Galactoceles Mimicking Suspicious Solid Masses on Sonography

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Objective. The purpose of this study was to evaluate the sonographic appearance of a galactocele that can sonographically mimic a suspicious solid mass and to differentiate between a galactocele and a solid mass. ***Methods.*** From September 2002 to February 2004, 33 galactoceles classified as Breast Imaging Reporting and Data System category 4 were included. They were all confirmed by sonographically guided core biopsies. Their sonographic imaging and clinical findings were reviewed retrospectively. ***Results.*** The lesions had a round or irregular shape in 26 patients (78.8%), a noncircumscribed margin in 31 (93.9%), a nonparallel orientation in 22 (66%), and posterior shadowing in 13 (39.4%). Twenty-five nodules (75.8%) had internal hypoechogenicity or mixed echogenicity. Twenty-nine (87.9%) of 33 lesions showed a relatively sharp convex echogenic rim on the anterior or posterior wall. ***Conclusions.*** Galactoceles have various sonographic findings, many of which are similar to those of suspicious solid breast masses. However, there is a tendency for a galactocele to appear as a small, round hypoechoic nodule with an indistinct or microlobulated margin and mild posterior shadowing. It is helpful to search for a partial anterior or posterior echogenic rim to identify a galactocele. ***Key words:*** breast abnormalities; breast neoplasm; breast sonography.

Abbreviations
BI-RADS, Breast Imaging Reporting and Data System

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A galactocele is pathologically defined as a benign cystic lesion lined by cuboidal epithelium that contains milk. These lesions are mostly found in women while lactating or within a few months after lactation.[1–3] On sonography, this lesion is typically a well-circumscribed ovoid anechoic or hypoechoic mass with posterior acoustic enhancement or a fat-fluid level.[4] This can be useful for differentiating it from a solid tumor. Galactoceles not associated with pregnancy or lactation have also been reported,[5–8] and recent reports have shown that some galactoceles can have variable sonographic findings and may even resemble the appearance of a suspicious solid mass.[5,9]

The aim of this study was to examine the atypical sonographic findings of a galactocele appearing to be a suspicious solid mass and also to examine the sonographic findings that suggest a galactocele.

Materials and Methods

From September 2002 to February 2004, 8631 women were referred to our institution for breast sonography, and the final assessments of these examinations were prospectively recorded according to the Breast Imaging Reporting and Data System (BI-RADS).[10] The sonographic examinations and sonographically guided biopsies were performed by 1 of 4 radiologists who were experienced in breast imaging. The sonograms were obtained with HDI 5000 (n = 20) and HDI 3000 (n = 13) sonography units (Philips Medical Systems, Bothell, WA) and 10-MHz linear array transducers. With the use of the HDI 5000 machine, compound imaging was performed in all cases.

Among the 8631 cases, 804 breast lesions (9.3%) were categorized as BI-RADS 4, suspicious for malignancy. Sonographically guided percutaneous biopsies were performed on 715 of these 804 BI-RADS 4 lesions with a 14-gauge automated biopsy gun (n = 663) and an 11- or 8-gauge vacuum-assisted biopsy device (n = 52). Finally, 33 lesions (4.6% of 715 lesions) in 31 patients were confirmed to be galactoceles, and these lesions made up our study population. The numbers of tissue samples that had been obtained were 2 to 5 for 14-gauge automated gun biopsy (n = 32) and 11 for 11-gauge vacuum-assisted biopsy (n = 1).

The clinical records of the 31 patients were reviewed in terms of patient age, obstetric history, symptoms at presentation, and the interval between the last delivery and symptom appearance. Mammography was performed in 24 women with dedicated equipment (DMR; GE Healthcare, Milwaukee, WI). Standard craniocaudal and mediolateral oblique views were routinely obtained, and additional mammographic views were obtained as needed. Nine of our patients were younger than 39 years, and 6 were younger than 35 years. Because of the hazard with mammography for young breasts, referring physicians chose sonography as the first tool of evaluation for chief symptoms such as palpable lumps and screening in high-risk patients.

The sonograms and the mammograms were independently and retrospectively reviewed by 2 experienced radiologists. Both studies were reviewed together for each patient. Any discrepancy was resolved by consensus.

