Skin diseases of the breast and nipple

Inflammatory and infectious diseases

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Learning objectives
After completing this learning activity, participants should be able to identify the etiologies of inflammatory and infectious skin processes that affect the breasts and nipples; discuss the work-up and diagnosis of these conditions; explain the appropriate treatment for these conditions; and recognize special considerations that must be given when treating patients that are breastfeeding.

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Certain dermatologic conditions are unique to the breast and nipple, whereas others may incidentally involve these structures. All require a nuanced approach to diagnosis and treatment because of the functional, sexual, and aesthetic importance of this area. The lactating patient requires special management because certain treatment options are contraindicated. All dermatologic conditions involving the breast and nipple require careful evaluation because malignancy of the breast can be mistaken for a benign condition or may trigger the development of certain dermatologic conditions. The second article in this continuing medical education series reviews common and uncommon inflammatory and infectious conditions of the breast and nipple and provides insight into both the diagnosis and the treatment of this heterogeneous group of diseases. For the purposes of this article, these conditions are divided into 4 distinct categories: 1) dermatitis; 2) radiation-induced changes; 3) mastitis; and 4) miscellaneous dermatologic conditions of the breast and nipple. (J Am Acad Dermatol 2019;80:1483-94.)

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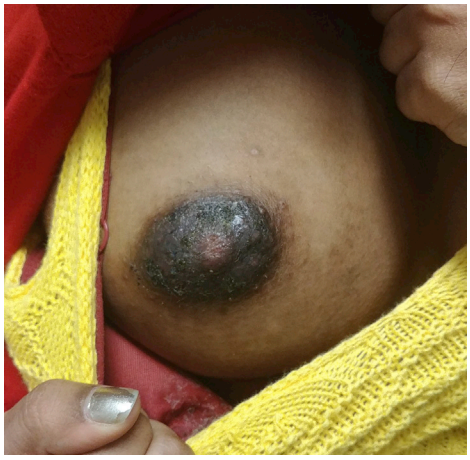

Fig 1. Atopic dermatitis of the nipple and areola.

All dermatologic diseases involving the breast and nipple require a nuanced approach to diagnosis and treatment in this sexually, functionally, and aesthetically important site. We discuss the diagnosis and management of inflammatory and infectious skin processes affecting the breast and nipples. Conditions that occur incidentally in this area but do not require different management when occurring on the breast and nipple are not included.

DERMATITIS

Atopic dermatitis

Atopic dermatitis (AD) affects the breast and nipple in ≤20% of patients with AD and is the cause of approximately half of all breast and nipple dermatitis occurring during breastfeeding.[1,2] AD of the breast and nipple resembles classic AD elsewhere, often occurring concomitantly. In some cases, the nipple or breast may be the only area involved (Fig 1).[3,4] Most cases are bilateral.[4] Nipple AD frequently flares during breastfeeding and often presents in conjunction with irritant or allergic contact dermatitis. Lactation-induced cracking of the nipple can predispose the mother to eczema herpeticum and impetiginization via secondary infection by organisms residing in the nursling's oropharynx.[2]

AD of the breast and nipple is typically diagnosed when a patient reports a personal or family history of atopy without other clear inciting causes of their dermatitis (Fig 1).[5,6] In the nonbreastfeeding patient, breast and nipple AD is managed similarly to AD arising elsewhere on the body, except that the use of topical steroids should be limited because the breast and nipple skin is thin and prone to atrophy. In breastfeeding patients, some medications are contraindicated because of the risk of transmission to the infant via breast milk or direct contact.[5] Table I lists the presumed safety of medications that are commonly used to treat nipple AD and other types of dermatitis in a breastfeeding mother.[7-9] All topical therapies should be wiped off the nipple before breastfeeding to limit direct infant exposure. Expressed breast milk should be used to wipe topical medications from the breast and nipple before nursing because it is less irritating to the skin than water and other solutions.

