Essential Anatomy for oncoplastic surgery

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Introduction

• Rationale for anatomical basis for OPS

• Anatomical considerations:
  1. Surface anatomy
  2. Surgical anatomy
  3. Applied Anatomy
ONCOPLASTIC BREAST ANATOMY

• BCS
• OPS: Level I-II oncoplastic surgery (GR/TM)
• Contralateral breast symmetrization
• Skin (±NAC) sparing mastectomy
• Immediate reconstruction
  – Implant based
  – Autologous tissue based
Introduction

Reconstructive Point of View

Anatomical features critical for optimal results:

- Quality and tension of skin flaps
- Preservation of the inframammary fold frame
- Viability of nipple–areola complex (NAC)
- Integrity of the pectoralis muscle
- Quality of abdominal and latissimus flaps
• If we look at breast surgery complications like NAC necrosis, skin sloughing, wound complications and fat necrosis, we will realize that it largely corresponds to anatomical reasons.
• That’s why a thorough anatomical understanding is a must.
Surface anatomy
a) **Langer’s lines:** predominant orientation of collagen fibers in the skin. Skin crease lines around the breast are essentially circular.

b) **Kraissl lines:** lines of maximum skin resting tension run in a more transverse orientation across the breast.
ONCOPLASTIC BREAST ANATOMY

“Modified Sweat Glands”
NAC

• The epidermis of the nipple and areola is highly pigmented and somewhat wrinkled.
• The skin of the nipple contains numerous sebaceous and apocrine sweat glands and relatively little hair.
• The 15 to 25 milk ducts enter the base of the nipple, where they dilate to form the milk sinuses.
• These sinuses terminate in cone-shaped ampullae.
• The circular areola surrounds the nipple and varies between 15 and 60 mm in diameter. Its skin contains lanugo hair, sweat glands, sebaceous glands, and Montgomery’s glands, which are large, modified sebaceous glands with miniature milk ducts that open into Morgagni’s tubercles in the epidermis of the areola.
ONCOPLASTIC BREAST ANATOMY

Segmental TDLU distribution

Oncological aspect
ONCOPLASTIC BREAST ANATOMY

“Superficial Fascia”
Existence as a distinct layer
56%
In those containing this layer;
Complete 58%
Irregular / contains islands of breast tissue 42%

Main anatomical features of the breast

- The footprint
- Breast conus
- Skin envelope
Breast Footprint
Starting from the pectoralis tendon 3 to 6 cm below the superior most point of the anterior axillary fold, extending down the lateral chest wall

Medially, the inframammary fold of the breast footprint extends to within 1 to 2 cm of the sternal midline

Curving laterally at a point 7 cm below the sternal notch

Superiorly, this curve tapers into the lateral part of the chest wall at approximately two finger-breadths below the clavicle just before ending at its lateral border back at the axillary fold.
1. Quantity and quality

2. Redundant skin will lead to awkward breast shapes and to (early) ptosis.

3. Skin shortage or over-tightening will lead to flattening of the breast and wound healing problems
Conus of the breast

\[ SA = \pi r^2 + \pi rl \]
Anatomy of the breast

- Epidermis
- Dermis
- Superficial layer of superficial fascia
- Cooper's ligament
- Glandular tissue
- Mammary duct
- Mass
- Deep layer of superficial fascia
- Retromammary fat pad
- Pectoralis major fascia
- Pectoralis major
Figure 1.1. Raised flaps between the subcutaneous tissue and the breast. (1) Subdermal plane. (2) Subcutaneous plane.
Determinants of optimal mastectomy skin flap thickness

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ONCOPLASTIC BREAST ANATOMY
ONCOPLASTIC BREAST ANATOMY
Skin flaps
Ligaments of the breast
“Wueringer’s fibrous septum”

Thin horizontal septum of dense connective tissue

Horizontal Septum

Fig. 9.1. Wueringer’s horizontal septum, which attaches the nipple-areola complex to the thoracic wall at the level of the fifth rib, includes branches and perforators from the intercostal, thoracacromial, and lateral thoracic vessels as well as the deep branch of the fourth intercostal nerve.
Origin of horizontal septum from thoracic wall at the level of 5th rib connects with a ligament originating from pectoralis fascia at the same level, which extended into the IMF
ONCOPLASTIC BREAST ANATOMY