Sonographic findings were classified according to the BI-RADS system.[10] They were assessed in terms of size, shape, orientation, margin, echogenicity, boundary, and posterior characteristics such as the presence or absence of posterior shadowing and posterior acoustic enhancement (Table 1). Associated calcifications and ductal dilatation were also evaluated. In addition, the rims were classified as having either an anteroposterior sharp convex curvilinear echogenic foci or not. The size of each lesion was based on the largest imaging dimension. The distance of the lesion from the nipple was described.

Results

All 31 patients were women, and their mean age was 48 years (range, 29–73 years). The indications for examinations were screening for a mammographically dense breast in 20 (63.6%), a growing mass on sonography in 3 (9%), a palpable mass in 6 (18%), localized pain in 1 (3%), and nipple discharge in 1 (3%). Three patients had a family (n = 1) or personal (n = 2) history of a breast malignancy.

The interval between last delivery and the breast examination was 3 to 41 years. Two patients had no delivery history. There were no lesions related to lactation in this study.

Table 1. Items in Sonographic Findings

Item	Description
Shape	Oval
	Round
	Lobular
	Irregular
Margin	Circumscribed
	Noncircumscribed
	Microlobulated
	Angular
	Indistinct
	Spiculated
Orientation	Parallel
	Nonparallel
Echo pattern	Hyperechoic
	Isoechoic
	Hypoechoic
	Complex
Lesion boundary	Abrupt transition
	Thick echogenic halo
Posterior echogenicity	Acoustic enhancement
	Posterior shadowing
	Normal
Associated surrounding findings	Calcification
	Ductal dilatation

Twenty-four patients underwent mammography. All mammograms showed heterogeneously or extremely dense breast tissue (composition grade 3 or 4). Only 2 patients had positive mammographic findings, with a developing focal density in 1 case and an oval circumscribed nodule in the other case (Figure 1A). Table 2 shows the sonographic findings. The most common shape for the lesions was round (n = 19 [57.6%]; Figures 2 and 3). Thirty-one lesions (93.9%; Figures 2–5) had a noncircumscribed margin, and half of those lesions showed a microlobulated margin (n = 15 [48.4%]). A major portion of lesions showed a nonparallel orientation (n = 22 [66%]; Figures 3–5) and internal hypoechogenicity (n = 23 [69.7%]; Figures 3–5). For posterior shadowing, the frequency of its appearance was different according to the sonographic equipment used. We used 2 types of sonographic machines. One was a conventional machine (HDI 3000), and the other had the additional function of compound imaging (HDI 5000). The conventional sonograms showed posterior shadowing in 10 (76.9%) of 13 cases (Figure 1). The remaining cases obtained with compound sonography showed them less frequently (n = 3 [15.0%]; Figure 2). Nearly 90% of the lesions (n = 29 [87.9%]) showed a convex echogenic rim on the anterior or posterior walls (Figures 1–5).

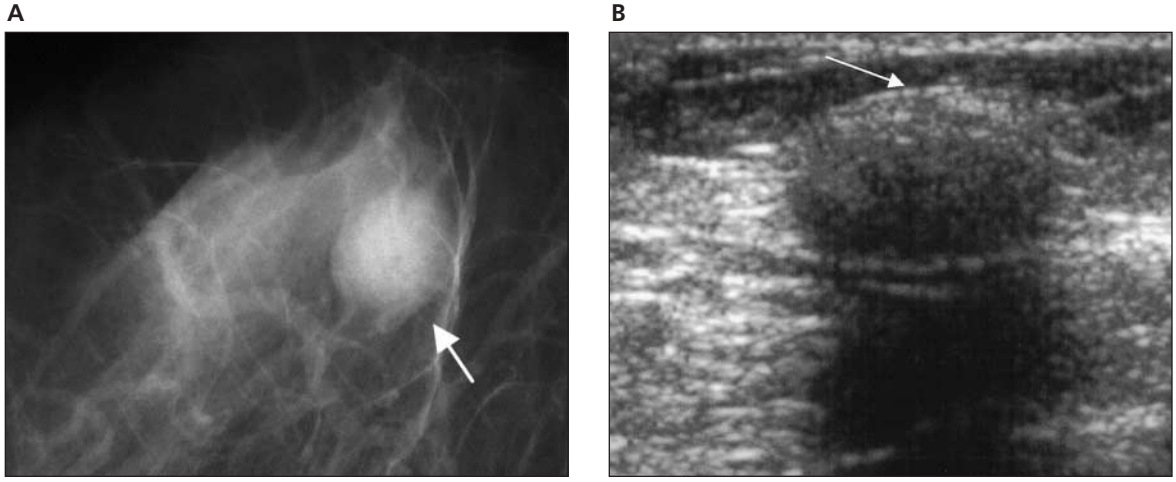
The average maximum dimension of the lesion was 0.8 cm (median, 0.6 cm; range, 0.3–2.6 cm). The average distance from the nipple to the lesion was 2.12 cm (range, 0–4 cm).

