Granulomatous mastitis with erythema nodosum: A case report and mini-review of the literature

RONAK SAEED AHMED[1,2], ABDULWAHID M. SALIH[1,3], LANA R.A. PSHTIWAN[1], ASO S. MUHIALDEEN[1], KARZAN M. SALIH[1], MASTY K. AHMED[1], HARDI M. DHAHIR[1], SHKO H. HUSSEIN[1], HALKAWT OMER ALI[1] and FAHMI H. KAKAMAD[1,3,4]

[1]Department of Scientific Affairs, Smart Health Tower, Sulaymaniyah 46001, Iraq; [2]Department of Dermatology, Shahid Nabaz Dermatology Teaching Center for Treating Skin Diseases, Sulaymaniyah 46001, Iraq; [3]College of Medicine, University of Sulaimani, Sulaymaniyah 46001, Iraq; [4]Kscien Organization for Scientific Research (Middle East Office), Sulaymaniyah 46001, Iraq

Received April 30, 2025; Accepted September 10, 2025

DOI: 10.3892/wasj.2025.402

Abstract. Granulomatous mastitis (GM) is a rare chronic inflammatory disease of the breast, often mistaken for malignancy. The present study describes the case of a patient with GM associated with erythema nodosum (EN). A 37-year-old female patient presented with a 2-month history of a painful mass in the left breast, accompanied by bilateral skin lesions on the lower limbs. A physical examination revealed a tender breast mass (3 cm in size) and multiple erythematous subcutaneous nodules on the lower limbs. Laboratory tests revealed an elevated white blood cell count and hypochromic microcytic anemia. A breast ultrasonography demonstrated a hypoechoic mass in the left breast. Core needle biopsy revealed non-caseating granulomas consistent with GM. The final diagnosis was GM associated with EN. Treatment with prednisolone and colchicine led to the resolution of symptoms within 4 weeks. In addition, a brief literature review identified six studies reporting cases of GM with EN, all of which occurred in female patients aged 16 to 42 years. Of note, three cases had lesions in the right breast. Common presentations included breast pain, swelling and EN with systemic symptoms such as arthralgia. Histopathological analyses consistently showed granulomatous inflammation with negative cultures. Treatment primarily involved the use of corticosteroids, resulting in significant improvement or resolution. In general, an accurate diagnosis of GM is crucial to prevent unnecessary interventions. Management with corticosteroids can lead to favorable outcomes. Understanding systemic associations, such as EN, is vital for comprehensive patient care.

Correspondence to: Dr Fahmi H. Kakamad, College of Medicine, University of Sulaimani, Madam Mitterrand Street, HC8V+F66, Sulaymaniyah 46001, Iraq
E-mail: kakamad.fahmi@gmail.com

Key words: breast, granulomatous mastitis, erythema nodosum, histopathology, skin lesions

Introduction

Granulomatous mastitis (GM) is a rare, benign, chronic inflammatory breast disease (1). It is characterized histologically by lymphocytes, plasma cells, epithelioid histiocytes, and multinucleated giant cells, with the formation of non-caseating granulomas and abscesses (2,3). Its incidence is estimated at 2.4 cases per 100,000 females in the USA. GM is most commonly observed in premenopausal women during or after pregnancy, though it can also occur in nulliparous women. Reported cases span a wide age range, from as young as 11 years to patients in their 60s, 70s and even 80s (2,4,5).

GM is generally divided into two etiological types: Idiopathic and secondary. Idiopathic GM has no clearly identified cause, although an autoimmune mechanism is strongly suggested, given its favorable response to corticosteroids and its links with other autoimmune conditions. Secondary GM, on the other hand, arises from specific underlying factors, including infectious agents, such as *Mycobacterium tuberculosis*, fungi, parasites, or bacteria, as well as systemic illnesses such as sarcoidosis and granulomatosis with polyangiitis (6,7).

The clinical diagnosis of GM requires careful evaluation, as it can be easily mistaken for other conditions, such as non-puerperal mastitis, breast abscess, or, more commonly, carcinoma (8). GM may also be associated with systemic manifestations, including erythema nodosum (EN), which is the most common form of panniculitis, an inflammatory disorder of the subcutaneous fat characterized by erythematous, tender nodules that typically appear on the anterior aspect of the lower extremities. It has been linked to autoimmune conditions, such as sarcoidosis and inflammatory bowel disease (9,10). However, the coexistence of GM and EN is exceedingly rare, with only limited documentation in the literature regarding clinical features and therapeutic approaches (11). Given this rarity, the present case report aimed to add to the available evidence by describing a patient with concurrent GM and EN. The present case report follows the CaReL guidelines, and all cited references were reviewed for eligibility and relevance (12,13).

