

# LIPOSUCTION

Review of Anatomy, Techniques, Anesthesia &  
Safety

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# Disclosures

I have no conflicts of interest or financial disclosures.

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# ASPS Cosmetic Surgery Statistics

Procedure	2020	2019	2000
Breast Augmt.	193,073	287,085	212,500
Liposuction*	<b>211,067</b>	<b>265,209</b>	<b>354,015</b>
Rhinoplasty	352,555	362,299	389,155
Blepharoplasty	325,212	354,105	327,514
Facelift	234,374	261,987	133,856

\* This number may be understated as the ASPS survey does not include all specialties performing liposuction procedures.

# History Liposuction

all for your interest & reference only

- Liposuction was originally described by Drs. Arpad & Giorgio Fischer (Ob-gyn, father & son) in Rome, Italy in 1974 and was published in 1976. They used dry technique & large blunt cannulas (same as used for D&C).
- Dr. Yves-Gerald Illouz, a French plastic surgeon born in Algeria, developed interest in liposuction in 1977 and visited Drs. Fischer. Dr. Illouz developed hypotonic saline hydro-dissection technique.

# History of Liposuction continued (2)

- Dr. Pierre Fournier, Ob-gyn, France in 1978, added Lidocaine, introduced multi-port entry, syringe lipo-sculpture and eventually mega-liposuction.
- Liposuction was imported into the U.S. by physicians who attended liposuction courses by Illouz & Fournier in Paris – Drs. Rhoda Narins, (Derm '78), Lawrence Field (Derm '78), Norman Martin (ENT '79).

# History of Liposuction continued (3)

- Liposuction was initially **rejected** by French and US plastic surgeons; it was not accepted until Dr. Illouz was invited to present his experience to the ASPS annual meeting in 1982.
- In 1982, first U.S. workshop on Liposuction was organized by **AACS** by Drs. Newman (ENT) & Dolsky (plastic) in Philadelphia.
- First live liposuction workshop in US was conducted by AACS in Hollywood, CA in 1983.

# History of Liposuction continued (4)

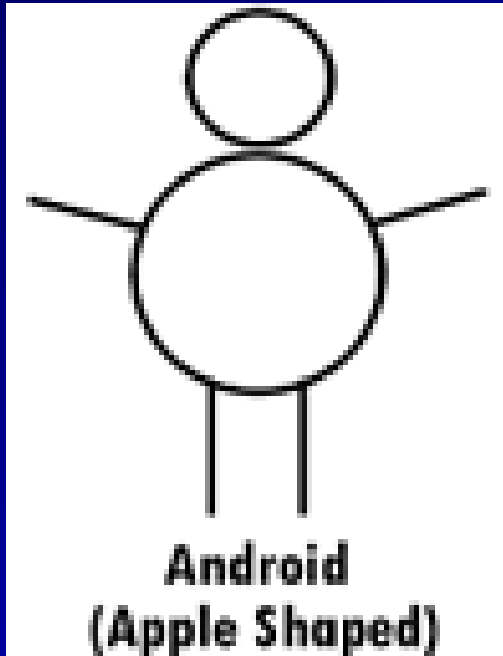
- In 1985, Jeffery Klein, (Derm.) learned about liposuction at a course by Drs. Fenno and Johnson in 1985. He developed tumescent technique of liposuction out of necessity. Being a dermatologist, he was denied liposuction privileges at Hoag Memorial hospital in Newport Beach, CA. Thus, he developed office-based liposuction under local anesthesia.
- Based on documentable, factual history, liposuction was both first described & innovated by “non-plastic” **cosmetic surgeons.**

# AACS Guidelines for Liposuction Surgery 2006

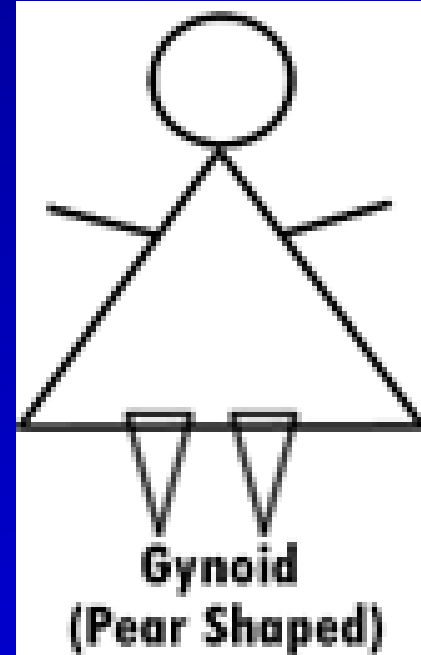
- Although dated, it is an important, thoughtful document. It deserves reading.
- It is available on the AACS website.
- Has an extensive bibliography referencing many original articles not normally quoted by the standard plastic surgery literature.



# Gender Differences in the Distribution of Adipose Tissue

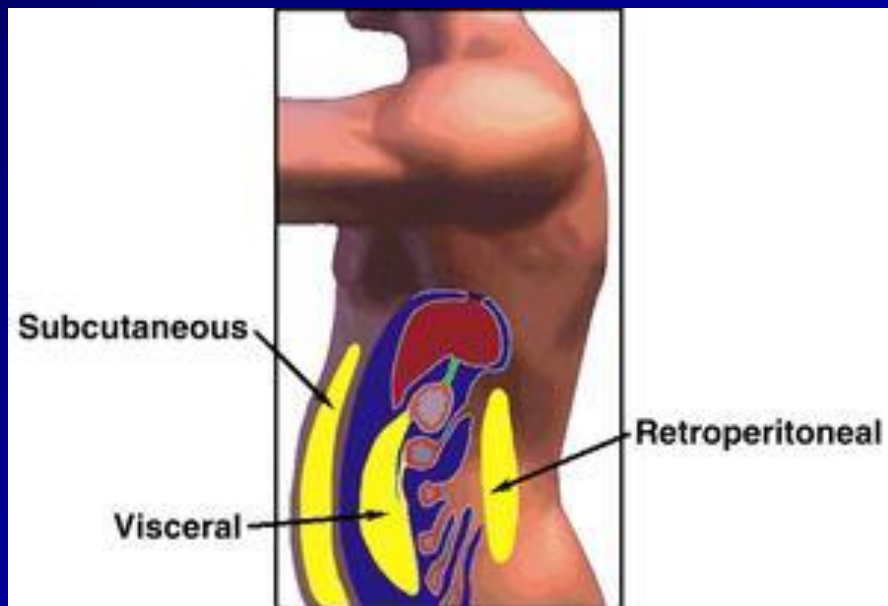


Upper and lower abdomen, flanks and nape of the neck

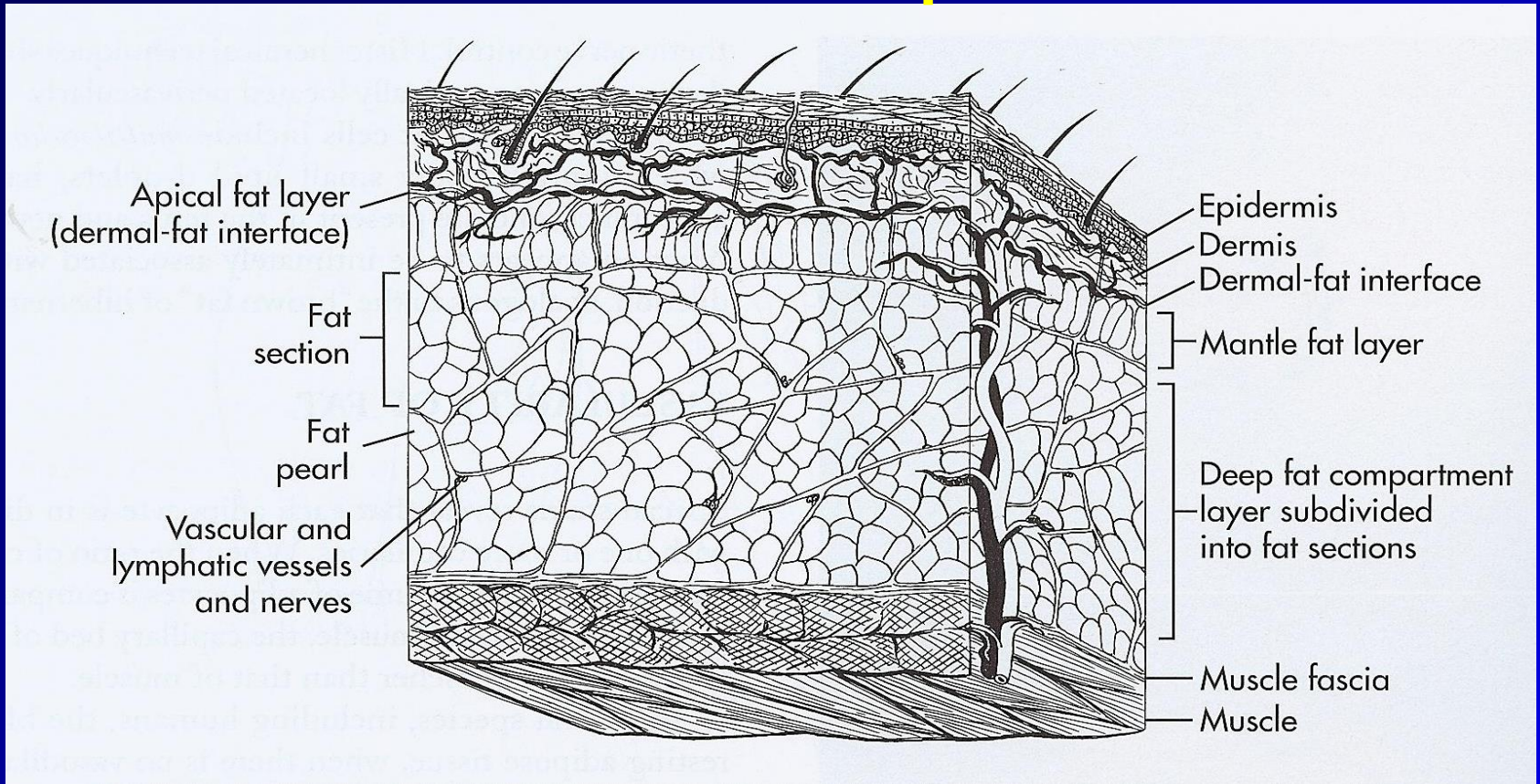


Lower abdomen, hips, upper thighs and buttocks

# Adipose Tissue in the Abdomen



# Subcutaneous Adipose Tissue



Subcutaneous tissue is bounded above by reticular dermis consisting of collagenous fibers in a net-like (reticular) pattern

# Adipocyte (Fat Cells)

- Adipocyte is typically 0.1mm in diameter with some cells half the size and some twice the size.
  - Fat is stored in adipocytes in a semi-liquid state as triglycerides and cholesteryl ester.
  - Average 70 kg adult has **30 billion cells** weighing 30 lbs pounds (13.5kg).
  - **Number of fat cells is mostly static after puberty; with excess weight gain the fat cell will increase about four-fold in volume before dividing.**
  - Fat cells are metabolically active and secrete several adipokines: Resistin, adiponectin, leptin & apelin.
- R. Pool, 2001*
-



# Body Mass Index & Obesity

□  $\text{BMI} = \text{wt (kg)} / \text{height (m)}^2$

□  $\text{BMI} = \text{wt (lbs)} / \text{height (in)}^2 \times 704.5$

- BMI of 18.5-24.9 healthy weight
- BMI of 25-29.9 considered overweight
- BMI of >30 is obese
- BMI of >40 is morbidly obese

# Ideal Body Weight (IBW)

For reference only

- **IBW** in males  $IBW = 50 \text{ kg} + 2.3 \text{ kg per each inch in height over 5 feet}$
- **IBW** in females  $= 45.5 \text{ kg} + 2.3 \text{ kg per each inch in height over 5 feet}$
- **Adjusted body weight (ABW)** is used for calculation of doses of medications in patients weighing  $> 30\%$  of calculated IBW
- $ABW = IBW + 0.4 (\text{actual weight} - IBW)$
- IBW and ABM are used to calculate medication dosages in obese patients

