, MD, FRCSC
2009

BC Surgical Oncology Breast Cancer Update

Breast Reconstruction

Disclosures

- Paid consultant to Allergan and LifeCell

Learning Objectives

- Review basics of Breast Reconstruction
- Review current concepts in Breast Reconstruction
- Review new trends and technologies in breast recon
- Controversies:
  - Reconstruction and recurrence
  - Contraindications
  - TRAM vs. DIEP
  - Skin Sparing Mastectomy
  - NAC Sparing Mastectomy

Breast Reconstruction

- Currently, approximately 2500 new cases of breast cancer per year in BC
- ? Number of mastectomies
- Reconstruction rates in literature range from 3%-40%
- In US, 5 year average rate (1999-2003) for breast reconstruction following mastectomy was 23.6%- probably lower in BC

BC Cancer Agency Guidelines

8. Potential contraindications to breast reconstruction

- **Severe lung disease**
- **Advanced diabetes**
- **Recent heart attack**
- **Heavy smokers**
- **Metastatic disease**
- **Those whose emotions, motivation or personal circumstances make it difficult for them to cope with additional surgery and healing**

Definitions

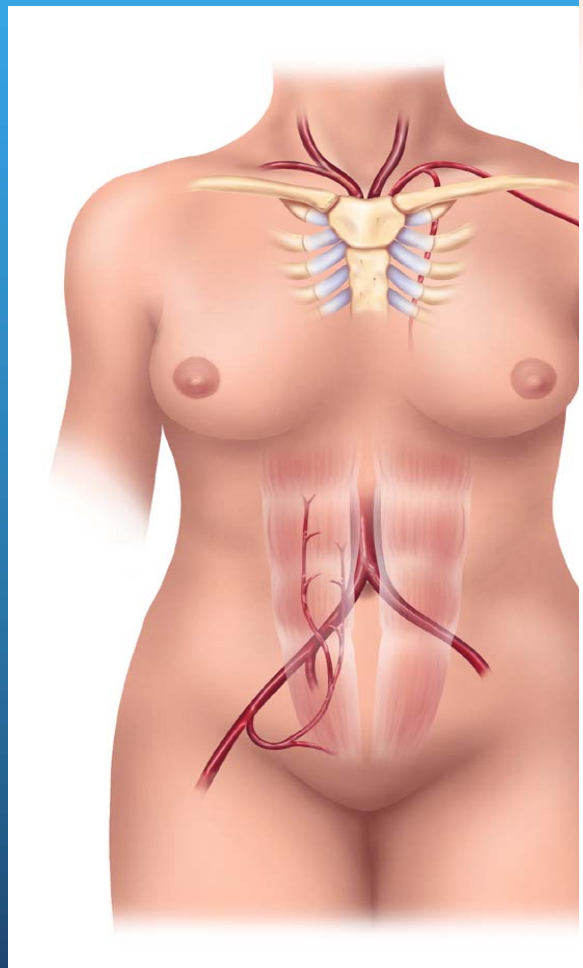
- Autologous Reconstruction- breast mound is formed from patients own tissue only:
  - TRAM- Transverse Rectus Abdominus flap
  - DIEP- Deep Inferior Epigastric Artery Flap
  - SIEA- Superficial Inferior Epigastric Artery Flap
  - LatissimusDorsi
  - SGAP, IGAP, TUG

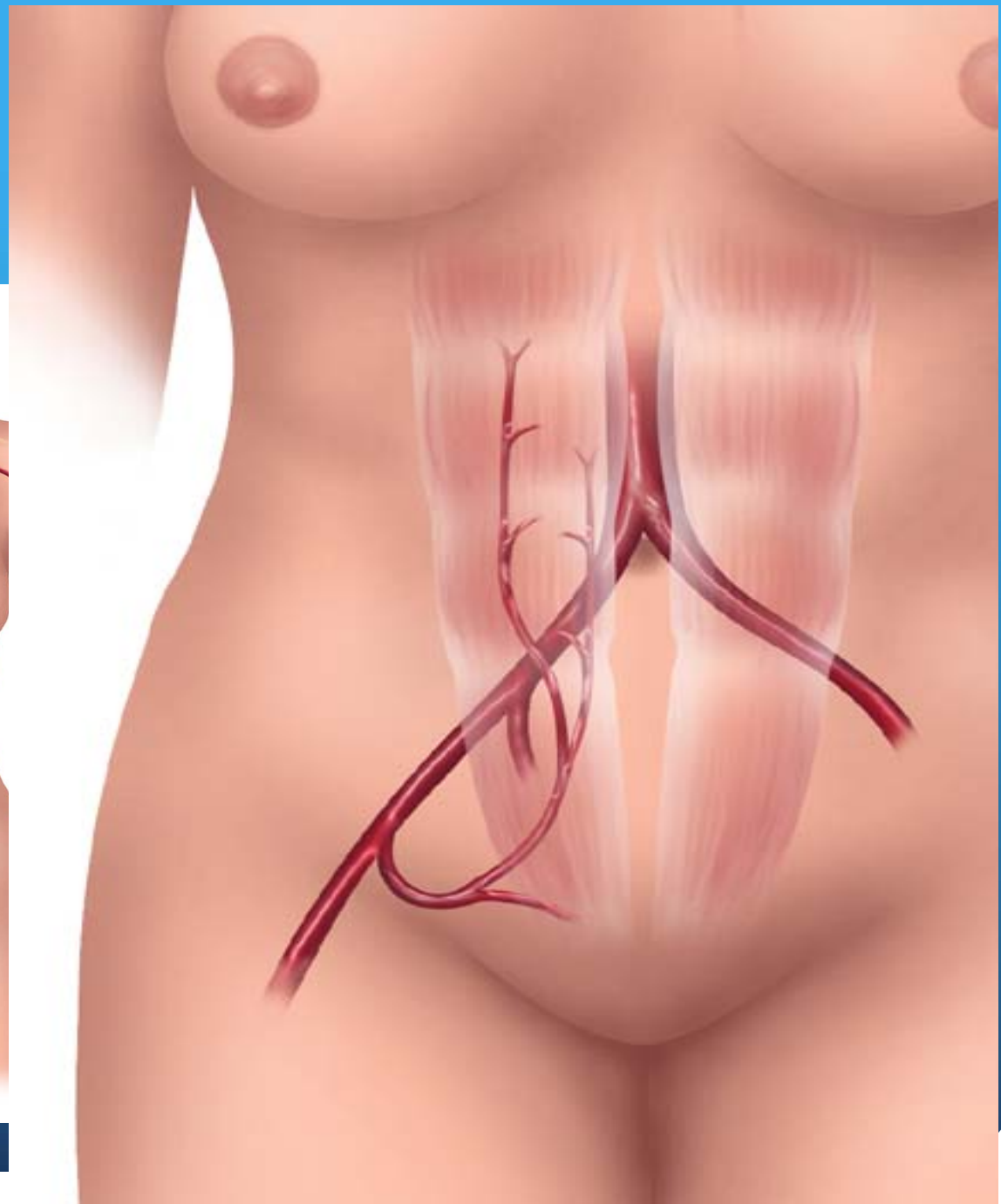
- Non Autologous Reconstruction- Breast mound formed from an implant in either one or two stages
  - Saline
  - Silicone
  - Form stable silicone

- Immediate Reconstruction- Reconstruction started at same time as mastectomy
- Delayed Reconstruction- Reconstruction started at some time after mastectomy
- Skin Sparing Mastectomy (SSM)- only nipple areolar complex removed
- Nipple Sparing Mastectomy- all of breast skin envelope left including nipple areolar complex
  - Specific guidelines exist for this exist (tumor size, location)
  - Excellent option for prophylactic mastectomies

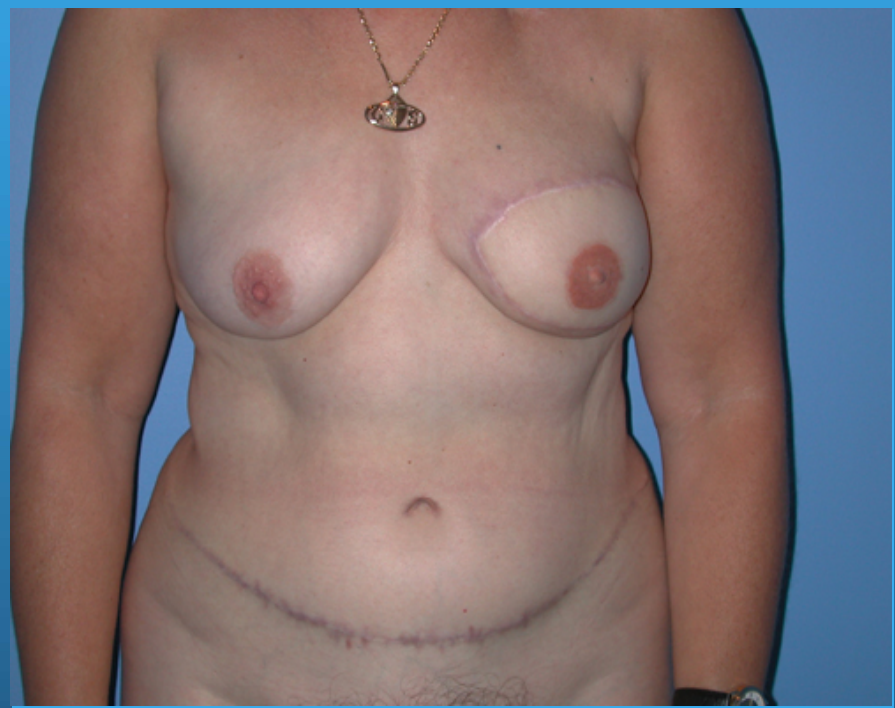
- Flap- Tissue moved on the body that has its own blood supply
- Free Flap- Flap that requires a microvascularanastamosis

