



# Granular Cell Tumor Originating from the Pectoral Muscle: A Rare Extramammary Finding on Mammography

대흉근에서 발생한 과립 세포 종양: 유방촬영술에서 보이는 드문 유방외 병변

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A granular cell tumor (GCT) is a rare soft tissue tumor that usually arises from the striated muscle of the tongue. Few literatures have reported pectoral muscle involvement of the GCT. Herein, we report a rare case of a GCT originating from the pectoral muscle below the breast with multimodal imaging appearance.

**Index terms** Granular Cell Tumor; Pectoral Muscle; Multimodal Imaging

## INTRODUCTION

Granular cell tumor (GCT) is a rare, benign neoplasm that usually arises from striated muscle of the tongue but can occur in a breast approximately in 7% (1, 2). The origin of GCT is assumed to be from Schwann cells by the presence of the S-100 protein (3). In the breast, GCT was reported to originate from interlobular breast stroma or pectoral muscle and the location of GCT is predominantly in upper inner quadrants of the breast (3, 4). GCT presents as a palpable lump in breast and the incidence of GCT is estimated about 1 in 1000 cases of breast cancer (2). As there have been limited numbers of case reports about GCT originating from breast or pectoral muscle, breast radiologists are not familiar with the imaging finding of GCT.

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Herein, we report a case of GCT in the pectoral muscle of upper mid breast which was detected on mammography and breast US. The imaging and pathologic features of GCT are discussed, demonstrating the diagnostic difficulty of GCT in the breast.

## CASE REPORT

A 29-year-old female patient was referred from an outside hospital for evaluation of a palpable mass in her right upper mid breast. There was neither family history of breast cancer nor remarkable past medical history. Physical examination showed that palpable mass was relatively fixed. Breast mammography revealed that asymmetry without calcifications within the pectoral muscle in mediolateral oblique view of right breast (Fig. 1A). Sonographic examination of the breast was performed using an Aixplorer system (SuperSonic Imagine, Aix en Provence, France) with a high-frequency broadband width linear array transducer. It revealed a 2.1-cm oval shaped, indistinct and some spiculated marginated, hypoechoic mass within pectoral muscle of right far upper inner breast. The mass showed internal preserved echogenic fibrillation pattern of muscle with bulging contour of pectoral muscle (Fig. 1B). Color Doppler US revealed a peripheral vascularity (Fig. 1C). Shearwave elastography demonstrated mixed color pattern in and around the mass with mean kPa of 300 (Fig. 1D). Based on imaging findings, the possibility of malignancy could not be excluded, with differential diagnosis of soft tissue tumor of muscle origin or hematoma. As the sonographic features of the mass were suspicious for malignancy, a core biopsy was done for the mass under sonographic guidance using a 14-gauge BARD Monopty device (Franklin Lakes, NJ, USA) and the pathologic result was benign GCT. The patient underwent wide local excision. On gross specimen, the tumor seemed to be originating from the border of pectoral muscle and not from the breast tissue and invaded between bundles of skeletal muscle with spiculate margin. The tumor showed homogenous pale yellow-tan appearance with solid and firm texture (Fig. 1E). Microscopic examination revealed the specimen consisted of sheets, nests, or trabeculae of epithelioid and polygonal cells (Fig. 1F). Most of observed tumor cells had centrally located mildly hyperchromatic small nuclei and abundant amount of finely granular-appearing eosinophilic cytoplasm with indistinct cell border (Fig. 1F). On immunohistochemical analysis, these cells showed positive for S100 and CD68 (Fig. 1F), but showed negative for desmin, confirming with a diagnosis of GCT of pectoral muscle. Although several microscopic foci of moderate nuclear pleomorphism including multinucleation were observed, there was no definite evidence of findings suggesting malignant potential, such as increased mitotic activity, tumoral necrosis, spindling, prominent nucleoli, and high nuclear-cytoplasmic ratio. Observed nuclear atypism was thought to be degenerative atypia.

This case report was exempt from the ethical approval in our institution. This study was performed according to the latest ethical principles in the Declaration of Helsinki (2013).

