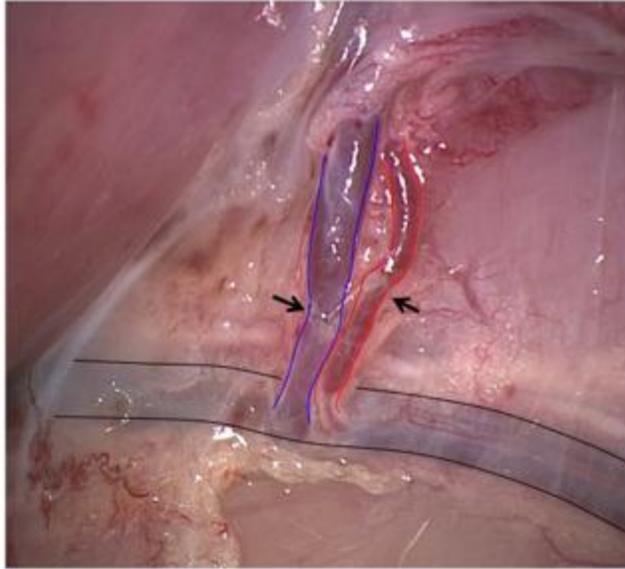


Figure 2. End-to-end anastomoses (black arrows) of the superficial epigastric artery and vein remained patent at 24 hours. The superficial epigastric artery (red lines) and vein (blue lines) are shown arising from the femoral vessels (black lines).

12:23 PM - 12:25 PM

Discussion

12:25 PM - 12:27 PM

Remote Ischemic Preconditioning's Effect On Fat Graft Volume

Andrew Gassman, Los Angeles, CA, USA

Andrew Austin Gassman, MD; Justine Lee, MD/PHD; University of California Los Angeles

Fat grafting has become a useful adjunct in the reconstructive surgeon's treatment armamentarium. Inconsistencies in transfer and local ischemia prior to the development of recipient circulation all contribute to highly variable long-term results associated with fat grafting. Remote Ischemic Preconditioning (RIPC) is a cheap non-invasive technique that has been used in several animal models and multicenter clinical trials to protect several organ systems. The specific aim of this project was to analyze the volume retention of lipoaspirate transferred in the setting of either donor or recipient RIPC.

We obtained subcutaneous adipose tissue from FVB mice transgenically engineered to express eGFP and Luciferase. These samples were obtained either with or without the use of temporary hindlimb tourniquet time prior to harvest. The samples were excised and passed through serially smaller lipoaspiration cannulas (16 to 19 gauge), centrifuged (500g for 2 min), and decanted. The treatment and control fat was injected into the dorsal skin folds of genetically identical FVB mice that did not express GFP or Luciferase. The viability and volume of the transferred tissue was examined over a 28-day time period by bioluminescence after

intraperitoneal injection of Luciferin using a Maestro IVIS optical small animal scanner. Additionally, after experimental completion the tissue transferred was explanted and examined histologically. The specimens were stained with H&E, CD31, CD34, and GFP.

Bioluminescence was able to non-invasively track the presence of transferred lipoaspirate tissue over a 28 day time period. There was a significant difference in bioluminescence and calculated graft volume at Day 0 and 28. The RPC group demonstrated approximately 700% and 400% increase over control at each time point, respectively. Histological analysis at 28 days confirmed the presence of donor adipocytes, and that they were gradually replaced by recipient inflammation and scar tissue. However the amount of interstitial fibrosis was substantially less in the RPC group. Additionally, the RPC group retained a substantially greater amount of GFP suggesting retention of donor cells. The control tissue demonstrated increased CD31 and CD34 suggesting increased vascularity.

This work has achieved two goals. Firstly, It demonstrates that the bioluminescence of adipocytes transferred from a luciferase expressing donor may be used to non-invasively monitor tissue viability and volume over a prolonged period of time. Secondly, RPC has the ability to increase the viability of donor adipocytes when transferred via liposuction cannula, and the transferred tissue is less likely to undergo interstitial fibrosis.