On retrospective review of biopsy notes, 18 of 32 lesions on which 14-guage automated core needle biopsy was performed were smaller after firing of the biopsy needle.

Discussion

A galactocele is an uncommon benign lesion of the breast and is defined as an encysted collection of milk products that is lined by flattened cuboidal epithelium.[1–3] Galactoceles are usually associated with pregnancy and lactation. Kopans[2] reported that the sonographic findings that indicate galactoceles are well-defined, contain low-level internal echoes, and show posterior acoustic enhancement, similar to a circumscribed solid breast tumor. Recently, as whole-breast bilateral screening sonography in high-risk women or women with dense breasts on mammography is being performed and high-resolution sonographic equipment is becoming more widely distributed, incidentally found nonspecific nodules on sonography are more commonly identified.[11–13] Galactoceles mimicking solid nodules might be some of them. In our study, 20 (63.6%) of 33 galactoceles were found on screening sonography for a mammographically dense breast, whereas in most of the literature, galactoceles have been reported to appear with palpable lumps.[2,3,14] The averages of the widest dimension were 5.6 cm (range, 1.7–12 cm) by Winkler,[15] 5.7 cm (1.5–14 cm) by Golden and Wangensteen,[1] and 1.7 cm

Figure 1. Palpable mass in the left breast in a 50-year-old woman. **A**, Mammography shows a 1.5-cm oval circumscribed mass (arrow) at the subareolar region. **B**, Sonography shows a 1.5-cm oval circumscribed hypoechoic nodule with posterior shadowing. An echogenic rim (arrow) can be seen at the anterior margin.



(0.4–4 cm) by Stevens et al.[9] In this study, the average maximum diameter of the lesion was 0.7 cm (range, 0.3–2.6 cm). We suggest that smaller galactoceles are apt to be detected incidentally.[1,9,15]

In this study, galactoceles constituted about 4.6% of category 4 lesions undergoing core needle biopsy. It is quite a high frequency, considering that only the suspicious, solid-looking nodules were included. A galactocele is usually associated with lactation, even though a few reports suggest that it might occur several years postpartum (13 and 30 years).[1,5] There were no lactation-related lesions found in this study. The mean duration from the postpartum period was 15 years, and 4 women had no pregnancy history. One explanation for this might be that a lactation-related galactocele tends to have a cystic appearance and was therefore excluded from the study.[5]

In theory, a galactocele can be initiated by several factors: secretory breast epithelium, present or previous prolactin stimulation, and some form of ductal obstruction.[15] In addition to lactation, several breast lesions resulting in ductal obstruction or a generalized condition such as breast surgery, transplacental passage of prolactin, and oral contraceptives can create factors that promote the development of a galactocele.[6–8,16,17] Because bilateral whole-breast sonography has been added to complement mammography in the preoperative evaluation of patients with breast cancer, it is important to differentiate malignancy-mimicking benign lesions such as galactoceles and foci of malignancy. We encountered 1 galactocele with a malignancy (Figure 3) simultaneously and 2 cases with a history of contralateral breast malignancy.

Table 2. Sonographic Findings in 33 Galactoceles

Sonographic Finding	Frequency, n (%)
Shape	
Oval	4 (12.1)
Round	19 (57.6)
Lobular	3 (9.1)
Irregular	7 (21.2)
Margin	
Circumscribed	2 (6.1)
Noncircumscribed	31 (93.9)
Microlobulated	15 (48.4)
Angular	1 (3.2)
Indistinct	11 (35.5)
Spiculated	4 (12.9)
Orientation	
Parallel	11 (33.3)
Nonparallel	22 (66.7)
Echo pattern	
Hyperechoic	1 (3)
Isoechoic	7 (21.2)
Hypoechoic	23 (69.7)
Complex	2 (6.1)
Lesion boundary	
Abrupt transition	28 (84.8)
Thick echogenic halo	5 (15.2)
Posterior echogenicity	
Acoustic enhancement	3 (9.1)
Posterior shadowing	13 (39.4)
Normal	17 (51.5)
Associated surrounding findings	
Calcification	1 (3)
Ductal dilatation	1 (3)

