

28th Annual Perinatal Conference

Complicated Mastitis

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Disclosure

Nothing to Disclose

Historical Perspective

Nomenclature of Mammary Duct-associated Inflammatory Disease

Term/Pathognomonic Factor	Investigators
Morbid condition of lactiferous duct	Birkett, 1850 ^[1]
Mastitis obliterans	Ingier, 1909 ^[2]
Chronic pyogenic mastitis	Payne et al, 1943 ^[3]
Stale milk mastitis	Deaver and McFarland, 1917 ^[4]
Varicocele tumor of the breast	Cromar, 1921 ^[5]
Plasma cell mastitis	Bloodgood, 1923 ^[6]
Involucional mammary duct ectasia with periductal mastitis	Adair, 1933 ^[7]
Comedomastitis	Foote, 1945 ^[8]
Periductal mastitis	Tice et al, 1948 ^[9]
Chemical mastitis	Geschickter, 1948 ^[10]
Fistulas of lactiferous ducts	Stewart, 1950 ^[11]
Mammary duct ectasia	Zuska et al, 1951 ^[12]
Squamous metaplasia	Haagensen, 1951 ^[13]
Secretory cystic disease of the breast	Patey and Thackray, 1958 ^[14]
Periductal mastitis/duct ectasia	Ingleby, 1942 ^[15]
	Ingleby and Gershon-Cohen, 1960 ^[16]
	Dixon, 1989 ^[17]

Haagensen Theory

- An evolutionary disease process
- Coined the term *mammary duct ectasia* (dilation of the subareolar terminal ducts)
- Stages in the pathogenesis of subareolar abscess:
 - dilation of ducts + accumulation of debris (no inflammation)
 - periductal inflammation with necrosis
 - fibrosis

Mammary Duct-Associated Inflammatory Disease Sequence (MDAIDS)

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    graph LR
      A((Normal breast)) --> B((Mammary duct ectasia))
      B --> C((Periductal inflammation/mastitis))
      C --> D((Subareolar breast abscess))
      D --> E((Peri-areolar fistula))
    
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- Breast Is A Modified Sweat Gland
- Squamous Metaplasia + Duct Ectasia ➡ Obstruction
- Depending On Variables:
 - Location And Extent Of Squamous Metaplasia
 - Degree Of Duct Ectasia
 - Degree Of Obstruction
 - Hormones (Estrogen, Prolactin)
 - Environment (Smoking)
 - Nutrition (Vitamin A Deficiency)
 - Anatomy (Nipple Retraction)
 - Bacterial Growth

Hormonal Influences

Prolactin:

- ↓ prolactin (dopamine release, altered estrogen metabolism, vitamin A receptor)
- promote MDAIDS by ↓ human milk fat globule membrane (HMFGM) - inhibits adhesion of bacteria

Estrogen:

- ↓ estrogen activity (smoking) impairs the hormonally controlled integrity of the breast duct epithelium

Nutritional Factors

Vitamin A:

- deficiency induces keratinizing squamous metaplasia (head and neck, bronchi, uterus, and cervix)
- increasing evidence that vitamin A (or retinoids) have a significant effect on mammary duct epithelial cell proliferation and differentiation
- Vitamin A deficiency impairs blood clearance of bacteria and results in decreased phagocytic activity in vitro

Smoking

- 90% of recurrent breast abscess are exposed to cigarette smoke for many years
- Risk of a recurrent subareolar breast abscess ↑ cigarette
- severe periductal inflammation is more often associated with heavy smoking (>10 cigarettes per day) and younger age
- increased incidence of mammary duct squamous metaplasia
- In the nonlactating breast, 7% of women secretions are mutagenic in the Ames tests and contain oxidized steroids and lipid peroxides. These metabolites might be responsible for direct cellular injury leading to reactive squamous metaplasia

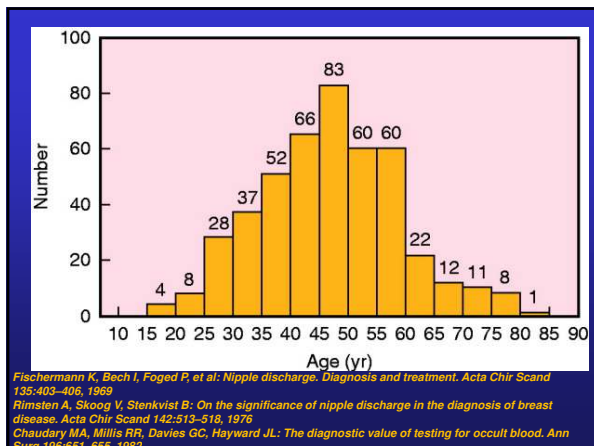
Schafer P., Furrer C., Mermillod B.: An association of cigarette smoking with recurrent subareolar breast abscess. *Int J Epidemiol* 1988; 17:810-813.