Anatomy



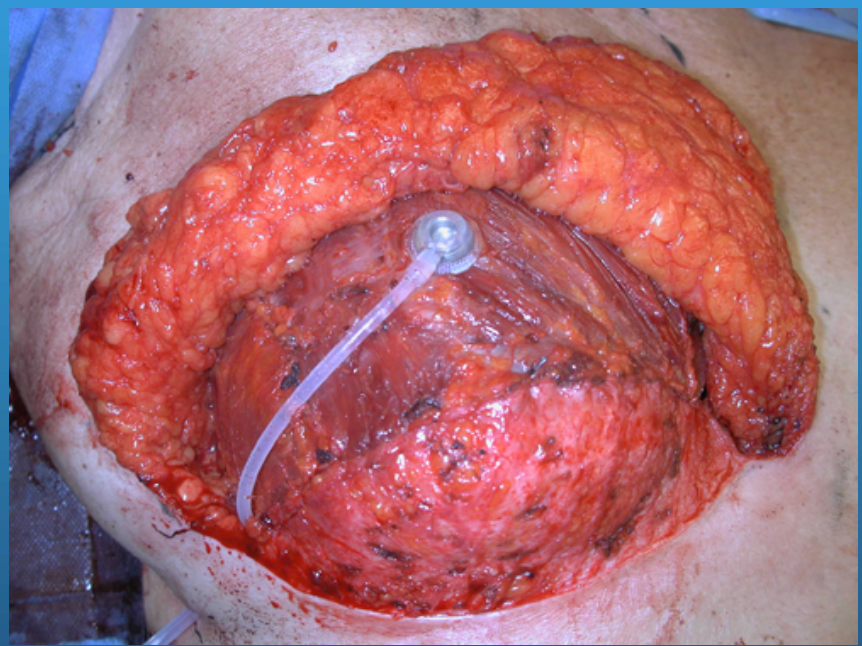


Delayed Left PedicledIpsilateral TRAM



Bilateral Immediate TRAM

Reduction Pattern Mastectomy and Immediate Non autologous recon



Immediate Style 150

- 260g gel
- 100cc NS at time of surgery (260-290cc total)
- 120cc added POD 17

- 2 year follow up
- Required capsulectomy on R (radiated) side

Timing Issues

- Immediate Reconstruction
  - Advantages – can maintain breast skin and possibly NAC
  - Less surgery for patient
  - ? Better for patients psychologically

  - Disadvantages- unpredictability of mastectomy flap survival
  - Final pathology may change treatment plan- reconstruction may impact adjuvant therapy or vice versa.
  - Patients less satisfied with result

Delayed Reconstruction

- Disadvantages
  - Increased surgery for patient
  - Loss of advantage of Skin sparing techniques
  - May have significant soft tissue deficits
- Advantages
  - Stable soft tissue envelope
  - Final pathology and all adjuvant therapies known
  - Patient has “lived with” mastectomy defect

Impact of Reconstruction on Outcomes

- Mortenson et al (Arch of Surgery September 2004): Immediate reconstruction resulted in increased wound complications, but no delay in delivery of adjuvant chemotherapy
- Gouy et al (Annals of Surgical Oncology, February 2005):48 immediate reconstruction, 181 no reconstruction, 32 delayed reconstruction. No delay in chemotherapy, no delay in radiotherapy, no differences in survival.

- Bezuhly et al (Cancer October 2009): review of the NCI SEER registry. Showed improved breast cancer specific survival amongst all reconstructive patients compared to mastectomy alone. Greatest survival benefit in implant reconstruction patients under 50, followed by autologous reconstruction under 50.
- Conclusion: Immediate breast reconstruction is associated with a decreased breast cancer specific mortality, particularly among younger women.

Surveillance

- In the past, concerns have been raised regarding the possibility of a reconstruction “hiding” recurrence and delaying treatment to affect outcome
- This has resulted in patients occasionally being told they should wait 5 years before having reconstruction

- Mccarthy et al have demonstrated that for non autologous reconstruction, there is no difference in recurrence rates compared to non reconstructed matched patients
- Howard et al have demonstrated the same finding for autologous TRAM patients
- In both groups, recurrence was always detected as skin changes
- There was no difference in outcome in either group compared to non reconstructed patients with recurrence
- The possibility of recurrence on chest wall exists, but is not common. Langstein et al demonstrated that this group did not have a difference in outcome, nor any delay in detection

- No evidence that breast reconstruction has negative impact on recurrence rates, survival or surveillance.

Current Techniques for Breast Reconstruction

- Flaps
  - TRAM- pedicled or free
  - Perforator flaps
  - Pedicled Lat dorsi and implant
- Impant Based
  - Two stage Tissue expander to Implant
  - Single stage device
  - Dermal Matrix single stage

TRAM Flap

- Gold standard for many years
- Uses abdominal tissue based on perforators from Superior epigastric artery in RA muscle
- Requires sacrifice of central 2/3 (muscle sparing) or all of ipsilateral RA muscle
- Flap tunneled into mastectomy defect through IMF

TRAM

- 3 -4 hours for unilateral
- 5 hours for bilateral
- 3-4 day hospitalization
- 6-12 week recovery
- Very low (<1/500) flap loss rate

DIEP

- Deep Inferior Epigastric Artery Perforator Flap
- Designed on a single perforator (ideally) based on the DIEA and vein
- Perforator and DIE system harvested with no muscle, with goal of maintaining functional abdominal wall
- Requires microsurgical anastamosis into IMA or Thoracodorsal vessels

DIEP

- 5-7 hours unilateral
- 10-14 hours bilateral
- 5-7 day hospitalization
- Shorter recovery
- Higher (1-4%) total flap loss rate

TRAM vs. DIEP

- Why choose one over the other?
  - Argument for a DIEP is that it has much lower donor site morbidity (bulge, hernia, weakness).
  - However, takes much longer, higher flap necrosis rate, comparable fat necrosis rates.
  - Most literature compares free TRAM to DIEP. None for pedicled TRAM to DIEP.
  - Man et al (PRS Sept. 2009) did a meta analysis and critical review of Free TRAM to DIEP. 37 studies identified: Found DIEP flap reduced abdominal wall morbidity by half, but had a two fold risk of fat necrosis and flap loss compared to TRAM.

TRAM vs. DIEP

- Ascherman et al (PRS Jan 2008) reviewed 117 patients with pedicled TRAMS:
  - .85% hernia rate
  - 1.7% abdominal bulge rate
  - 2.6% abdominal tightness that resolved
  - No mesh infections or removal

TRAM vs. DIEP

- Often surgeon dependent
- My personal choice:
- Young patients with high abdominal wall demands- DIEP
- Bilateral Reconstructions- usually DIEP
- Older unilateral patients with low demands- pedicled TRAM

Implant Reconstruction

- 2 stage
  - TE placed at time of mastectomy, usually submuscular to pectoralis major and serratus fascia laterally, occasionally deep to Rectus fascia as well
  - Expansion done in office starting 2-3 weeks after surgery
  - Second stage 2-3 months after final expansion

Implant Reconstruction

- Single Stage
  - Device which is a combined tissue expander/ implant used. Fill tube and port removed after final expansion volume achieved
  - Dermal Matrix used to cover implant in lower pole

Implant Reconstruction

- First stage (mastectomy and TE placement) – 2.5 hours, overnight stay
- Second stage- 1 hour daycare procedure

Implants

- Saline- silicone elastomer shell filled with saline intra operatively
- Disadvantages
  - Palpability
  - Visibility, rippling
- Advantages
  - Not silicone
  - Ruptures readily detected

Silicone

- Use discontinued in 1994 in NA as a result of FDA moratorium
- Concerns regarding:
- Failure rates and local tissue complications such as silicone granulomas, capsular contracture, implant extrusion
- Auto immune diseases and systemic illness related to silicone

Currently Available Silicone Implants

- Re introduced in Canada in 2006 after multiple large cohort studies found no link between silicone and systemic illness
- Current implants have a much thicker outer shell which virtually eliminates gel bleed. Failure rate reduced to approximately 1% per year
- Gel is crosslinked and cohesive, so even with shell failure, gel does not escape