12:27 PM - 12:29 PM

The Groin vs. Submental Vascularized Lymph Node Flaps: A Head to Head Comparison of Surgical Outcomes following Treatment for Upper Limb Lymphedema

Chang Gung Memorial Hospital, Taoyuan, , Taiwan

Ming-Huei Cheng; Thomas Constantinescu; Chia-Yu Lin; Ketan M. Patel; Chang Gung Memorial Hospital, Chang Gung University and Medical College

Introduction

Growing experience in lymphatic microsurgery, particularly vascularized lymph node (VLN) transfer has allowed for the discovery and utilization of new lymph node sources. The groin (VGLN) and submental (VSLN) lymph node flaps have been described as valuable options in the treatment of upper limb lymphedema. Although published reports have shown success with each of these options, no comparative evaluation has been performed of these two valuable lymph node flaps. Therefore, we performed a comparative analysis following submental and groin VLN transfers in the setting of upper limb lymphedema.

Methods

A retrospective review of a prospectively maintained database of patients who received microsurgical treatment for lymphedema was reviewed. Patients who had either submental or groin VLN transfer for upper limb lymphedema were isolated. Patient measurements were obtained at the same follow-up evaluation in both cohorts. Patient characteristics and demographics were compared. Outcomes of interest included flap characteristics, post-operative and intraoperative complications, and limb circumference changes at the designated follow-up following reconstruction.

Results

Nineteen patients were identified and met inclusion criteria. More identified patients underwent VGLN (68%) as compared to VSLN (32%) flaps for upper limb lymphedema. Patient age, BMI, and symptom duration were similar between cohorts ($p=0.8$; $p=0.7$; $p=0.6$, respectively). On evaluating flap characteristics, similar vein diameter (2.6 v. 3.0mm; $p=0.3$) and artery diameter (2.1 v. 2.4mm; $p=0.3$) were found between VGLN and VSLN cohorts, respectively. Similar lymph node numbers were found between flaps, respectively (3 v. 4; $p=0.4$). Circumference reduction was higher in the VSLN cohort (35.3%) as compared to the VGLN cohort (23.4%) during the 6-month follow-up evaluation, but did not reach statistical significance ($p=0.3$). Total number of complications was higher in the VGLN cohort as compared to the VSLN cohort (38.5 v. 16.7%; $p=0.04$).

Conclusion

Vascularized groin and submental lymph node flaps are both valuable surgical options in treating upper limb lymphedema. Flap characteristics are similar between VLN flap options. Similar improvements in limb circumference may be expected with both VLN flaps, albeit with an increased complication rate with the VGLN flap.

12:29 PM - 12:31 PM

The Utility of High Resolution Magnetic Resonance Angiography (MRA) using Gadofosveset Trisodium in Vascularized Lymph Node Transfer

Mount Sinai Beth Israel Medical Center, New York, NY, USA

Erez Dayan, MD; Mark L. Smith, MD; Joseph H. Dayan, MD; Beth Israel Medical Center

BACKGROUND: Vascularized lymph node transfer (VLNT) has become an increasingly popular treatment option for patients with lymphedema. There is very little literature regarding the role of Magnetic resonance angiography (MRA) in VLNT. MRA provides practical information relevant to pre-operative assessment as well as donor and recipient site selection when performing lymph node transfer. Pre-operative selection of the optimal donor site is complicated by variability in the quantity of lymph nodes available and their vascular supply. Recipient site assessment is also a critical step. Prior surgery and radiation may result in a vessel-depleted recipient site requiring an alteration in surgical planning. Pre-existing stenosis of the venous outflow, if unrecognized, can negatively impact the outcome of the procedure. In longstanding lymphedema, fat hypertrophy can occur. The relative fluid to fat content may be difficult to assess. Since only the fluid component is treated by VLNT, the presence of extensive fat hypertrophy may alter the surgical plan. Postoperatively, it is important to quantify the number of viable lymph nodes transferred to correlate with clinical outcomes. We have performed high resolution MRA using Gadofosveset Trisodium in all patients undergoing VLNT and report on the utility of this modality in surgical decision-making and evaluating outcomes.