Clinical Presentation

- Incidence is ↑
- Closely Associated w/ Tobacco (↑ among women)
- Symptomatic MDAIDS = 20% Of Benign Conditions
- Peak Incidence 40 - 49 y

Holliday H., Hinton C.: Nipple discharge and duct ectasia. In: Blamey R.W., ed. *Management of breast disease*, London: Tindall; 1986.

Condition	Incidence of MDAIDS stage	Clinical presentation	Clinical evaluation	Treatment
Mammary duct ectasia	100%	Asymptomatic n = 3509 (see Table 6A-2) • Nipple discharge—single/multiple ducts; nipple crusting • Duct retraction • Nipple inversion • Noninflammatory subareolar induration/mass (see Table 6A-3)	History Physical examination Cytology of discharge Occult blood of discharge Mammogram if mass/induration present Ductogram FNA cytology	Antibiotics Metronidazole and a cephalosporin 500 mg tid for 10 days; duct excision; duct plate excision
Periductal inflammation/mastitis	Mean: 20%	Symptomatic n = 10,195 (see Table 6A-2) • Pain (noncyclic mastalgia) 44% • Nipple inversion 48% • Subareolar inflammatory mass 57%	History/physical examination FNA cytology Mammogram Ductogram	Discontinue smoking; antibiotics (as above); duct excision; duct plate excision; retinoic acid (future)
Subareolar breast abscess	Mean: • 21% of patients with breast sepsis • 4.2% of all BEMADID	(see Table 6A-11) • Red, hot, tender; abscess 15% • Spontaneously drained; surgically drained	History/physical examination FNA cytology to rule out cancer C&S for origin	Antibiotics (as above); incision and drainage; excise duct(s); retinoic acid (future)
Peri-areolar fistula	Mean 4.2% of patients with sepsis	Untreated 100% Sinus opening to fistula heals over; spontaneous recurrence of abscess with repeated discharge via fistula		Excise fistula and duct close 2nd intention




Pain / Tenderness

- History Of Clinical Features, Character, Relationship To Menstruation, Site, Radiation, Duration And Associated Factors
- Physical Examination (Rule Out Muscleskeletal Pain)
- Mammography
- No Active Treatment Needed
 - Firm Supporting Bra 24 h/day
 - Nonsteroidal Anti-inflammatory Drug Or Mild Analgesic For Comfort

Nipple Discharge

- 8% to 84% of Pts
- Secretions Vary From Yellow, Brown, Red To Dark Green
- Consistency Varies From Serosanguineous To Toothpaste-like
- Initially Involve One Duct Or Segment Of The Breast
- May Involve Many Ducts
- May Be Bilateral



Rimsten A, Skoog V, Stenkvist B. On the significance of nipple discharge in the diagnosis of breast disease. Acta Chir Scand 1976; 142:513-518.
Leis Jr H.P., Pilnik S., Dursi J., et al: Nipple discharge. Int Surg 1973; 58:162-165.
Funderburk W.W., Syphax B. Evaluation of nipple discharge in benign and malignant diseases. Cancer 1969; 24:1290-1296.

Nipple Retraction

- Painless
- Rule Out Cancer
 - Length Of History
 - Onset Of Symptoms
- Can Develop After One Or Two Inflammatory Episodes
- Long-standing Nipple Inversion Is Benign And Easily Recognized
- Usually Bilateral

• > 40 y or Sudden Onset is Malignant Until Proved Otherwise

Clinical/Investigative Feature	Mammary Duct Ectasia of MDAIDS	Carcinoma
History	>1yr (present since puberty)	<1yr
Pain (%)	33	<10
Discharge	Creamy, green	Serous, blood stained
Nipple (examine carefully)	Partial, central, symmetrical retraction, often bilateral	Complete unilateral retraction with deformity of areola
Mass	Tender, firm lesion with discrete outline	Nontender, hard lesion with ragged outline
Cytology	Foam cells	Malignant glandular cells
Ductography	Ectatic ducts	Intraluminal mass
Fine-needle aspiration	Cystic lesion, no residual mass, no blood on aspiration	Hard lesion; malignant glandular cells
Mass	Biopsy	Biopsy
Follow-up	No mass: re-examine every 4mo and take annual mammogram	