# Patient Selection for Liposuction

- Patients with stable weight
  - Patients with areas of adipose tissue not responding to diet and exercise
  - Patients with BMI < 30 (ideal. i.e. weight of < 1.3 of IBW)
  - Patients without a lot of skin laxity or numerous stretch marks
  - **Patients must be committed to keep their post-op weight stable without gain**
-

# Patient Evaluation

- ❑ Skin quality, presence of stretch marks, cellulite
- ❑ Pinch test (assess thickness of adipose tissue)
- ❑ Evaluate musculo-fascial contour of abdomen
  - Consider intra-abdominal fat
  - Asses for umbilical and other **hernias**
  - Asses for Rectus muscle diastasis (“mommy pooch”)
- ❑ Note presence of abdominal scars
- ❑ Select areas of liposuction, estimate the anticipated amount of fat to be removed and decide on a single versus staged procedures



# Contraindications for Liposuction

- ❑ Morbidly obese patients
- ❑ Unstable weight, recent weight gain
- ❑ Unrealistic expectations / Body Dysmorphic Syndrome
- ❑ Poor skin elasticity, (excessive skin laxity)
- ❑ Intra-abdominal fat deposits
- ❑ Complicating medical conditions (history of bleeding disorders, cardiac disease, thrombophlebitis)

# Abdominal Ventral Hernia



# Pre-operative evaluation

- ❑ **Always think safety**
- ❑ Recognize the unhealthy patient
- ❑ Prevent Deep Venous Thrombosis
- ❑ Minimize blood loss
- ❑ Consider total surgery/anesthesia time

# Tumescent Anesthesia

- Tumescent Technique (by Dr. Jeffery Klein) revolutionized liposuction
- Tumescence (swelling or enlargement)
  - Infusion 3:1 or greater amount of fluid as compared to the amount to be suctioned out
  - Provides firmness to the tissue to facilitate fat removal and sculpting
  - Minimizes blood loss

# Benefits of Tumescent Anesthesia

- ❑ Pure tumescent anesthesia is performed with no or minimal oral sedation
- ❑ Lidocaine decreases post-operative discomfort
- ❑ Lidocaine has a bacteriostatic effect
- ❑ Liposuction using tumescent fluid can be combined with I.V. sedation or general
- ❑ Addition of bupivacaine to tumescent solution is not recommended due to a risk of an irreversible cardiac arrest

# Tumescent Fluid

## □ Klein's Tumescent Solution Formula

- Normal Saline 1000mL
- Lidocaine 1% 50mL 500mg
- Epinephrine 1:1000 1mL 1mg
- NaHCO<sub>3</sub> 8.4% 10mL 10 mEq

**Results in Lidocaine 0.05% with  
1:1,000,000 Epinephrine**

□ MEMORIZE THIS FORMULA

□ REMEMBER: 1% equals to 10mg/mL

# Mixing of Tumescent Fluid (1)

**Memorize 1% = 10mg/mL**

**Thus, one 50mL bottle of 1% lidocaine contains 500mg of lidocaine.**

**When making Klein's formula tumescent solution, think about lidocaine and epinephrine components separately.**



# Useful to remember

$$1\% = 10\text{mg/mL}$$



**Derivation:**  $1\% = 1/100 = 1 \text{ part}/100 \text{ parts}$  (same units cancel) =  $1\text{gm}/100\text{gm} = 1,000\text{mg}/100\text{gm}$

But, in the metric system 1gm of water has a volume of 1mL at 4 degrees Celcius, i.e. water has a density of 1gm/mL . Thus,  $1,000\text{mg}/100\text{gm} = 1,000\text{mg}/100\text{mL} = 10\text{mg/mL}$ .

**So,  $2\% = 20\text{mg/mL}$ ;  $0.5\% = 5\text{mg/mL}$**



# Mixing of Tumescence Fluid (2)

One liter (1,000mL) of standard Klein's solution has 500mg of lidocaine and 1mL of epinephrine 1:1,000.



1mg/mL of epinephrine in one liter (1,000 mL) will be diluted to 1:1,000,000

# Mixing of Tumescence Fluid (3)

So, if you use one 50mL bottle 1% lidocaine with epinephrine 1:100,000, you need to add additional 0.5mL of epinephrine (1:1,000) to make standard Klein solution. It already contains correct amount of lidocaine.



# Mixing of Tumescence Fluid (4)

**Double Klein's solution =  
1000 mg Lidocaine and 1:1  
million epinephrine in 1 Liter  
NS / LR**



**Can be made using  
2 bottles of 1% lidocaine w/ epi**

# Variations in Tumescent Solution

## □ For General Anesthesia (Super-wet technique)

– Normal Saline	1000mL	
– 1% Lidocaine	40mL	400mg
– 1:1000 Epinephrine	0.5mL	0.5mg
– NaHCO <sub>3</sub> 8.4%	none	

## □ Results in Lidocaine 0.04% with 1:2,000,000 Epinephrine

# Normal Saline & Lactated Ringer's (LR)

- Both NS and LR are used for tumescence
- Both NS and LR are used. At one time, there was concern about use of LR and possible metabolic alkalosis, but this was only a theoretical concern.
- Even when using LR, it is more comfortable for the patient to add about 5cc of bicarbonate per liter to decrease pain during infiltration in an awake patient

# Lidocaine

- Provides local analgesia
- Decreases requirement need for analgesia
- According to the PDR, the maximum dose Lidocaine with Epinephrine is 7mg/kg
- **In 1987 Dr. Klein demonstrated that 35 mg/kg safe when injected as tumescent fluid technique, and later this was increased to 50-55 mg/kg**
- Variable absorption (face vs. body)
- Metabolized primarily by Cytochrome P450
- Ten percent is excreted unchanged in urine

# Lidocaine

- ❑ Ostad, Kageyama, Moy: *Dematol.Surg.* 1986 demonstrated that Lidocaine levels up to 55 mg/kg are safe for liposuction
- ❑ Ten percent is excreted unchanged in urine

# Lidocaine & Tumescent Solution

- ❑ **Lidocaine is lipophilic**
- ❑ Onset of anesthesia takes 15 minutes and reaches maximum at 25 minutes in the presence of epinephrine
- ❑ **Peak plasma levels typically achieved at 12 hours after injection in body liposuction**
- ❑ Peak levels in the face occur earlier
- ❑ Lidocaine remains in tissues for up to 18 hours
- ❑ Only about 20% of infiltrated Lidocaine is removed by liposuction--measurement of aspirate



# Absorption of Lidocaine

- Slow absorption of Lidocaine from a tumescent solution to serum occurs because:
  - Interstitial pressure above capillary pressure collapses capillaries and venules
  - Fluid volume increases the diffusion distance
  - Fluid dilution decreases concentration gradient
  - Epinephrine vasoconstriction decreases capillary absorption
  - Adipose tissue is relatively avascular
  - Lidocaine is **lipophilic**; fat cells act as a reservoir for & limit immediate absorption into serum

# Drugs that increase levels of Lidocaine in serum

Mechanism of action – these medications **decrease Lidocaine breakdown** by inhibition of Cytochrome P450 enzymes

- Benzodiazepines
- Tricyclic antidepressants
- SSRI's anti-depressants
- Anti-fungals
- Calcium channel blockers

# Inhibitors of Cytochrome CYP 450 3A4 enzymes

## ANTIFUNGAL MEDICATIONS

Fluconazole  
Itraconazole  
Ketoconazole  
Miconazole

## BENZODIAZEPINES

Alprazolam  
Diazepam  
Flurazepam  
Midazolam  
Triazolam

## CALCIUM CHANNEL BLOCKERS

Amiodarone  
Diltiazem  
Felodipine  
Nicardipine  
Nifedipine  
Verapamil

## MACROLIDE ANTIBIOTICS

Clarithromycin  
Erythromycin  
Troleandomycin

## PROTEASE INHIBITORS

Indinavir  
Nelfinavir  
Ritonavir  
Saquinavir

## SELECTIVE SEROTONIN REUPTAKE INHIBITOR (SSRI)

## ANTIDEPRESSANTS

Fluoxetine  
Fluvoxamine  
Nefazodone  
Paroxetine  
Sertraline

# Lidocaine Toxicity

- ❑ Toxicity is **biphasic** (excitation followed by depression). It affects organs with high vascularity = brain and heart
  - ❑ **Symptoms – neurological sx @ lower doses (3 to 6 mcg/mL) :**
    - Light headedness, dizziness
    - Visual disturbances
    - Headache
    - Peri-oral tingling, numbness
    - Sedation
    - Impaired concentration
    - Dysarthria
    - Tinnitus
    - Metallic taste
    - Muscular twitching, tremors
-



# Lidocaine Toxicity – continued (2)

- Cardiac toxicity seen with higher plasma levels (>5 mcg/mL)
- Plasma concentrations <5 mcg/ml are unlikely to have cardiovascular toxicity
  - Levels of 5-10 mcg/mL may cause hypotension from **both** vascular smooth muscle relaxation and cardiac suppression
  - Direct cardiac effects may include:
    - Negative inotropy
    - Arrhythmias
      - widened PR interval, widened QRS, sinus tachycardia, sinus arrest, partial or complete AV dissociation

# Lidocaine Toxicity – Continued (3)

## □ CNS symptoms

- may be masked in patients pre-medicated with benzodiazepines, and thus the first sign of toxicity may be cardiovascular in nature

## □ When blood levels are very high ( $>10\text{mcg/mL}$ )

- patients may experience respiratory depression or arrest and cardiovascular collapse

# Treatment of Lidocaine Toxicity

- Intralipid-20® (20%)
  - Normally used for IV hyper-alimentation
  - Serves as a vehicle for other medications such as Propofol & Etomidate
  - Provides a “lipid sink” for binding in the serum of lipophylic local anesthetic Lidocaine & Bupivacaine
  - **Dosage:** IV bolus administration 100 mL of 1.5mg/kg Intralipid over 1 min, (may repeat up to 3mg/kg), followed by continuous infusion of 1000 mL/hr

# Treatment of Lidocaine Toxicity (2)

- Anti-convulsants
  - benzodiazepines (midazolam, lorazepam or diazepam)
- Vasopressors such as I.V. ephedrine and vasopressin as needed
- Obtain lidocaine blood level



# Treatment of Lidocaine Toxicity (3)

- ❑ Best treatment is prevention.
- ❑ Mix your own tumescent solution or closely supervise your RN assistants when mixing tumescent fluids.
- ❑ Calculate & review the safe, maximum lidocaine limits
- ❑ Reduce total dose of lidocaine whenever possible.