## DISCUSSION

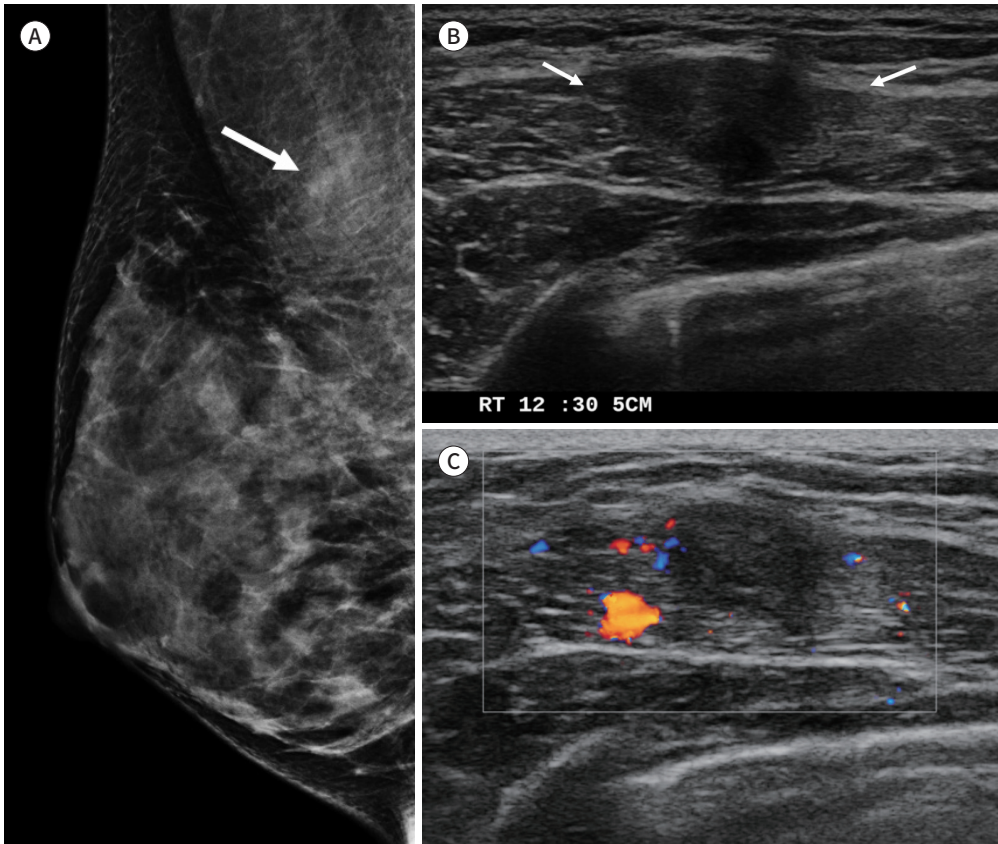
GCT is a rare tumor most frequently found in the striated muscle of tongue, but can also present in various sites (2). In 1926, GCT was first described by Abrikossoff and was given the

**Fig. 1.** A granular cell tumor arising in a 29-year-old female presenting with a palpable mass.

**A.** The mediolateral view of the right mammogram shows asymmetry in the upper breast near the pectoral muscle (arrow).

**B.** Transverse ultrasonography of the right 12:30 o'clock direction, 5 cm from the nipple, shows a 1.6 cm sized irregular hypoechoic mass with indistinct margin in the pectoral muscle layers (arrows).

**C.** Color Doppler ultrasonography shows peripheral hypervascularity.



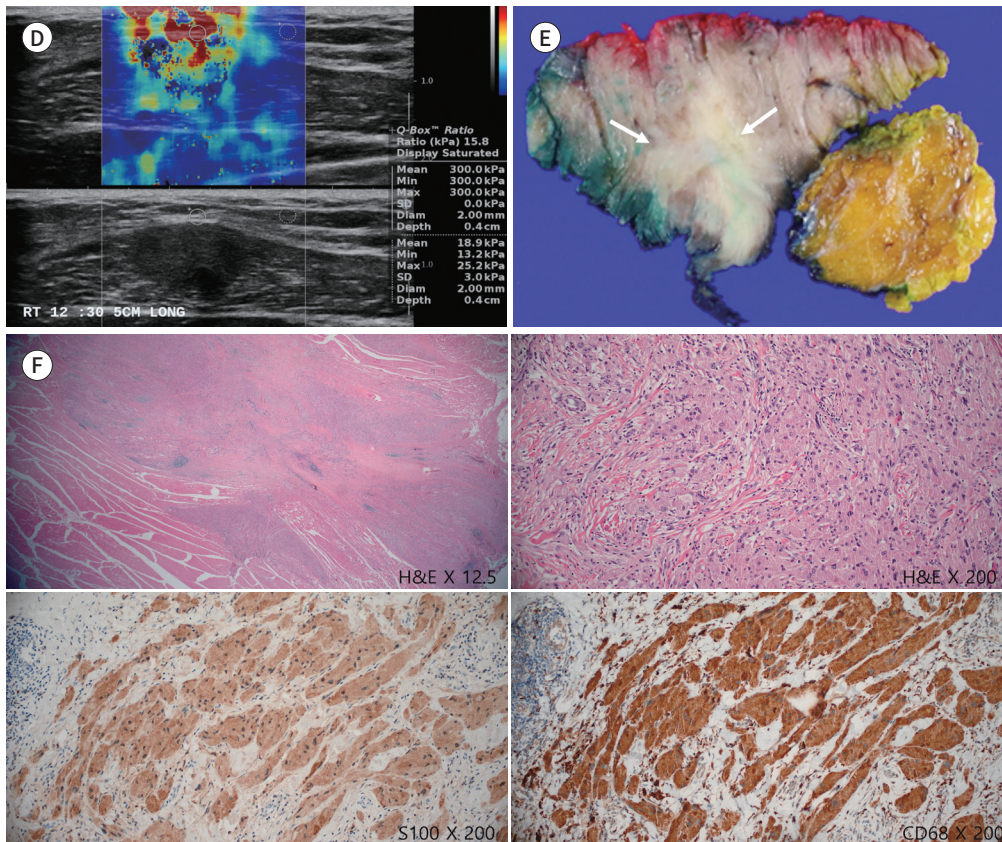
name of granular cell myoblastoma attributing to the similarity of cytology to myogenic cells (5). Nowadays, GCT is thought to be of Schwann cell or perineural origin due to positivity for the S-100 protein on immunohistochemical staining (3). In the breast, the origin of the tumor was assumed to be perineural cells in the peripheral nerves or their precursors in interlobular breast stroma (3). In contrary to breast cancer which is found most commonly in upper outer quadrants, GCT is frequently found in upper inner quadrants of the breast along the cutaneous sensory branches of supraclavicular nerve.