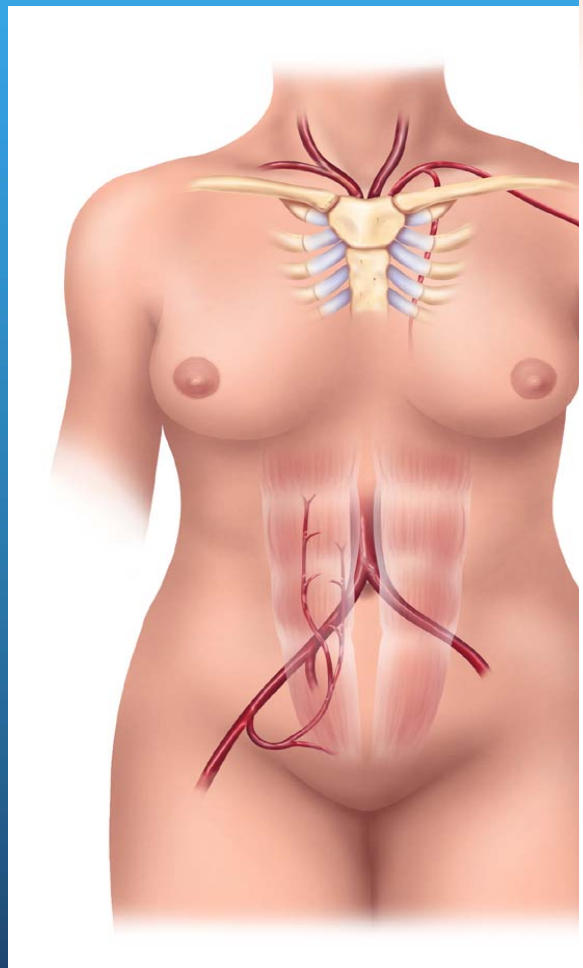
- Advantages of silicone implants
  - Better feel, less rippling, less palpability

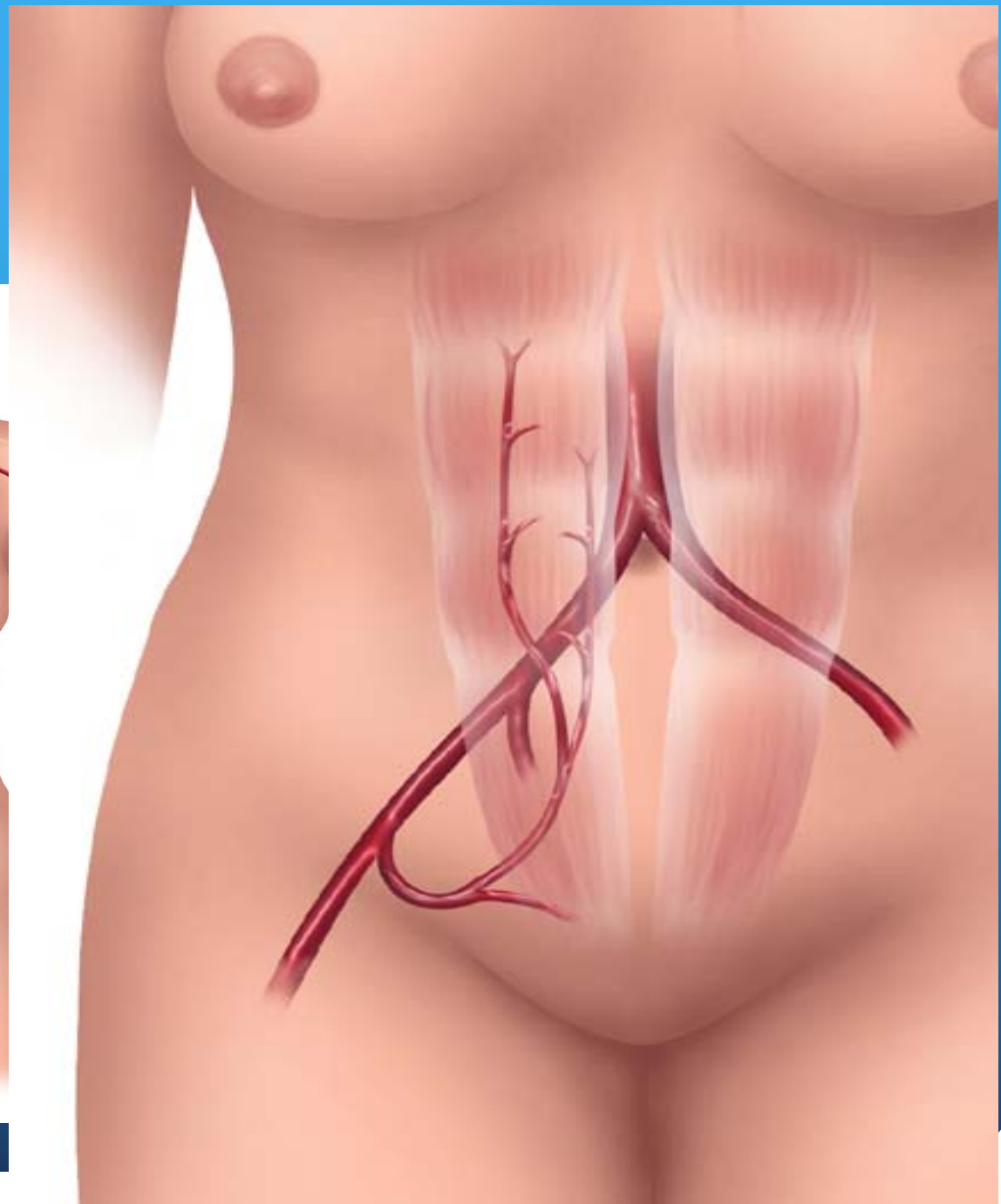
  - Disadvantages
  - Detection of shell failure
  - Patient concerns regarding silicone

- Other changes to implants include textured surfaces, which may reduce capsular contracture rates, as well as shaped implants, which allow more options in terms of breast shape.