Table I. Breastfeeding compatibility of topical and systemic medications for inflammatory and infectious conditions of the breast and nipple

Breastfeeding recommendation	List of medications
Breastfeeding compatible	Low to moderate potency topical corticosteroids; oral corticosteroids (should be administered 4 hours before lactation); calcipotriene; narrowband ultraviolet B light phototherapy
Likely breastfeeding compatible based on limited data	Topical immunomodulators (contraindicated per package insert); certain tumor necrosis factor−alfa inhibitors (adalimumab, etanercept, infliximab, etc); ustekinumab (may be safe, minimal data available); secukinumab (may be safe, minimal data available)
Contraindicated during breastfeeding	Category 1 superpotent topical corticosteroids; topical coal tar; acitretin; methotrexate; cyclosporine; psoralen plus ultraviolet A light phototherapy

Allergic contact dermatitis

Allergic contact dermatitis (ACD) is a common cause of breast and nipple dermatitis in both breastfeeding and nonbreastfeeding patients.[10] In nonbreastfeeding patients, breast and nipple ACD is commonly caused by a reaction to clothing material, often bras, and can be caused by detergents or fabric softeners (Fig 2).[11] One series found that 36% of patients with breast and nipple dermatitis had a positive patch test to 5-chloro-2-methyl-4-isothiazolin-3-one, a common preservative in detergents and fabric softeners; 25% of patients had improvement upon avoidance of this contact allergen.[11] Tattoos (including nipple tattooing after radical mastectomy), nipple piercings, and nail polish are also commonly reported contact allergens.[12] Patients with intertrigo who do not improve with conventional therapy should be queried about topical nystatin and ketoconazole

Abbreviations used:

ACD:	allergic contact dermatitis
AD:	atopic dermatitis
CARP:	confluent and reticulated papillomatosis
FFD:	Fox-Fordyce disease
HNA:	hyperkeratosis of the nipple and areola
HS:	hidradenitis suppurativa
ICD:	irritant contact dermatitis
NHNA:	nevoid hyperkeratosis of the nipple and areola
RRD:	radiation recall dermatitis
STB:	superficial thrombophlebitis of the breast

use in this area because some preparations have been associated with ACD.

ACD arising in the breastfeeding patient typically occurs because of one of the aforementioned sources of contact allergens or from 1) nipple creams and other products marketed to breastfeeding mothers to relieve irritation from breastfeeding (eg, lanolin, chamomile, or aloe vera) and 2) solid foods introduced into a breastfeeding baby's diet (Table II).[2]

Irritant contact dermatitis

Irritant contact dermatitis (ICD) of the breast and nipple is caused by friction from ill-fitting clothing, exercise, or from agents that directly injure the skin.[5] While ICD from exercise is classically bilateral, breast asymmetry may cause unilateral involvement. In breastfeeding patients, ICD commonly occurs from direct mechanical and moisture-related injury during lactation. It may also occur when improper nipple drying techniques are used after breastfeeding.[13] Women should be counseled to air dry the breast after feeding to limit nipple irritation.[13]

Psoriasis

Psoriasis can present anywhere on the breast and nipple (Fig 3). Patients with breast and nipple psoriasis may experience either koebnerization or sparing after breast irradiation for the treatment of breast cancer.[14,15] Inverse psoriasis involving the inframammary region may mimic candidiasis, intertrigo, seborrheic dermatitis, or dermatophyte infection because of its lack of scale, maceration, and well demarcated appearance.[16] The 2017 National Psoriasis Foundation Guidelines for the treatment of inverse psoriasis recommend appropriate therapy for patients with inframammary psoriasis (Table III).[17] During breastfeeding, psoriasis of the nipple may flare because of koebnerization and hormonal changes.[5] Treatment during breastfeeding should follow the special management considerations discussed above.

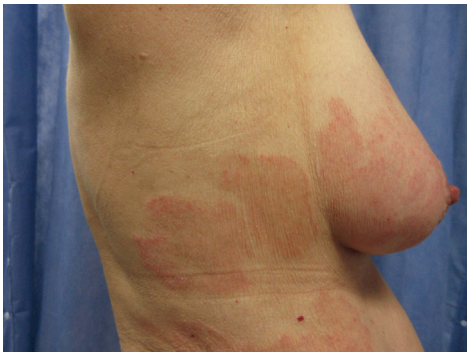

Fig 2. Allergic contact dermatitis of the chest and breasts. (Photograph courtesy of S. Brett Sloan, MD.)