# Epinephrine

- ❑ Used for vaso-constrictive effects, usually 1mL of epinephrine 1:1,000 per liter of NS or LR
- ❑ Use with caution in patients with underlying heart disease and hypertension
- ❑ Upper limit has been cited as 0.07 mg/kg but some have proposed as much as 10mg per procedure

# Sodium bicarbonate

- Decreases pain during the infiltration of tumescent fluid, whether NS or LR, especially in awake or lightly sedated patients;
- Infiltrate tumescent solution slowly

# 2006 Guidelines for Liposuction Surgery

## □ Documentation

- Pre-operative weight
- Anatomical sites treated
- Quantity & concentration of tumescent fluid
- Total doses of drugs utilized
- Total volume of fat extracted
- Volume of supra-natant fat
- Technique & devices utilized
- Type of anesthesia
- Drains (if placed)
- Postoperative garments utilized

# Liposuction Aspirate

Document volumes by photos:

Total volume  
suctioned out

Volume of supra-  
natant fat

Infra-natant is low in  
hematocrit; does not  
clot when collected  
into a jar



# 2006 Guidelines for Liposuction Surgery

- ❑ Max lidocaine 45-55 mg/kg
- ❑ Mega-liposuction
  - >6000mL supranatant fat
  - Serial liposuction preferred
  - Higher morbidity/mortality
- ❑ Maximum safe removal of fat
  - 5000 mL supranatant fat
- ❑ Use sterile technique
- ❑ Continuous monitoring
  - Vitals, O2 sat, EKG, ETCO2 (if general)
  - I.V access if >100 cc fat removed
- ❑ At least one person must be ACLS trained
- ❑ Location – facility accredited by AAAHC or equivalent

# Drug & Volume Limits for Liposuction

- Maximum dosing of lidocaine
    - - ASPS 35mg/kg
    - AAD 45mg/kg
    - **AACS 55mg/kg**
  - Maximum dosing of epinephrine
    - Oregon 0.07 mg/kg, Colorado 0.05 mg/kg
  - Maximum volume fat aspirate
    - AACS - 5L
    - Florida - 4L
    - Oregon 5% of Wt up to 4.5L max
-



# Tranexamic acid (TXA)

- ❑ In tablet and IV form. FDA-approved for prevention of excessive blood loss from major trauma, postpartum bleeding, surgery, tooth removal, nosebleeds, and heavy menstruation.
- ❑ Synthetic analog of the amino acid lysine
- ❑ Anti-fibrinolytic, reversibly binds 4-5 lysine receptor sites on plasminogen. Decreases the conversion of plasminogen to plasmin, thus preventing fibrin degradation and preserving the fibrin matrix framework
- ❑ Side-effects occur rarely, changes in color vision
- ❑ No increase in blood clotting in patients without clotting disorders

# Use of Tranexamic Acid to Reduce Blood Loss in Liposuction

Cansancao, Alvaro Luiz et al. Plastic and Reconstructive Surgery: May 2018 - Volume 141(5) pg 1132-1135

- Twenty women undergoing liposuction were divided into two groups: Ten received 10 mg/kg of tranexamic acid IV versus ten control patients without TXA. They measured hematocrit preop, in lipo-aspirate (infranant) and postop.
- Hematocrit levels at day 7 postoperatively were 48 percent higher in the ten TXA.
- One percent drop in the hematocrit level was found after liposuction of  $812 \pm 432$  ml in TXA and  $379 \pm 204$  ml in the group without TXA.
- **Thus, the use of tranexamic acid could allow for same aspiration of 114 percent more fat, with comparable variation in hematocrit levels.**

# Operative Considerations

# Choice of Anesthesia

- Always use Tumescent or Superwet technique
  - Can use oral sedation, I.V. sedation, local only (for cases with small number of areas and small volume of aspirate)
  - General anesthesia, esp. for large volume cases, and when combined with abdominoplasty, body lift, etc.
-

# Oral Sedation

- Useful in properly selected patients & when performing moderate volume liposuction
- Pre-medicate with oral alprezolam 2mg or triazolam 0.5mg, oxycodone/acetaminophen 5mg/325mg, and promethazine 12.5 -25mg or ondansetron 4mg
- Establish IV access for fat aspirate > 100cc
- Use tumescent fluid with 500mg-1000mg lidocaine per liter for smaller cases
- Use the higher concentrations, esp. in the peri-umbilical region; also may add oral tabs prn

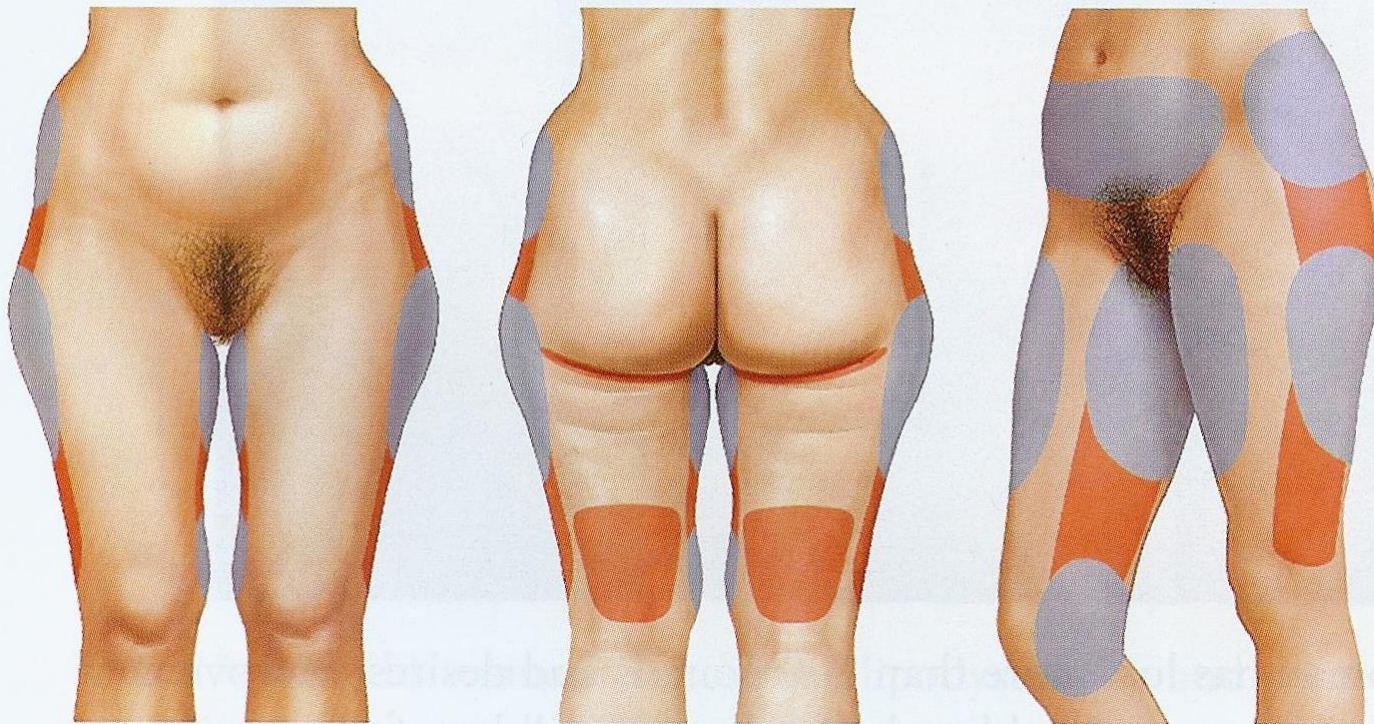
# Photographic documentation of pre-operative markings





# Respect the Zones of Adherence

ZONES OF ADHERENCE



- Inferolateral iliotibial tract
- Gluteal crease
- Lateral gluteal depression
- Middle medial thigh
- Distal posterior thigh



# Incisions (Adits) for Liposuction

- Incision (small stabs) must be designed to minimize post-op visibility, especially in pts. with Fitzpatrick >type 3 skin.
  - **Adit** is an engineering term that describes a horizontal opening by which a mine is entered or drained. A micro-**adit** used in tumescent **liposuction** is a small circular hole made by a 2 mm skin biopsy punch. Micro- adits (or stab incisions) without suturing facilitate post-operative drainage.
-

# Peristaltic Infusion Pump & Multi-port Infiltration Cannula



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# Estimates of Tumescant Fluid Volume (for reference only)

- ❑ Whole face and neck -- 250mL
- ❑ Typical neck – 100mL
- ❑ Upper Arms -- 500mL
- ❑ Bra-roll– 1,000mL
- ❑ Male chest – 1,000mL
- ❑ Upper Abdomen--1,000mL
- ❑ Lower Abdomen--1,000mL
- ❑ Waist & hips-- 1,000mL
- ❑ Pubis -- 250 mL
- ❑ Medial thighs – 250-500mL
- ❑ Lateral thighs – 250 mL
- ❑ Medial Knee < 100 mL
- ❑ Calves – 250mL

# Infiltration of Tumescent Fluid

- ❑ Incisions are made with a #11 blade, about 5mm wide to diminish friction burns
- ❑ Infiltration cannula is attached to a peristaltic pump
- ❑ Approximately up to 3:1 ratio of infiltrate to anticipated fat aspirate (less if doing superwet technique)
- ❑ Infiltrate to increased tissue turgor and skin blanching and feather into adjacent areas

# Infiltration of tumescent fluid

- Use highest tolerable speed when sedated or under general anesthesia
- Try depot and then return with higher-speed passes
- Fan out in all directions
- Beware of sensitive areas
- Can use several access ports to allow for cross-tunneling

# Lipo-disruption

- ❑ Prior to suctioning – may use Bluggerman-Mangubat disruptor cannula
- ❑ May use PAL-assisted 4mm flared Mercedes cannula with vacuum suction off for lipo-disruption prior to liposuction
- ❑ **Endpoint is looser glide with less resistance**
- ❑ Special attention needed to hard to reach or sensitive areas
- ❑ Consider lipo-disruption at the end of procedure to smooth out any irregularities

# Types of Liposuction

- ❑ Suction-assisted (SAL)
- ❑ Syringe-assisted (for small lipo-transfer)
- ❑ Power-assisted (PAL)
- ❑ Ultrasonic-assisted (UAL) = VASER
- ❑ Laser-assisted (LAL)
- ❑ Radio-frequency-assisted (RFAL)



# Suction-assisted Liposuction- SAL

- ❑ Cannula connected to vacuum suction set at 1 atm (-29cm H<sub>2</sub>O) or 30 cc syringe with Johnny lock or equivalent
- ❑ Multiple styles of cannulas and spatulas available with multiple hub configurations
- ❑ Advantages:
  - time tested technique, low cost, multiple cannula size and configurations
- ❑ Disadvantages:
  - difficulty in treating fibrous areas, operator fatigue

# Cannula hole configurations

- ❑ Most common is the Mercedes configuration
- ❑ Can use expanded Mercedes or double Mercedes for additional speed
- ❑ Most cannulas have blunt tips to decrease the likelihood of penetrating unwanted areas
- ❑ Toledo V tip configuration allows cutting action of fibrous areas and release areas with existing scars, used infrequently

**MERCEDES**

Featuring three openings in a circumferential pattern near the distal tip of the shaft

**ACCELERATOR III™**

Three openings in a triangular pattern. Our most popular tip design.

**LAS VEGAS™**

Similar to the Accelerator III, the Las Vegas employs a single distal opening with two proximal openings. Less aggressive at the tip. Ideal for feathering.

**STANDARD**

The cannula that started it all. One opening near the tip.

**GILLILAND ETCHING CANNULA**

Four openings in a linear pattern. Distal end of each opening is raised for etching of subcutaneous tissue.

**BECKER™**

Riblike projections facilitate breakdown of tissue prior to aspiration, increasing speed and efficiency in a wide range of procedures.

**BECKER TEAR DROP™**

Similar to the Becker™, with proximally flared ribs.

**SPATULA**

So named because of its flattened profile, the spatula cannula is ideal for cervical and facial procedures.

**KEEL COBRA**

"V" shaped design allows easy penetration and unprecedented efficiency and control. Two side openings near the tip and a single hole positioned below.

**FOURNIER**

Three openings in a linear pattern

**KEEL COBRA II**

Grooved laterally for improved guidance and tissue ingress, the Keel Cobra II features side openings near the tip and a third proximal hole similar to the Keel Cobra, above.

**SATTLER™**

24 small lumens surrounding distal tip.

**CANDY CANE™**

Features three elongated lumens in a spiral pattern as shown.

