



# Imaging Findings of Nodular Fasciitis in Breast including Artificial Intelligence Mammography and Shear Wave Elastography: A Case Report


유방의 결절성 근막염의 인공지능 유방촬영술과 탄성초음파를 포함한 영상 소견: 증례 보고

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Nodular fasciitis is a benign fibroblastic proliferation rarely reported in the breast. We report the case of a 55-year-old woman who presented with imaging findings that resembled a malignancy. Mammography revealed an isodense nodule with partially indistinct margin in the right breast, showing the abnormality score 75% on artificial intelligence. Ultrasonography revealed an oval hypoechoic nodule with microlobulated margin, echogenic halo, increased blood flow, and soft elasticity. After core needle biopsy and excision, nodular fasciitis was diagnosed. Although nodular fasciitis of the breast is rare, it may mimic malignancy; therefore, it should be considered as a differential diagnosis to prevent unnecessary intervention.

**Index terms** Fasciitis; Ultrasonography; Elastography; Mammography; Artificial Intelligence

## INTRODUCTION

Nodular fasciitis (NF) is a benign fibroblastic proliferation that is often located in deep sub-

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cutaneous area or fascia (1). The most common locations for NF are upper extremities, trunk, head and neck and lower extremities. It has been reported to occur mainly in young and middle-aged adults (2).

However, it has rarely been reported in the breast. NF can mimic breast cancer clinically and radiologically (3-7). Here, we report the image findings including mammography with artificial intelligence (AI) and breast ultrasonography (US) with shear wave elastography (SWE) of NF in the breast.

## CASE REPORT

A 55-year-old woman visited our hospital for mammography and US for a regular follow-up of breast nodules. She complained of intermittent tingling pain in the right breast. On physical examination, there was no nipple discharge, palpable lesions or axillary lymphadenopathy. She had no history of breast cancer or trauma except for a diagnosing of fibrocystic disease in the left breast by surgery 14 years ago. She had a family history of breast cancer that included her sister.

Mammography showed a small isodense nodule with indistinct margin in the right upper posterior breast, only on the mediolateral oblique (MLO) view, compared to that performed 5 years ago. It was detected using an artificial intelligence-based computer-assisted diagnosis (AI-CAD) with an abnormality score of 75% (Fig. 1A). US revealed a 0.5 cm sized oval hypoechoic nodule with microlobulated margin, located 8 cm from nipple at the 9 o'clock position of the right breast, which was newly developed compared with US 2 years ago. No acoustic shadowing or associated calcification was observed. Doppler study showed increased blood flow in the lesion, and SWE revealed soft elasticity of 51.7 kilopascal and elasticity ratio of 4.33 (Fig. 1B). When the lesion was marked on the US and an additional MLO view was performed, it was correlated with nodule on mammography (Fig. 1A). Based on these findings, the lesion was assessed as low suspicious lesion, Breast Imaging Reporting and Data System (BI-RADS) category 4A.

US-guided core needle biopsy was performed using a 14-gauge needle. Histopathologic examination showed uniform, immature-appearing fibroblasts and myofibroblasts in a haphazard arrangement, along with scattered lymphocytes, and extravasated red blood cells (Fig. 1C). There were a few mitotic figures but no significant cytologic atypia. These findings were consistent with NF. Excision was then performed for confirmative diagnosis at the request of the patient, and the histopathologic result was again compatible with a diagnosis of NF. At the most recent follow-up, mammography and breast US performed 12 months after the surgery showed no evidence of recurrence or residual lesion at the surgical site.

This study was approved by the Institutional Review Board and the requirement for informed consent was waived (IRB No. 2022-08-009).