Case report

Patient information. A 37-year-old female patient presented to Smart Health Tower (Sulaymaniyah, Iraq) with a 2-month history of a painful left breast mass, accompanied by painful bilateral skin lesions on the lower limbs. She was a non-smoker with no prior medical or surgical history and no significant family medical history. The patient had 6 children, with a cumulative lactational history of ~12 years

Clinical findings. A physical examination revealed a tender mass in the left breast, accompanied by multiple tender, erythematous subcutaneous nodules on the lower legs, thighs, and, to a lesser extent, the buttocks (Fig. 1).

Diagnostic approach. Laboratory investigations revealed leukocytosis and hypochromic microcytic anemia. The anti-streptolysin O (ASO) titer and chest X-ray findings were within normal limits, and the interferon-gamma release assay (IGRA) result was negative (Table I). A breast ultrasonography (US) was performed, followed by a core biopsy to establish the diagnosis. A histopathological examination (HPE) was performed by the laboratory, as follows: The sections (5-μm-thick) were paraffin-embedded and fixed with 10% neutral-buffered formalin at room temperature for 24 h. They were then stained with hematoxylin and eosin (H&E; Bio Optica Co.) for 1-2 min at room temperature. The sections were then examined under a light microscope (Leica Microsystems GmbH). The HPE revealed non-caseating granulomas with epithelioid cells and multinucleated giant cells, consistent with GM. Based on the clinical and histological correlation, GM was identified as the underlying cause of EN (Fig. 2).

Therapeutic interventions. The patient was commenced on prednisolone 30 mg orally once daily and colchicine 0.5 mg twice daily, resulting in the complete resolution of EN within 4 weeks.

Follow-up. At the 7-month follow-up, the patient exhibited a complete clinical improvement, with full resolution of the EN lesions.

Discussion

In 1972, Kessler and Wolloch (14) described the first case of GM, emphasizing that its clinical features can closely resemble those of breast cancer. Such features include palpable masses, breast pain, swelling, skin alterations, abscess formation, ulceration, sinus tract or fistula development in advanced or chronic cases, and, at times, accompanying axillary lymphadenopathy (2,14). GM is considered to develop following injury to the breast ductal epithelium. Such damage permits luminal secretions to leak into the surrounding lobular connective tissue, initiating a localized inflammatory reaction. This process attracts lymphocytes and macrophages to the site, ultimately leading to a granulomatous inflammatory response (6).

The exact etiology of GM remains unclear; however, multiple mechanisms have been proposed, suggesting a multifactorial origin. Autoimmunity is considered the most accepted hypothesis, supported by the favorable response to corticosteroids and other immunosuppressive therapies, as well as the frequent association with systemic manifestations such as EN and arthritis (15). Hormonal influences appear significant, as GM occurs predominantly in women of reproductive age, particularly during the postpartum period, and has been linked to factors, such as pregnancy, breastfeeding, oral contraceptive use and hyperprolactinemia. A potential genetic predisposition has also been suggested, with certain human leukocyte antigen (HLA) types, including HLA-A*10, HLA-A*2403, HLA-B*18 and HLA-DR*17, found more commonly in affected individuals (15). Environmental and infectious triggers, including *Corynebacterium* species and other microbiological agents, have also been implicated. Overall, GM appears to result from a complex interaction of autoimmune, hormonal, genetic and environmental factors rather than a single underlying cause (15).

EN is a frequently encountered condition in rheumatology, characterized as an inflammatory process of the subcutaneous tissue. It typically presents with the acute onset of tender, erythematous nodules or plaques ranging from 1 to 6 cm in diameter (16). The lesions most often appear in a bilateral and symmetrical distribution, predominantly involving the pretibial regions of the lower extremities, though they may also extend to the ankles, thighs and forearms (17). In line with these observations, both the present case report and the study by Alungal *et al* (18) documented painful cutaneous lesions confined to the lower limbs.

In the present study, a literature review was also conducted to identify studies reporting GM associated with EN. The search was performed using Google Scholar with the key words 'granulomatous mastitis' and 'erythema nodosum', yielding six relevant reports (Table II) (1,16-20). The association between GM and EN was first described in 1987 (19). The documented patients ranged in age from 16 to 42 years, all of whom were female. Among the 6 cases, 3 cases involved lesions in the right breast.

