Draft Diagnostic Guidelines for Non-Mass Image-Forming Lesions by the Japan Association of Breast and Thyroid Sonology (JABTS) and the Japan Society of Ultrasonics in Medicine

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Background

Recently, ultrasonic instruments have remarkably improved, and smaller or earlier breast cancers have been found. Also, mammographic screening for breast cancer for women of 50 years and older has heightened people's desire to find and diagnose smaller or earlier lesions. The lesions that do not form mass images have been recognized, and a lexicon for reporting these is desired.

We have been discussing the diagnostic guidelines for breast cancer for the past 3 years. Non-mass image-forming lesions are contained as the objects of diagnosis. We present the tentative plan of the guidelines for non-mass image-forming lesions here.

Definition of the Non-Mass Image-Forming Lesions

Non-mass image-forming lesions are those lesions that are difficult to recognize as a "mass image." They may associate with "mass image-forming lesions." The ultrasonic images of breast disease consist of mass image-forming lesions and non-mass image-forming lesions.

Normal Breast Sonograms and Variants

Normal breast sonograms and their variants are the essential knowledge for understanding non-mass image-forming lesions. These factors may have an effect on ultrasonic breast images:

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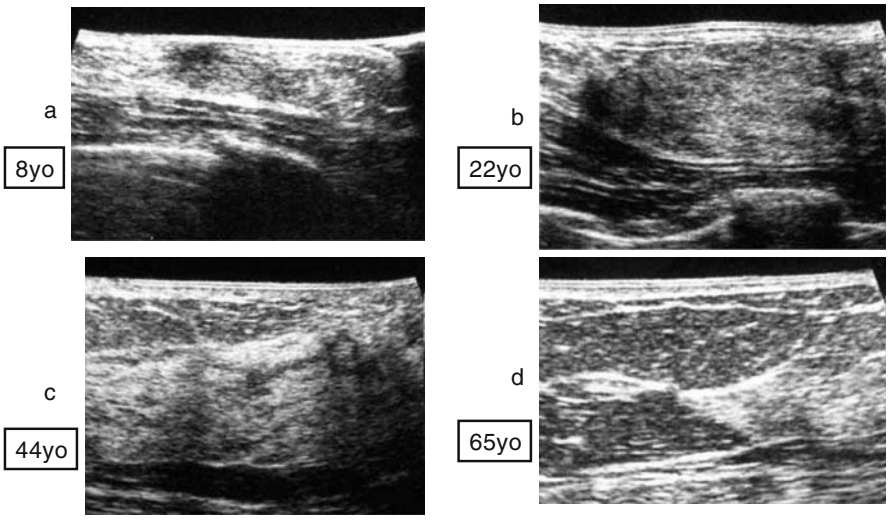


Fig. 1. Ultrasonic breast images and patient age

Age (Fig. 1)
Pregnancy
Breast-feeding
Hormone replacement therapy

Lesions That May Be Observed by Ultrasonic Examination as Non-Mass Image-Forming Lesions

- Duct dilatation
- Duct ectasia (contains plasma cell mastitis)
- Intraductal papilloma, multiple intraductal papilloma
- Mastopathy
- Epithelial hyperplasia
  - Adenosis
  - Multiple cyst
  - Fibroadenomatoid hyperplasia
  - Fibrosis
- Mastitis
  - Lymphocytic mastitis
  - Acute mastitis.
- Radial scar, complex sclerosing lesion
- Noninvasive ductal carcinoma
- Invasive ductal carcinoma with a predominant intraductal component
- Invasive carcinoma

Lexicon for Non-Mass Image-Forming Lesions

- Dilation of the duct
  Dilated ducts with or without internal echoes that may be in any area
- Wall thickening of the duct
  The wall of the duct is increased in thickness more than usual
- Irregularity of the caliber of the duct
  Irregularity of the anechoic area in the duct
- Internal echoes in the duct or tiny cysts
  Echoes in the duct or tiny cysts as follows:
    Solid echoes
    Floating echoes
    Linear high echoes
    High echo spots
    Fine high echo spots (smaller than 1 mm in diameter)
- Multi-vesicular pattern
  Multiple tiny or small cysts in the breast tissue
- Low echo area in the breast tissue
  Low echo area whose character is different from surrounding gland or same area in the ipsilateral breast (Fig. 2)
  Spotted or mottled low echo area
    Relatively small low echo areas form the spotted (or mottled) pattern
- Geographical low echo area
  Low echo area looks like geography as if spotted low echo areas fused into one
- Low echo area with indistinct margin
  Low echo area whose margins are not clearly defined
- Architectural distortion
  Distorted structure without mass image