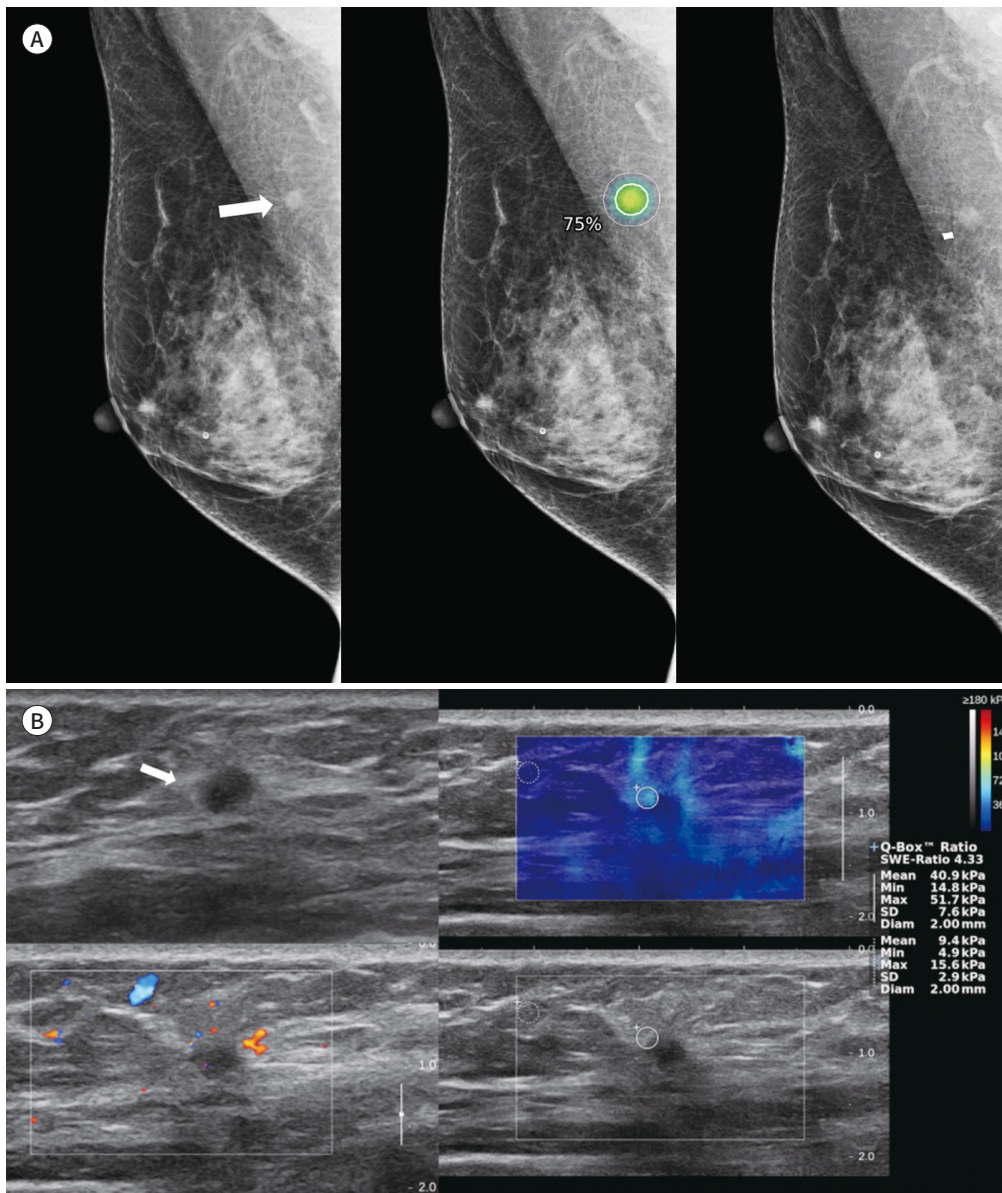
## DISCUSSION

Breast NF is rare and it was reported that 3.3% of NF occurred in the breast (2). The pathogenesis of NF remains unknown, but some reports agree that it is due to a reactive fibroblas-

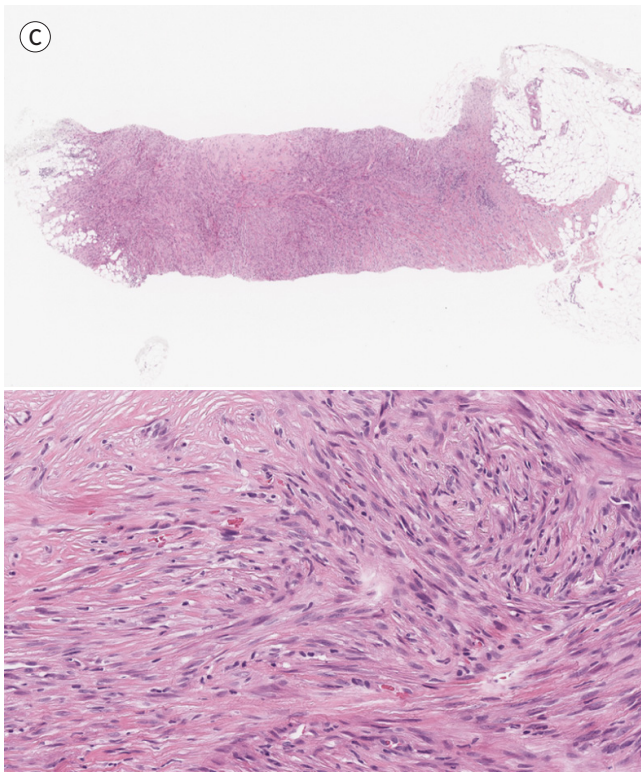
**Fig. 1.** Breast nodular fasciitis in a 55-year-old woman.

**A.** The mediolateral oblique view of mammography shows an isodense nodule with indistinct margin (arrow) in the right upper posterior breast (left image). Artificial intelligence-based computer-assisted diagnosis highlights concordant area and provides abnormality score of 75% (middle image). The lesion is concordant with the nodule observed on ultrasonography (with a marker) (right image).