Adams *et al* (19) described the case of a 24-year-old postpartum female patient presenting with a painful left breast mass, florid EN on both legs and periarthritis. The initial clinical impression suggested carcinoma due to the breast mass and nipple retraction; however, the prominent cutaneous lesions and joint involvement indicated an inflammatory rather than malignant etiology (19). Similarly, Salesi *et al* (1) reported the case of a 23-year-old pregnant female who developed painful right breast swelling, arthritis and EN on both tibiae. Their case highlighted that systemic manifestations, such as arthritis and panniculitis, may precede or occur concurrently with breast symptoms, supporting a potential autoimmune or hypersensitivity component in idiopathic GM (1).

Other reports support this pattern. Alungal *et al* (18) described the case of a 25-year-old female patient presenting with a breast mass, polyarthritis and EN, with nodules distributed on the shins and forearms. Bes *et al* (16) documented the cases of 2 female patients, aged 27 and 34 years, both of whom developed breast masses clinically suggestive of carcinoma, followed by EN on the lower legs. In these cases, EN developed either concurrently with or shortly after the breast lesion (16), as was also observed in the present case. Laor *et al* (20) extended the phenotype to a 16-year-old adolescent who presented with

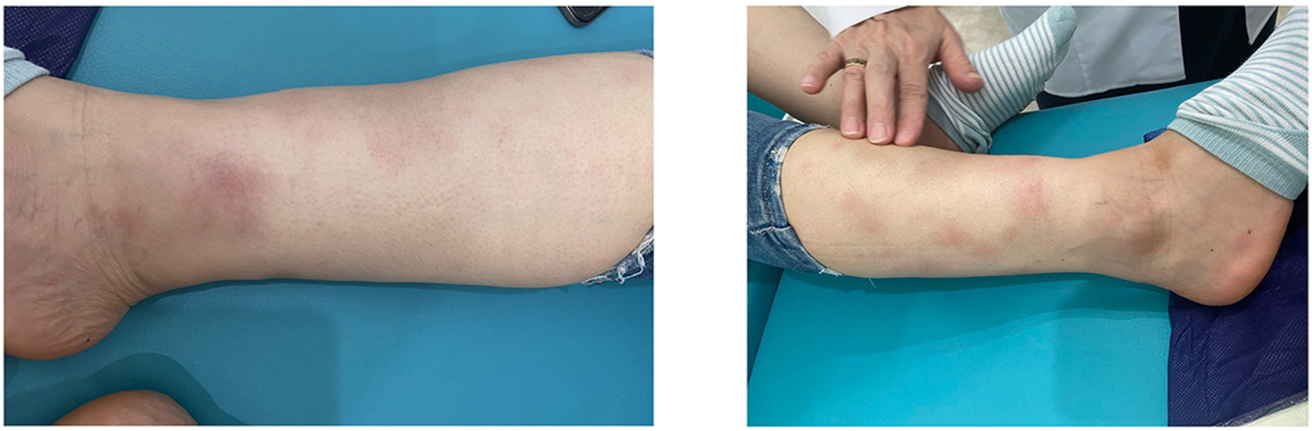

Figure 1. Multiple tender subcutaneous nodules on both legs. (Left panel) Anterior view of the right leg indicating several erythematous, ill-defined subcutaneous nodules with overlying erythema. (Right panel) Closer view highlighting confluent nodules on the anteromedial surface with violaceous discoloration.

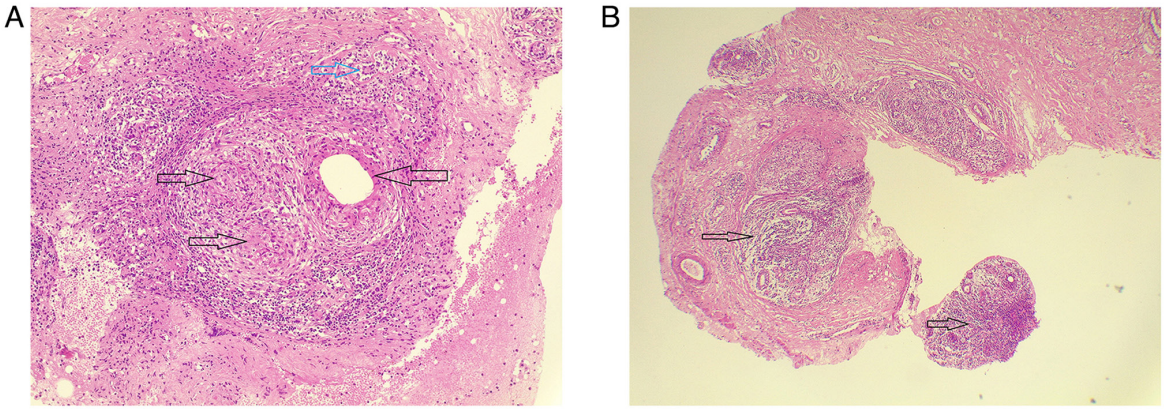

Figure 2. (A) Section of tissue core showing perilobular mixed inflammatory cell infiltration dark arrow). Hematoxylin and eosin staining; magnification, x4. (B) Another area demonstrating well-formed epithelioid granulomas (black arrows) with multinucleated giant cells (blue arrow). Hematoxylin and eosin staining; magnification, x10.

