Edema

Normal Tissue

Intracellular Edema

Interstitial Edema (pitting)

Fibrosis & edema (brawny)

venous hypertension
venous disease & stasis
heart failure
oncotic abnormalities
postural dependency
inflammation

- 1 -
Edema Due to Increased Formation
FILTRATION or HYDROSTATIC EDEMA

- 2 -
Edema Due to Decreased Resorption
Due to Obstruction or Obliteration of Lymphatics
LYMPHEDEMA

Lymph Nodes
Lymphatics
Lungs

Heart
Arteries
Capillaries
Veins
Serum Transudate
Interstitial Fluid
Edema

**Inflammatory:** cellulitis, lymphadenitis
**Cancer:** tumor, cancer surgery, radiation
**Trauma:** trauma, surgery
**Genetic:** Nonne-Milroy-Meige
**Developmental:** constriction bands
**Parasitic:** filariasis

**Normal Tissue**

**Intracellular Edema**

**Interstitial Edema**
	*(pitting)*

**Fibrosis & edema**
	*(brawny)*

**LYMPHEDEMA**

Edema Due to Decreased Resorption
Due to Obstruction or Obliteration of Lymphatics

-2-

Lungs

Heart

Arteries

Veins

Lymph

Capillaries

Serum Transudate

Interstitial Fluid
Common scenarios

Filariasis

Wuchereria bancrofti microfilaria

Brugia malayi, etc.

Approximate geographic distribution of lymphatic filariasis
(Parasites and Parasitological Resources)
Common scenarios

Postural edema
Venous disease

Postural edema, venous disease, and lymphedema are distinct entities, but in individual patients, there can be a mix of conditions some shared pathogenetic mechanisms and treatment modalities.
Common scenarios

Primary lymphedema

Nonne-Milroy-Meige
All are genetic & familial

Lymphedema congenita
10%

Lymphedema praecox
(childhood & young adult)
80%

Lymphedema tarda
(onset after age 35)
10%
Clinical pathology
Mechanisms

- Lymphatics
- Inflammation
- Thrombosis
- Genetics
- Proteins
- Fibrosis
- Pannicular dysplasia

Hydrostatics
- Gravity
- Fluid compartmentation
- Heart failure

Lymphedema
- upper extremity, gram-for-gram more disabling, but usually less severe
- lower extremity, more morbid

[Image of medical diagrams and tissues]
Clinical pathology

Chronic trophic skin & fascias
- Elephantiasis
- Hyperkeratosis
- Dermatophytosis
- Inflammatory dermatoses
- Liposclerosis
- Brawny edema
- Venous disorders
- Chronic ulceration
- Squamous cancer

Acute morbidity
- Exacerbated edema
- Inflammatory dermatoses
- Cellulitis
- Lymphangiitis
- Ulceration
- CHF
Clinical pathology

Mechanics & disabilities

Mass and weight
Hip and shoulder torque

Hydraulic effects, hand
Impaired gross motor
Impaired fine motor

Sedentary status
Deconditioning
Secondary Obesity

Impaired mobility
Impaired ADL
Impaired independence

Treatment needs
Garments, bandages, soil

Clothing & footwear
Furniture & seating

Vocational
Genital, Perineal, Sexual
Lifestyle

Hydraulic stiffness
Intrinsic posture
Fine motor

High torque
Rotator cuff

Mass & weight

Clothing
Compression garments

Ulceration
Trophic

Genital
Sexual

Deconditioning
Obesity

Mass & weight

Clothing, compression

High torque
Treatment

Compression

P = T w \left( \frac{1}{R_1} + \frac{1}{R_2} \right)

Pressure, Tension, Wall thickness, Radii in an elliptical sphere

T = P R

in a cylinder

Dutiful edema control = prophylaxis against complications
Treatment
Professional Services & Therapy

Basics
Edema Control
Compression

Acute complications

Prevention
Maintenance care
Chronic intervention
Peer group support
Dedicated clinics