Table II. Common contact allergens in the breastfeeding patient

Lanolin
Chamomile
Aloe vera
Chlorhexidine
Topical vitamin E
Fragrances
Tea bags (tannic acid)
Solid foods in the infant's diet

RADIATION-RELATED BREAST CHANGES

Radiation dermatitis

Radiation dermatitis occurs in almost all patients who are undergoing radiotherapy for breast cancer.[18] Acute radiation dermatitis occurring within 90 days of radiation exposure is graded in severity ranging from mild erythema to full-thickness skin necrosis (Table IV).[19,20] Most acute radiation dermatitis peaks 1 to 2 weeks after arising and resolves 2 to 4 weeks after radiotherapy is stopped.[21] Table V reviews the typical timeline within which different types of radiation dermatitis emerge. Risk factors for severe radiation dermatitis include large breast size, increased body mass index, postmastectomy radiation, unfractionated radiation, and higher cumulative radiation dose.[22] Prevention of severe radiation dermatitis can be facilitated by the use of sun-protective measures, topical steroids, topical silver sulfadiazine, gentle washing of irradiated skin, and limiting trauma to the irradiated area.[23-26]

Chronic radiation dermatitis

Chronic radiation dermatitis occurs >90 days after the completion of radiotherapy. The most

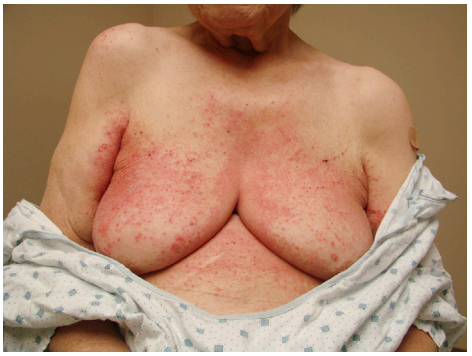

Fig 3. Psoriasis.

problematic forms of chronic radiation dermatitis are pigmentary changes, breast fibrosis, telangiectasias, chronic ulcer development, and secondary cutaneous malignancy (Fig 4).[27] Given the high risk of secondary malignancy after radiotherapy, biopsy specimens should be obtained from atypical lesions. The management of chronic radiation dermatitis is difficult. Pulsed dye laser can be used to improve telangiectasia of chronic radiation dermatitis.[28] Radiation-induced fibrosis is more difficult to treat. Treatment options include pentoxifylline plus tocopherol, superoxide dismutase, and interferon gamma.[29,30]

Radiation recall dermatitis

Radiation recall dermatitis (RRD) occurs in ≤6% of patients treated with radiotherapy developing in sites of previously irradiated skin after a patient is exposed to chemotherapy or other triggering medications or exposed to ultraviolet radiation.[31] Common offending medications are listed in Table VI. RRD is typically caused by offending medications initiated within 2 months of cessation of radiotherapy, although rare reports exist of medications causing this eruption >6 years after the termination of radiotherapy.[32,33] Reactions range from localized pruritus to ulceration and depend upon the specific drug administered. Management involves withdrawal of the offending agent. In severe cases, oral steroids, symptomatic management, and local wound care may be required.[34]

MASTITIS

Lactational mastitis

Lactational mastitis occurs in 10% to 30% of postpartum women.[35,36] When stagnant milk in the ducts becomes infected, it creates a warm, tender, swollen, erythematous overlying plaque. Fever and flu-like symptoms may be present. There is a bimodal distribution during breastfeeding, with most cases occurring either in the first 4 weeks postpartum or at the cessation of breastfeeding.[37] The most commonly implicated organisms include *Staphylococcus aureus*, *Staphylococcus albus*, *Escherichia coli*, and some streptococcal species.[35] Before the wide implementation of hand hygiene, a more virulent variant of lactational mastitis ("epidemic puerperal mastitis") caused by strains of *S aureus* was spread by health care workers.[38]

Lactational mastitis is a clinical diagnosis; routine ordering of breast milk cell counts, breast milk culture, and blood cultures is not recommended.[39] The treatment of choice is continued breastfeeding except in patients with HIV because lactational mastitis increases the risk of HIV transmission to the infant via breast milk.[40] Patients that cannot continue breastfeeding should manually empty their breasts. Management may also include nonsteroidal antiinflammatory drugs for symptom control and probiotics.[41] A Cochrane review on antibiotic use in lactational mastitis found "insufficient evidence" to recommend or refute their use.[42] Nonetheless, the World Health Organization continues to recommend the use of antibiotics because some studies have found that women receiving antibiotics have a shortened duration of episodes and decreased rate of progression to abscess formation.[35] In cases where antibiotics are used, the World Health Organization recommends beta-lactamase-resistant penicillins, cephalexin, amoxicillin, or erythromycin for 10 to 14 days.[35]

The most common complications of lactational mastitis are recurrence (occurring in approximately half of patients) and breast abscess formation (occurring in roughly one-third of patients).[36] Risk factors for abscess formation include a history of nonlactational breast abscess, tobacco use, and