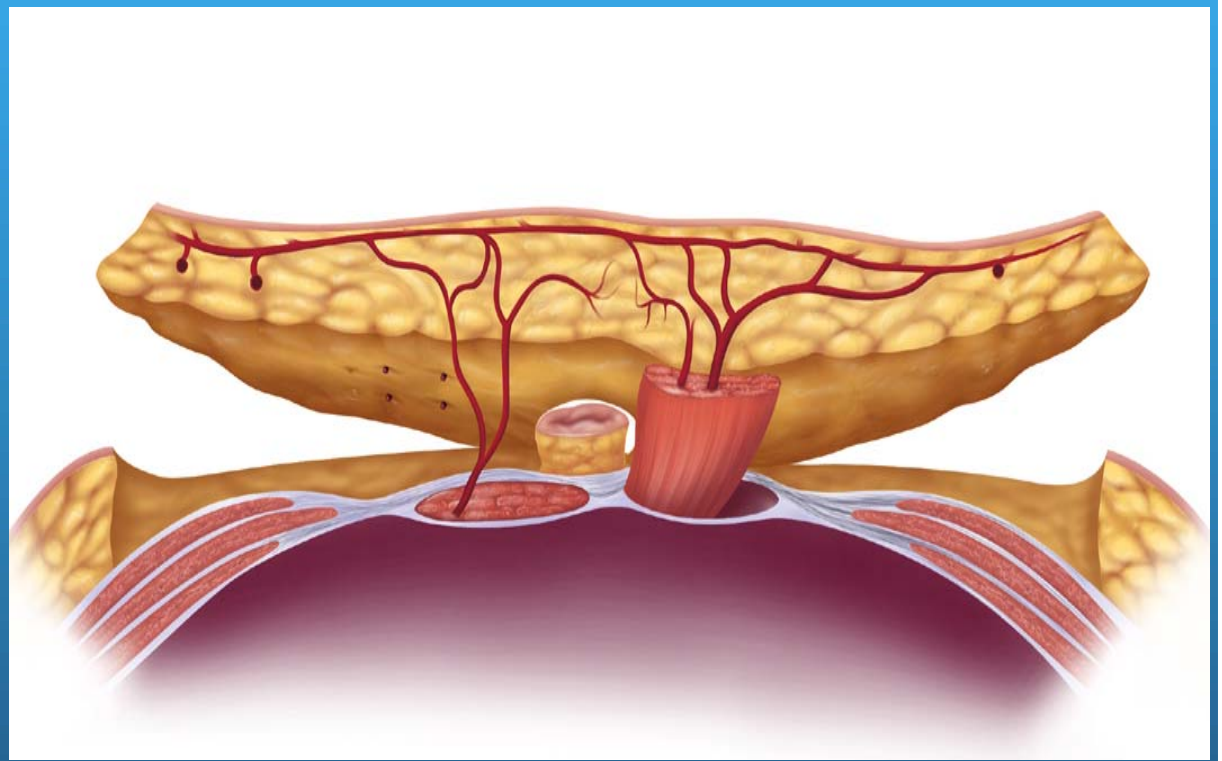
New Techniques

DIEP FLAP

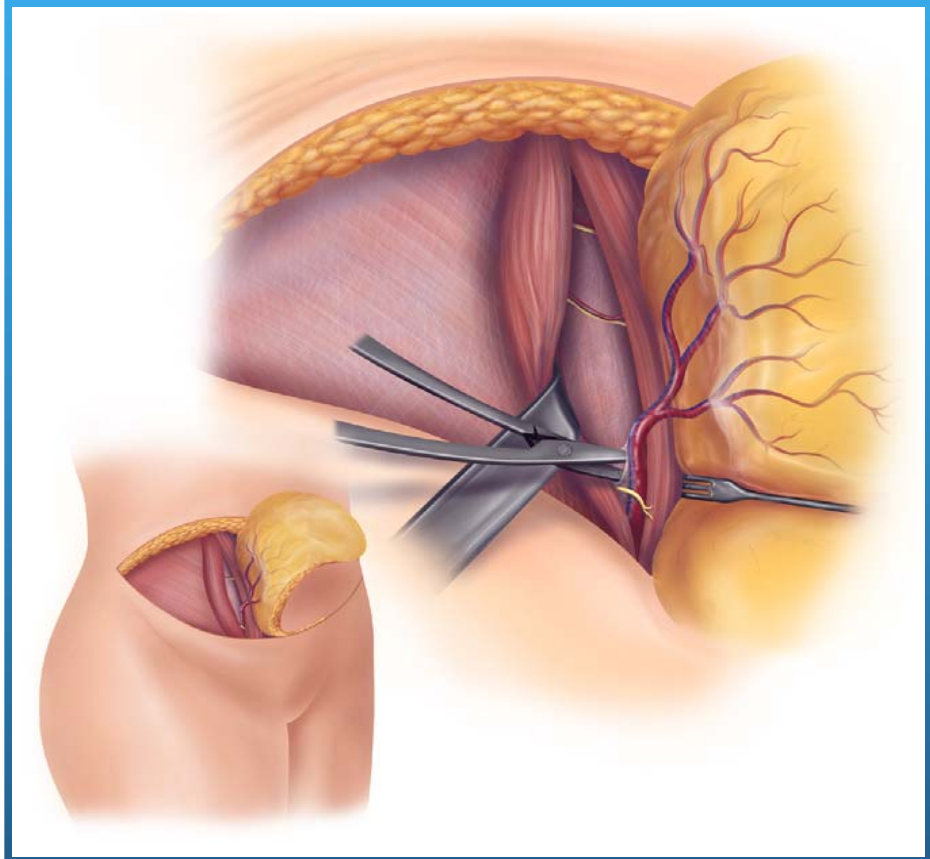


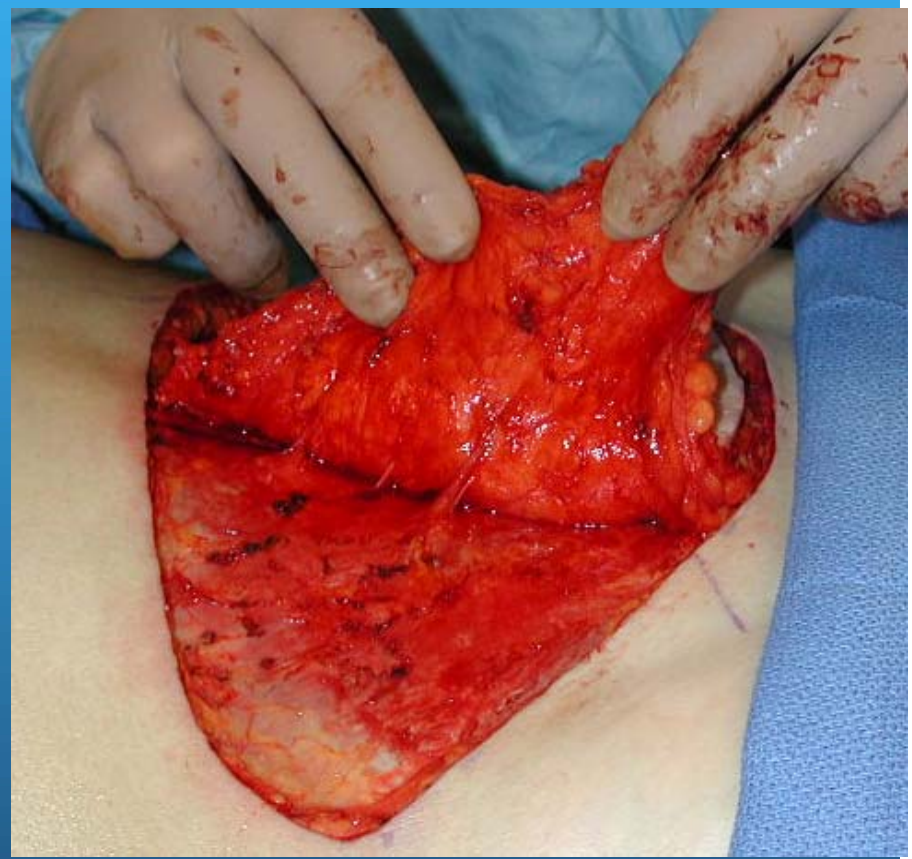


- Transverse dissection through abdomen.
- TRAM on right and DIEP on left.