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# Cannula Diameter

Though not rigorously demonstrated, many physicians think that cannulas with outside diameter  $>4\text{mm}$  are associated with higher rates of irregularities and seroma formation. Consider use of larger diameter cannulas when the overlying flap will be excised, i.e. Avelar lipo-abdominoplasty

# Intra-Operative Comfort & Safety

- ❑ Use warm fluids
- ❑ Use warm prepping solution
- ❑ Use warming blankets
- ❑ Set proper O.R. temperature to avoid hypothermia
- ❑ Position patient appropriately
- ❑ Pad all pressure points
- ❑ Flex knees over a pillow

# Liposuction Procedure

- Work as fast as you physically feel comfortable
- Use position changes and adit changes efficiently
- Suction in all directions circumferentially
- Work distal to proximal toward incisions to avoid indents and over-suction close to the adit
- Use long cannulas and use them to full length whenever possible
- Use the guide hand to provide compression and bring fat to cannula in a FLAT plane
- Have the assistant provide counter-tension

# End Points of Liposuction

- ❑ Improvement of contour
- ❑ Loss of tissue resistance
- ❑ Symmetrical pinch test
- ❑ Increased bloody aspirate
- ❑ Volume of aspirate relative to infiltrated volume



# Power-Assisted Liposuction

- Liposuction cannula connected to a powered hand piece that provides reciprocating movement forward and backward, 2-12 mm movement at 4,000--6,000 cycles/min
- Advantages:
  - less operator fatigue
  - decreased operative time
- Disadvantages:
  - cost



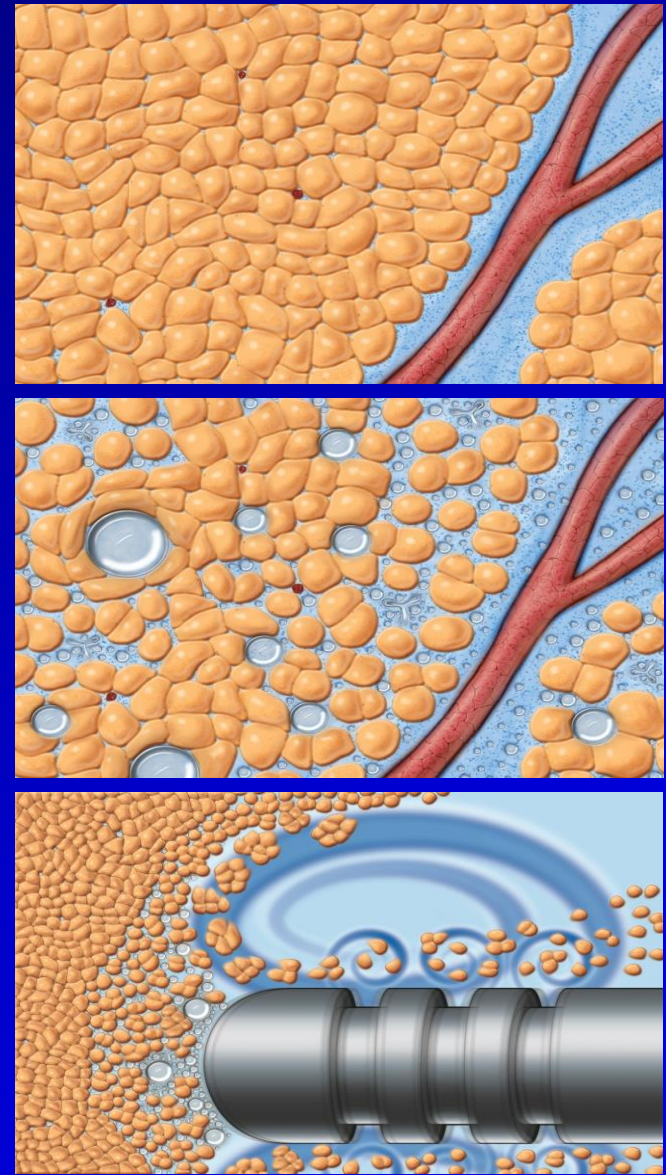
# VASER<sup>®</sup> vibration Amplification of Sound Energy at Resonance

- Useful for treatment of fibrous areas, revision liposuction, fat harvesting and increased skin tightening
- Energy and cannulas are designed to minimize trauma and preserve viability of fat cells & Adipose Derived Mesenchymal Progenitor Cells



## How VASER<sup>®</sup> Ultrasound Works

- ❑ There are millions of microscopic air bubbles in the tumescent solution
- ❑ When exposed to ultrasound energy, bubbles expand and eventually collapse
- ❑ Bubbles act as miniature crowbars to force the fat cells apart
- ❑ Once the fat is loosened, it is mixed with the tumescent fluid to form an emulsion
- ❑ **Acoustic streaming** causes intense localized swirling to further break up the fat into small clusters of cells
- ❑ Small groups of cells are excellent for fat transfer



# Vaser Ultrasonic Liposuction

- Emulsifies fat
  - cavitation and micro-mechanical effects
- Some cannulas employ standard suction others require routine liposuction after performing ultrasonic emulsification
- Especially useful for fibrous areas
- Disadvantages:
  - cost, time, potential dermal injuries

# Concept of Bulk Heating

- Additional energy (laser or radio-frequency) is delivered into the subcutaneous tissues to achieve temperatures of 45 -47 degrees C to induce new collagenesis and to increase skin contracture beyond that achieved by SAL alone
- Indicated for patients with increased skin laxity but need to achieve the bulk heating – time consuming & technique dependent
- Actual skin tightening often occurs less than advertised by the manufacturers



# SMART-LIPO Lasers

(for reference only)

- Smartlipo™ evolved through multiple improvements since its introduction in 2005
- 1<sup>st</sup> generation 1064 Nd:YAG lasers, power 6-18W delivered through 0.6mm-1mm diameter fibers
- Current Triplex SMART-Lipo has
  - 1064, 1320 and 1440nm wave lengths
  - 24 – 40 Watts of power
  - 40 Hz max repetition rate
  - 150  $\mu$ s pulse width



# Laser-assisted Liposuction (for reference only)

## □ Indications

- Localized small deposits of fat
- Useful for fat emulsification
- Useful for revision surgery and fibrous areas

## □ Advantages

- Potentially less bleeding and tissue trauma
- Potentially better skin contracture

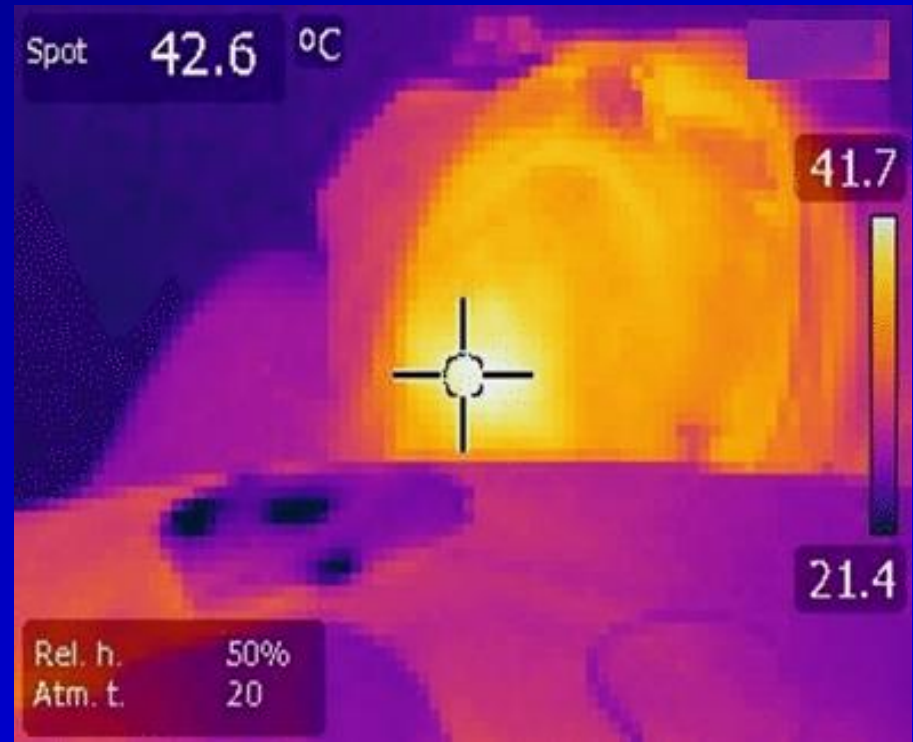
## □ Disadvantages

- Burn injury to dermis
- Cost

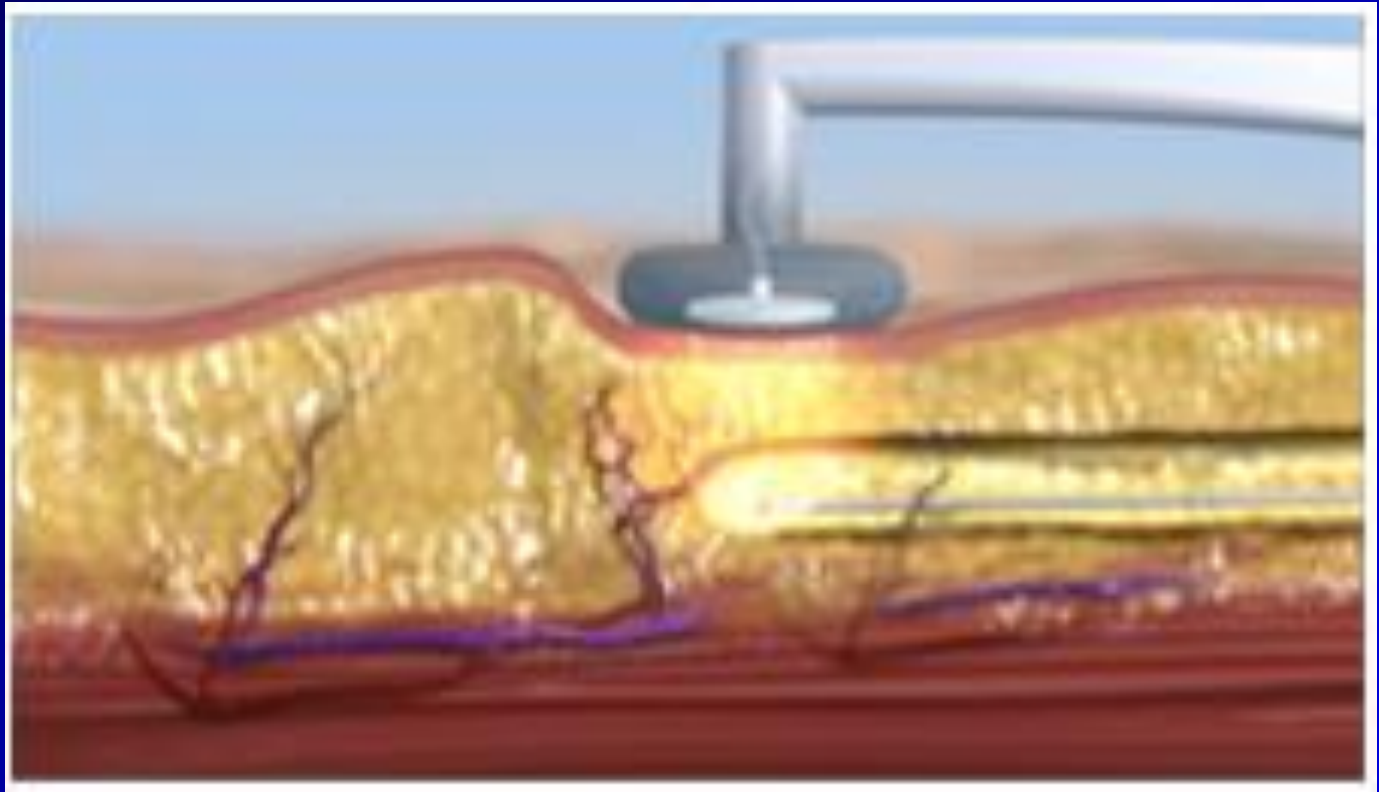


# Thermi-tite & FLIR Camera (for reference only)

Radio-frequency system designed for skin tightening. Infrared intra-operative imaging is used to assure uniform distribution of subcutaneous temperature (bulk heating) needed for fat melting and enhancement of skin tightening.



# BodyTite – RF-assisted liposuction



Continuous monitoring of temperature at the tip of the internal subcutaneous probe

# Renuvion (formerly J-Plasma)



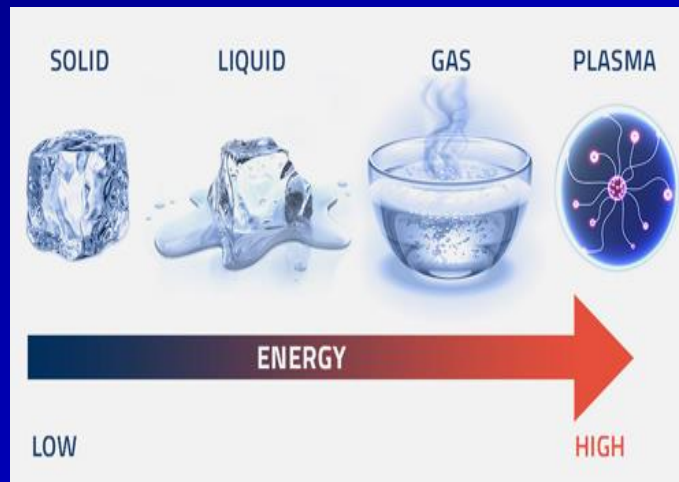
Helium gas is excited by waves of RF energy to create a stream of cool plasma. Only 0.1% of helium forms the plasma with heating to  $>85^{\circ}\text{C}$  for 0.040 to 0.080 seconds while the remaining 99.9% of the helium gas cools down the tissue. The system achieves contracture of the fibro-septal network and stimulation of collagen synthesis.