In addition to the textbook by Kopans,[2] there were a few reports in the literature that addressed the sonographic findings of galactoceles. Salvador et al[4] reported that a cyst with a fat-fluid level was a pathognomonic finding of a galactocele. A fat-fluid level corresponding to a wavy line separates the upper anechoic fatty liquid from the lower echogenic proteinaceous material. Stavros[18] suggested that the fat-fluid level is a combination of an upper isoechoic lipid layer and a lower anechoic layer with water components. Park et al[5] reported variable sonographic findings of a galactocele and stressed that a galactocele unrelated to pregnancy tends to show an atypical appearance, which can suggest a malignancy. Sawhney et al[14] suggested that fluid clefts and an anechoic rim resulted from the inspissation of internal contents as a possible indicator of a galactocele. In our study, considerable cases of pathologically proved galactoceles had various sonographic findings suggestive of malignancy. Most had a round or irregular shape (78.8%) and a noncircumscribed margin (93.9%), microlobulated, indistinct, or even spiculated. Some of them also showed posterior shadowing (39.4%). Such findings warranted biopsies.

The degree of posterior shadowing depends on the sonography equipment. In this study, 2 types of sonographic machines were used. One was a conventional sonography system, and the other had the additional function of compound imaging. The conventional sonography showed posterior shadowing in 10 of 13 cases (Figure 1). The cases obtained with compound sonography showed posterior shadowing in 3 of 20 cases (Figure 2). Considering that compound imaging shows less posterior acoustic shadowing or enhancement than conventional imaging,[19] the posterior shadowing in galactoceles would be expected to occur more frequently when conventional image is used.

In this study, 29 of 33 cases had a thin echogenic anterior (n = 26) or posterior (n = 21) rim. It was well depicted in the smaller lesions and is thought to be the lactiferous ductal wall because a galactocele is an intraductal lesion usually arising from a ductal obstruction (Figure 2C). The echogenic rim can assist in the differentiation of a galactocele from other suspicious malignant findings, although these findings are not definite in the diagnosis a galactocele. A galactocele should be considered as part of the differential diagnosis of a small, round hypoechoic nodule with an indistinct or microlobulated margin and mild posterior shadowing when incidentally found on a sonogram. It would be helpful to search for the partial anterior or posterior echogenic rim, especially if it is curvilinear. Nevertheless, a diagnosis of galactocele is often difficult to make on the basis of sonography alone, and a pathologic diagnosis is often warranted.

A limitation of our study is that we could not examine all the different kinds of sonographic findings of galactoceles; we only included the galactoceles that showed suspicious findings. Therefore, the percentage of lesions with sonographically suspicious features among all galactoceles could not be determined. We also did not define the positive predictive value of an echogenic rim for a galactocele. Therefore, another study is needed to confirm these findings or to determine a differential diagnosis. Another limitation is that we could correlate the anterior or posterior echogenic rim with pathologic specimens only in a limited number of cases. Because most cases were confirmed by automated gun biopsy rather than vacuum-