Pharmaceuticals
(benzo-pyrones)

Physical modalities
(heat & microwave)
Lymphedema therapy
(complex physical therapy)

Non-surgical options
Surgical options

Treatment
Achieving control
Prophylaxis
Maintaining control

CPT
Professional LT

ChênéSé
Saunas
Provider pitfalls:
Promise you everything

Lymphedema Therapy:
the state of the art

versus

Deny you anything

“THE CONSULTATION”
Thomas Rowlandson, 1808
Helpless physicians confronted by severe illness.

Compression
Physical modalities
Benzo-pyrones?
Dedicated clinics
CPT - professional LT
The history of lymphedema surgery is cobbled with rational ideas that never worked, because:

- the problem is too complex
- the problem is not common enough to get attention and develop expertise
- dilettante practitioners did these procedures improperly or without sufficient follow-up or adjuvant care

**Omentum Transfer**
Corrects the problem - if successful
Technique crucial
Treatment

Panniculectomy & variations

Does not cure the cause, but removes the effects

- Multiple stages
- Nuisance complications
- Prolonged recovery
- Inadequate edema control
Surgery

Dermatofasciectomy & skin reconstruction

We do dermatofasciectomy (dermatolipectomy) and skin reconstruction for other problems.

Why not do it for this one?

Acute degloving burns necrotizing fasciitis

Chronic venous ulcers immunopathetic ulcers hidradenitis
New technologies permit superior skin reconstruction. Don’t save disease when you can make healthy new parts.
<table>
<thead>
<tr>
<th>Big Scrotum</th>
<th>Big Kahuna</th>
<th>Big Cojones</th>
</tr>
</thead>
</table>

**THANKS, I LIKE YOUR IMPLANTS TOO.**
Results

Dermatofasciectomy and Integra

Three men: 33, 39, 53 yo (one more 41m in the works)
one disabled (forest ranger)
two sedentary and unemployed
all with secondary obesity
one had prior unsuccessful panniculectomies

Surgery: bilateral lower extremity dermatofasciectomies
concurrent R & L in one patient
sequential in other two

Integra: standard management
weekly visits until skin grafts

Skin grafts: from thighs, opposite leg, abdomen
harvest from disposable areas desirable

Touch-ups: one - second piece Integra (ankle tendons)
minor skin grafts
one - flap across popliteal

Utilization: 4 operations (2 pts), 5 ops (1 pt)
main sequence completed in 4 months
10 acute inpatient days

Wow: total resected mass (per patient) 80kg

Outcomes: ranger rtw 4 months from first procedure
others began rehabilitation and lost weight

All felt that their lives had been returned to them.
Non-operative care comes first
compression, modalities, lymphedema therapy

Surgery has a role when non-operative care fails
dermatofasciectomy and skin reconstruction with Integra is effective

Some important points
• multiple procedures are the rule
• do as much or as little in any one session
  as safety and circumstances permit
• if both extremities are to be done, sequential or concurrent okay
• if done serially, the second leg can donate
  the skin grafts for the first side
• sequential management is preferable
• a tourniquet is mandatory during leg fasciectomy
• thigh panniculectomy should precede
  leg surgery so that tourniquets can be placed
• have blood available during surgery
• the Integra reconstruction seems resistant to recurrent edema,
  but high quality elastic compression must remain in effect

Preventive or maintenance care must continue afterward
compression, modalities, lymphedema therapy
Summary

Dermatofasciectomy and Integra

Treat lymphedema first by compression and therapy; this is the current state of the art.

When therapy fails, conventional surgery (panniculectomy or fasciectomy and skin grafts) is a problematic option - complications and poor results sway management away from surgery.

Dermatofasciectomy and skin reconstruction with Integra is effective with few complications.

It is thus a good option in the integrated approach to care rather than something to be avoided.