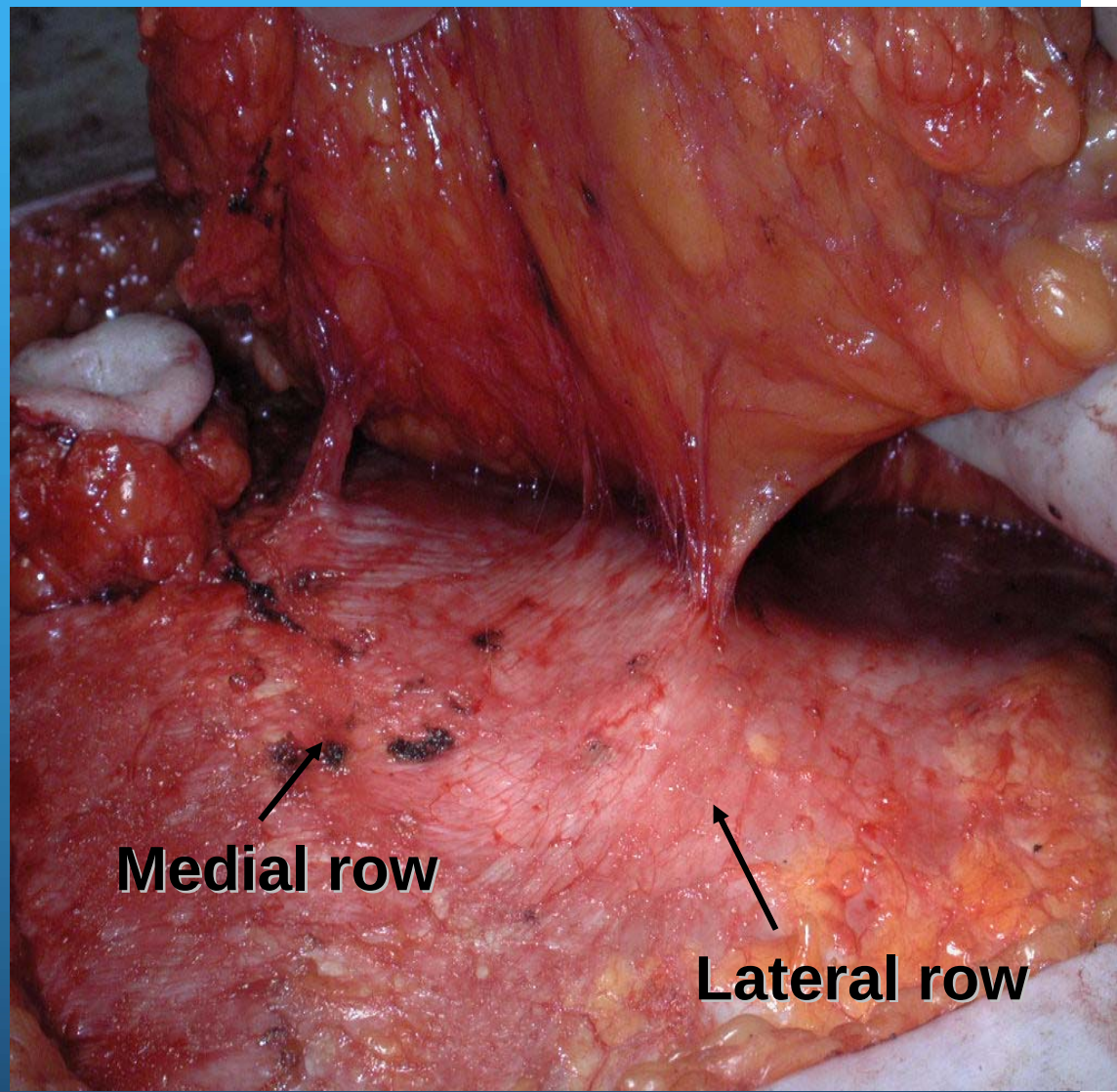


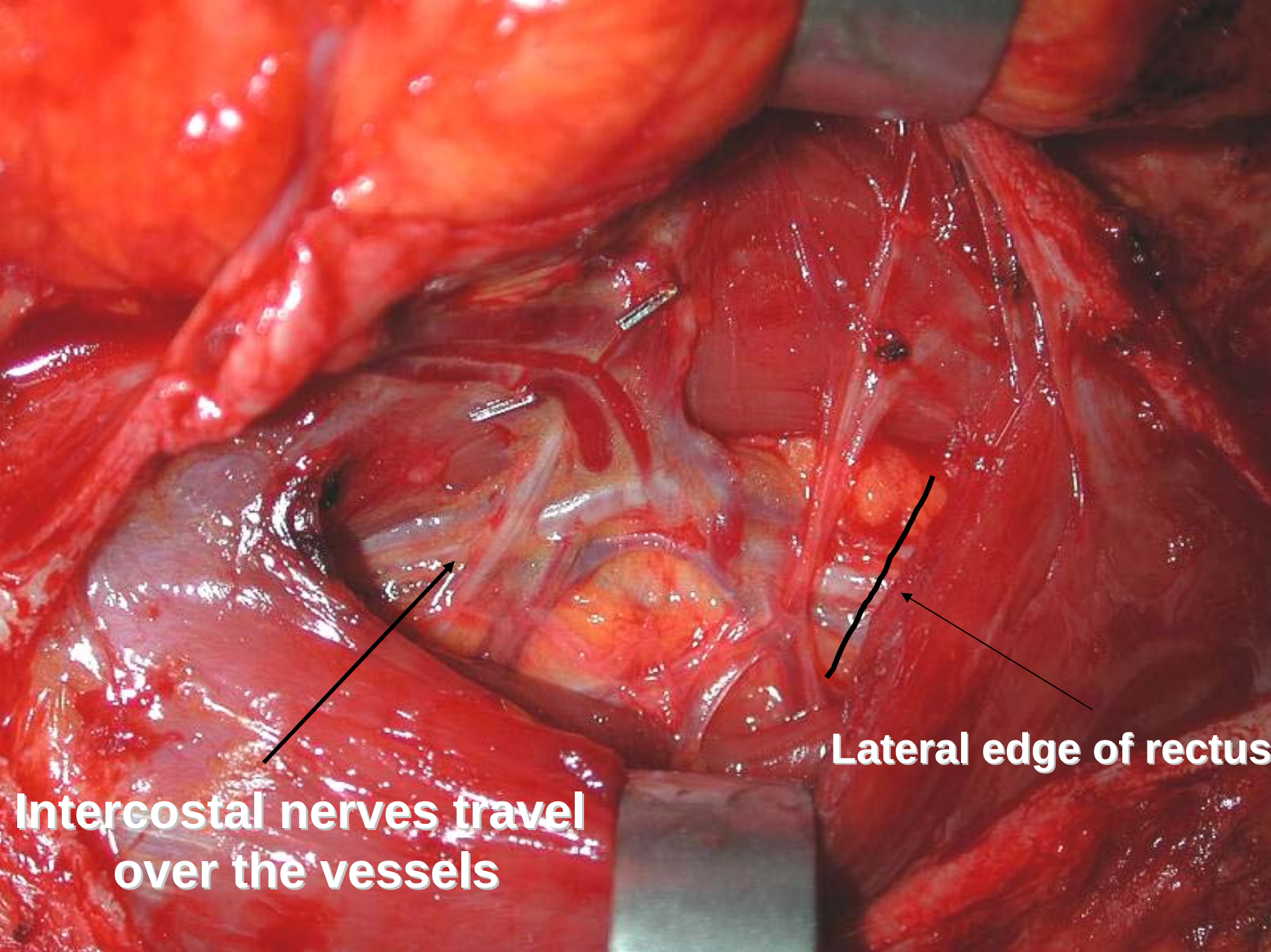
- Flap being elevated



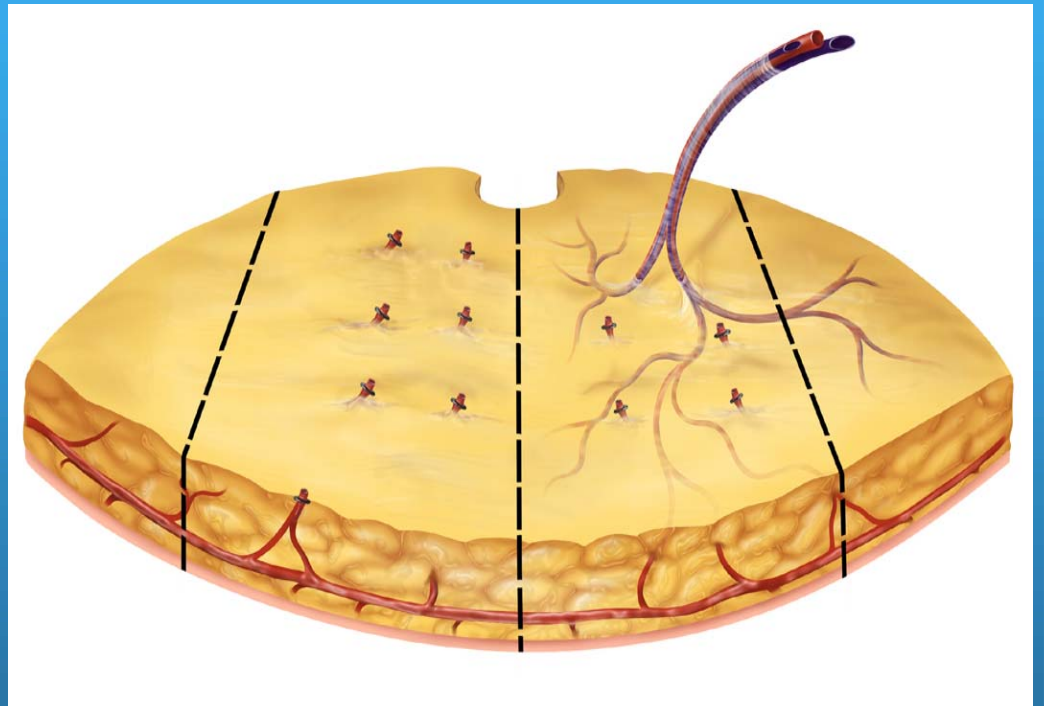


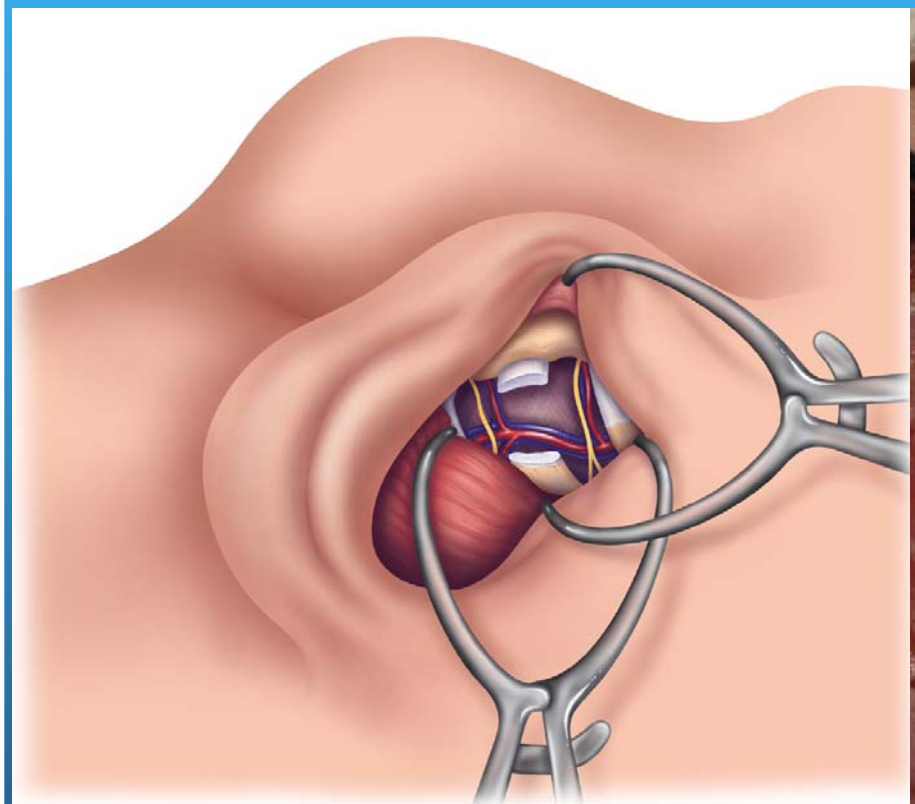
- Perforators are dissected out.
- No muscle is sacrificed and innervation is preserved.