Table III. 2017 National Psoriasis Foundation guidelines for inverse psoriasis

Degree of recommendation	Recommended treatment modalities
First-line	Initial 2- to 4-week course of low-potency topical steroids, topical immunomodulators (eg, tacrolimus), and calcitriol and calcipotriene
Second-line	Topical antimicrobials, emollients, and topical coal tar
Modalities in patients who are refractory to topical therapy	Botulinum toxin injections, excimer laser, and systemic agents (biologics and nonbiologics)

Table IV. Classification systems for severity of acute radiation dermatitis

Score	0	1	2	3	4	5
Radiation Therapy Oncology Group	No changes	Faint erythema or dry desquamation	Moderate to brisk erythema; patchy moist desquamation, mostly confined to skin folds and creases; moderate edema	Moist desquamation in areas other than skin folds and creases; bleeding induced by minor trauma or abrasion	Life-threatening consequences; skin necrosis or ulceration of full-thickness dermis; spontaneous bleeding from involved site; skin graft indicated	Death
European Organization for Research and Treatment of Cancer	No changes	Follicular, faint, or dull erythema; epilation; dry desquamation; decreased sweating	Tender or bright erythema; patchy moist desquamation; moderate edema	Confluent, moist desquamation other than skin folds; pitting edema	Ulceration; hemorrhage; necrosis	Death

Table V. Acute radiation dermatitis timeline

Skin changes	Time since initiation of radiotherapy
Sunburn-like changes	10-14 days
Hyperpigmentation	2-3 weeks
Dry desquamation	1-2 weeks after cumulative dose of 20 Gy (typically 3-4 weeks)
Moist desquamation	1-2 weeks after cumulative dose of 30 Gy (typically 4-5 weeks)
Ulceration	>5 weeks

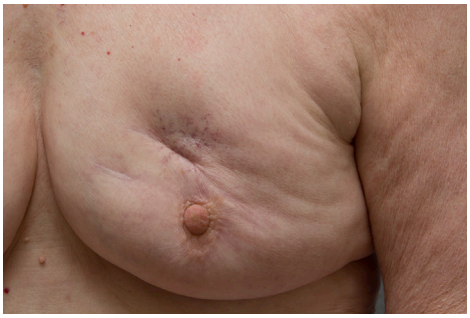

Fig 4. Chronic radiation dermatitis of the breast demonstrating telangiectasias and fibrosis. (Photography courtesy of Justin Finch, MD.)

diabetes.[43] Patients who do not improve after 48 hours should undergo breast ultrasound to evaluate for abscess formation. Needle aspiration is preferred to incision and drainage because aspiration is associated with lower postprocedure morbidity.[37]

Neonatal mastitis

Neonatal mastitis is an uncommon complication of physiologic breast hypertrophy of the newborn. Physiologic breast hypertrophy occurs in approximately 70% of newborns in the first weeks of life because of withdrawal of maternal estrogen that triggers neonatal prolactin release, stimulating breast bud hypertrophy.[44,45] In some cases, the hypertrophied breast bud becomes infected and appears clinically similar to lactational mastitis. The most common causative agent in neonatal mastitis is *S aureus*, although Gram-negative enteric rods and group B *Streptococcus* have also been implicated.[46] Management includes a neonatal sepsis workup with initiation of antistaphylococcal parenteral antibiotics until culture data are negative, at which time patients can be transitioned to oral antibiotics.[45] Half of all cases result in breast abscess formation requiring needle aspiration.[45,47] This must be performed with the utmost care because damage to the breast bud during aspiration can result in lifelong breast scarring, texture changes, asymmetry, and hypoplasia in ≤50% of patients.[48]

Tuberculous mastitis

Tuberculous mastitis is a rare form of extrapulmonary tuberculosis.[49] It can be the only focus of clinically evident tuberculosis or it can occur in the setting of disseminated tuberculosis.[49] There are 3 primary categories of breast tuberculosis.[50]

Nodular tuberculous mastitis. Nodular tuberculous mastitis is characterized by a slow-growing,