METHODS: MRA of recipient and potential donor sites was performed using a 1.5 Tesla MR system. Gadofosveset trisodium (up to 10 cc) was injected peripherally at a rate of 2 cc per second. Image post-processing was performed on a separate workstation. Forty-two patients underwent imaging for VLNT from the cervical, axillary or inguinal region to the upper or lower

extremity. MRA of the recipient extremity was also performed 1 year post-operatively to assess the viability of transferred nodes.

RESULTS: MRA delineated both donor and recipient site anatomy which altered the surgical plan in 10 patients. Proximal high grade venous stenosis was identified in 3 patients and was treated with lysis of the surrounding scar tissue. Five patients had vessel-depleted recipient sites requiring alteration in the anastomotic configuration including one patient requiring axillary vein reconstruction with vein graft. Donor lymph node harvest is typically performed contralateral to the recipient site, but in two patients, the ipsilateral donor site was selected because of preferable nodal anatomy identified on MRA.

CONCLUSIONS: VLNT requires meticulous planning and patient selection to ensure safe and successful transfer. MRA using Gadofosveset Trisodium provides high-resolution images that facilitate patient selection, surgical planning and assessment of outcomes.

12:31 PM - 12:33 PM

Tissue Oximetry Monitoring in Microsurgical Breast Reconstruction: Experience with 1050 Flaps

Beth Israel Deaconess Medical Center / Harvard Medical School, Boston, MA, USA

Christina R. Vargas, MD; Pieter G. Koolen, MD; Samuel J. Lin, MD; Adam M. Tobias, MD; Bernard T. Lee, MD, MBA, FACS; Beth Israel Deaconess Medical Center

Background: Near-infrared tissue oximetry has been introduced clinically as an objective, quantitative method of detecting flap vascular compromise. Its use in monitoring tissue perfusion following free microvascular transfer may allow for earlier detection of compromise than clinical assessment alone, potentially resulting in a higher likelihood of subsequent flap salvage. Large scale clinical evaluation of the impact of this technology on flap outcome has not previously been established. Continuous tissue oximetry monitoring was implemented at our institution in 2008 as an adjunct to traditional clinical assessment in the post-operative monitoring of microvascular free tissue transfer for breast reconstruction. This study aims to characterize the effect of tissue oximetry on rates of flap re-exploration and salvage over a ten year period, before and after the incorporation of this technology.

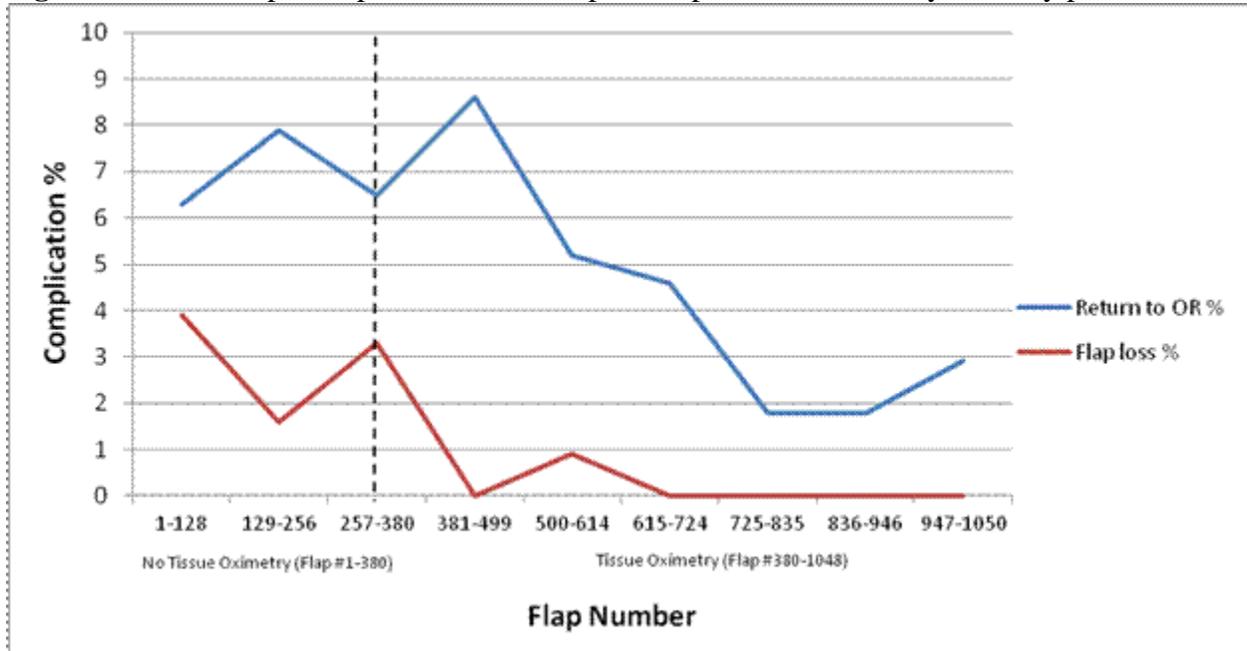
Methods: Review of a prospectively maintained database inclusive of all microsurgical free tissue transfers for breast reconstruction from February 2004 to February 2014 was performed. Patient demographic information, intraoperative data, and postoperative complications were identified for each flap. The rates of flap re-exploration and subsequent salvage were assessed before and after the addition of continuous tissue oximetry to the post-operative flap monitoring protocol.