Specific Condition	Patients with MDAIDS (n)	Patients with Specific Condition (n)	Symptomatic (%) Occurrence
Nipple Discharge			
Asymptomatic	103	8	8
Symptomatic	577	238	41
Nipple Inversion/Retraction			
Asymptomatic	103	7	7
Symptomatic	668	319	48
Pain and Tenderness			
Asymptomatic	103	12	12
Symptomatic	183	84	44
Mass (Periareolar)			
Asymptomatic	103	33	32
Symptomatic	399	203	51
Abscess			
Asymptomatic	103	1	1
Symptomatic	803	124	15
Fistula			
Asymptomatic	103	0	0
Symptomatic	176	34	19
Bilaterality			
Symptomatic	495	114	23

History

Nature and quantity of the discharge spontaneously, relation to menstrual cycle, pregnancy, and occurrence of trauma medications hormone replacement therapy, psychotropics, and antihypertensive drugs, as well as thyroid disorders and states of hyperplacatinemia

physiologic discharges tend to be bilateral and multiductal in origin, the secretion is clear to serous to milky and negative for occult blood.

Treatment Plan

In the absence of a subareolar induration or mass and in the presence of a normal mammogram, if a single duct is involved and if the discharge is purulent or green and sticky, the patient should be treated with antibiotics.

If the discharge is from multiple ducts and is persistent, is occult blood positive, and has not responded to antibiotic treatment, then on the basis of clinical judgment, surgery may be indicated

Complicated Mastitis & Breast Abscess

- Diagnostic and therapeutic challenge
- No consensus on optimal management strategies

Subareolar And Recurrent Abscess

- Penultimate Stage In The Pathophysiology Of MDAIDS
- Mixed Organisms (Anaerobes)
- Rapid Onset Of Breast Pain, Tenderness And Swelling Of Central Subareolar Tissue
- History Of Similar Problems
- Resolution Of Symptoms Followed By Asymptomatic Interval (Months / Years) Followed By Recurrence
- Physical Findings Of Tenderness, Swelling, Erythema, Sloughing Of Skin, And Induration Or Fluctuation
- With Chronic, Recurrent Abscesses: Periareolar Fistula

Treatment Plan

If the abscess is in its early stages (consisting of an indurated mass), a 2-week course of antibiotics consisting of a cephalosporin and metronidazole, elective excision is planned for 2 to 4 weeks after resolved

Mature Abscess

If the abscess is fluctuant or has already drained spontaneously, treatment with the patient under general anesthesia consists of making a wide incision to obtain effective drainage and to culture the pus. The patient is then given the two antibiotics for 10 days and monitored weekly to ensure satisfactory resolution with healing. Operative treatment of the abscess and the associated duct under general anesthesia is then planned for 4 to 6 weeks later.

Nonsurgical Management

subareolar abscesses for subareolar breast abscesses resulted in complete resolution

Presentation

Symptoms:

- skin erythema
- palpable mass
- tenderness
- fever
- pain
- most commonly women between 20 and 50 years of age

Nonlactational

- centrally (subareolar or periareolar)

Lactational

- periphery of the breast (upper outer quadrant)

Geschickter C.F.: Diseases of the breast, 2nd ed. Philadelphia, JB Lippincott, 1948.
Tice G.J., Dockerty M.B., Harrington S.W.: Comedomastitis: A clinical and pathologic study of sata in 172 cases. Surg Gynecol Obstet 1948; 87:525-546.
6. Ingleby H.: Normal and pathologic proliferation in the breast ith special reference to cystic disease Arch Pathol 1942; 33:573-588.

Deaver J.B., McFarland J.: The breast: its anomalies, its diseases and their treatment, Philadelphia, Blakiston, 1917.

Association With Breast Cancer

Initial Presentation:

- Inflammatory changes may be the initial presentation of a breast cancer → ALWAYS biopsy breast abscesses

Wound Infection After Lumpectomy For Breast Cancer:

- The incidence of acute infection following lumpectomy may be reduced by reapproximation of the deep breast tissue when possible.