Table VI. Common triggers of radiation recall dermatitis

Chemotherapy	Bleomycin, capecitabine, cisplatin, cyclophosphamide, cytarabine, dactinomycin, docetaxel, doxorubicin, etoposide, 5-flurouracil, gemcitabine, melphalan, methotrexate, paclitaxel, trimetrexate, and vinblastine
Immunotherapy	Bevacizumab, cetuximab, erlotinib, gefitinib, interferon-alfa, nivolumab, pazopanib, pembrolizumab, sorafenib, sunitinib, trastuzumab, and vemurafenib
Antimicrobials	Acyclovir, antimycobacterial therapy, azithromycin, cefazolin, cefotetan, levofloxacin, gatifloxacin, and vancomycin
Others	Hydroxyurea, nimesulide, phentermine, simvastatin, St. John's Wort, and tamoxifen

ill-defined breast mass that is clinically and radiographically indistinguishable from malignancy.[51]

Disseminated tuberculous mastitis. Disseminated tuberculous mastitis is characterized by multifocal tubercles throughout the entire breast with ipsilateral axillary lymph node involvement.[52]

Abscess tuberculous mastitis. Abscess tuberculous mastitis may present with sinus tracking to the overlying skin.[50,52]

The diagnosis of tuberculous mastitis requires histopathologic examination.[52] Biopsy specimens demonstrating necrosis and granuloma formation should be stained and cultured for acid-fast bacteria and undergo *Mycobacterium tuberculosis* polymerase chain reaction testing.[52] Management involves excision followed by histopathologic examination to rule out other processes, including malignancy.[50] All patients require antimycobacterial agents.[50]

Candida mastitis

Candida mastitis is a cause of nipple and breast pain during breastfeeding.[5,53,54] Its presentation is subtle and may only be indicated by nipple and areolar erythema and cracking.[5] The diagnosis is often made after oral thrush is identified in the nursing child.[5] While some authorities recommend breast milk culture or vaginal culture for Candida, this practice is neither sensitive nor specific for Candida mastitis, and therefore a trial of treatment is recommended when the diagnosis is suspected.[55]

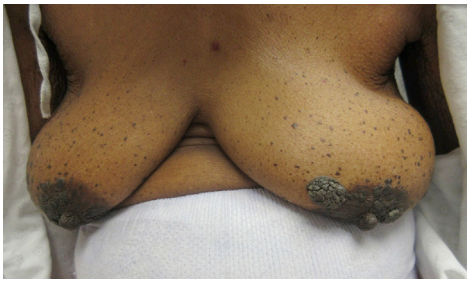

Fig 5. Hyperkeratosis of the nipple and areola. (Photograph courtesy of Marti Rothe, MD.)

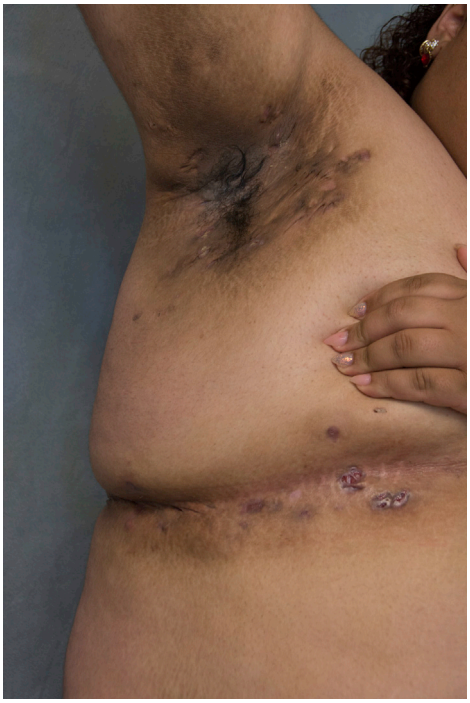

Fig 6. Hidradenitis suppurativa of the intermammary skin. (Photography courtesy of Justin Finch, MD.)

Initial treatment with topical nystatin or topical azoles after breastfeeding is recommended, followed by treatment with oral fluconazole in resistant cases.[5,55,56] The nursling must also be treated to prevent reinfection of the mother.[5] Patients with suspected Candida mastitis who do not respond to a trial of treatment should be evaluated for Raynaud phenomenon of the nipple because it also presents subtly and accounts for ≤25% of cases of nipple and breast pain during breastfeeding.[57] A diagnosis of Raynaud phenomenon of the nipple is suggested by a personal history of Raynaud phenomenon occurring elsewhere and by a failed trial of treatment for suspected Candida mastitis.