Results: 1,050 flaps were performed during the study period: 380 prior to tissue oximetry monitoring and 670 thereafter. Mean follow-up was 1679 days. There were 54 instances of operative flap re-exploration and 12 complete flap losses during the 10 year period. 6.8% of microsurgical flaps underwent re-exploration before the use of tissue oximetry compared with 4.1% thereafter ($p=0.08$). Breast flap salvage rate prior to initiation of tissue oximetry

monitoring was 57.7%, and increased to 96.4% using oximetry ($p=0.0007$). The overall rate of complete flap loss decreased from 2.9% to 0.1% with the use of tissue oximetry in the monitoring protocol ($p=0.0001$).

Conclusion: Inclusion of continuous tissue oximetry during post-operative monitoring of microsurgical free tissue transfer for breast reconstruction is associated with significant improvement in flap salvage rates and fewer complete flap losses.

Figure: Rates of flap re-exploration and complete flap loss over the 10-year study period



12:33 PM - 12:35 PM

Discussion

12:35 PM - 12:37 PM

A Comparison of Quality of Life, Psychological Response, and Body Image Between Immediate and Delayed Breast Reconstruction: A Prospective Long-term Outcome Study

Jiayi Hu, Toronto, ON, Canada

Jiayi Hu, MD¹; Toni Zhong, MD, MHS²; Shaghayegh Bagher²; Anthony Vo²; Anne C. O'Neill²; Kate Butler²; Kelly A. Metcalfe²; Stefan Hofer²; (1)McMaster University, (2)University Health Network

Background:

Women diagnosed with breast cancer and undergoing mastectomy as a treatment modality can suffer significant psychosocial distress. Therefore, it is important to measure the success of postmastectomy breast reconstruction (PMBR) in improving the various dimensions of

psychosocial health. The objective of our study was to first evaluate the quality of life (QOL), body image, sexuality and psychological responses, such as anxiety and depression, in a sample of women following PMBR, and then to compare these responses between immediate breast reconstruction (IBR) and delayed breast reconstruction (DBR).

Patients and Methods:

All patients who underwent breast reconstruction between September, 2009 and August, 2012 at the University Health Network were approached to complete the Body Image Scale (BIS, 0-30),

Sexuality Scale, Hospital Anxiety and Depression Scale (HADS, 0-42) and the BREAST-Q (0-100) pre-operatively, as well as at 6, 12, and 18 months post reconstruction. Descriptive statistics of outcomes were calculated and the difference between groups at each time point was measured using Wilcoxon rank sum test. The relationship between each repeated psychosocial outcome and follow up time was studied using a linear mixed effect model. A generalized linear regression model was used to calculate the difference in BREAST-Q scores between the groups.

