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LVA

LYMPHOVENOUS ANASTOMOSIS -MICROSURGICAL TREATMENT OF LYMPHEDEMA

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PLASTIC SURGEON



WHAT IS (SECONDARY) LYMPHEDEMA

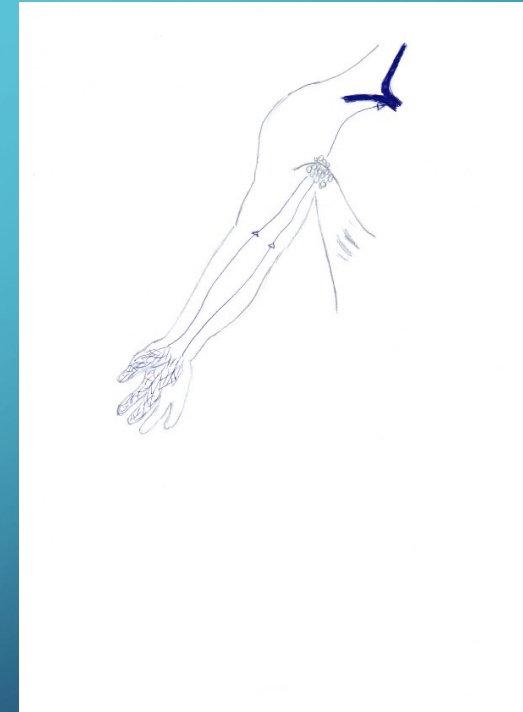
- Resection of lymph nodes with interruption of lymphatic ducts.
- Lymphatic stasis
- Increased pressure in lymphatic ducts
- Inflammation with CD4 cells
- Th2 cells inhibit angiogenesis
- Th2 cells causing fatty degeneration

Olszewski 2002

Zampell/Mehrara 2015

Savetsky/Mehrara 2015

Avraham/Mehrara 2013



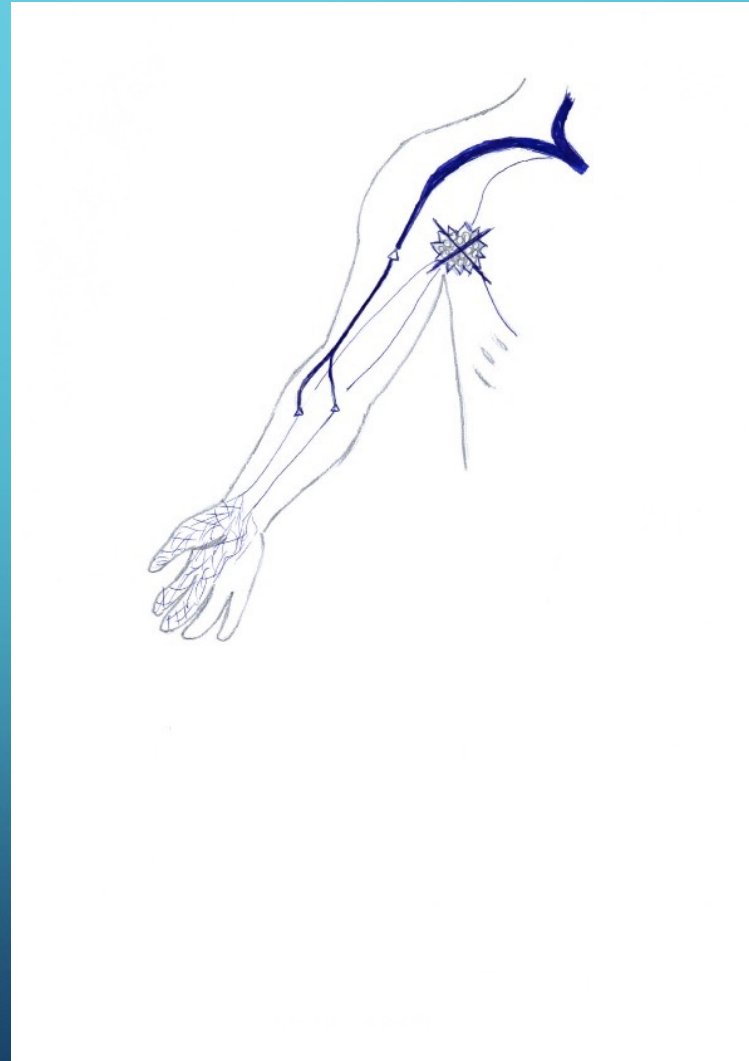
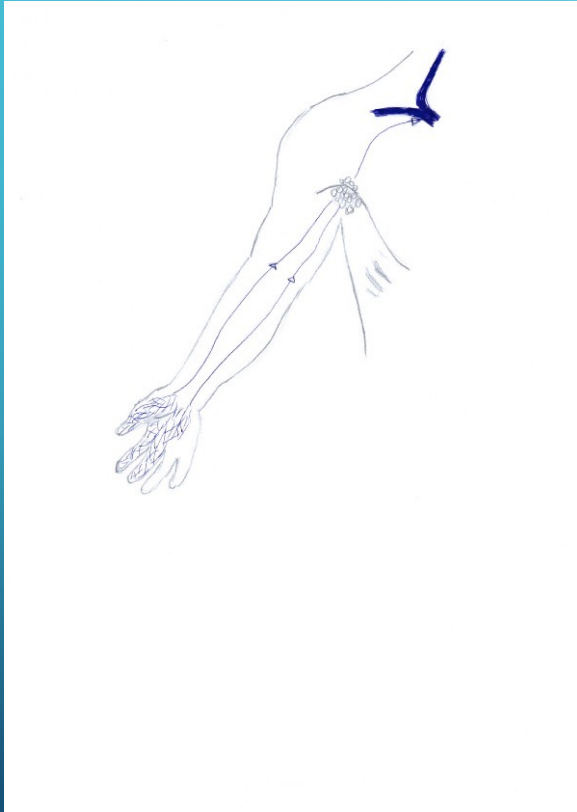
RISK FACTORS FOR PATIENTS GETTING LYMPHEDEMA