breast swelling, polyarthritis, and EN on the shins and thighs, highlighting that the same constellation can occur even in younger age groups. Recently, Pesce *et al* (17) reported the case of a 42-year-old female patient whose presentation was initially indistinguishable from breast cancer. However, the incidental finding of bilateral EN on her legs shifted diagnostic suspicion toward idiopathic GM (17).

The diagnosis of GM is often challenging due to imaging modalities, such as US, mammography and magnetic resonance imaging, which typically yield non-specific findings, usually demonstrating only a mass, parenchymal distortion, or multifocal lesions. Consequently, HPE remains the definitive diagnostic method, and the biopsy of any suspicious area is essential. Characteristic features of GM include chronic granulomatous inflammation with giant cells, leukocytes, epithelioid cells, and macrophages (21).

In the case presented herein, the diagnosis was established through a combination of histopathology and systematic exclusion of infectious and systemic causes, consistent with approaches reported in the literature. Clinical suspicion was raised by a unilateral painful breast mass accompanied by EN. A laboratory evaluation revealed leukocytosis and anemia, whereas ASO titers, chest radiography and IGRA were negative. The US identified a mass, prompting a core biopsy. Histopathological analysis demonstrated non-caseating granulomas composed of epithelioid histiocytes and multinucleated giant cells, without evidence of caseous necrosis or microorganisms, confirming idiopathic GM as the underlying process. The diagnosis was further supported by the resolution of EN following immunomodulatory therapy.

In the case described in the study by Alungal *et al* (18), fine-needle aspiration cytology demonstrated epithelioid cells, multinucleated giant cells and non-caseating granulomas. Specific stains for bacteria, fungi and acid-fast bacilli were negative, and autoimmune serological analyses did not yield any notable findings, supporting a diagnosis of idiopathic GM (18). Bes *et al* (16) emphasized the pitfalls of misdiagnosis: Of note, 1 patient was initially treated as having tuberculosis due to a misinterpreted histological analysis exhibiting necrosis. Upon reevaluation, the cultures were negative, and the presence of EN guided the recognition of idiopathic GM (16). Laor *et al* (20) performed a broader pediatric workup, including autoimmune serologies and ophthalmological examination for sarcoidosis, all of which yielded negative results. A histological analysis confirmed lobulocentric granulomas with microabscesses, establishing

Table I. Laboratory test results with reference ranges.

Test name	Result	Unit	Normal range
Complete blood count			
White blood cell count	12.5	10^9/l	4-11
Lymphocytes	2.0	10^9/l	1-3.5
Lymphocyte percentage	16.3	%	15-45
Monocytes	1.7	10^9/l	0.2-1.5
Monocyte percentage	14.1	%	2-15
Granulocytes	8.8	10^9/l	2-7.5
Granulocyte percentage	69.6	%	40-80
Red blood cell count	4.34	10^{12}/l	3.8-5
Hemoglobin	11.0	g/dl	11.5-15.5
Hematocrit	34.3	%	36-46
Mean corpuscular volume	79.2	fl	80-100
Mean corpuscular hemoglobin	25.5	pg	27-32
Mean corpuscular hemoglobin concentration	32.2	g/dl	32-36
Red cell distribution width	50.8	fl	30-150
Red cell distribution width percentage	11.6	%	11-99.9
Platelet count	413	10^9/l	150-400
Mean platelet volume	8.5	fL	7-11
Platelet distribution width	11.9	fL	0.1-99.9
Procalcitonin	0.35	%	0.01-9.99
Ferritin, serum	33.6	Ng/ml	13-150
IGRAs-QuantiFERONE(R)- TB Gold Plus			
Nil	0.04	IU/ml	
TB1 minus Nil	0.0	IU/ml	
TB2 minus Nil	0.0	IU/ml	
Mitogen minus Nil	8.91	IU/ml	
Interpretation result	*Mycobacterium tuberculosis* infection NOT likely		
Anti-streptolysin O	56	IU/ml	0-200

IGRAs, Interferon-Gamma Release Assays; TB, tuberculosis; g/dl, grams per deciliter; fl, femtoliter; pg, picogram; ng/ml, nanograms per milliliter; IU/ml, international units per milliliter.

idiopathic GM in an adolescent (20). Pesce *et al* (17) highlighted the cancer-mimicking nature of idiopathic GM on imaging, ultimately reaching the diagnosis through core biopsy demonstrating lobulocentric granulomatous inflammation, after cultures and stains excluded infection.