Disadvantages

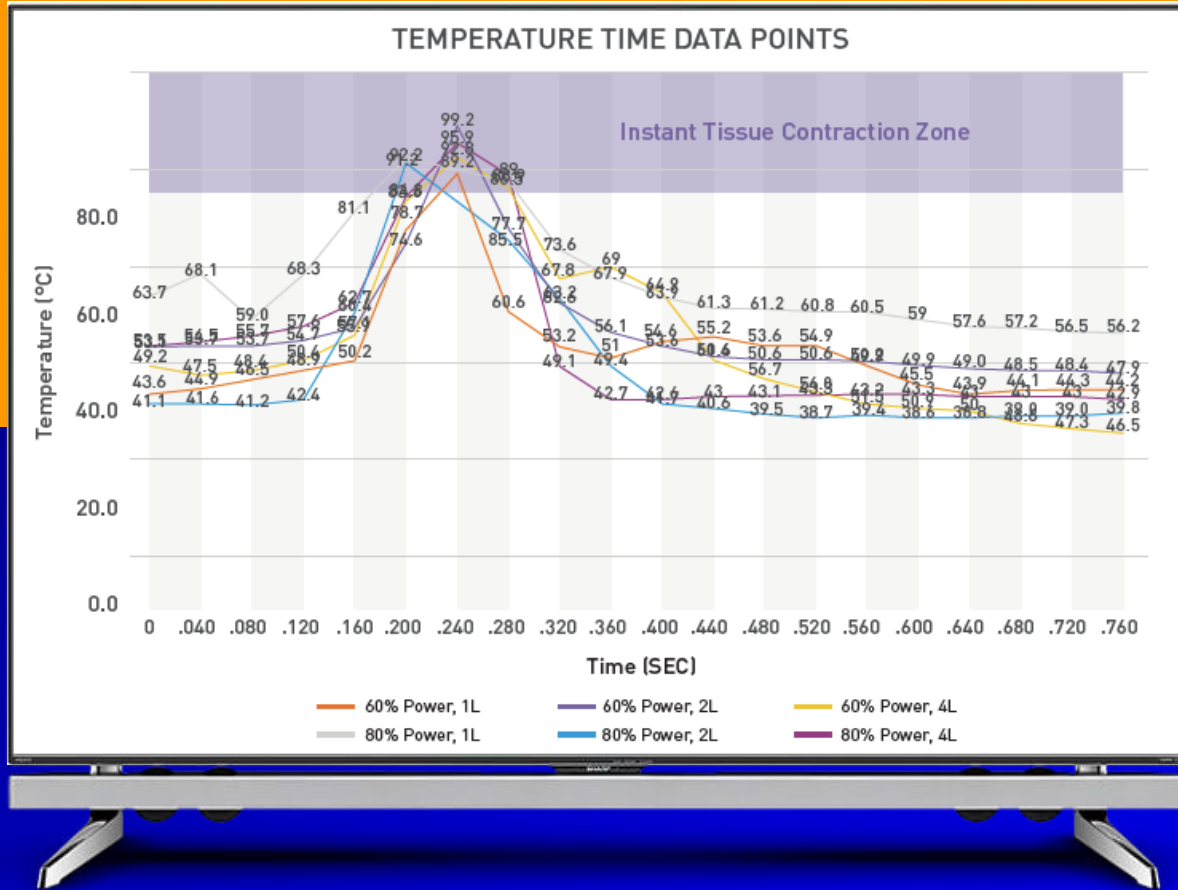
Cost Equipment & Disposables

# Plasma Energy—the 4th State of Energy



- Plasma is created by adding energy to a gas stream
- non-touch modality.
- Minimal diffusion of thermal energy to adjacent tissue.

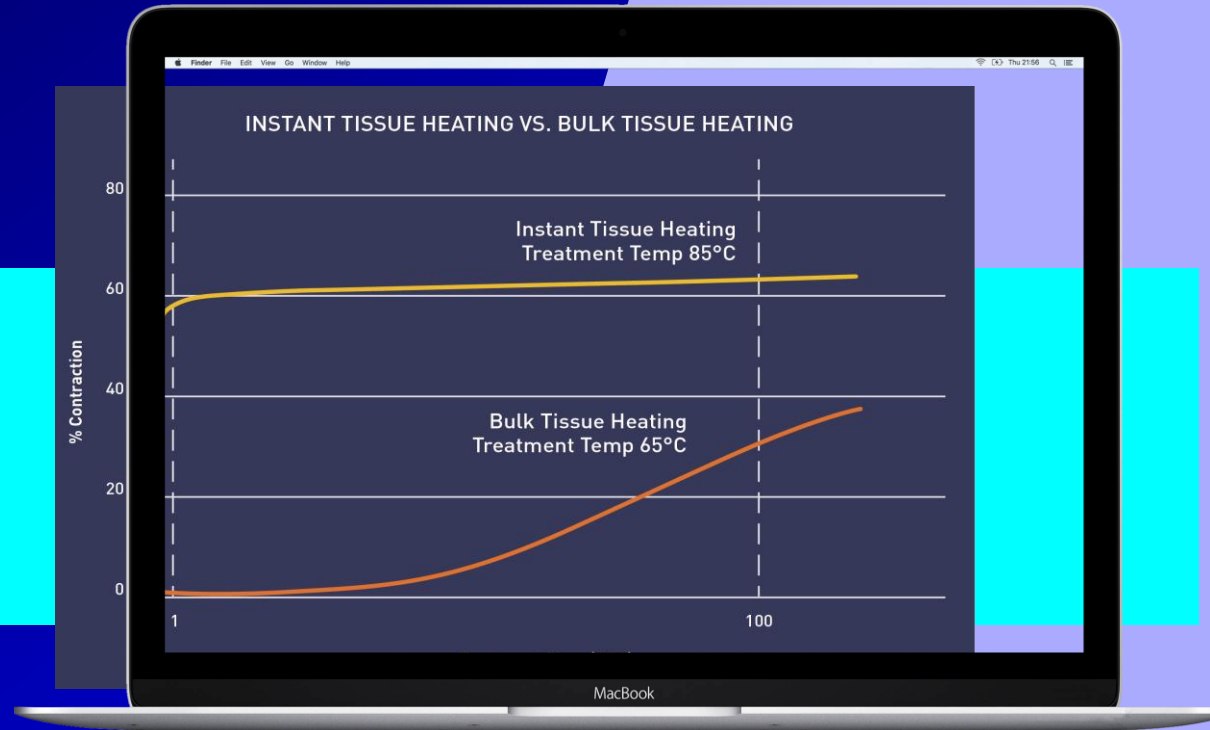
# Renuvion Temperature Time Data Points<sup>1</sup>





# Instant Tissue Heating vs. Bulk Tissue Heating

- > Collagen reacts very predictably to the application of heat
- > At higher temperatures, shorter treatment times can be used to achieve maximum contraction<sup>2,3,4,5,6</sup>



# Prevention of Complications

- ❑ Better to err on less suctioning under-resection
- ❑ Avoid superficial liposuction
- ❑ Use care with aggressive cannulas
- ❑ Assistant may help to stretch the area
- ❑ Move cannula to different area with each pass
- ❑ Use multiple incisions
  - Facilitates crisscross pattern for liposuction
  - Ensure incision size is appropriate for cannula size



# Prevention of Complications

- ❑ Maintain intra-operative data sheet
- ❑ Superficial liposuction/dermal injury is not necessary for skin contracture
- ❑ Do not close incisions or close only loosely
- ❑ Pad pressure points (ankles, ulnar nerve, etc under sedation or general anesthesia
- ❑ Abduct arms to less than 90 degrees to prevent
- ❑ Careful in the prone position, pad & protect

# Postoperative Care

- ❑ Cover punctures with super-adsorbent pads & chucks, consider adult diapers
- ❑ Place compression garment next morning
  - Garment to be worn 24 hours a day for 2 weeks, then half day for additional 2-4 weeks
- ❑ Massage therapy – dough rolling pins
- ❑ Possibly use repeat session of external ultrasound for lumpiness

# Complications

**“Learn from mistakes of others. You can’t live long enough to make them all yourself.” *Eleanor Roosevelt***



# Prevention of Complications

- ❑ Recognize the unhealthy patient's Medical History: allergies, cardiac, pulmonary DVT risk, etc.
  
- ❑ Stay rather superficial tangential with cannulas knowing the location of the tip at all times
  - Small diameter infusion cannulas are more dangerous
  - Can cause abdominal perforations
  - Can cause intra-thoracic entry & pneumothorax
  
- ❑ History of prior liposuction or Cool-sculpting
  - Concrete-like interstitial scarring
  - Increased cannula resistance

# Recognize the Unhealthy Patient

- Large patients = may be trouble. BMI>32 associated with increased incidence of all complications
  - More difficult anesthesia management
  - Higher **DVT** risk
  - Potential skin necrosis
  - Higher rate of irregularities, residual skin laxity
  - Require more extensive experience



# Poor Patient Selection (visceral, intra-abdominal fat)



# Complications

- Local, rather mild complications – rather common
- Local, serious complications – rare
- Systemic complications – both, minor and serious, are not frequent but can be fatal

# Common & Less Serious Complications

- ❑ Skin surface irregularities
- ❑ Numbness & dysesthesia
- ❑ Seromas or hematomas
- ❑ Friction burns & focal skin necrosis
- ❑ Allergic reactions to drugs
- ❑ Noticeable scars
- ❑ Skin discoloration
- ❑ Nerve injury – neuropraxia

# Contour & Skin Surface Irregularities

## □ Lipo-trough

- Excessive and uneven removal of fat
  - Large aggressive cannulas
  - Improper patient positioning
  - Carelessness

## □ Lipo-knot

- Focal area of insufficient liposuction

## □ Temporary Lumpiness

- First noticed 1-2 weeks after surgery
- May be the result of impaired lymphatic drainage
- Most pronounced 2-4 weeks after surgery

# Correction of a Lipotrop over-resection contour deformity

Correction of lipotrop using lipo-shifting & fat transfer.