- Genetic – Molecular level functional defect
- Genetic - Anatomical level functional defect
- Obesity
- Age
- Infection

PROGRESSION OF LYMPHEDEMA

- An inflammatory reaction closes the lymphatic ducts from proximal to distal.
- Progression can vary from 6 months to 30 years.
- Increased pressure in lymphatic ducts from Normal 40mmHg, in lymphedema 200-300mmHg (Olszewski)
- Over time the edema is converted to scar tissue and fatty tissue. (Mehrara 2015)
(Brorson 2006)

WHAT IS A «LYMPHOVENOUS ANASTOMOSIS - LVA»



Surgically
creating a
valve

THE PHYSIOLOGY OF THE LVA

- A valve for release of high-pressure lymphatic fluid.
- A bypass. From lymphatics to vein distally
- Pressures in lymphatic ducts normally 40mmHg. In Lymphedema 200-300mmHg
- The veins have a negative pressure.

INDICATIONS

- Secondary lymphedema
- Stage 1-3A Lymphedema
- Good compliant patient with a lymphedema therapist
- Realistic expectations
- Careful counselling is important since many patients may feel “desperate” in dealing with a chronic disease that will affect the rest of their life.
- Lower or upper extremity
- Health

HISTORY OF LVA

- LVA was performed already in the 70s in Australia! - “Blind LVA”.
- 42% got a sustained volume reduction
- 44% of the excess reduction was achieved.
- 58% reduction of cellulitis incidence
- Performed blindly – without using ICG mapping or ICG intraoperative guidance.
- Low magnification: 10x vs 39x
- Old sutures – versus small S&T sutures

1977 O'Brien Australia

TECHNOLOGY ADVANCE

THE ICG ANGIOGRAPHY - DIAGNOSIS AND STAGING OF LYMPHEDEMA LYMPHANGIOGRAPHY

- Performed in clinic
- Unpublished data – safe. Antibiotic cover recommended only in patients with prior cellulitis or immunosuppression.
- ICG injected in webspaces
- PDE camera or IC Flow camera
- More sensitive than scintigraphy

ICG – INDOCYANINE GREEN – VERDYE™

- Non – toxic
- Fluorescence at 806 nm (near infrared light)
- Eliminated by the liver and kidney
- Painful – like the sting of a bee **for 45 seconds.**
- Can leave a green spot in the skin for up to 12 months postoperatively
- Extensively used in other fields of medicine – Ophthalmology and intensive care
- It has been proven to be safe for use in reconstructive surgery

2011 Liu/Zenn/Neligan USA



WHAT INFORMATION IS GAINED FROM AN ICG ANGIOGRAPHY

- Anatomy and location: where is the lymphatic vessel?
- Dynamics: What function does the vessel have? Degree of fibrosis and contractions.
- **Diagnosis and Staging**
- Preoperative **mapping and planning.**

STAGING AND MAPPING

ICG Lymphography Staging



Stage 0 1 2 3 4

Chang DW, Suami H, Skoracki R. Plast Reconstr Surg 132: 1305-1314, 2013.



