BREAST ANATOMY & HISTOLOGY

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- Primary biological function: to make milk
- Symbol of female gender, beauty, sex appeal.... Differing among cultures and ages
- Symbol of death (breast cancer)
- The only organ not fully developed at birth
- Changing appearance during a woman's life:
 - Before, during and after puberty
 - During the menstrual cycleDuring pregnancy and breastfeeding
 - During pregnancy and br
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A solid foundation for IBCLCs...

 'A thorough understanding of the anatomy, histology and physiology of the breast provides a solid foundation upon which to investigate and treat women and infants experiencing breastfeeding difficulties.' (Geddes D., 2007)











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11



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12











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24

Areolar glands (cont.)

Study on 29 mothers [Shaal et al.2006, in BF&HL p. 84]

- Mean number of glands: 8.9 (range 0 -38)
- Number unrelated to the size of areola
- Similar between the left and right breast
- More AGs located on the upper, lateral section (where usually baby's nose directed).

Ison B T et al. Radiographics 2009;29:509-523

A) Areola of a lactating woman (day 3 postpartum), with AG giving off their secretion (arrow). About 1 in 5 lactating women reported seeing a visible fluid emission from their areolar glands. Discret from Figure 1. Areolar glands and infant behavior. Douxet S, Soussignan R, Sagot P, Schaal B (2009) The Secretion of Areolar (Montgomery's) Glands from Latating Woman R, Sagot P, Schaal B (2009) The Secretion of Areolar (Montgomery's) Glands from Latating Woman R, Sagot P, Schaal B (2009) The Secretion of Areolar (Montgomery's) Glands from Latating Woman Elicits Selective, Unconditional Responses in Neonates. PLoS ONE 4(10): 1573. doi:10.1371/journal.pone.000757

http://www.plosone.org/article/info:doi/10.1371/journal.pone.0007579

Nipple

- Conical elevation located in the center of the areola.
- Average diameter is 1.6 cm, length 0.7 cm.
- Nipples vary in size and shape, some variations carry the potential for a difficult latch.
- Diameter increases during pregnancy (by 9.5 to 11.5 mm) (and at each pregnancy) (and at each pregnancy)



19

Smooth muscle fibers function as a closure mechanism to keep milk from leaking. Longitudinal inner muscles and outer circular muscles make the nipple erect when stimulated.

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Very rich muscular and nervous structure of the nipple & areola complex

- Role of the areolar glands
- Let's enter through a nipple pore...

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Action pour l'Allaitement, France

PLAN Introduction

- External view
- Internal view ('new' anatomy)

- Historical perspective
- New research methodology
- New findings
- Clinical implications
- · Supply to the breast
- Histology









PLAN

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- Introduction
- External view
- Internal view ('new' anatomy)
 - Historical perspective
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29

New research

- Ramsay DT, Kent JC, Hartmann RA and Hartmann PE. Anatomy of the lactating human breast redefined with ultrasound imaging. Journal of Anatomy 2005 206:525-534.
- > The University of Western Australia, Medela. Anatomy of the lactating breast. CD, edited by Medela AG 2006.



> Geddes DT. The use of ultrasound to identify milk ejection in women - tips and pitfalls. International Breastfeeding Journal 2009 4:5 Breast anatomy, ER LCTP 2019 30













Milk ducts diameter vary between women





37

Main milk duct: 0.4 mm (a) Main milk duct: 9.2 mm Merging milk ducts: 0.8 mm (b) and 0.75 mm (c). Geddes International Breastfeeding Journal 2009 4:5 doi:10.1186/1746-4358-4-5 Breast anatomy ER LCTP 2019

Detection of milk ejection by ultrasound



Ultrasound scanning position for detection of milk ejection in the lactating breast. The breast that is not suckled/expressed is monitored using a high frequency linear array ultrasound transducer. The milk duct monitored is in the lateral portion of the breast near the base of the nipple. Minimal pressure must be used to avoid compression of the duct.

Geddes International Breastfeeding Journal 2009 4:5 doi:10.1186/1746-4358-4-5









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Milk ducts (cont.)