Towards Nipple-Areola

Covered cranially and caudally by two dense layers of arteries

Intraglandular:

• Cranially; thoracoacromial artery branches
• Caudally; 4th & 5th intercostal arteries-cutaneous perforators
Horizontal Septum

At its medial and lateral edges, septum becomes more dense and curves upwards; ligaments attaching breast to thoracic wall.
Towards Nipple-Areola Subcutaneous:

- Medially; contains perforating branches internal thoracic artery traversing 2nd – 4th intercotal spaces
- Laterally; contains branches of the lateral thoracic artery
The inframmary fold
IMF
No macrostructure featuring IMF

No anatomy textbook described any ligament

Highly debated, related to theories
A true inframammary ligament?

THEORY

“Prepectoral ligament”: it is not a true ligament but rather the
capsule of a gland of ectodermal origin. Crescent shaped
ligament between skin and anterior surface of pectoralis major muscle


Subcutaneous, dense fibrous strand following margin of IMF and
extends from sternum to lateral margin of pectoralis major at
preaxillary fold.

“Inframammary crease ligament”: condensation of rectus abdominis fascia medially and fascia of the external oblique and Serratus anterior laterally. Originates medially from 5th rib periosteum and laterally from fascia between 5th and 6th ribs which inserts into deep dermis of IMF.

The inframammary fold

“Condensation of tissue within the superficial fascia system”
Fusion between the superficial and mammary fascia yields the inframammary fold
IMF

• No demonstrable ligamentous structure of dense regular connective tissue
• No mammary tissue
• Only epidermis, dermis, superficial fascia, adipose tissue
• Superficial and deep fascial layers connected to the dermis.

No such organized connective tissue structure in the region of IMF.

Blood Supply
Blood Supply of the breast

- Second internal mammary perforator
- Internal mammary perforator
- External mammary artery
- Anterolateral intercostal perforators
- Lateral thoracic artery
- Anteromedial intercostal perforator
Blood supply

Most consistent is from medial (via internal thoracic artery).

Also supplied from anterior intercostal arteries and lateral thoracic artery.

Very rarely from direct branches of the axillary artery or posterior intercostal arteries.
NAC blood supply
A = branches from internal mammary (thoracic) artery
B = supraclavicular branches
C = perforator from Intercostal system
D = lateral thoracic system
Venous drainage

• The venous drainage of the breast is divided into a superficial system and a deep system.
  1. The superficial system:
    • transverse (91%) and longitudinal (9%)
  2. Deep system: follows the arterial supply
Venous drainage

- These venous pathways lead to the pulmonary capillary network and provide a route for metastasis to the lungs.
- The vertebral system of veins provides an entirely different metastatic route. These veins form a vertebral venous plexus and provide a direct venous pathway for metastases to bones of the spine, pelvis, femur, shoulder girdle, humerus, and skull.
Nerve Supply

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<th>Lateral cutaneous branches of ICN</th>
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Nerve supply

INTERCOSTOBRACHIAL NERVE

Lat. cutaneous branch of T2 intercostal nerve
Emerges from 2\textsuperscript{nd} intercostal space
Anastomoses with \textit{cutaneous brachii medialis} nerve (branch of \textit{plexus brachialis})
Supplies skin on med. & post. arm
\begin{itemize}
  \item 90\% from T2 alone
  \item 3\% from T3 alone
  \item 7\% from a combination of T2 and T3
\end{itemize}
ONCOPLASTIC BREAST ANATOMY
Thoracodorsal artery and perforator
Lateral intercostal artery and perforator
Skin and fat from armpit area transferred to breast defect
Latissimus muscle preserved
Conclusion
• Thorough anatomical knowledge is a must to perform safe breast surgical procedures
• Respecting anatomical guidelines would prevent complications and improve outcome