Proximal to
Distal
progression

Chang, Skoracki 2013

HOW IS THE SURGERY PERFORMED?

General anesthesia

Local and sedation possible.

Lying still is important

PREOPERATIVE MAPPING

1. Pushing the contrast through the vessel with a pen reveals patency.
2. I mark the region with best flow proximally and sometimes where a crossing vein is seen
3. One anastomosis per vessel

POSTOPERATIVE TREATMENT AND FOLLOW UP.

- US vs Asian set up.
- **USA**
 - Elevation and elastic wrapping first 2 – 3 weeks
 - Wait until wound has healed
 - Compression stocking – One compression grade down.
 - No “intensive treatment”
 - No manual therapy for 4 weeks
 - Ambulation gradually increased
- **Asia** – compression stocking from start.
- Full ambulation

LYMPHEDEMA THERAPY IS NEEDED POSTOPERATIVELY!

- Manual therapy
- Compression
- Evidence-based treatment
- Relevant endpoints: Long lasting improvement of lymphedema

RESULTS LVA

- Good results are obtainable
- A valve for the system.
- **74%** get a volume reduction
- On average the reduction is **33%** of the excess volume.
- 96% obtain “symptom improvement”
- Systematic review – range of results, but similar
- Volume effect not as powerful as liposuction but this is fluid and not fatty tissue that is removed
- LVA does not cure lymphedema

2013 Chang/Skoracki USA
2017 Scaglioni (review) Switzerland

SKIN BIOPSIES SHOW IMPROVEMENTS AFTER LVA

- Biopsy specimens were fixed and analyzed for inflammation, fibrosis, hyperkeratosis, and lymphangiogenesis. Six months following LVA.
- **83% of patients had symptomatic improvement** in their lymphedema
- Histological analysis at this time demonstrated **a significant decrease in tissue CD4+ cell inflammation in the lymphedematous limb (but not in the normal limb used as a control) biopsies ($p < 0.01$).**

2015 Torrisi USA

VERY FEW COMPLICATIONS

- It is a size-wise very small surgery

CAN THE EDEMA GET WORSE?

- Unlikely that the surgery would make things worse
- If no effect – the edema gets worse as part of the chronic disease.

ALL SUCCESSFUL RESULTS ARE DEPENDENT ON POSTOPERATIVE LYMPHEDEMA THERAPY

- All patients will need to continue with compression therapy.
- Some early unpublished results may indicate that a decrease in the degree of compression stockings can be achieved.
- Patients and therapists may note a decreased resistance to manual therapy after a successful LVA.
- Important to counsel patients accordingly.
- **Important to work in a multidisciplinary mode.**

THE FUTURE OF SUPERMICROSURGERY, LVA AND LYMPHEDEMA

- Extending the use of the supermicrosurgery technique
- Lymphoceles
- LMVA
- Technology advancement

OTHER SURGICAL TREATMENTS FOR LYMPHEDEMA

- Physiological: Lymphnode transfer - Dr Corinne Becker
- Resectional: Resection/liposuction - Dr Corinne Becker

COMBINATION THERAPY

- The latest trend.
- Resection/liposuction + LVA + Lymphnode transfer.



FUTURE CHALLENGES

- How do we select the correct patients?
- When is the best time to treat with surgery?
- The first goal is to get patients to a stage where they can be at a stable phase without compression therapy
- Current research in preventative LVAs performed at MSKCC
- The long term goal is finding a cure for lymphedema – whether surgical, medical or therapeutical.

TAKE AWAY MESSAGES

- LVA does have an effect in about 70% of patients.
- Patients need to be carefully selected for this procedure
- Preoperative evaluations in a multidisciplinary approach is needed.
- Tailor made treatment is of essence.
- Referral by lymphedema therapists may be preferable.
- Patients will continue to need treatment after the surgery.