**B.** Ultrasonography reveals a 0.5 cm sized oval hypoechoic nodule with microlobulated margin and echogenic halo (arrow) in the right breast (left upper image). Doppler imaging shows increased vascularity in the lesion (left lower image). Shear wave elastography reveals a soft elasticity with a maximum elasticity value of 51.7 kilopascal and elasticity ratio of 4.33 (right image).



tic proliferation triggered by local injury, despite only 10%–15% of patients have prior history of trauma (3, 8). Our patient had no history of trauma. The typical clinical presentation of NF is a solitary small subcutaneous nodule that grows rapidly and is occasionally painful (3). In our case, a nodule was detected on routine mammography and the patient complained of intermittent tingling pain in the right breast.



**Fig. 1.** Breast nodular fasciitis in a 55-year-old woman.

**C.** The cells seen in the needle biopsy specimen are uniform, immature-appearing fibroblasts and myofibroblasts in a haphazard arrangement (H&E stain,  $\times 40$ ; upper image). Scattered lymphocytes and extravasated red blood cells are also present (H&E,  $\times 200$ ; lower image).

H&E = hematoxylin and eosin

There are only a few reports demonstrating the image findings of NF of the breast (3-7). NF can appear variably on mammography, but most commonly presents as a hyperdense mass with suspicious findings such as spiculated and poorly defined margin, and these findings are very similar to those of breast cancer (3, 5). No calcification was reported. In our case, an isodense nodule with partially indistinct margin was detected by mammography. The mammography results were analyzed using commercial AI software (Lunit INSIGHT, v1.1.4.3, Lunit Inc., Seoul, Korea) that provided an abnormality score in percentages of 0%–100% with a heatmap. The AI software detected the lesion with a malignant score of 75%, which was considered as positive. An abnormality score of less than 10% is considered negative for malignancy (9). According to a study on AI-CAD results, higher scores are associated with a higher probability of cancer and higher BI-RADS category (9). The probability of malignancy in our case by AI was higher than mammographic interpretation without AI. AI's false positive rate was reported as 7% by a published study and only two cases had scores higher than 50% (9). However, further research including a large number of cases will be needed for the false positive rate of AI.

On US, the most common feature of NF is a hypoechoic mass with irregular margin. Non-parallel orientation, acoustic shadowing, and echogenic halo are common findings. Vascularity is reportedly to be variable (3-7). Our patient showed an oval hypoechoic mass with microlobulated margin and mild vascularity. To date, there have been only two reports of breast NF describing the elasticity features based on strain elastography, and no reports dealing with quantitative parameters of SWE. Lin and Bao (6) reported the strain elastography findings of two breast NFs. One lesion had a Tsukuba stiffness score of 3, indicating equivocal

elasticity, and the other had a score of 1, which was considered negative. According to another report, two cases have shown hardness with a strain ratio of 3.2 and 4.5, compared to the surrounding subcutaneous fatty tissue (7). Our lesion had a soft elasticity with a maximum elasticity value of 51.7 kilopascal and elasticity ratio of 4.33 on SWE.

To the best of our knowledge, this is the first report of a breast NF analyzed by AI mammography abnormality score and SWE. This case is meaningful in that it will help research on non-malignant lesions showing high AI scores in mammography or future study on imaging findings of NF in the breast.

NF rarely recurs after surgical removal and does not metastasize. Local excision can be performed for diagnostic and therapeutic purposes. However, spontaneous resolution has been reported in some cases (3, 4, 10). Follow-up of US or mammography after core biopsy can be performed to monitor spontaneous resolution and avoid unnecessary surgery (4).

In this report, we present the mammography, US findings of a breast NF, as well as SWE features and AI-based mammographic results. We believe that it is important to consider NF as a differential diagnosis of benign entities that mimic malignancy in breast imaging to prevent misdiagnosis and unnecessary treatment interventions.

#### Author Contributions

Conceptualization, P.J.Y.; data curation, P.S.H.; formal analysis, P.S.H.; investigation, P.J.Y., J.M.; methodology, P.S.H., J.M.; supervision, P.J.Y.; validation, P.S.H.; visualization, P.S.H.; writing—original draft, P.S.H., K.J.I.; and writing—review & editing, P.J.Y., J.M., K.J.I.

#### Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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## 유방의 결절성 근막염의 인공지능 유방촬영술과 탄성초음파를 포함한 영상 소견: 증례 보고

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결절성 근막염은 양성 섬유모세포 증식으로 유방에는 드물게 보고된다. 저자들은 악성 영상 소견을 보인 55세 여자 환자의 증례를 보고한다. 유방촬영술에서 오른쪽 유방에 유방조직과 비슷한 밀도를 보인 부분적으로 경계가 불명확한 결절이 보였고 인공지능 점수는 75%였다. 초음파에서 미세 소엽상 경계, 주변부 고에코를 가진 타원형의 저에코 결절이 보였고 증가된 혈류와 부드러운 탄성도를 보였다. 조직검사와 수술 후 결절성 근막염으로 진단되었다. 결절성 근막염은 유방에서 드물지만, 악성과 비슷하게 보일 수 있다. 따라서 불필요한 중재시술을 막기 위해 감별진단으로 고려되어야 한다.

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