# Hyperpigmentation



## □ Causes:

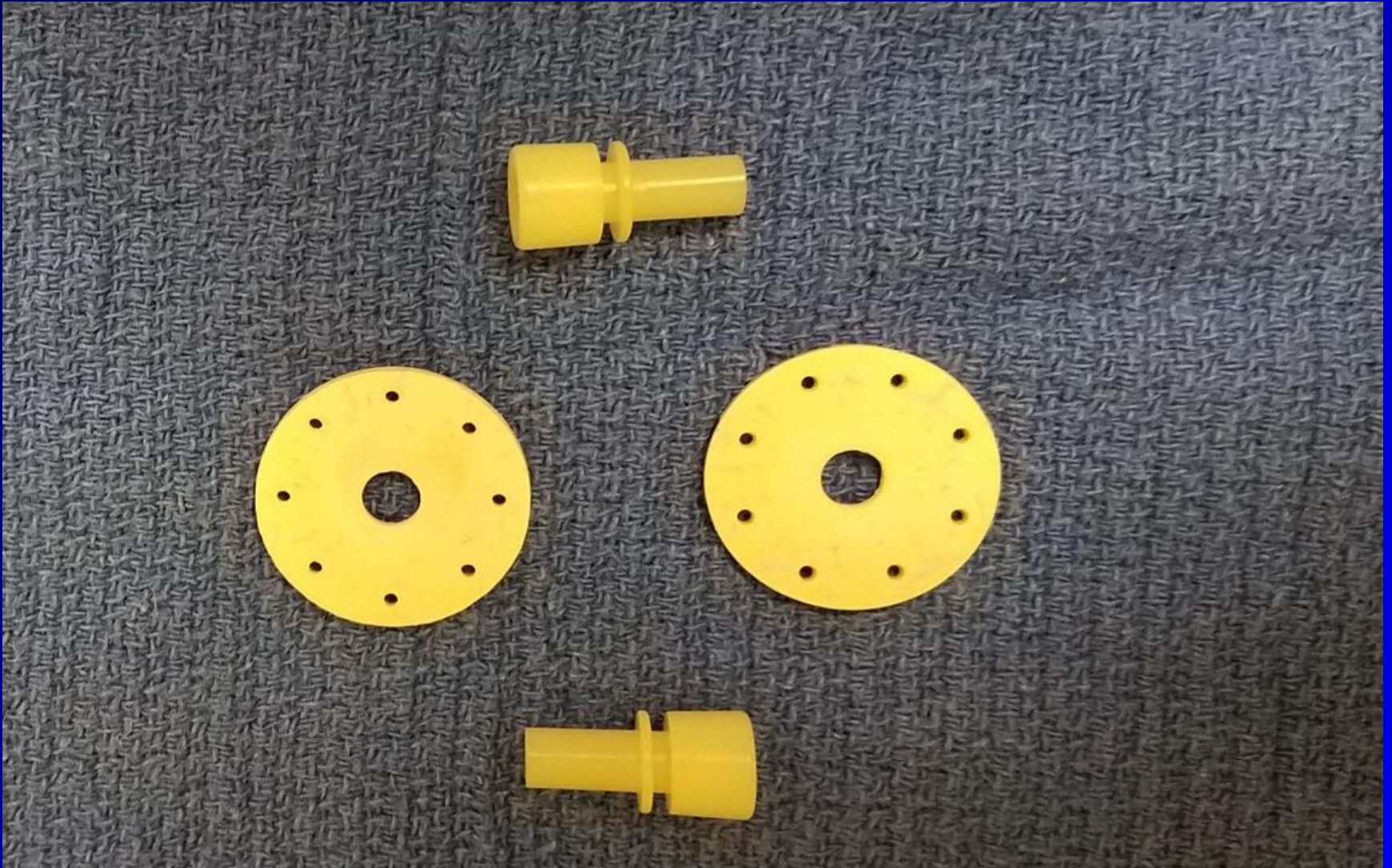
- Dermal trauma/friction

## □ Treatment:

- Hydroquinone 4% cream bid
- Kojic acid cream 2-4% qd



# Adit inserts - prevention of friction burns



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# Adit insert - friction burn prevention



# Cutaneous Burns

## □ Causes:

- Dermal injury from superficial liposuction
- Thermal burn from ultrasonic liposuction
- Contributing factors: smoking, diabetes

## □ Treatment:

- Local wound debridement
- Topical Silver Sulfadiazine 1% cream  
bid

# Seroma

- Factors influencing
  - Larger cannula size
  - Obese patients BMI>30
  - Larger volume liposuction
  - Additional energy used: Laser & ultrasonic liposuction

# Treatment of Seromas

- ❑ Serial needle aspiration, compression garment
- ❑ Evacuation & hyper-inflation with air
- ❑ Insertion of seroma catheter, may benefit from diagnostic ultrasound assist
- ❑ Seromadesis (air infiltration, hypertonic saline, talc, tetracycline)
- ❑ Injection of fibrin sealant (eg. Tisseel®)

# Severe and Uncommon Complications

## □ Anesthesia

- IV fluid overload
- Hypothermia
  - Acidosis
  - Defective coagulation
- Aspiration pneumonia
- Severe hypoxia
- Cardiac arrest
- Allergies
- Lidocaine toxicity
- Malignant hyperthermia

## □ Intra-operative care

- excessive blood loss
- injury to the abdominal organs

## □ Post-operative care

- Deep venous thrombosis
- Pulmonary embolism
- Infections < 1%
- Necrotizing fasciitis

# Lipoaspiration and Its Complications: A Safe Operation

Lázaro Cárdenas-Camarena, M.D.

*Guadalajara, Mexico*

TABLE IV  
Major Complications ( $n = 1047$  patients)

Type of Complication	No. of Patients	Percentage	Remarks
Fat embolism syndrome	2	0.19	In both patients, minor lipoaspiration was combined with gluteal lipoinjection. One patient also had abdominoplasty and the other one received breast implants
Cutaneous necrosis	1	0.1	Patient had two previous liposuctions
Extended infection	1	0.1	Late infection in the area where the drains were placed
Total	4	0.38	



# Serious Surgical Complications (Uncommon)

- ❑ Permanent sensory nerve dysfunction
- ❑ Infections / Necrotizing Fasciitis
- ❑ Viscus perforation

# Infections



# Necrotizing Fasciitis

- Type I – polymicrobial (aerobic/anaerobic)
- Type II- Group A  $\beta$ -hemolytic streptococci
- A rare but devastating complication
- Mortality 25-40%

# Type I NF

(Polymicrobial-most common)

- ❑ Group B streptococci
- ❑ Anaerobes
  - Bacteroides sp.
  - Peptostreptococcus sp.
  - Clostridium sp.
- ❑ Enterococci
  - Gram-negative bacteria
    - E. coli
    - Proteus sp.
    - Klebsiella
    - Pseudomonas
    - Serretia marcescens
    - Pasteurella sp.

## Type II NF (less common)

- Group A  $\beta$ -hemolytic streptococci
  - Strep. pyogenes
- Staphylococci
  - Coagulase negative and positive

# Presentation of Necrotizing Fasciitis

- ❑ Severe pain, may be along with inflammation
- ❑ May appear as a cellulitis
- ❑ Bronzing of skin and bullae formation within 3-5 days
- ❑ Finally becomes dull, blue-grey hue followed by frank necrosis



# Necrotizing Fasciitis

## □ Blood tests

- May show elevated WBC, hyperglycemia, hypocalcemia, elevated CPK
- Bacteremia is seen in 46% of blood cultures

# Management of NF

- Early diagnosis
- Fluid resuscitation & hospitalization
- Broad spectrum antibiotics to cover staph, strep, gm (–) rods and anaerobes
  - Clindamycin 600-1200mg I.V. tid
  - Cefuroxime 750-1500mg I.V. tid
- Surgical Management
  - Cornerstone of the treatment
    - Aggressive excision
    - Return to O.R. in 24-48 hours
- Adjunctive therapies
  - Hyperbaric oxygen
  - I.V. Immunoglobulin
  - Hemovac therapy to close already debrided defects

# Systemic Complications

- ❑ Lidocaine toxicity (as mentioned previously)
- ❑ Liposuction syncope
- ❑ Anemia
- ❑ DVT / PTE
- ❑ Pulmonary edema
- ❑ Fat embolism

# Syncope, hemodilution & anemia

- ❑ Vasovagal syncope due to dehydration resulting from insufficient I.V. fluid replacement & third-spacing.
  - ❑ Even without liposuction, infusion of 5 Liters of tumescent fluid decreases the hematocrit by 10%.
  - ❑ Hemoglobin will fall by 1-3% by fifth day following liposuction due to aspirated blood and blood accumulation in “third space”.
-

# Hemodilution / Anemia

Healthy 70kg adult can lose up to 900 mL of whole blood before early signs of shock are evident.

- First signs: tachycardia and anxiousness
- Blood pressure does not drop until 15-30% of blood volume lost (approximately 750-1500 ml)

# Survey of Systemic Complications

Grazer FM, deJong RH. Fatal Outcomes of Liposuction: Census Survey of Cosmetic Surgeons. *Plast Reconstr Surg.* 2000;105:436-446

Survey of North American members of the American Society for Aesthetic Plastic Surgery showed mortality rate 19.1 per 100,000 cases of liposuction. The main cause was pulmonary thrombo-embolism.



# Systemic Complications

Housman TS, Lawrence N, Mellen BG, et al. The Safety of Liposuction: Results of National Survey. *Dermatol Surg.* 2002;28:971-978

Survey of 66,000 cases of true tumescent liposuction showed mortality rate of zero

# Venous Thromboembolism

## Virchow's Triad

- ❑ Stasis
- ❑ Vessel Damage
- ❑ Activation of Coagulation

# Risk factors for DVT and PTE

- ❑ Recent surgery / having multiple procedures
- ❑ History of previous blood clots
- ❑ Hyper-coagulable states (e.g. Protein C or S deficiency, factor V-Leiden)
- ❑ Older patient
- ❑ Cancer
- ❑ Oral contraceptives (>35µg estrogen/day)
- ❑ Obesity
- ❑ Venous stasis / immobilization (prolonged bed rest)
- ❑ Large varicose veins
- ❑ Tobacco abuse

# Venous Thrombosis and Pulmonary Embolism in Plastic Surgery

- Pannucci et al. 2011 published validation of Caprini Risk Assessment Model in PRS pts.
- Included 1126 control patients in VTE Prevention Study: all had general anesthesia and planned post-op hospital admission without any chemoprophylaxis; had 60-day post-op follow-up; majority had scores of 3-6
- At 60 days overall VTE incidence was 1.69%
- **11.3 % of pts. with Caprini > 8 had a VTE event**

# 2005 Modified Caprini scale

## Choose All That Apply

### Each Risk Factor Represents 1 Point

- Age 41-60 years
- Minor surgery planned
- History of prior major surgery (< 1 month)
- Varicose veins
- History of inflammatory bowel disease
- Swollen legs (current)
- Obesity (BMI > 25)
- Acute myocardial infarction
- Congestive heart failure (< 1 month)
- Sepsis (< 1 month)
- Serious lung disease incl. pneumonia (< 1 month)
- Abnormal pulmonary function (COPD)
- Medical patient currently at bed rest
- Other risk factors \_\_\_\_\_

### Each Risk Factor Represents 3 Points

- Age over 75 years
- History of DVT/PE
- Family history of thrombosis\***
- Positive Factor V Leiden
- Positive Prothrombin 20210A
- Elevated serum homocysteine
- Positive lupus anticoagulant
- Elevated anticardiolipin antibodies
- Heparin-induced thrombocytopenia (HIT)
- Other congenital or acquired thrombophilia

If yes:  
Type \_\_\_\_\_

\*most frequently missed risk factor

### Each Risk Factor Represents 2 Points

- Age 60-74 years
- Arthroscopic surgery
- Malignancy (present or previous)
- Major surgery (> 45 minutes)
- Laparoscopic surgery (> 45 minutes)
- Patient confined to bed (> 72 hours)
- Immobilizing plaster cast (< 1 month)
- Central venous access

### Each Risk Factor Represents 5 Points

- Elective major lower extremity arthroplasty
- Hip, pelvis or leg fracture (< 1 month)
- Stroke (< 1 month)
- Multiple trauma (< 1 month)
- Acute spinal cord injury (paralysis)(< 1 month)

### For Women Only (Each Represents 1 Point)

- Oral contraceptives or hormone replacement therapy
- Pregnancy or postpartum (<1 month)
- History of unexplained stillborn infant, recurrent spontaneous abortion ( $\geq 3$ ), premature birth with toxemia or growth-restricted infant

Total Risk Factor Score

# Deep Venous Thrombosis

## □ Diagnosis:

- Most common symptom - **NONE**
- Calf pain, leg swelling, Homan's sign, venous cord
- Duplex ultrasound

## □ Prevention:

- Discontinue BCPs 4 weeks before and 2 weeks after surgery
- TED hose
- Sequential Compression Devices intra-operatively and post-operatively
- Avoid too many surgical sites

## □ Chemoprophylaxis:

- Low molecular weight heparin (Lovenox) 40mg SQ qD begin within 6 hours of surgery, use till fully ambulatory



# Mechanical Prophylaxis

- Compression Stockings
- Early Ambulation
- Warming Blanket
- Patient Positioning
- Sequential Compression Devices intra-operatively and post-operatively

# Prophylaxis Recommendations

- Pre-Operative
    - Discontinue BCP's four weeks before and two weeks after surgery
  
  - Pre-Operative Holding
    - Graduated compression stockings
      - Maintain for one week
    - Intermittent compression devices (SCDs)
      - Maintain until next morning
  
  - Intra-Operative
    - Flex knees at 5 degrees with pillow
  
  - Post-Operative
    - Insist on early ambulation
-

# Chemoprophylaxis

- ❑ In a higher risk patient, consider low molecular weight heparin (Lovenox) 40mg SQ daily until fully ambulatory.
- ❑ Begin within six hours following the onset of surgery, usually at the completion of the operation.
- ❑ Lovenox does not significantly increase the risk of a post-op hematoma; can be reversed with protamine sulfate
- ❑ Oral anti-coagulants: Rivaroxaban (Xarelto) and Apixiban (Eloquis) are both factor Xa inhibitors, FDA-approved for prevention of DVT following hip and knee replacement and prevention of clots in atrial fibrillation.
- ❑ Seem effective but are expensive & do not have a reversal agent.
- ❑ Morales et al. retrospectively compared 1572 pts. following large volume liposuction treated with Lovenox versus oral anticoagulants and found them similarly effective. *Aesthet Surg J.* 2016 36(4) 440-9

# Venapro DVT prevention

- ❑ Portable, home-use SCD for mechanical prophylaxis
- ❑ Rechargeable battery
- ❑ Compression to 50mm Hg once per minute
- ❑ Patient buys for \$200
- ❑ Patient keeps the system, does not return



# Effectiveness of Compression Stockings in Prevention of DVT

- Air travel study: 200 patients randomized w/ & w/o stockings
- All had duplex ultrasound before and after travel
- 12 pts detected w/ symptomless DVT did NOT use the stockings
- No DVT in the volunteers using stockings
- Blood tests
  - 11 heterozygous for factor V mutation
  - 4 prothrombin gene mutation.
  - 2 DVT volunteers were positive for factor V Leiden.
  - Full blood count, platelet, and other assays were not predictive of DVT
- 10% of air travelers > 50 years develop symptomless DVT
- **Elastic compression stockings are effective DVT prophylaxis**

Scurr JH, et al. *Frequency and prevention of symptomless deep venous thrombosis in long-haul flights: a randomized trial.* Lancet May 12, 2001;357:1485-9.