The management of GM remains a subject of debate, perhaps attributed to its infrequent occurrence and the limited comprehension of its pathophysiology, as well as its prevalence among economically disadvantaged patients. Several therapy approaches have been documented, although their effectiveness has varied. The alternatives include careful waiting, surgical intervention, systemic corticosteroids and chemotherapeutic medicines. Corticosteroid administration has emerged as the most consistently effective intervention across published series. Alungal *et al* (18) reported the rapid remission of both breast and systemic manifestations following glucocorticoid therapy, while Bes *et al* (16) described the cases of 2 female patients with idiopathic GM-associated EN who exhibited a marked improvement on corticosteroids after the misdiagnosis of tuberculosis was excluded. By contrast, Adams *et al* (19) observed spontaneous regression with symptomatic management, and Pesce *et al* (17) described the case of a patient managed conservatively without corticosteroids in whom EN resolved spontaneously, suggesting a variable natural course. In the case in the present study, oral prednisolone combined with colchicine resulted in the complete resolution of both cutaneous and breast manifestations. The addition of colchicine, although less frequently reported in the literature, may be particularly rational given its efficacy in neutrophilic dermatoses, such as EN, as demonstrated by Salesi *et al* (1), who employed colchicine alongside steroids and azathioprine with favorable outcomes.

A limitation of the present case report is the unavailability of breast US images. Although the US was performed and its findings described, the absence of imaging documentation may limit the clarity and illustrative value of the case.

In conclusion, the accurate diagnosis of GM is essential to prevent unnecessary interventions. Management with corticosteroids can lead to favorable outcomes. Understanding

Table II. Reported cases of GM with erythema nodosum identified in the literature.

First author, year of publication	Location of skin lesion	No. of cases	Age (years)	Sex	Presentation	Previous history	Physical examination	Laboratory tests	Imaging findings	Histopathology findings	Management	Follow-up	(Refs.)
Salesi, 2011	Right breast, anterior tibia	1	23	F	Pain and swelling in the right breast, generalized body pain, arthralgia in hands, elbows, shoulders, knees, and ankles, arthritis, swelling in both knees and ankles, malaise, painful red nodules in the anterior tibia, nodules in the right breast with purulent discharge	NA	Right breast: pain, swelling, nodules with purulent discharge; anterior tibia: painful red nodules	WBC=7,400 (Neut=68%, Lymph=25%), Hb=11.8, PLT=431,000, ESR=85, CRP ++, RF -, ANA -, dsDNA -, ANCA -, Ca=8.6, P=3.8, Alk-P=328, Alb=3.9, FBS=102, Wright -, 2ME -, ACE=NL, tuberculin skin test=negative	Breast mammography: subcutaneous fat and fibroglandular tissue edema, two images of collections with dense fluid; normal chest X-ray	Multiple granulomas with acute inflammatory cells, lympho-plasma cells, histiocytes, epithelioid cells, noncaseating granuloma, negative for acid-fast bacilli and fungal infection	Prednisolone 15 mg, colchicine 1 mg, azathioprine 100 mg daily	All lesions disappeared 15 days after the beginning of the drugs	(1)
Bes, 2010	Right leg; Both legs	2	34, 27	F	Painful lump in left breast; Lump in left breast and painful red EN lesions in both legs	No history of TB, diabetes mellitus, or family history of breast pathology; No TB infection or breast cancer in family history (Case 2)	Case 1: Mass (5x5x4 cm) with induration in upper left breast, palpable left axillary nodes; Case 2: 10-cm diameter, sensitive hard mass in the upper outer quadrant of the left breast, axillary lymphadenomegaly	Case 1: Normal chest X-ray, negative Mantoux test; Case 2: Normal chest X-ray, negative Mantoux test, CRP 32, ESR 45 mm/h	Case 1: N/A; Case 2: Bilateral breast MRI: collections in the upper outer quadrant of the left breast, a multiloculated abscess, diffuse contrast involvement, increased blood flow, six lymph nodes in the left axilla, ductuli with hemorrhagic contents, pathologic contrast-involvement in the periductal fibroglandulary tissue	Case 1: Granulomas with Langhans-type giant cells, neutrophils, small lymphocytes, epithelioid cells; negative bacterial, fungal, and mycobacterium cultures; Case 2: Microabscess foci with polymorpho-nucleated neutrophils and epithelioid histiocytes, negative for TB	Oral Aprednisolone 32 mg/day (Case 1); Methylpredn-isolone 32 mg/day, tapered by 4 mg weekly (Case 2)	Right leg (Case 1); Both legs (Case 2)	(16)

Table II. Continued.