Results:

In 106 participants, there were 30 IBR and 76 DBR. 96% of these patients completed the baseline questionnaire and 75, 82, and 69 % completed the follow up survey at 6 months, 12 months, and 18 months post-operatively, respectively. The IBR group underwent less adjuvant therapies and had more favourable cancer staging status ($p < 0.01$). The DBR group had significantly worse pre-operative assessment of body image, sexuality, satisfaction with breast, psychological wellbeing and sexual wellbeing. Moreover, the DBR group had significant improvement over time in all the aforementioned surgical outcomes post-operatively. The IBR group only showed significant improvement in terms of anxiety and body image over time. There are no significant differences in outcome scores observed between the two reconstruction groups at each follow up time point. The effect of timing of breast reconstruction is largest in satisfaction with breast (Cohen- $d=1.34$), sexual wellbeing (Cohen- $d=0.06$) and psychological wellbeing (Cohen- $d=0.56$).

Conclusion:

Patients undergoing DBR tend to experience more psychosocial distress in terms of body image, sexuality, and psychosocial and sexual wellbeing prior to PMBR. PMBR does restore a woman's sense of femininity, body image, and sexual well-being by reducing the psychological distress at 6, 12, and 18 months post-operatively.

12:37 PM - 12:39 PM

Race still matters: Factors associated with immediate breast reconstruction in 48, 564 patients from the 2005-2011 NSQIP datasets

University of Pennsylvania, Philadelphia, PA, USA

Jonas Nelson; John Fischer; Paris Butler, MD, MPH; Jason D. Wink; Joseph Serletti; Liza Wu,

MD; University of Pennsylvania
Background:

Immediate breast reconstruction (IBR) rates are increasing, yet recent patterns based on race, ethnicity and patient comorbidities are unknown. The purpose of this study is to perform an updated, comprehensive analysis of IBR using the American College of Surgeons – National Surgical Quality Improvement (NSQIP) dataset with a specific focus on race and ethnicity.

Methods:

All women undergoing mastectomy only or mastectomy with IBR from 2005 to 2011 were identified in the ACS-NSQIP datasets. IBR patients were compared to patients undergoing mastectomy only with regards to preoperative variables. Any significant variable in univariate analysis was subjected to a bootstrap analysis for internal validation. Based on inclusion in the final bootstrap model, a multivariate logistic regression was performed to determine factors independently associated with receipt of IBR. Significant factors were utilized to design a weighted risk model to predict preoperative receipt of IBR. IBR patients were then categorized by type of reconstruction (implant/expander reconstructions (I/E) or autologous reconstructions). Each of these respective cohorts was compared to patients undergoing mastectomy alone, and then subjected to a multivariate analysis to determine preoperative factors associated with each modality of reconstruction.

Results:

Overall, 48,564 mastectomy patients were included, of which 16150 (33%) underwent IBR. IBR rates increased significantly over the study period from 26% of patients in 2005 to 40% in 2011 ($p < 0.001$). Following a bootstrap, regression analysis determined that patient race (non-white), older age, obesity, impaired functional status, ASA class > 3 , and presence of comorbid conditions were all negatively associated with receipt of IBR (all $p < 0.001$). A model created based on this data demonstrated that patients with no risk factors have a 50% rate of IBR. However, IBR drops in a linear fashion with an increasing score category. Examining I/E reconstruction, each of the overall factors continued to display a strong, negative association with IBR. When examining autologous reconstruction, receipt of IBR in white compared to black ($p = 0.69$) and Hispanic patients ($p = 0.15$) did not significantly differ.

Conclusions:

This study examining IBR with the ACS-NSQIP dataset demonstrates that certain populations are less likely to undergo this potentially beneficial treatment. Specifically, differences based on race and ethnicity continue, even with a national focus on the topic. Interestingly, although I/E reconstruction is increasing nationally, this may be a disproportionate increase in white patients. A greater focus on continued patient education and cultural understanding is warranted to provide all patients presenting for mastectomy the opportunity for IBR.

12:39 PM - 12:41 PM

Getting the Most Out of the Abdomen: The Stacked DIEAP/DCIAP Flap for Breast Reconstruction

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Background: The DIEAP flap has become the gold standard for microvascular breast reconstruction. However, there are some distinct limitations of the flap based on angiosome perfusion. If included in the flap, the lateral portions are prone to vascular insufficiency and resultant fat necrosis. Microvascular augmentation of the lateral portion of the flap by a secondary DCIAP pedicle offers several distinct advantages over the traditional DIEAP flap. It allows perfusion of the lateral portion of flap reducing fat necrosis. For those patients who need additional volume, it augments the volume of the DIEAP flap. And by physically dividing the flaps, it allows for independent inset. This allows for the an anterior and posterior placement of the flaps and improvement of breast projection and aesthetics.