# Pulmonary Thrombo-embolism

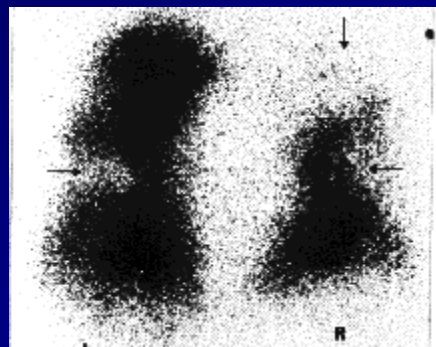
## □ Symptoms

- Shortness of breath
- Chest pain (usually worse with breathing)
- Anxiety
- Dizziness, light headedness
- Tachycardia
- Hypotension



# Pulmonary Thrombo-embolism

- Diagnosis
  - Chest x-ray
  - V/Q scan
  - Helical CT scan
  - Pulmonary angiogram
  
- Treatment
  - Anti-coagulation
  - Greenfield filter
  - 50% mortality rate



## Hampton's Hump:

Wedge shaped opacity

## Westermark's Sign:

Lung oligemia (radiolucency)

Basal infiltrate

Elevated diaphragm

Blunting of costophrenic angle

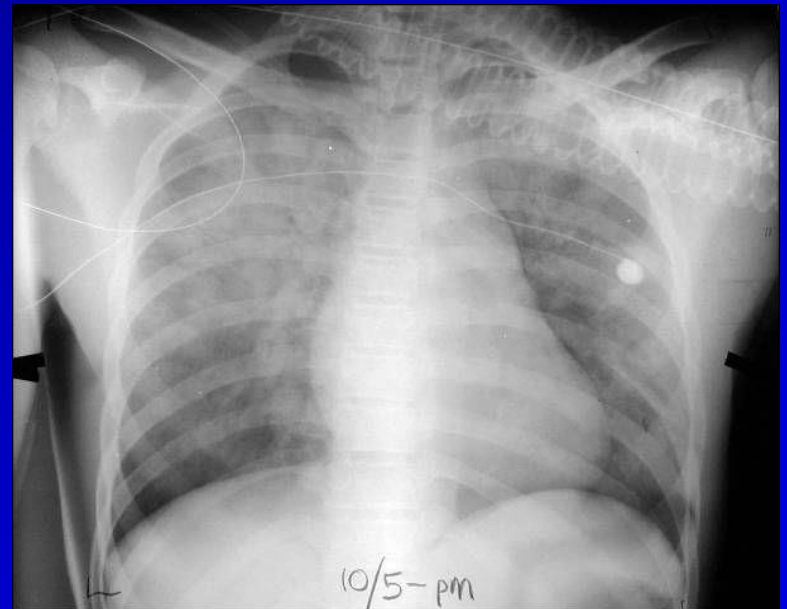
# Pulmonary Edema

## □ Presentation

- Basilar rales
- JVD
- Orthopnea
- Frothy pink sputum

## □ Causes

- Excessive I.V. fluids
- Cardiogenic
  - Valve insufficiency
  - Left heart failure



# Fat Embolism

- Major Diagnostic Criteria
  - Dyspnea, respiratory insufficiency
  - Confusion, Stupor, Delirium, Coma
  - Skin petechiae
- Minor Diagnostic Criteria
  - Fever > 38.5
  - Tachycardia
  - Jaundice
  - Retinal & Renal Changes
  - Anemia, Thrombocytopenia
  - Fat macroglobulinemia
  - Elevated sedimentation rate

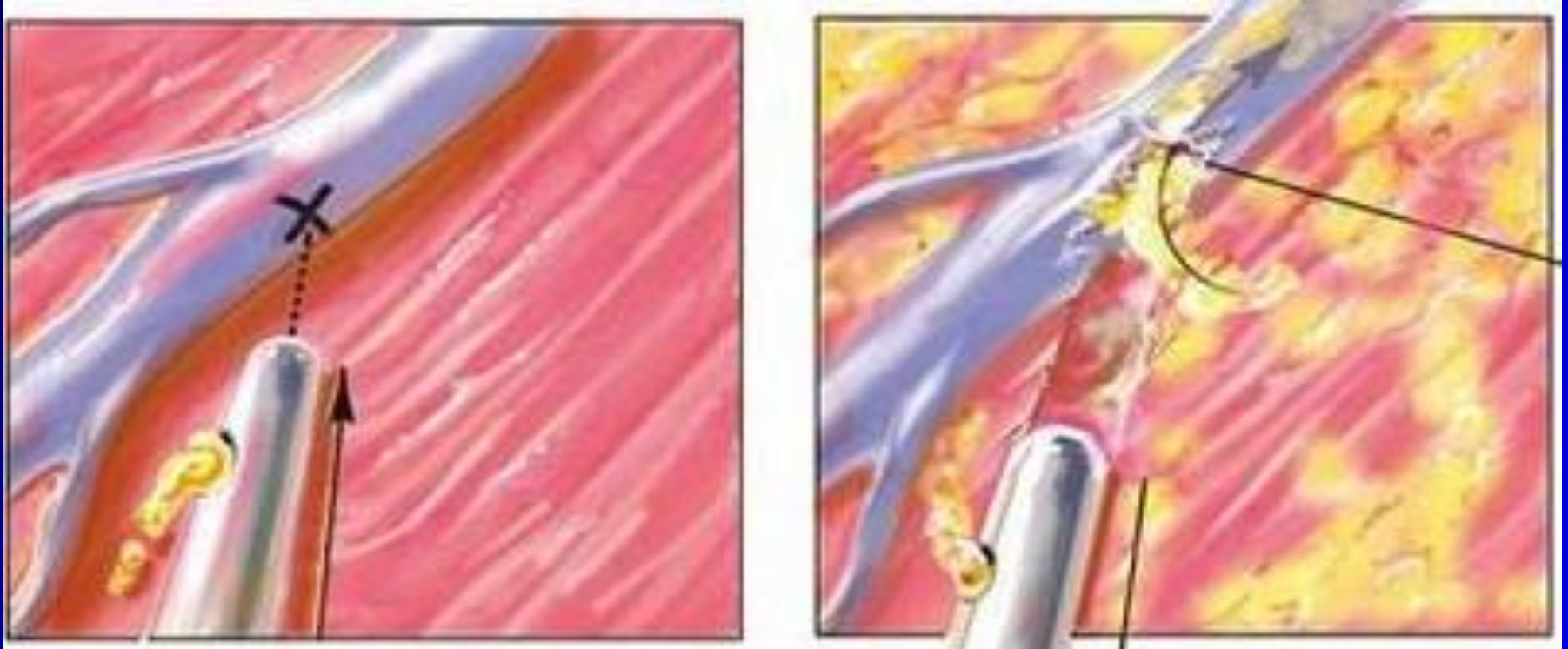
# Pathophysiology of Fat Embolism

## □ Fat micro-embolization

- Venous, subclinical micro-embolization is probably common following liposuction
- Mechanical plugging of vessels on the **arterial** side occurs if patient has a patent foramen ovale or an arterio-venous malformation
- Biochemical effects from enzymatic breakdown of the fat micro-emboli in the lung alveoli

## □ Fat macro-emboli

# Fat Macro-embolization into gluteal vein



Tear in vein wall



# Treatment Fat Embolism

## □ Treatment:

### – Supportive

- Treat symptoms of shock (blood/ IV Fluids)
- Pulmonary supportive treatment – oxygen & if necessary intubation & mechanical ventilation

# Special Considerations

- Gynecomastia)

- Decide if excision of the breast gland & and possibly skin excision will be needed in addition to the liposuction

- Breast reduction using liposuction

- Consider assessment and documentation of fibrous tissue density using a mammogram

# Gynecomastia Breast Reduction



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# Gynecomastia Breast Reduction



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# Gynecomastia

- ❑ The most common form we see as cosmetic surgeons is pseudo-gynecomastia associated with long-standing obesity and decreased testosterone in older man.
- ❑ True gynecomastia involves enlargement of the breast gland and is a possible side-effect numerous medications or cannabis usage.
- ❑ Endocrinologic work-up may be needed to assess for increased production of estrogen, prolactin or decrease production of testosterone. Also consider mammogram to rule out breast cancer.

# **Technical Recommendations for Specific Areas**

**(For reference)**



# Face/Neck

- Stay above the SMAS
- Consider Bichat's fat pad
- Consider parotid and masseter hyperplasia/hypertrophy
- Beware CN VII- marginal mandibular
- Use 2-3mm cannulas, may use syringe SAL
- Do not skeletonize the skin
- Focus on enhancing jaw line and submental region to the first neck crease