Table VII. Hurley system for grading severity of hidradenitis suppurativa

Grade	Description
1	Abscess formation (1 or multiple) without associated scarring or sinus tract formation
2	Recurrent, multifocal abscesses with associated scarring or sinus tract formation
3	Widespread involvement with multiple abscesses and multiple interconnected sinus tracts

MISCELLANEOUS DERMATOLOGIC CONDITIONS OF THE BREAST AND NIPPLE

Hyperkeratosis of the nipple and areola

Hyperkeratosis of the nipple and areola (HNA) is characterized by a thick, hyperpigmented, hyperkeratotic, nevoid-appearing lesion on the nipple or areola (Fig 5).[58] Lesions can be unilateral or bilateral and typically present in postpubertal females but can sometimes affect males.[59] HNA occurs in 3 distinct entities: 1) extension of an epidermal nevus onto the areola or nipple; 2) in the setting of other dermatoses; and 3) nevoid HNA. Nevoid HNA is thought to be hormonally mediated because it may develop during pregnancy; it has also been reported in men who are receiving diethylstilbestrol.[60,61] HNA will not resolve without treatment. Topical treatment options include 6% salicylic acid, retinoid cream, calcipotriol, and urea cream.[60,62,63] Refractory cases can be managed with cryosurgery, radiofrequency ablation, CO_2 laser ablation, or surgical excision.[64-67]

Hidradenitis suppurativa

Hidradenitis suppurativa (HS) is a chronic inflammatory disease that affects apocrine gland–bearing skin.[68] It is characterized by the recurrent development of double comedones, subcutaneous nodules, abscesses, and sinus tracks that can eventually lead to scarring of affected areas (Fig 6). It occurs in approximately 1% of the population, with a 3:1 female to male predominance, and is exclusively a disease of postpubertal individuals with a peak incidence in patients who are in their 20s and 30s.[69] Axillary and groin disease is most common; breast involvement occurs in around 10% of patients.[70] While the exact pathogenesis of HS remains controversial, it is thought that follicular plugging results in rupture of the pilosebaceous unit, which triggers an aberrant inflammatory response in adjacent tissue that ultimately causes the disease's characteristic lesions. Disease severity is variable and is classified on the Hurley scale (Table VII).

Table VIII. Treatment options for hidradenitis suppurativa

Antibiotics	Topical clindamycin, topical erythromycin, oral clindamycin, oral dapsone, oral tetracycline, oral minocycline, and oral rifampin
Hormonal therapy	Combination oral contraceptives, cyproterone acetate, and 5-alfa reductase inhibitor
Immunosuppressive agents	Adalimumab, apremilast, cyclosporine, ustekinumab, and corticosteroids (systemic and intralesional)
Other treatment options	Oral zinc and topical and systemic retinoids
Procedural options	Wide local excision, CO_2 laser ablation, neurotoxin injection, radiotherapy, and radiofrequency treatment

Risk factors for severe disease include active tobacco use and obesity.[71] Severe disease strongly impacts quality of life and is associated with depression.[72] Despite this, treatment options remain limited and only variably successful. Table VIII lists medical and procedural treatment options for HS.[69,70,73-79] In patients with severe disease that is not controlled with aggressive medical management, localized wide excision of affected areas is highly effective and should be considered.[76] Surgical management of HS affecting the breast and nipple historically required mastectomy; the use of split-thickness skin grafting has now facilitated more cosmetically appealing surgical results.[76] The use of biologic medications for management of HS is a growing area of interest.[75,79] In 2016, adalimumab became the first treatment for moderate to severe HS approved by the US Food and Drug Administration after 2 multicenter phase III trials demonstrated that roughly half of studied individuals with moderate to severe HS had a ≥50% decrease in abscess and inflammatory nodule count with no new abscess or draining fistula counts after 12 weeks of treatment.[79]

Intertrigo

Intertrigo is characterized by the presence of macerated, erythematous patches involving body folds that occur from friction and moisture. The

Table IX. Superinfections of intertrigo, risk factors, and management

Microbe	Unique clinical features	Risk factors	Antimicrobials
Candida spp.	Satellite papules and pustules; potassium hydroxide examination reveals pseudohyphae	Recent systemic corticosteroid use; diabetes mellitus; personal history of vaginal candidiasis; personal history of HIV or other immunosuppressive disease	Topical nystatin, topical azoles, and oral fluconazole
Group A *Streptococcus*	Absence of satellite lesions; characteristic foul odor; can cause poststreptococcal glomerulonephritis; skin culture positive for streptococcal species	Pediatric population; affected contacts	Topical mupirocin, oral amoxicillin, oral cephalexin, and oral erythromycin (in patients who are allergic to penicillin)
Pseudomonas aeruginosa	Greenish-blue staining of bra or shirt; greenish-yellow hue on Wood's lamp examination; presence of follicular papules and pustules elsewhere	Hot tub exposure	Oral ciprofloxacin
Other bacterial infections (eg, *Staphylococcus aureus*, *Proteus mirabilis*, and *Proteus vulgaris*, etc)	Failure to respond to conservative management; microbe identified on skin culture		Organism-dependent; empiric therapy with topical mupirocin recommended