First author, year of publication	Location of skin lesion	No. of cases	Age (years)	Sex	Presentation	Previous history	Physical examination	Laboratory tests	Imaging findings	Histopathology findings	Management	Follow-up	(Refs.)
Pesce, 2023	Bilateral lower legs, below the knees, on the anterior and lateral aspects of the lower legs, and perimal-leolar areas	1	42	F	Left breast pain and induration, bilateral erythematous/ purplish-brown skin lesions on lower legs, slightly painful, nonpruritic nodules	Left colon surgery in early childhood due to an intestinal malformation	Left breast: firm mass with ill-defined edges, 4-cm diameter in the upper inner quadrant; bilateral lower legs: erythematous/ purplish-brown lesions, mildly tender nodules between 1 and 6 cm, warm to the touch	Positive C-reactive protein 106 mg/l; liver function tests normal; anti-streptolysin O, blood cultures, and urine cultures negative; purified protein derivative skin test negative	Mammography: new developing asymmetry in the upper inner quadrant of the left breast, no skin thickening; breast ultrasound: hypoechoic, no mass lesion with Doppler vascularization, surrounding adipose tissue with increased echogenicity, preserved skin around the lesion	Breast parenchyma with marked lymphocytic lobulitis, epithelioid histiocytes with pseudonodular appearance, intense lympho-plasmacytic inflammatory infiltrate with polymorpho-nuclear leukocytes; PAS and Ziehl-Neelsen staining negative for pathogens	Conservative management with active surveillance	One month after the initial visit, erythema nodosum resolved spontaneously, and granulo-matous mastitis remained stable	(17)
Alungal, 2016	Both legs and the forearm	1	25	F	Pain and swelling in the left breast with yellowish discharge from nipple, bilateral pain, swelling, and redness of multiple joints, low-grade fever, painful red nodules on limbs and forearm	No specific history reported	Tender axillary lymphadenopathy, erythematous palpable discrete nodules over both limbs and forearm, a 5x4 cm tender and firm swelling in the upper inner quadrant of the left breast	Hemoglobin 10.5 gm%, total leukocyte counts 12,700 cells/mm^3, with 79% neutrophils, platelet count 3.2 Lakhs/mm^3, ESR 64 mm/1st h, normal renal and liver function tests, normal urinalysis, negative blood culture, normal chest radiography	Follow-up ultrasonogram showed a significant decrease in the size of the breast lump	FNAC showed a collection of epithelioid cells, multinucleated giant cells, and non-caseous granuloma; negative gram and acid-fast bacilli stainings, negative fungal, TB, and atypical mycobacteria cultures, negative tuberculin skin test, negative anti-citrullinated cyclic peptide, antinuclear	Oral corticosteroids	Symptom-free after one month, with a significant decrease in the size of the breast lump	(18)

Table II. Continued.

First author, year of publication	Location of skin lesion	No. of cases	Age (years)	Sex	Presentation	Previous history	Physical examination	Laboratory tests	Imaging findings	Histopathology findings	Management	Follow-up	(Refs.)
										antibody, P and C antineutrophil cytoplasmic antibodies, normal serum angiotensin converting enzyme level, normal serum Ca			
Adams, 1987	Both shins	1	24	F	Painful lump in left breast, tender red lumps on both shins, arthralgia affecting hands, knees, and ankles; developed 4 months postpartum	No nipple discharge, no use of contraceptive pill or other medication	Pyrexia (38˚C), hard, tender mass (12x9 cm) in the left breast with indrawing of nipple, erythema nodosum on both legs, periarthritis in both ankles, no lymphadenopathy	Normal hemoglobin and white cell count, raised ESR (104 mm/h) and CRP (374 mg/ml), normal biochemical profile (including Ca and liver function tests), negative routine cultures of sputum, urine, and breast tissue; negative cultures of breast tissue for mycobacterium by guinea-pig inoculation, anti-streptolysin O titre <200 Todd units, normal chest X-ray, no evidence of immune dysfunction, normal serum immunoglobulins, negative tests for	Not specified	Histology showed areas of inflammation predominantly related to breast lobules, granulomata, and foci of microabscess formation, characteristic of idiopathic granulomatous mastitis; four acid-fast bacilli were seen on Ziehl-Neelson staining	Indomethacin, rifampicin, and isoniazid for 6 weeks until negative culture results; rapid resolution of fever, erythema nodosum, and arthritis, sterile discharge from the wound persisted for 6 weeks	Gradual decrease in size of the lump with almost complete resolution at 5 months	(19)

Table II. Continued.