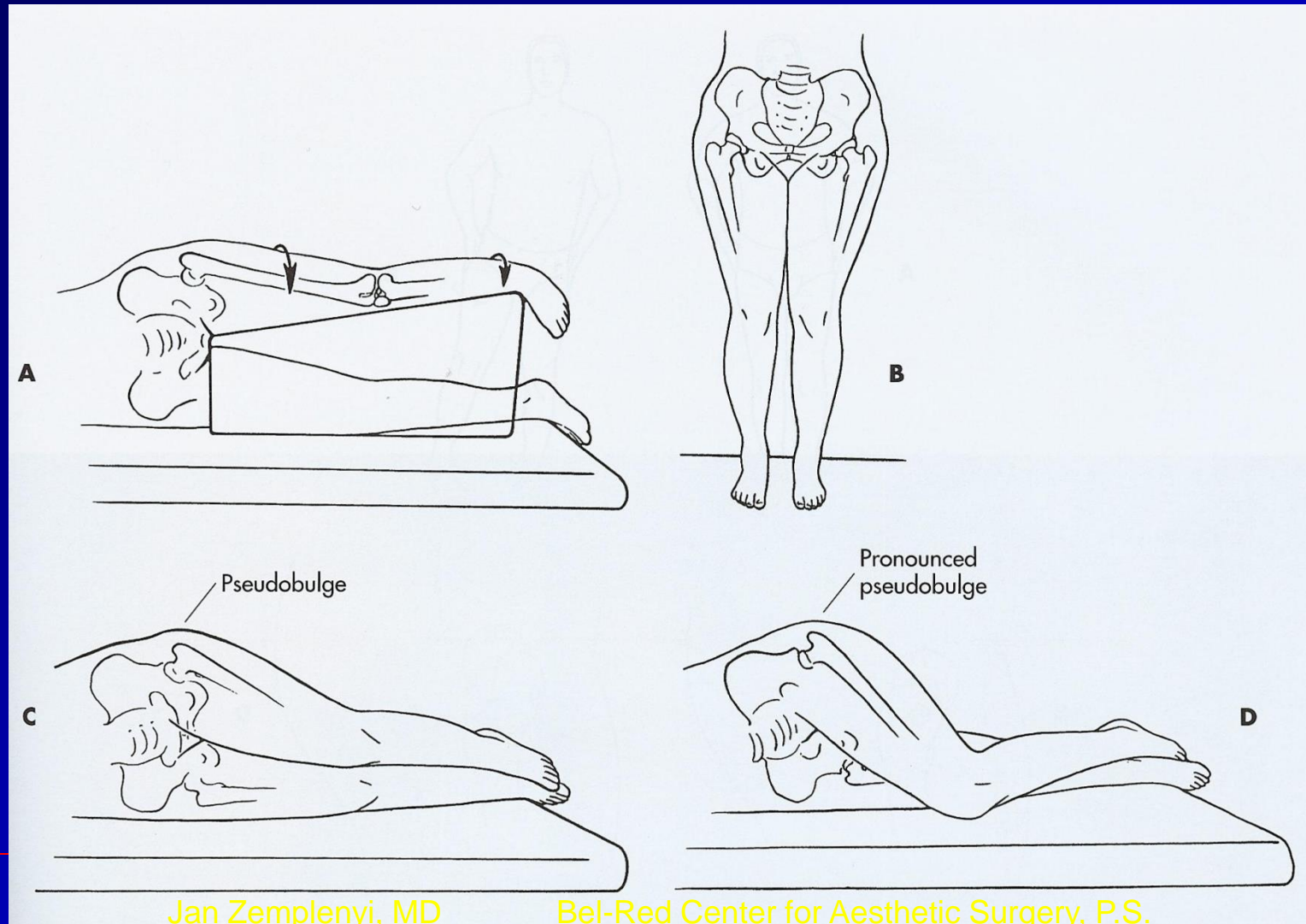
# Abdomen

- ❑ Address the umbilicus early and effectively
- ❑ Use the umbilical port for 270 degrees of cannula rotation
- ❑ Make incisions in the supra-pubic and umbilical region
- ❑ Small, reducible hernias can be finger-isolated
- ❑ Beware lap bands, and consent for their potential destruction

# Lateral thighs

- ❑ Proceed carefully, convex area
- ❑ Beware the greater trochanter
- ❑ Small volume lipo-aspirate ~100mL
- ❑ Superior inguinal & subgluteal incision
- ❑ Consider lateral positioning of the patient

# Liposuction of Lateral Thighs-precaution



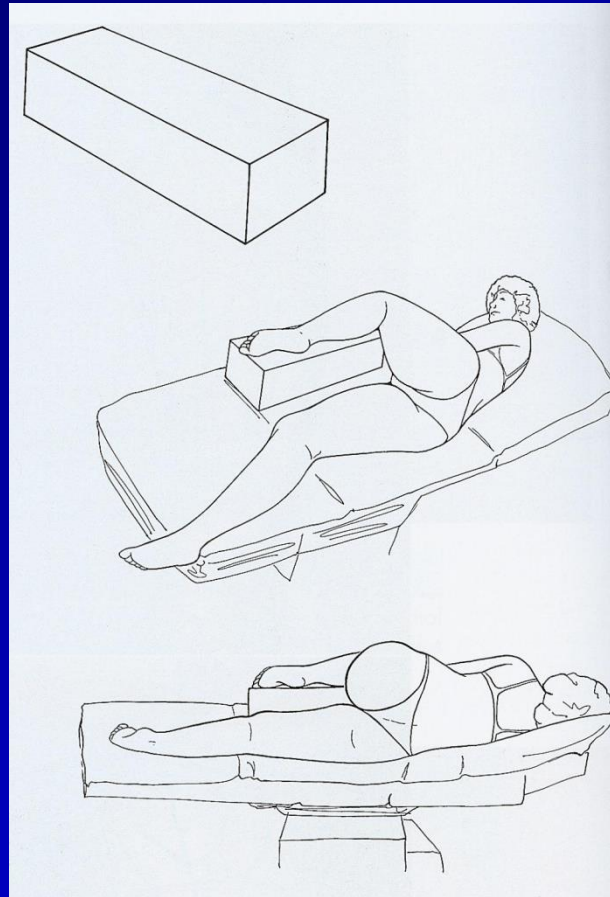
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# Medial thighs

- ❑ Inguinal adit
- ❑ Consider inferior adit, use 3mm cannula
- ❑ Small volume lipo-aspirate <250mL
- ❑ Lipo-troughs are common, soft fat
- ❑ Work high to low
- ❑ Proceed carefully
- ❑ Stay deep and conservative

# Liposuction of Knees/Inner Thighs

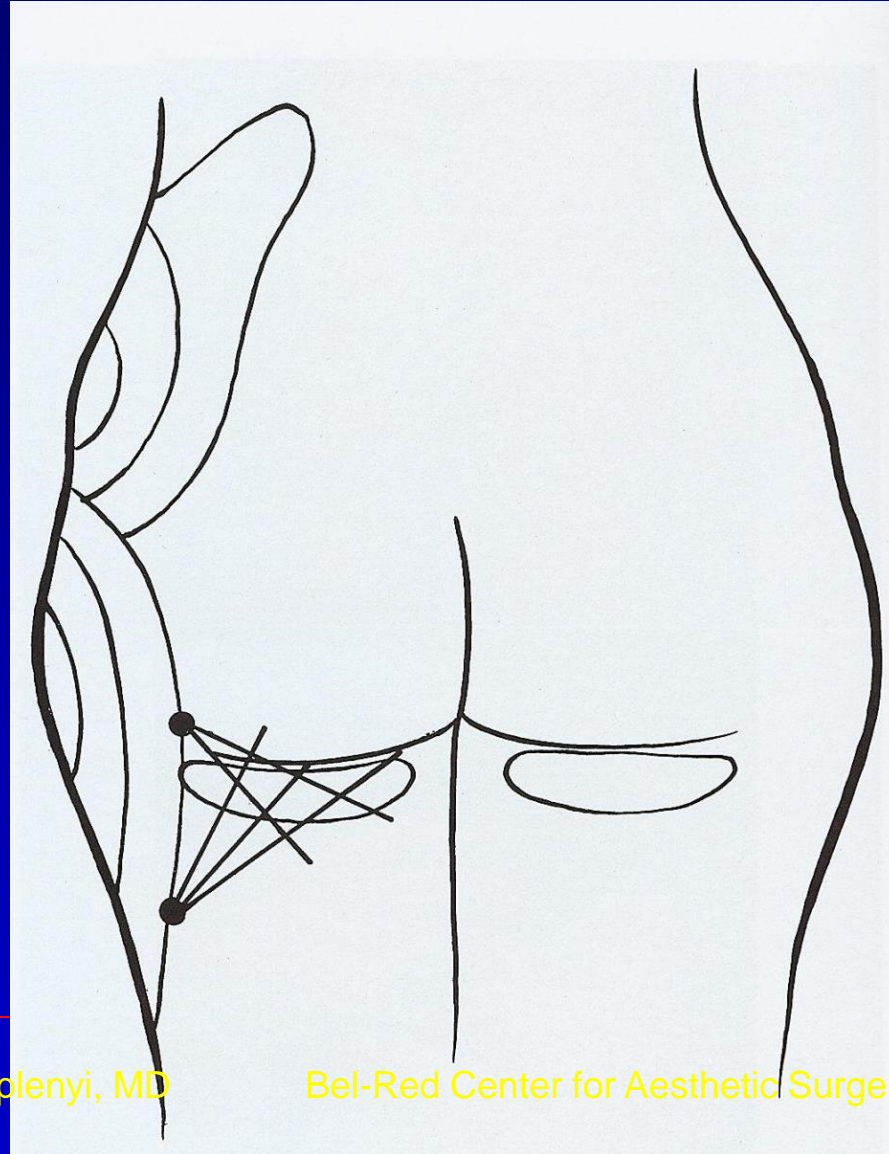




# Banana roll

- Small volume tumescent <100mL
- Avoid disruption of the subgluteal fold
- Preserve the lateral one-third for butt support
- Emphasize risk of increased cellulite appearance
- Beware of lowering position of the sugluteal fold by exposing the pre-existing true subgluteal fold

# Banana roll & Infra-gluteal fold



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# Buttocks

- In general, just say no.
  - Can consider a gentle, deep, overall reduction.
  - Suggest staged treatment over months.

# Sacrum

- Should be a smooth, diamond-shaped reduction with lateral wings over the buttocks
- Respect the true height of the buttocks (do not cut them off)

# Medial knees

- ❑ Small volume lipoaspirate < 25mL
- ❑ Inferomedial inferior incision
- ❑ Generally, rewarding and forgiving area

# Calves

- ❑ Small volume lipo-aspirate < 100mL
- ❑ Supero-medial and supero-lateral incision for gastrocnemius area reduction
- ❑ Infero-medial and infero-lateral incision for contour of below the gastrocnemius
- ❑ Proceed carefully
- ❑ May cause post-op muscle spasm



# Arms

- Typically two incisions above the elbow:
  - infero-medial - 2 cm above bottom of the bicipital groove
  - infero-lateral - 2cm along posterior aspect of upper arm
- Use prone position positioning with the supported arm “hanging off” the arm-board. Beware of injury to the ulnar nerve
- Be conservative, keeping the fat aspirate low, only about 50 to 100mL per side
- Inform about possible residual loose skin; consider for use of additional thermal energy devices for tightening; consent for possible, delayed crescent or full brachioplasty

# Liposuction of the Arms



A



B

# “Bra-Roll”

- ❑ Over-infiltrate with tumescent fluid than you would think
- ❑ Contour lateral to the line of the trapezius
- ❑ Mark the patient’s bra line to decide the incision location
- ❑ Beware of over resection of the waist

# Gynecomastia

- ❑ Infiltrate the area below the NAC & gland very thoroughly
- ❑ Lipo-disrupt fibrous tissue
- ❑ Use spiral cannula
- ❑ Consider additional thermal energy devices if available
- ❑ Don't overdo if only fat is suctioned out without any breast gland
- ❑ Consent for a possible gland excision
- ❑ The goal is to get the NAC turned down and out
- ❑ Avoid suctioning cephalo-medially to the inferior border of the Pectoralis Major

# Results

# Neck Liposuction



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# Neck Liposuction



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# Neck Liposuction



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# Arm Liposuction



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# Hips/Flanks/"Love-handles"



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# Thighs Liposuction



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# Thighs Liposuction



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# Thighs Liposuction



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# Abdomen Liposuction



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# Abdomen Liposuction



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# Case Presentations

# 38-year-old man 6ft, 225 lbs presents for consideration of body contour and “man boobs”



What do you want to know?

PMH? Meds?

Tobacco? Cannabis?

What is his BMI?

Is he a good candidate?

Does he need gland excision?

Does he have mostly pseudo-gynecomastia (obesity).

What anesthesia will you use?

# Day of Surgery

What is the maximum amount of lidocaine?

How will you mix the tumescence?

Where will you place the incisions?

What special devices will you use if available?



# ANSWERS (1)

## Maximum Lidocaine

225lbs : 2.2 kg/lbs = 102 kg

102 kg x 55mg/kg = 5,625mg

Tumescent fluid mixed at 500mg  
per Liter in this case

5,625mg : 500mg/L = 11.25 Liters

Incisions: Will start in lateral or prone position  
and access posterior “love handles”

Then rotate into supine position



# ANSWERS (2)

Then make the adits in the superior umbilicus for access to epigastrium.

And 1 or 2 suprapubic incision for access to the anterior flank and hypogastrium

For gynecomastia consider VASER, aggressive Toledo or Candy cane cannula with PAL or SMART-Lipo. Access through areolas and anterior axilla. For example I will often use the left areolar incision to access the right breast through a small pre-sternal tunnel to allow for a longer excursion of the cannula.

# POD #10

- ❑ Develops more pain and swelling in the hypogastrium?
- ❑ How will you aspirate?
- ❑ Will you send aspirate for culture?
- ❑ How many times will you aspirate?
- ❑ What will you do next if seroma persists?

# ANSWERS (3)

After two aspirations, if the volume of the serous fluid is not significantly diminishing despite on going garment compression, I will have a radiologist insert in a seroma catheter under ultrasound control. I have tried to inflate air to close down a seroma and it did work too well. I have not done TCN seromadesis (sclerotherapy), but it as been described.

# Six months post-op



**Thank you.**