inframammary fold is commonly affected, as are the axillary, interdigital, and intergluteal areas.[80] Obesity, diabetes, large pendulous breasts, and HIV all predispose patients to the development of intertrigo.[80] Management involves barrier creams and absorbent products, such as gauze, that limit friction between opposing skin surfaces and that help with moisture control.[80-82] A short course of low-potency topical steroids or topical immunomodulators to provide symptomatic relief and hasten clearance may also be used.[82] In patients with recalcitrant disease, an alternative diagnosis, such as inverse psoriasis, should be considered.[83]

The management of intertrigo is often complicated by the development of a superinfection.[16,80] Both fungal and bacterial superinfections may occur (Table IX). Candida is the most common superinfection. Candida intertrigo is suggested by observation of satellite pustules and papules; a potassium hydroxide preparation can confirm the diagnosis (Fig 7).[80,82] Initial management includes topical nystatin or topical azole in combination with barrier creams.[80,82] Combination azole/corticosteroid products are efficacious but may be cost prohibitive and overused by the patient, resulting in atrophy.[81,83] Patients who do not respond to topical antifungals can be treated with oral fluconazole.[84]

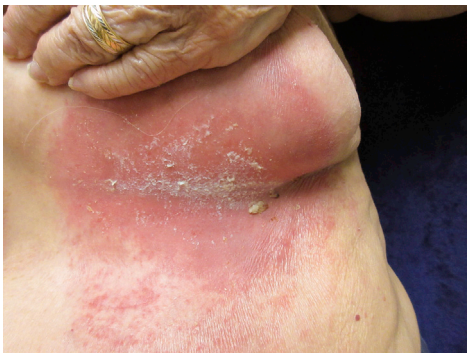

Fig 7. Candidiasis of the inframammary region. Note the characteristic satellite lesions.

Superficial thrombophlebitis of the breast

Superficial thrombophlebitis of the breast (STB), also known as Mondor disease, is a benign condition of the breast that is characterized by a painful, palpable cord on the anterior chest wall caused by thrombophlebitis of the lateral thoracic, superior epigastric, or thoracoepigastric veins.[84,85] STB occurs in all age groups, although adults are most commonly affected.[85] There is a female predominance of 3:1, and it is almost always unilateral. Approximately half of all cases have a clear inciting factor (Table X). Up to 12.7% of cases are associated

Table X. Inciting causes of superficial thrombophlebitis of the breast

Breast malignancy
Breast surgery (including obtaining a biopsy specimen from the breast)
Vigorous upper extremity exercise
Intravenous drug use
Breast trauma
Tight clothing
Breast infections
Hereditary thrombophilia (a common cause of bilateral disease)
Autoimmune disease

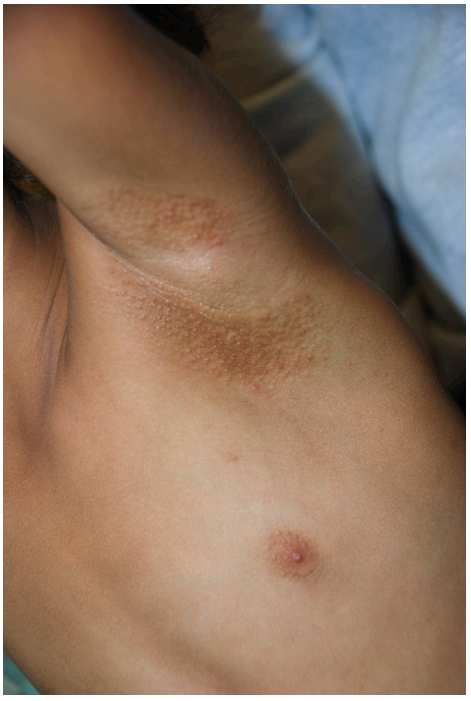

Fig 8. Fox-Fordyce disease involving the axilla and nipple. (Photography courtesy of Hanspaul Makkar, MD.)

with a concomitant breast malignancy, and therefore age-appropriate breast imaging is required.[86] Treatment is symptomatic, with warm compresses and nonsteroidal antiinflammatory drugs used for pain control.