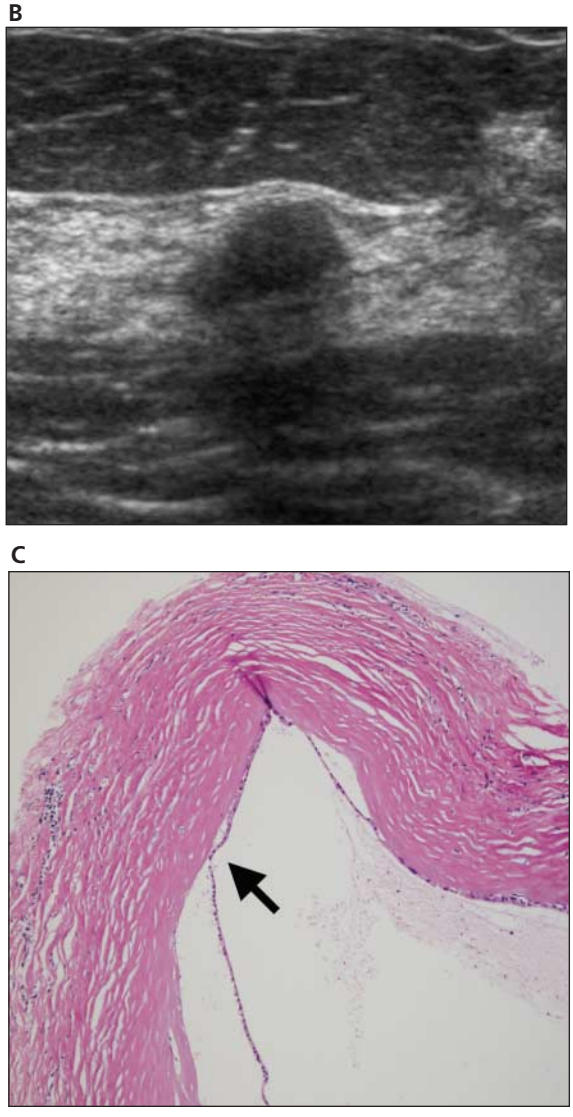
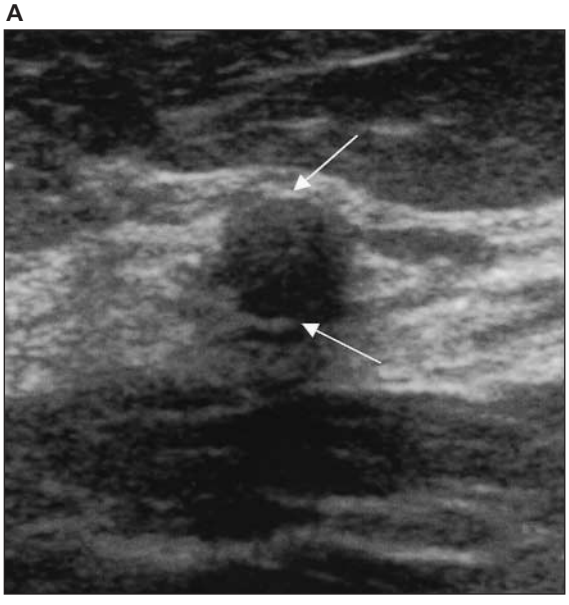


Figure 2. Images from a 55-year-old woman who underwent screening sonography for a dense breast. Sonography shows a 7-mm isoechoic nodule, round, not parallel in orientation, with an indistinct margin and posterior shadowing. The echogenic anterior and posterior rims (arrows) are showed. The nodule was confirmed to be a galactocele by vacuum assisted biopsy. **A**, Transverse scan. **B,** Longitudinal scan. **C**, Cyst lined by flat epithelial cells (arrow) and encompassed by a thick fibrous wall (hematoxylin-eosin, original magnification ×100).



assisted biopsy or excision, a small amount of specimen was insufficient for correlation with the echogenic rim. Another limitation is that the sonographic methods were not consistent throughout the study. Thirteen cases were imaged with conventional sonography, and the remaining cases were imaged with compound techniques (not conventional). This factor could affect the sonographic findings of galactoceles.

In conclusion, a galactocele can have sonographic findings mimicking a suspicious solid breast mass, although it tends to appear as a small, round, microlobulated hypoechoic nodule with mild posterior shadowing. Moreover, when radiologists encounter such a sonographic mass, it would be useful to search for a partial anterior or posterior echogenic rim to identify the mass as a galactocele.

Figure 3. Palpable mass at the left upper outer quadrant in a 51-year-old woman. Sonography showed a typical finding of malignancy (not shown), but there was another incidentally noted 0.4-cm nodule at the left upper medial quadrant. This was a round, microlobulated hypoechoic nodule with mild posterior shadowing suspicious for malignancy. The echogenic foci in the anterior and posterior linings are shown (arrows). The nodule was confirmed to be a galactocele by sonographically guided core biopsy.