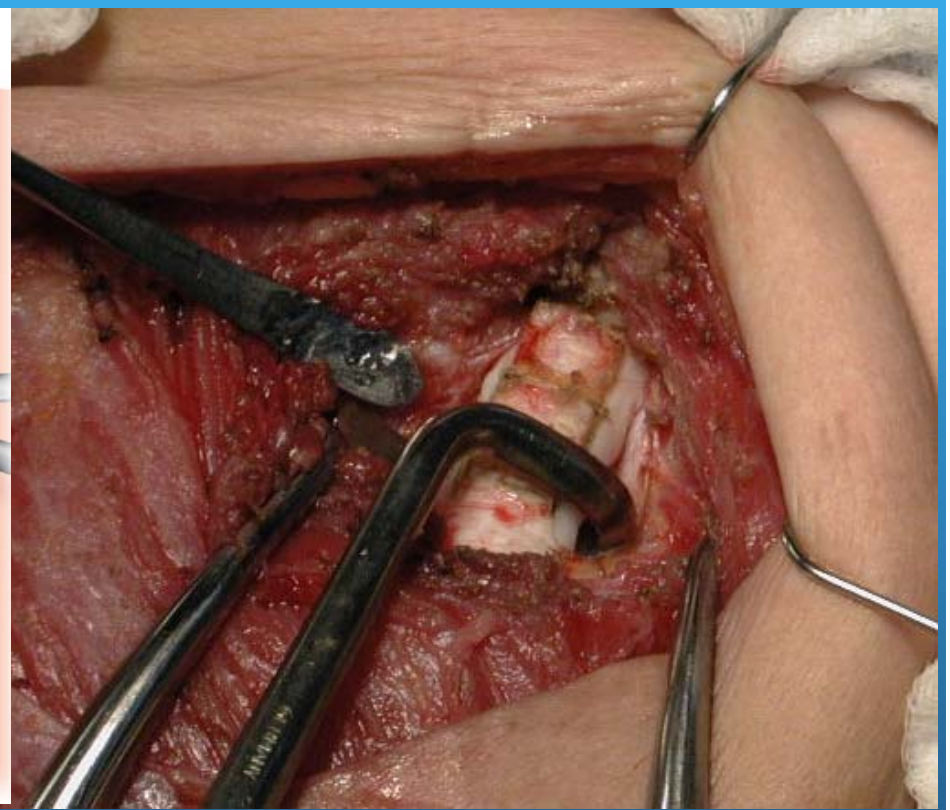



Intercostal nerves travel over the vessels
Lateral edge of rectus

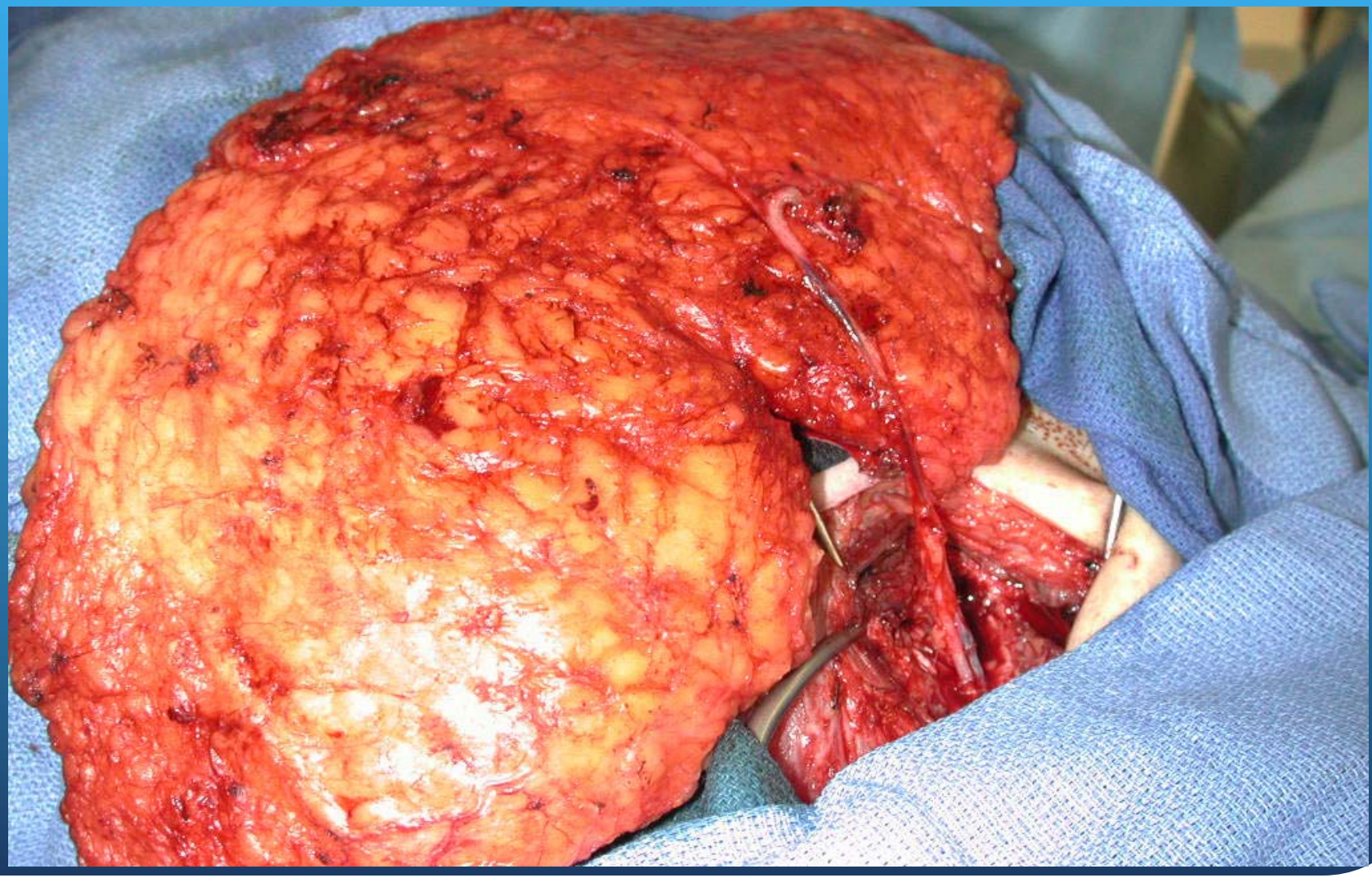
- Flap usually elevated on 1 -2 perforators.
- Remainder of the perforators are cut and clipped at the level of the fascia.







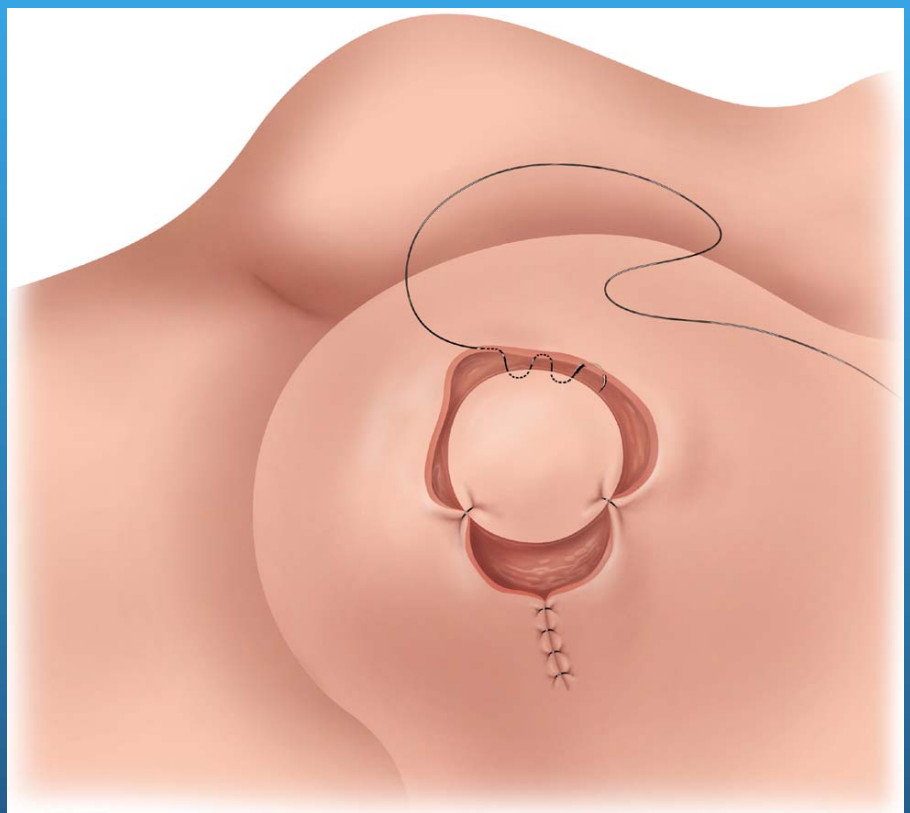
*DIEP*anastomosed to *IMA*

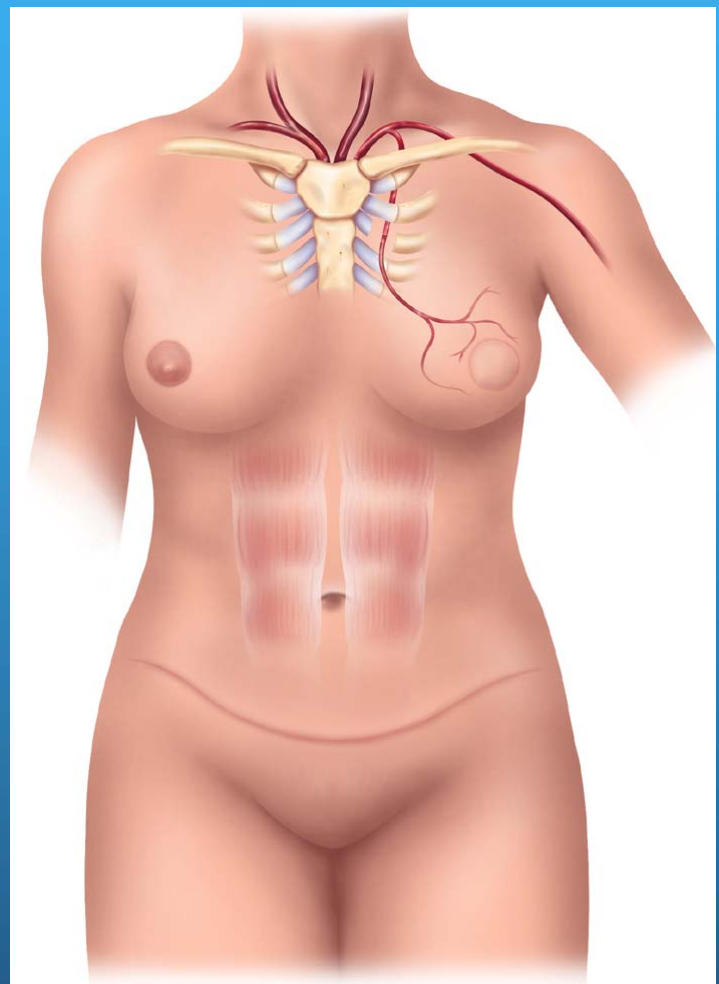


*DIEP*anastomosed to *IMA*

- Vein dissected until single vein seen.
- Leaves a long pedicle that may twist . Surgicell to reduce the twist.