Clinically, GCT is frequently found in middle aged female. In the breast, it may present as palpable mass less than 3 cm without pain because it grows slowly and stabilizes when it is approximately 3 cm in diameter (6). It is generally mobile but it can also be fixed to pectoralis fascia. They can be well-defined regular and round to ill-defined and irregular.

Radiologically, imaging findings of GCT are nonspecific and various because GCT can be originated from interlobular breast stroma or pectoral muscle. GCTs present with focal asymmetries or irregular shaped masses with spiculation on mammography (7). However, some cases present with round shaped, circumscribed marginated masses suggesting benignity. Microcalcifications are usually absent (1). In our case, GCT presented as asymmetry without



**Fig. 1.** A granular cell tumor arising in a 29-year-old female presenting with a palpable mass.  
**D.** Shearwave elastography shows mixed color pattern in and around the mass with a mean kPa of 300.  
**E.** Gross specimen shows a solid, firm tumor with yellowish-white cut section (arrows).  
**F.** Microscopic examination reveals that the specimen consists of sheets, nests, or trabeculae of epithelioid and polygonal cells with abundant amount of finely granular-appearing eosinophilic cytoplasm, and the specimen shows positivity for S100 and CD68 on immunohistochemical stain.  
 H&E = hematoxylin and eosin



calcifications within the pectoral muscle on mammography because GCT arises from pectoral muscle. Ultrasonographic findings are also nonspecific, showing either benign looking circumscribed masses or solid, heterogeneous, poorly defined masses with or without peripheral hypervascularity (4, 7). Some studies suggested the presence of sparse internal echogenic foci within the mass may be helpful to differentiate GCT from breast cancer (6). According to the study by Yang et al. (8), hyperechoic halo surrounding mass which may reflect the infiltrative growth pattern was found in five of seven patients. Regarding elastographic finding of GCT, there have been no published literatures. In our case, GCT showed mixed color pattern in and around the mass with mean kPa of 300 on shearwave elastography, suggesting malignant lesion as cutoff values between malignant and benign lesions have been reported to be as 80 kPa for mean elasticity (9, 10).

The final diagnosis can be usually achieved by pathologic examination. The core biopsy specimens are sufficiently representative to provide pathological diagnosis (6). The positivity of S-100 immunohistochemical staining, which indicates Schwann cell origin of GCT, is used to diagnose GCT (3). Malignant GCT is defined as at least 3 of the following features: necrosis, ve-

sicular nuclei with large nucleoli, spindling, high nuclear to cytoplasmic ratio, pleomorphism, and increased mitotic activity (> 2 mitoses/10 high power fields at 200 × magnification). The core biopsy can differentiate malignant GCT from benign GCT if malignant characteristics were found on core biopsy specimens. Wide local excision is regarded as gold standard in the treatment of benign GCT because GCT has an infiltrative growth pattern and local recurrence is associated with incomplete excision. Axillary sampling or sentinel lymph node biopsy is not indicated as nodal invasion is extremely rare (2). However, malignant GCT should be treated like other malignant breast tumors because inadequate treatment has a poor overall outcome.

In summary, GCT of the breast are rare neoplasm which can be presented as palpable lump in the breast. The correct differentiation of GCT is difficult after imaging evaluation and accurate diagnosis can be possible by pathologic examination after core biopsy. Elastographic finding of GCT was not also helpful for differential diagnosis from breast cancer due to high mean elasticity. From various imaging features of our case, radiologists should consider the possibility of GCT in the presence of unique features such as palpable mass in far upper inner location in pectoral muscle below breast and internal echogenic foci within tumor on ultrasonography.

#### Author Contributions

Conceptualization, S.S.E.; investigation, Y.H.; supervision, S.S.E.; visualization, L.J.H.; writing—original draft, Y.H.; and writing—review & editing, S.S.E., C.K.R.

#### Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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과립 세포 종양은 드문 연조직 종양으로써 주로 혀의 줄무늬 근육에서 발생한다. 과립 세포 종양이 대흉근에서 발생한 예는 매우 드물게 보고되었다. 이에 저자들은 유방 아래의 대흉근에 발생한 과립 세포 종양의 증례를 다양한 영상 소견과 함께 보고하고자 한다.

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