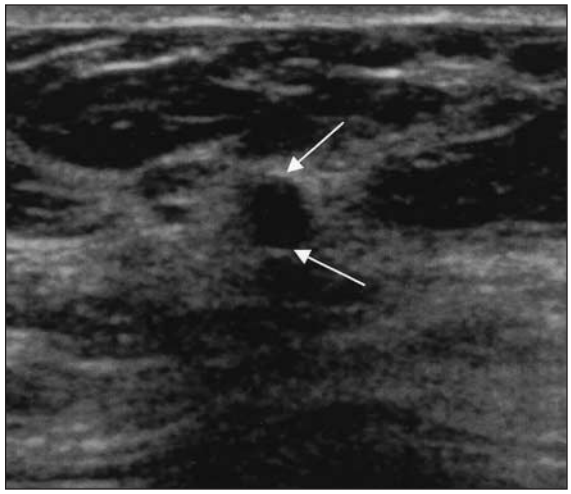


Figure 4. Sonogram from a 41-year-old woman who underwent screening sonography for a dense breast. The sonogram shows a 1-cm irregular, angular hypoechoic nodule. The anterior rim (arrow) is shown be seen. The result of core needle biopsy was a galactocele.

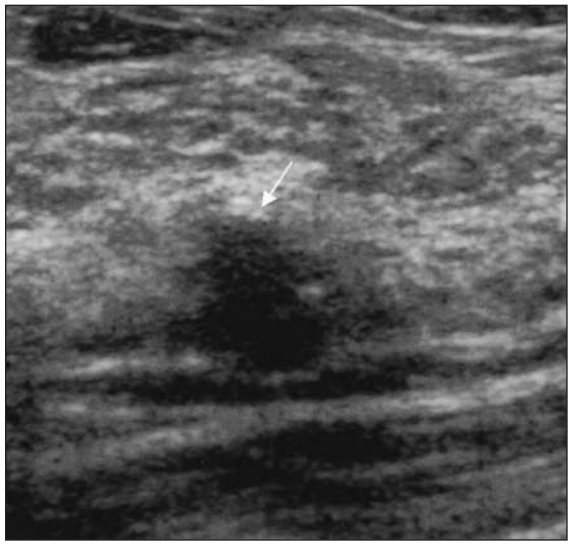
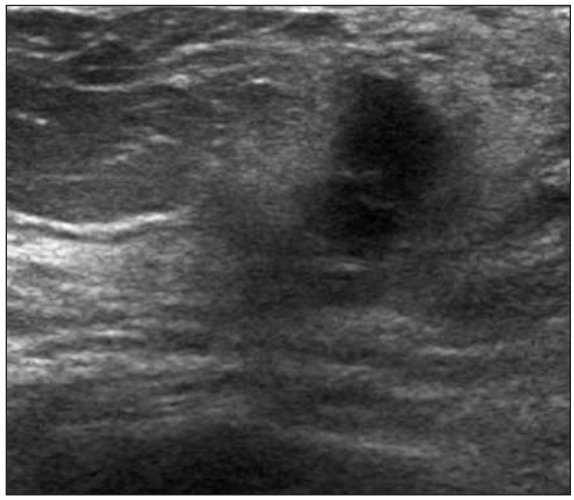


Figure 5. Palpable lump in the left breast in a 50-year-old woman. A mammogram taken at the private clinic showed a focal asymmetric density (not shown). **A**, Sonography shows a 10-mm irregular hypoechoic nodule, spiculated, not parallel in orientation, in the corresponding area of the left breast on the mammogram. **B**, After the first firing of the 14-gauge biopsy needle, the nodule shrank. The core needle biopsy revealed a galactocele.

A



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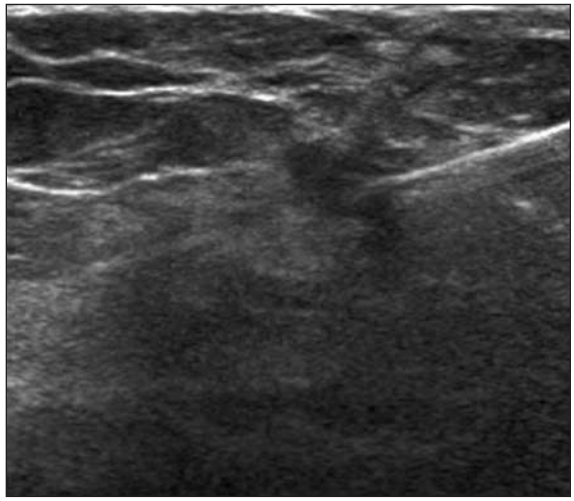

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