- Final insetting with closure of SSM and abdomen

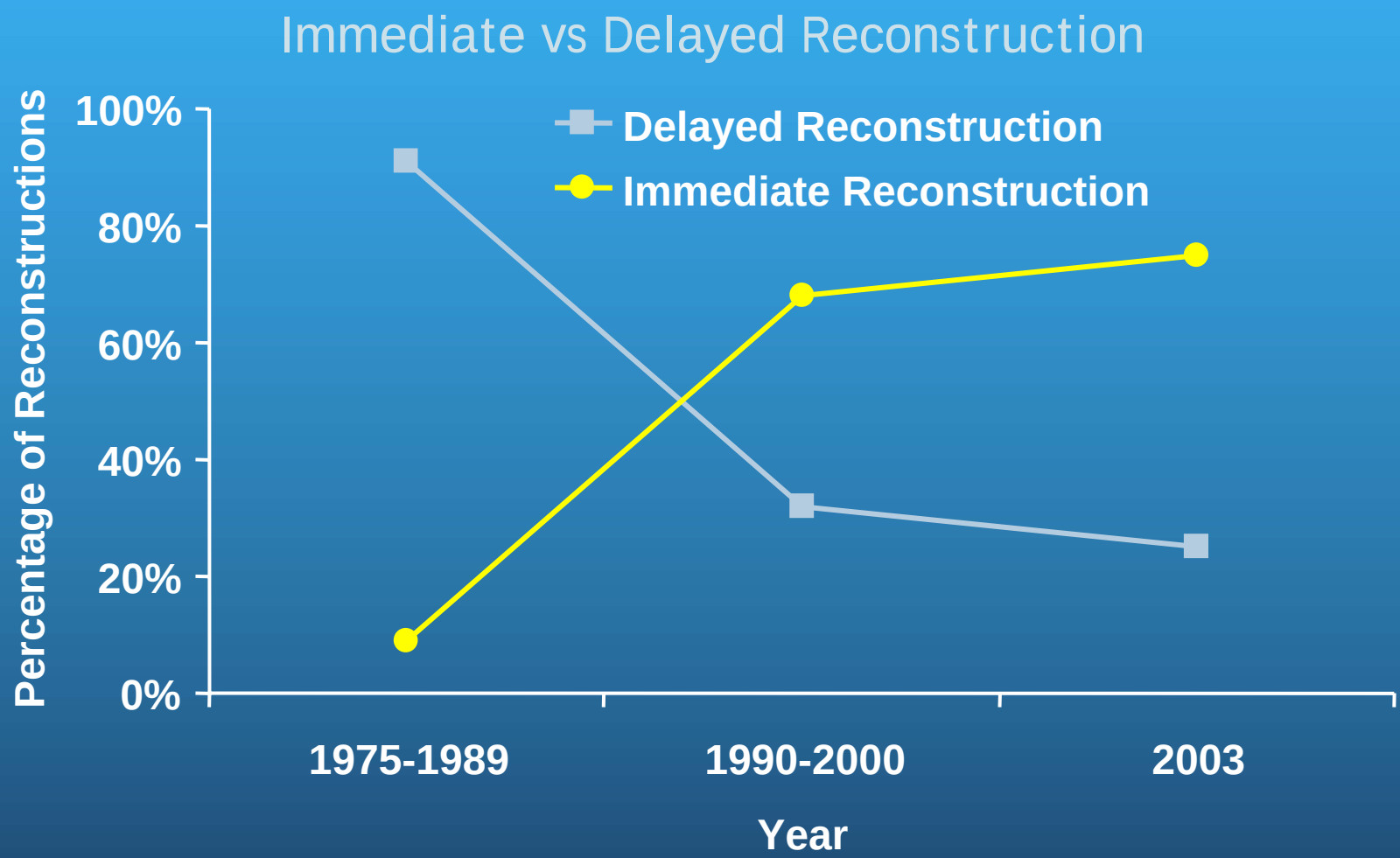




Dermal Matrices

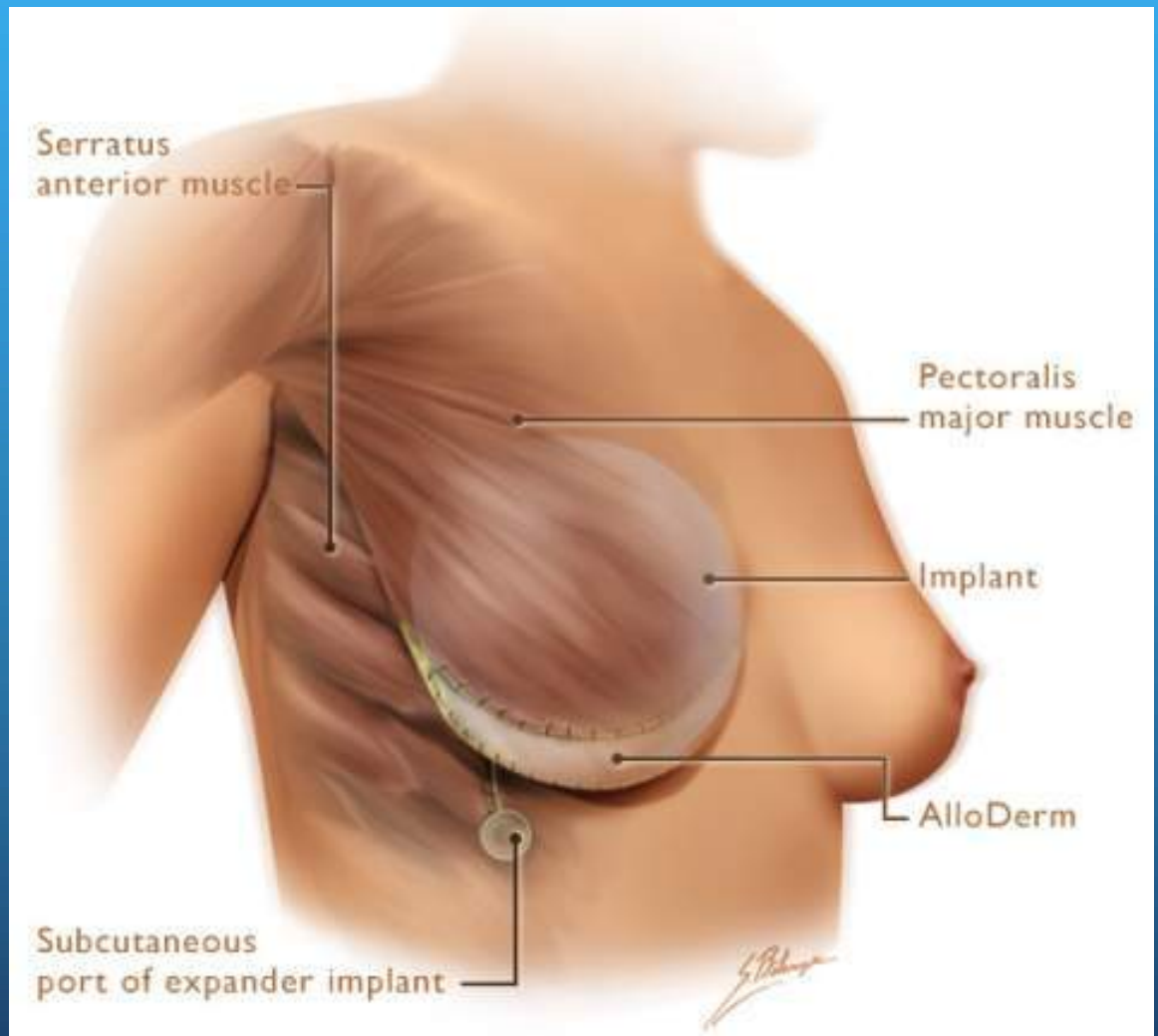
- Acellular dermal matrices (usually from cadaver or porcine dermis) can be used to replace the lower muscular sling in TE/Implant reconstruction.
- May result in less pain, decreased capsular contracture, lower revision rates, and better implant coverage and aesthetic result
- Expensive!! However, avoid second operating, avoid use of tissue expander ($1400.00 disposable device) and lower revision rates.

Reconstruction



Newman LA, Kuerer HM, Hunt KK, et al. *Ann Surg Oncol*. 1998;5:620-626.
American Society of Plastic Surgeons, 2004. Available at http://www.plasticsurgery.org/.

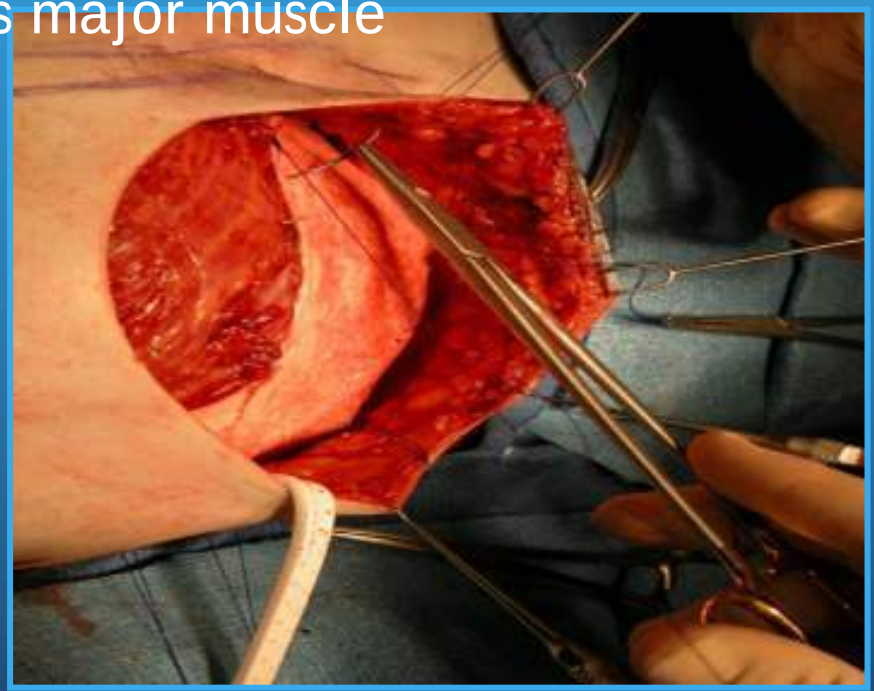
Support


Serratus
anterior muscle
Pectoralis
major muscle
Implant
AlloDerm
Subcutaneous
port of expander implant

Support

Intraoperative Steps

- While removing staples sequentially, suture AlloDerm® to pectoralis major muscle



Courtesy of Scott L. Spear MD, Georgetown University School of Medicine, Washington, DC.