Fox-Fordyce disease

Fox-Fordyce disease (FFD) is a rare disease characterized by the development of intensely pruritic papules on apocrine sweat gland–bearing skin caused by the obstruction of apocrine sweat glands (Fig 8).[87-89] The pathogenesis of FFD is multifactorial, although it is thought to have a hormonal component because it primarily occurs in postpubertal females and usually resolves during pregnancy and after menopause.[89] The condition flares during periods of increased apocrine sweating (eg, stress). Pruritus is extreme, and secondary hair loss caused by intense scratching is not unusual. Histopathologic examination may reveal dilation of the apocrine duct with spongiosis and surrounding perifollicular and perivascular inflammation.[90,91] Topical steroids remain the mainstay of management. Other treatment modalities are listed in Table XI.[92]

Table XI. Fox-Fordyce disease treatment options

Topical, systemic, and intralesional corticosteroids
Topical immunomodulators
Topical benzoyl peroxide
Second-generation antihistamines (symptomatic)
Topical and systemic retinoids
Combination oral contraceptives
Surgical excision

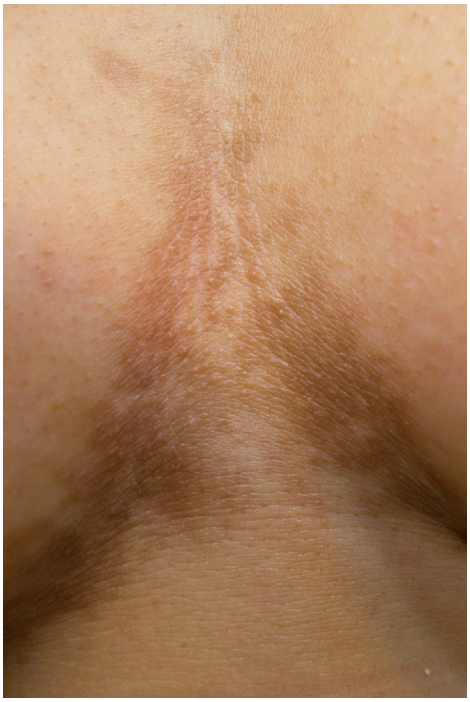

Fig 9. Confluent and reticulated papillomatosis involving the intramammary region. (Photograph courtesy of Justin Finch, MD.)

Confluent and reticulated papillomatosis

Confluent and reticulated papillomatosis (CARP) is a rare condition characterized by the development of hyperkeratotic, brown to hyperpigmented papules and plaques that typically demonstrate

Table XII. Revised diagnostic criteria for confluent and reticulated papillomatosis

Presence of scaly brown macules and patches with associated reticulation and papillomatosis
Involvement of the upper trunk, neck, and flexural areas
Negative fungal staining or inadequate response to antifungal therapy
Excellent response to antibiotics

central confluence and peripheral reticulation (Fig 9).[93] This condition affects the breast and inframammary area as well as the neck, trunk, abdomen, and other flexural areas.[93] It has a slight male predilection and typically begins in the postpubertal period.[93]

The pathogenesis of CARP is not fully understood; however, 2 prevailing theories exist. The first theory is that it is caused by infection with *Dietzia papillomatosis,* a Gram-positive actinomycete; the second theory is that it represents a disorder of keratinization with possible genetic and endocrine components.[94,95] Previously, this condition was thought to occur secondary to infection with *Malassezia furfur*; however, it is now suspected that cases attributed to *M furfur* were actually misdiagnosed tinea versicolor. The diagnosis of CARP can be difficult because it appears clinically similar to tinea versicolor, acanthosis nigricans, and Darier disease. To assist with diagnosis, study groups have proposed diagnostic criteria (Table XII).[96]

CARP is highly responsive to antibiotics, although it may recur in ≤33% of patients.[97] Minocycline or azithromycin are typically used during treatment, although other oral antibiotic medications have also been used, as has topical mupirocin.[97,98] Topical retinoids, oral retinoids, and topical vitamin D are occasionally used in antibiotic-resistant cases.

In conclusion, the breast and nipple form a unique functional unit. There are a variety of inflammatory and infectious dermatologic conditions that are unique to the breast or that require special considerations when occurring on the breast. Management of these conditions can also be complicated when they present during breastfeeding.

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