Methods: Between January 2009 and December 2013 we performed a series of 41 flaps (18 bilateral and 5 unilateral flaps) in 23 patients. 25 flaps were for immediate reconstruction and 16 were for delayed reconstruction. Patient demographics, previous surgeries, hospital course and complications and outcomes were analyzed. DCIAP pedicle length and caliber were recorded. Flap weights were measured. Microvascular arrangement of the pedicles is detailed. Primary and secondary flap division and placement were analyzed.

Results: 23 patients underwent stacked DIEAP/DCIAP flaps. Flap failure was 0 percent. Comparing results to historical controls there was a reduced incidence of fat necrosis (5% compared to 10%). Subjective improvement in breast aesthetics was noted with improved projection appearance. DCIAP pedicle length averaged 3.4cm, venous diameter 1.65mm and secondary flap weight 127 grams. Microvascular arrangement of the pedicles was branch chain anastomosis in 100% of cases with 66% having an anastomosis to a lateral or medial branch of the DIEAP pedicle and 34% having an anastomosis to the cephalic continuation of the DIEAP pedicle. 73% of flaps were divided and independently inset and 27% were folded and kept as a single unit.

Conclusions: Microvascular lateral augmentation of the DIEAP flap with DCIAP pedicle is technically feasible with reliable and predictable pedicle length and caliber. By microvascularly augmenting the lateral portion of the flap you can effectively reduce the potential for fat necrosis, increase the potential volume transfer of each hemi-abdomen and with independent flap inset have the potential to improve aesthetic results by placing additional volume where needed.

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Septocutaneous Tensor Fasciae Latae (Sc- TFL) or Lateral Thigh Perforator (LTP) Flap for Autologous Breast Reconstruction: a Two Years of Experience
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Title:

Septocutaneous tensor fasciae latae (sc- TFL) or lateral thigh perforator (LTP) flap for autologous breast reconstruction: two years of experience.

Text:**Introduction**

The lateral thigh region as donor site for breast reconstruction was described in the past by Elliot Kind and Allen as case reports. Preoperative imaging was not used .

In the magnetic resonance angiography (MRA) of patients scheduled for a breast reconstruction with DIEP flap, the constant presence of septocutaneous perforators in the lateral thigh region, running between the tensor fasciae latae and the gluteus medius and minimus muscle was observed. This led us to explore this region as a donorsite for breastreconstruction. In this abstract we describe our first results

Material and methods

Radiological study: the MRA's of sixty patients scheduled for autologous breast reconstruction were analyzed, with particular attention to perforators running between the tensor fasciae latae and the gluteus medius and minimus muscles and originating from the ascending branch of the lateral circumflex femoral artery. The number and location of septocutaneous branches of the LCFA, origin of the LCFA and maximal pedicle length were reported.

Clinical experience: ten consecutive LTP flaps were performed for breast reconstruction in 7 patients. Patients demographics, perforator characteristics, operative technique and time, length of hospital stay and outcomes were registered.

Results

Radiological study: From the 60 MRA's analyzed only 37 were included. A total of 109 septocutaneous perforators were found (mean of 1,5 Sc-perforators for every thigh). The mean pedicle length was 8,7 cm. Every perforator originated from a branch of the (LCFA). The LCFA originated in 6,4% of cases from the arteria femoralis communis and in 93,6% of cases from the arteria femoralis profunda. In a vertical plane the mean distance of the perforator from the antero-superior iliac spine was 8,7 cm.

Clinical cases: ten LTP flaps were successfully performed. The scar at the donor site was oriented in different ways depending on the desire and shape of the patient. No major complication occurred: minor complications were treated conservatively.

Conclusion

The LTP flap is the second choice after the DIEP flap in our institution for autologous breast reconstruction: it can be dissected in prone position simultaneously with the mastectomy en/or dissection of the mammary vessels, it has a long pedicle with a good caliber, the scar at the donor site can be often hidden under the underwear even improving sometimes the shape of the patients.

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Discussion