These patients had a 15% lean body surface acute loss of skin,

yet their care was elective,

largely outpatient,

and resolved a disabling historically difficult-to-treat problem.

This is another example of Integra’s utility to redefine the care of complex problems.
The National Surgical Institute of Philadelphia. N.E. Cor Broad & Arch Sts.

The Institute of Dumb-Ass Plastic Surgeons

Who would have a nicer life and make a better living if they did not do this crap.
Lymphedema, due to obstructed lymphatics from various causes, can cause grotesque tissue hypertrophy, forced immobility, and secondary obesity and disabilities. Morbidity, as ulceration and cellulitis, is common. Treatments are compression, physical modalities, and peer group psycho-social support. Surgery has a role, to treat ulcers or for panniculectomy, often with prolonged skin and wound complications. Management is variably successful, sometimes very much so, but failure is common due to inadequate patient and provider knowledge, lack of community or personal resources, and obstinacy of the disease. Reported here are three patients with familial praecox (idiopathic young adult onset) lymphedema. All were resolved of disabling lower extremity lymphedema by complete excision of all involved skin and fascias, and skin reconstruction with Integra artificial skin.

Principles of care. Prevention and pre-emptive control is better than trying to reduce advanced edema. Compression bandages and habits of leg elevation are the crucial control measures. When advanced edema resists compression, “lymphedema therapy” by trained therapists can reduce limb size, often dramatically so, to the point that ordinary compression can maintain the improvement. Some notable clinics worldwide have resources dedicated to this problem, and in these special venues, therapy and bandaging effectively manage the problem for most patients. When compression and therapy fail or are inordinately difficult to administer, surgery becomes a problematic option. The conventional procedure, staged fasciectomy with skin preservation, is plagued by necrosis, ulceration, and ineffective results. Dermatofasciectomy with skin grafts often results in chronic ulceration. Using Integra in lieu of skin grafts, patient care after fasciectomy is dramatically simplified, and the Integra leads to a high quality skin reconstruction that is more stable over tendons, joints, and time.

Patients. Three men, 33, 39, 53 yo. One was disabled as a forest ranger, two had sedentary lives, all had secondary obesity. One had had prior panniculectomies but with persistent edema, ulceration, dermatitis, excess mass. Bilateral lower extremity dermatofasciectomies were performed all at once or in staged sessions, based on individual circumstances. Resected-reconstructed areas were posteromedial thigh, dorsal foot, and total knee, leg, ankle. Integra was applied immediately, then managed by standard practice, observing it weekly and applying skin grafts when fully regenerated. A second piece of Integra was used around one ankle for better tendon coverage. Each patient had 4 operations, completed in 4 months. Averages for each patient: total resected mass 80kg, 10 acute inpatient days. The ranger returned to work 4 months from first procedure. The others began rehabilitation programs and lost additional weight. All felt that their lives had been returned to them.

Recommendations. Treat lymphedema first by compression and therapy. When this fails, dermatofasciectomy and skin reconstruction with Integra is effective. Unlike conventional panniculectomy and skin grafts, where bad results and long complications sway management away from surgery, Integra reconstruction is effective and largely uncomplicated. It is thus a good option in the integrated approach to care rather than something to be avoided. The following are important points for safe and effective completion of these reconstructions: multiple procedures are the rule; as much or as little can be done in any one session as safety and circumstances permit; a tourniquet should be used to avoid hemorrhage during leg fasciectomy; thigh panniculectomy should precede leg surgery so that tourniquets can be placed; have blood available during surgery; both extremities can be done concurrently; if done serially, the second leg can donate the skin grafts for the first side; the Integra reconstruction seems resistant to recurrent edema, but high quality elastic compression must remain in effect. These patients had a 15% lean body surface acute loss of skin, yet their care was elective, largely outpatient, and resolved a disabling historically difficult-to-treat problem, another example of Integra’s utility to redefine the care of complex problems.