- Ductal network: complex ; ducts not always arranged in a radial or symmetrical manner.
- Ductal anatomy: similar for each breast but can vary greatly between women.
- Main function of ducts: transport, not storage of milk.
- Resting duct diameter (prior to milk ejection) can differ greatly between women (range: from 1 mm to 4.4 mm).

Milk ducts (cont.)

- At milk ejection the ducts expand in diameter (average 58%).
- The main milk ducts near the nipple are: – approximately 2 mm in diameter,
 - superficial,
 - branching close to the nipple,
 - easily compressed and occluded.
- The conventionally described 'lactiferous sinuses' behind the nipple do not exist.
- The number of milk ducts that exit the nipple ranges from 4 to 18 (average 9). 44



Glandular tissue Site of milk production Breastmilk synthesized by mammary secretory epithelial cells (lactocytes). Lactocytes line the alveoli. Alveoli (10 to 100) grouped into bunches → lobules Lobules (20 to 40) → lobes (4 to 18) Ratio glandular/fatty tissue is 2:1 65% of the glandular tissue located in a 30 mm radius from the base of the nipple.





Axillary tail, or tail of Spence

- In 95% of women, the ducts ascend into the axilla, partly under the lateral border of the pectoralis majora.
- Occasionally the extension reaches until the apex of the axilla.





















Clinical implications

- Number of milk ducts lower than previously believed → loss of only a few ducts has more consequences.
- The intermingling of fat and glandular tissue may make breast surgery more complex in order to preserve a woman's future potential to breastfeed.
- Milk removal: larger milk duct diameters associated with longer milk ejection episodes.
- Ducts superficial and compressible → well fitted breastshield (flange) needed during breast expression.

Future use of ultrasound scanning

61

- Detection of blockage of duct (not easily compressed, like DVT)
- Assessment of amount of glandular tissue (for low milk supply, breast asymmetry...)
- Further research on milk ejection reflex, role of position of the nipple in the mouth in relation with suck/swallow/breath cycle...















Histology of the lactating breast: not studied in depth

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- Due to ethical considerations
- And difficulties to acquire tissue from lactating breasts (compared to nonlactating breasts or to animal models).





Alveolar secretory cell: LACTOCYTE

- Alveolus consists of a continuous single layer of lactocytes
- Delineated at the outside by the basal lamina.



 Coupled with specialized cell junctions, which are tight during established lactation, and leaky during pregnancy. Recat anatomy, ER, LCTP_2019 71

Portion of the lactocyte directed towards the lumen is termed "apical" and the outer portion "basal". Microvilli project from the apical surface of the cell

- Milk secretion occurs at the apical surface of the lactocyte.
- Increased intra-alveolar pressure → flattens lactocytes and decreases milk secretion.

72

Myoepithelial cells

- Surround the alveolus and extend onto the milk ducts.
- Smooth muscle filaments, appearance differs depending on location:
 - Cells that surround the alveoli are stellate shaped.
 - Cells associated with ducts are spindle shaped, aligned longitudinally. Breast anatomy ER LCTP 2019





(minute amount

required)

myoepithelial cells with brownish deposits in the cytoplasm Breast anatomy_ER_LCTP_2019

74

Milk ducts

75

- · Form the pathway for milk to be transported to the nipple.
- · Do not actively participate in either the secretion or modification of milk.
- Consist of an inner layer of epithelium, stratified squamous type in the nipple, cuboidal within the gland.

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Milk ducts (cont.) • Terminal duct lobular unit (TDLU): lobular architecture and intralobular connective tissue (hormonally responsive, fibroblasts, macrophages, lymphocytes, vessels). Continuous basement membrane follows contour of the ducts and ductules.

- · Main ducts are supported by fibrous connective tissue.
- · Shape of duct varies according to amount of milk (more irregular when less milk). Breast anatomy ER LCTP 2019 77



Nipple

- Contains numerous sebaceous glands independent of hair follicles, dense fibrous stroma containing erectile smooth muscle tissue, stratified squamous epithelium resembling skin but with increased melanin pigment.
- Stratified squamous epithelium extends into duct lumens for a short distance.
- Nipple is unpigmented before menarche, pigmentation increases after first menstrual cycle

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79





Other References (histology section)

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82

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