Support

- **Intraoperative Step**
- Drain pla

Courtesy of Ron Israeli, MD, FACS, Great Neck, NY.

Right NAC sparing, left SSM

- Because of the possibility of single stage reconstruction, and the potential decreased revision rates, there may be a good economic model for using dermal matrix products, in addition to better patient outcomes.

Fat Grafting

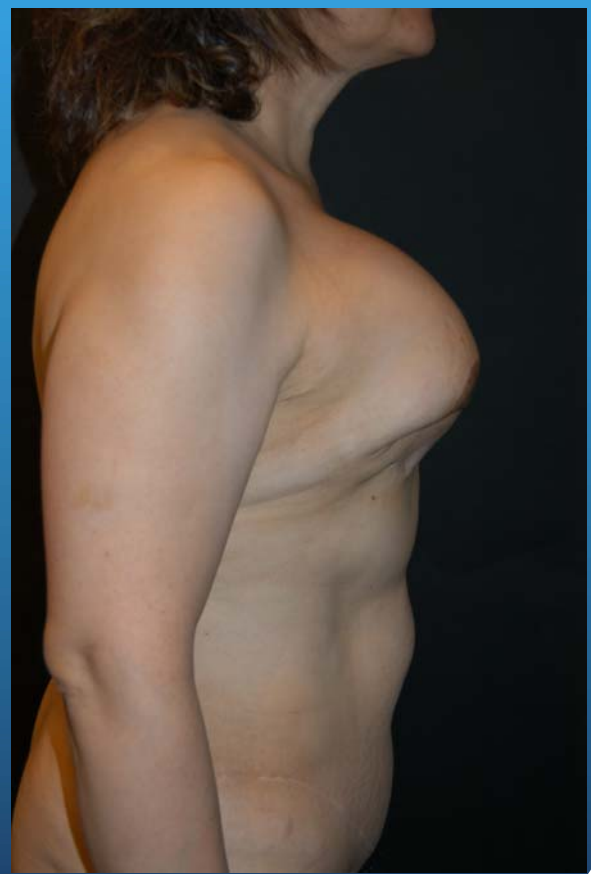
- Autologous fat grafting has been used in the past for improvement of contour abnormalities
- Recently, has been reported with good results for:
  - Lumpectomy defects
  - Improvement of radiated tissue
  - Total reconstruction

Fat Grafting

- In addition to adding autologous volume, fat in lipoaspirate has been shown to contain mesenchymal stem cells
- Thought that these can have a positive influence on surrounding tissues
- Has demonstrated promising effects on radiated tissue, both prior to reconstruction to improve tissue and after reconstruction
- Concern has been raised about surveillance in fat grafted breasts

- There have been several studies that have looked at imaging of breasts after fat grafting.
- All have demonstrated that radiologists can distinguish fat grafts (including calcification) from other areas of concern
- Core biopsy recommended if any uncertainty exists

Pre-OP Photos



Post-OP Photos- 1 week

Post op Photos- 6 months

Controversies

- Radiation
- NAC Sparing Mastectomy

Radiation

- Effects of radiation on tissue-
  - fibrosis and scarring which changes quality of skin, muscle
  - Colour changes
  - Telangiectasia
  - Decreased vascualrity

Radiation

- Effects of Radiation on breast reconstruction
  - Possible fat necrosis in flaps
  - Contracture of skin envelope
  - Increased capsular contracture around implants
  - Thinning of coverage over implants

Radiation

- As a result of the side effects of radiation, some have proposed only offering delayed reconstruction to patients who need radiation
- Many authors have suggested only autologous reconstruction for these patients

Radiation

- There is increasing evidence that well perfused flaps will tolerate post op radiation well, and therefore patients can have immediate reconstruction
- In our centre, we still offer immediate non autologous reconstruction to appropriate patients who will need adjuvant therapy, knowing that they may need to convert to some type of autologous coverage.
- Several studies have shown that a radiation dose is not affected by either the tissue expander itself or the metal plate within it.

Radiation- Tissue expander implant

Radiated extended Latissimusdorsi

Radiated Delayed TE Reconstruction

Post Radiation and Tattoo

Radiation- Summary

- Is not a contraindication to reconstruction
- Can impact result of reconstruction in setting of immediate reconstruction (not an issue in autologous delayed reconstruction)
- Requires ongoing communication between radoncand surgeon

Nipple Sparing Mastectomy

- Preservation of NAC allows maintenance of all skin envelope (no flattening of breast) and improved aesthetics.
- Concern about leaving breast tissue or tumour behind, especially with centrally located tumours.
- No Consensus, but recommendations in literature include:
  - Tumour<3cm diameter and not multicentric
  - Tumour>2cm from NAC
  - Clinically negative lymph nodes
  - Frozen section and/or permanent section of sub nipple core of tissue

NAC Sparing Mastectomy

Paepke et al (Ann Surg August, 2009) reported on 109 NAC sparing mastectomies in 96 patients, including 33 breasts with malignancy within areolarmarging. All done with frozen section control, resulting in 12% conversion to SSM. Mean follow up of 34 months with no recurrence within NAC.

2 distant mets, 1 chest wall recurrence and 1 axillary recurrence

Gerber et al (Ann Surg. March, 2009) reported on 246 patients with 101 month follow up:

- 48 SSM, 60 NSM, 130 MRM and autologous reconstruction.
- There were no significant differences between groups in local recurrence rates or distant metastasis rates.

Training in Skin and NAC Sparing Mastectomy

- Significantly increased incidence of MFN with SSM
- Learning curve
- Small incisions
- Most Canadian trained plastic surgery graduates are well trained in breast reconstruction.
- How much exposure to advanced mastectomy techniques is there in General surgery progams?
- Are there enough GS trained to meet demand?
- ?? What constitutes adequate training, adequate volumes per year with these techniques?

Barriers to Reconstruction

- Resources- Plastic Surgeon, OR time,
- Information/ Knowledge- patient or physician
- Communication
- Timing- referral too late- delay from end of chemo to surgery would potentially have negative effect on outcome

Contraindications to Reconstruction

- Obese: (BMI >30) CONCLUSION: Obese patients, in contrast to normal weight and overweight patients, have a statistically significantly higher risk for developing overall (one or more) and multiple flap complications, overall donor-site complications, TRAM flap delayed wound healing, and minor flap necrosis. (Spear et al, PRS, March 2007 in pedicled TRAM flaps)

- Smoking:CONCLUSIONS: Logistic regression identified active smoking as a statistically significant risk factor for developing multiple flap complications and TRAM infection, while former smoking was a risk factor for multiple flap complications and TRAM delayed wound healing. Thus, active and former smoking should similarly be considered contraindications for pedicled TRAM flap breast reconstruction, unless the patient has stopped smoking for more than 4 weeks before surgery. (Spear et al, PRS, December, 2005)

Locally Advanced

- Is it reasonable?

  - Clarity of definition

Results

- 30 patients met all the criteria
  - Stage:
    - **IIIA: 15(50%)**
    - IIIB: 13 (26%)
    - IIIC: 2 (6.7%)
  - Median age 47 years (33-64)
  - Median follow-up time 3.51 years (1-9.4)

- Reconstructive technique
  - 22 (73%) unilateral TRAM flaps
  - 2 (6.7%) bilateral TRAM flaps
  - 5 (16.7%) unilateral latissimus dorsi (LD) flaps
  - 1 (3.3%) LD + TRAM flap

Local recurrence and distant relapse

Study	No. Patients	Median Follow-up (months)	Local recurrence (%)	Distant relapse (%)
Ho	30	42.1	10	23.3
Newman[3]	50	58.4	10	32
Slavin[15]	161	64	11	--
Foster[4]	252	48 (mean)	3	11
Styblo[16]	21	26	5	29
Godfrey[17]	21	25.2	14	19

Contraindications to Reconstruction in UBC Program

- BMI >35
- Active Smokers
- NOT Locally advanced: Protocol is changed:
  - If flap reconstruction, have all therapy as neoadjuvant (avoids radiating flap)
  - If non autolgous, neoadjuvant chemo, surgery, then radiate Tissue expander
  - ? Resource utilization for Locally advanced patients

Immediate Becker 50 150 g

Immediate Style 150

- 59 yo L cystosarcoma phylloides
- Mastectomy with LD for coverage
- Delayed Style 150 reconstruction

- 11 months - delayed reconstruction with SH 14.5 cm device
- 150cc placed in OR
- 1 fill and second stage done 2 months later

Delayed, Radiated Ped TRAM

Thank You