First author, year of publication	Location of skin lesion	No. of cases	Age (years)	Sex	Presentation	Previous history	Physical examination	Laboratory tests	Imaging findings	Histopathology findings	Management	Follow-up	(Refs.)
								autoantibodies, circulating immune complexes, and activated lymphocytes, negative tuberculin skin test, negative Kveim biopsy					
Laor, 2022	Bilateral shins and lower thighs	1	16	F	Right-sided painful breast swelling, polyarthritis, erythema nodosum on bilateral shins and lower thighs	No trauma, fever, weight loss, night sweats, cough, shortness of breath, irregular bowel patterns, or changes in stool pattern; no recent vaccination, travel, exposure to animals, or consumption of exotic foods	Right breast with firm, poorly circumscribed area of induration (11 cm diameter), erythematous tender patch with central fluctuation above areola, no abnormalities in nipple-areola complex; active arthritis of bilateral knees and ankles, EN on lower extremities	Hemoglobin 11 g/dl, hematocrit 34.3%, WBC $10.6x10^3/\mu$lL, polymorpho-nuclear cells 77%, lympho-cytes 13%, monocytes 9%, eosinophils 1%, platelets $291x10^3/\mu$l, elevated ESR (37 mm/h)	Ultrasound: large complex area (3.3 cm thickness) with internal vascularity; negative chest roentgenogram for mediastinal lymphadeno-pathy, cardiac, or pulmonary abnormalities	Histopathology: noncaseating granuloma within breast lobules with neutrophils and microabscess formation; cultures negative for bacterial, fungal, and AFB organisms	Wide local excision, trimethoprim-sulfametho-xazole, naproxen, prednisone (60 mg daily) with taper over 12 weeks	Steady and complete resolution of all symptoms; near return to baseline prior to discharge; sustained improvement with steroid taper	(20)

F, female; WBC, white blood cell count; Hb, hemoglobin; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; Neut, neutrophils; Lymph, lymphocytes; PLT, platelets; RF, rheumatoid factor; ANA, antinuclear antibody; dsDNA, double-stranded DNA; ANCA, anti-neutrophil cytoplasmic antibodies; Ca, calcium; P, phosphorus; Alk-P, alkaline phosphatase; Alb, albumin; FBS, fasting blood sugar; 2ME, 2-mercaptoethanol; ACE, angiotensin-converting enzyme; EN, erythema nodosum; MRI, magnetic resonance imaging; FNAC, fine-needle aspiration cytology; PAS, periodic acid–schiff; TB, tuberculosis; AFB, acid-fast bacilli.

systemic associations, such as EN, is vital for comprehensive patient care.

Acknowledgements

Not applicable.

Funding

No funding was received.

Availability of data and materials

The data generated in the present study may be requested from the corresponding author.

Authors' contributions

RSA and AMS were major contributors to the conception of the study, as well as to the literature search for related studies. KMS, MKA and FHK contributed to the clinical management of the patient, assisted in data acquisition and interpretation, and participated in the literature review and manuscript preparation. ASM, HMD, SHH and HOA contributed to the conception and design of the study, the literature review, the critical revision of the manuscript, and the processing of the table. LRAP was the radiologist who performed the assessment of the case. AMS, ASM, and RSA assisted in diagnosing the patient, contributed to the management of the patient, and participated in manuscript review. FHK and KMS confirm the authenticity of all the raw data. All authors have read and approved the final manuscript.

Ethics approval and consent to participate

Verbal consent was initially obtained from the patient, followed by written informed consent at a later date for participation in the present case report.

Patient consent for publication

Verbal consent was initially obtained from the patient, followed by written informed consent at a later date for the publcatoin of the present case report and any accompanying images.

Competing interests

The authors declare that they have no competing interests.