Delayed breast cellulitis and abscesses:

- external beam radiation therapy
- brachytherapy

Breast Lymphedema:

- mild erythema
- edema
- secondary to treatment-related disruption of breast lymphatics
- typically self-limited (1 month to 1 year)

Evaluation

Clinical Examination

- mass
- erythema
- skin warmth
- skin thickening
- tenderness

Ultrasound

- adjunct to physical examination
- high

Mammography:

- after successful management of acute breast infection or abscess
- to exclude malignancy

In the acute setting, abnormal mgm and US findings may be difficult to differentiate from malignancy

Microbiology

Staphylococcus aureus (most common organism)

Pseudomonas aeruginosa

Staphylococcus epidermidis

Proteus

Serratia

Bacterioides

Sterile on culture: (20 to 40%)

Cigarette smoking

- increased rates of anaerobic breast infections
- increased rates of recurrent breast abscess

Body Art (nipple piercing and tattoos)

- incidence as high as 10% to 20% in the months following the procedure
- organisms include aerobic, anaerobic, and mycobacterial infections

Unusual Breast Infections

Unusual Pathologic Organisms: (endemic to specific areas and specific patient populations)

- *Actinomyces* species
- *Brucella*
- *Mycobacterium tuberculosis*
- *Fusarium solani*
- *Echinococcus*
- *Cryptococcus*
- *Paragonimus*

Necrotizing Soft Tissue Infection And Gangrene Of The Breast

- rare
- polymicrobial in etiology
- associated with anticoagulant treatment, trauma, and in the postpartum period
- management similar to other areas:
 - early diagnosis
 - early and aggressive surgical management
 - systemic antibiotics
 - broad-spectrum antibiotics

Breast Cancer Vs Mastitis/Abscess

- Breast cancer
- squamous cell carcinoma
- lymphoma
- incidence of 4% (routine biopsy of the abscess cavity)
- percutaneous management for selected cases is acceptable
- failure to resolve symptoms should prompt tissue biopsies to exclude malignancy

Scott B.G., Silberfein E.J., Pham H.Q., et al: Rate of malignancies in breast abscesses and argument of ultrasound drainage. *Am J Surg* 2006; 192:869-872

Periareolar Fistula

patients presenting with the other features of MDAIDS (i.e., nipple discharge, breast pain, varying degrees of nipple retraction, and acute subareolar abscess)

the frequency of fistula related to a breast abscess varies from 4% to 20%

most of the tracts studied are lined by granulation tissue. In only a few was squamous metaplasia found

history should emphasize frequency and time intervals of antecedent acute subareolar abscesses or a subareolar inflammatory mass that had either discharged spontaneously or had been surgically incised and drained

nipple discharge, nipple retraction, a history of lactation, and breast biopsies. patient's smoking

On physical examination, the site and location of the fistula opening in the involved breast should be noted. Both breasts should be inspected for nipples are retracted, subareolar masses, nipple discharge, or discharge from the fistula of the involved breast.

Treatment Plan

Antibiotics

The fistula tract into the subareolar-retronipple space should be excised, together with the duct (ductectomy) as it emerges through the nipple. The resulting wound is left open and loosely packed or closed primarily, w

Management

Antibiotics

no or a small fluid collection seen on ultrasound, a trial of oral antibiotics best directed by local antibiograms

Surgical Incision and Drainage

surgical incision

disruption of septae

open packing

limitations to this approach may include need for general anesthesia, high cost, and cosmetic deformity

recurrence rates between 10% and 38% requiring additional procedures

biopsy of the abscess cavity wall

following abscess resolution, mammography and breast ultrasound to exclude malignancy

Aspiration

primary aspiration is an alternative to primary surgical management (lactational and nonlactational abscesses)

Benefits cosmesis, lack of requirement for general anesthesia, no requirement for wound packing, and decreased cost

success rates with single and multiple aspirations of breast abscess are 57% to 79% and 80% to 96%

fail to improve with multiple aspirations or whose clinical condition deteriorates require operative drainage and/or tissue biopsy

technique: 16-gauge needle (or larger if necessary) with aspiration and irrigation of the cavity through an area where the skin is not

thinned from inflammation

ultrasound to guide aspiration is associated with higher rates of success but is not required

oral antibiotics as a component of initial therapy for breast abscess managed with aspiration

Cultures of aspirated fluid may be useful to guide antibiotic choice

Following initial management, patients should undergo clinical reassessment to determine resolution of requirement for additional

treatment (repeat aspiration or surgical drainage)

Median time to resolution of breast abscess with aspiration is 2 weeks (range, 1-7 weeks)

Factors that have been associated with failure of aspiration include large size (>3cm) and loculations

Progression or failure of symptoms to improve with serial aspirations mandates surgical management as outlined previously

Management

Antibiotics

- no or a small fluid collection (PE/US)
- best directed by local antibiograms