References

1. Salesi M, Karimifar M, Salimi F and Mahzouni P: A case of granulomatous mastitis with erythema nodosum and arthritis. Rheumatol Int 31: 1093-1095, 2011.
2. Salih AM, Pshtiwan LR, Abdullah AM, Dhahir HM, Ali HO, Muhialdeen AS, Hussein BO, Hassan SH and Kakamad FH: Granulomatous mastitis masking ductal carcinoma *in situ*: A case report with literature review. Biomed Rep 20: 1-5, 2023.
3. Grover H, Grover SB, Goyal P, Hegde R, Gupta S, Malhotra S, Li S and Gupta N: Clinical and imaging features of idiopathic granulomatous mastitis-The diagnostic challenges and a brief review. Clin Imaging 69: 126-132, 2021.
4. Parperis K, Achilleos S, Costi E and Vardas M: Granulomatous mastitis, erythema nodosum and arthritis syndrome: Case-based review. Rheumatol Int 41: 1175-1181, 2021.
5. Korkut E, Akcay MN, Karadeniz E, Subasi ID and Gursan N: Granulomatous mastitis: A ten-year experience at a university hospital. Eurasian J Med 47: 165-173, 2015.
6. Esmaeil NK, Salih AM, Hammood ZD, Pshtiwan LR, Abdullah AM, Kakamad FH, Abdullah HO, Ahmed GS, Abdalla BA and Salih RQ: Clinical, microbiological, immunological and hormonal profiles of patients with granulomatous mastitis. Biomed Rep 18: 1-8, 2023.
7. Wang X, He X, Liu J, Zhang H, Wan H, Luo J and Yang J: Immune pathogenesis of idiopathic granulomatous mastitis: From etiology toward therapeutic approaches. Front Immunol 15: 1295759, 2024.
8. Fletcher A, Magrath IM, Riddell RH and Talbot IC: Granulomatous mastitis: A report of seven cases. J Clin Pathol 35: 941-945, 1982.
9. Cribier B, Caille A, Heid E and Grosshans E: Erythema nodosum and associated diseases. A study of 129 cases. Int J Dermatol 37: 667-672, 1998.
10. Olfatbakhsh A, Beheshtian T and Djavid GE: Granulomatous mastitis, erythema nodosum, and oligoarthritis in a pregnant woman. Breast J 14: 588-590, 2008.
11. Moreno-Vílchez C, Llobera-Ris C, Penin RM, Pla MJ, Mitjavila F and Marcoval J: Granulomatous mastitis associated with erythema nodosum: A case series of 42 patients. Med Clín 158: 229-232, 2022 (In English, Spanish).
12. Prasad S, Nassar M, Azzam AY, José FG, Jamee M, Sliman RKA, Evola G, Mustafa AM, Abdullah HO, Abdalla BA, *et al*: CaReL guidelines: A consensus-based guidelineson case reports and literature review (CaReL). Barw Med J 2: 13-19, 2024.
13. Abdullah HO, Abdalla BA, Kakamad FH, Ahmed JO, Baba HO, Hassan MN, Bapir R, Rahim HM, Omar DA, Kakamad SH, *et al*: Predatory publishing lists: A review on the ongoing battle against fraudulent actions. Barw Med J 2: 26-30, 2024.
14. Kessler E and Wolloch Y: Granulomatous mastitis: A lesion clinically simulating carcinoma. Am J Clin Pathol 58: 642-646, 1972.
15. Shorbagi AI, Alwardat D, Parlakgumus A, Pekoz BC, Taş ZA and Al Ojaimi M: An update on granulomatous lobular mastitis: It is time to tell the untold. J Clin Pract Res 45: 115-122, 2023.
16. Bes C, Soy M, Vardi S, Sengul N and Yilmaz F: Erythema nodosum associated with granulomatous mastitis: report of two cases. Rheumatol Int 30: 1523-1525, 2010.
17. Pesce KA, Peralta KL, Chico MJ, Wernicke A and Binder F: Granulomatous mastitis with erythema nodosum: A breast cancer mimicking entity. Radiol Case Rep 18: 3809-3814, 2023.
18. Alungal J, Abdulla MC and Narayan R: Idiopathic granulomatous mastitis with erythema nodosum and polyarthritis. Reumatismo 68: 97-99, 2016.
19. Adams DH, Hubscher SG and Scott DG: Granulomatous mastitis-a rare cause of erythema nodosum. Postgrad Med J 63: 581-582, 1987.
20. Laor L, Ganguli S and Fakioglu E: Granulomatous mastitis, erythema nodosum, and polyarthritis: A case report. J Med Case Rep 16: 146, 2022.
21. Evans J, Sisk L, Chi K, Brown S and To H: Concurrent granulomatous mastitis and invasive ductal cancer in contralateral breasts-a case report and review. J Surg Case Rep 7: rjab519, 2021.