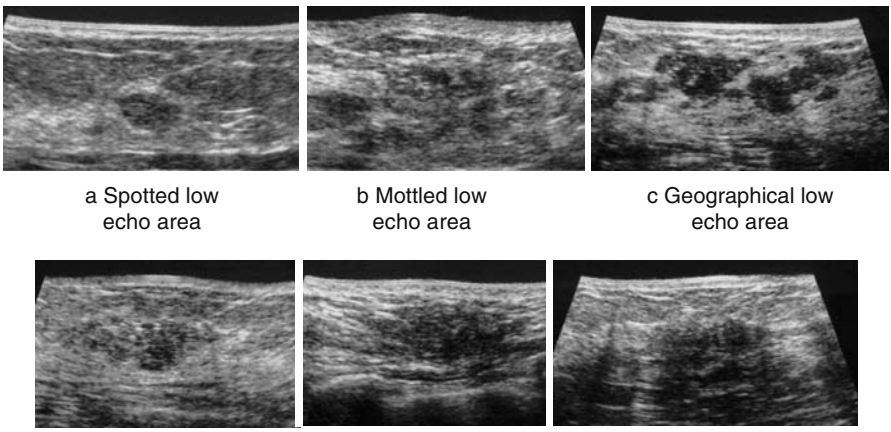


Fig. 2. Low echo area in the breast tissue

Assessment and Categories

Assessment categories are decided as follows:

Category 0: Assessment is incomplete
Category 1: Negative
Category 2: Benign
Category 3: Benign, but malignancy cannot be ruled out
Category 4: Suspicious abnormality
Category 5: Highly suggestive of malignancy

Duct Dilatation (a): Duct Dilatation Without Internal Echoes (Fig. 3)

Dilated ducts with no internal echoes can be seen in the peripheral area outside the areola. They may be complicated with wall thickening by inflammation.

Bilaterally and multiple: category 2
  Dilated ducts
Solitary: category 3
  Dilated duct
  Duct ectasia

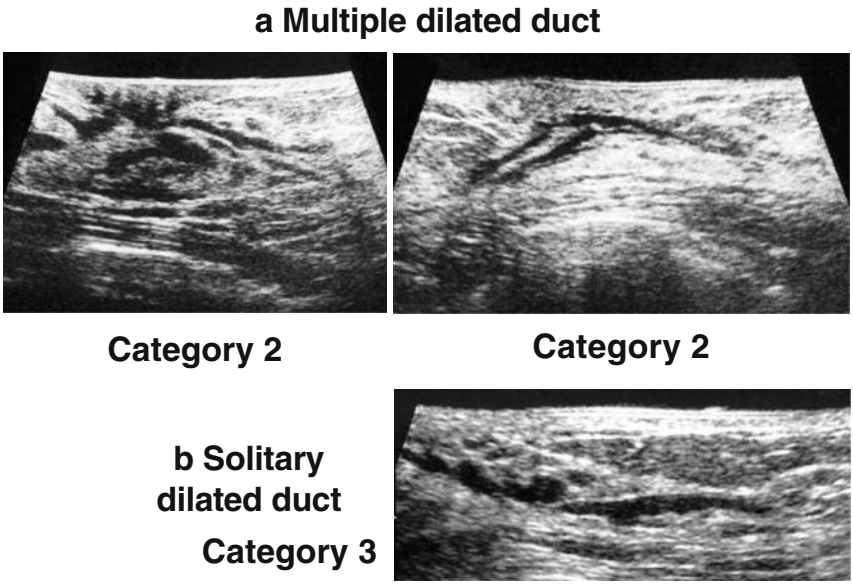


Fig. 3. Duct dilatation without internal echoes

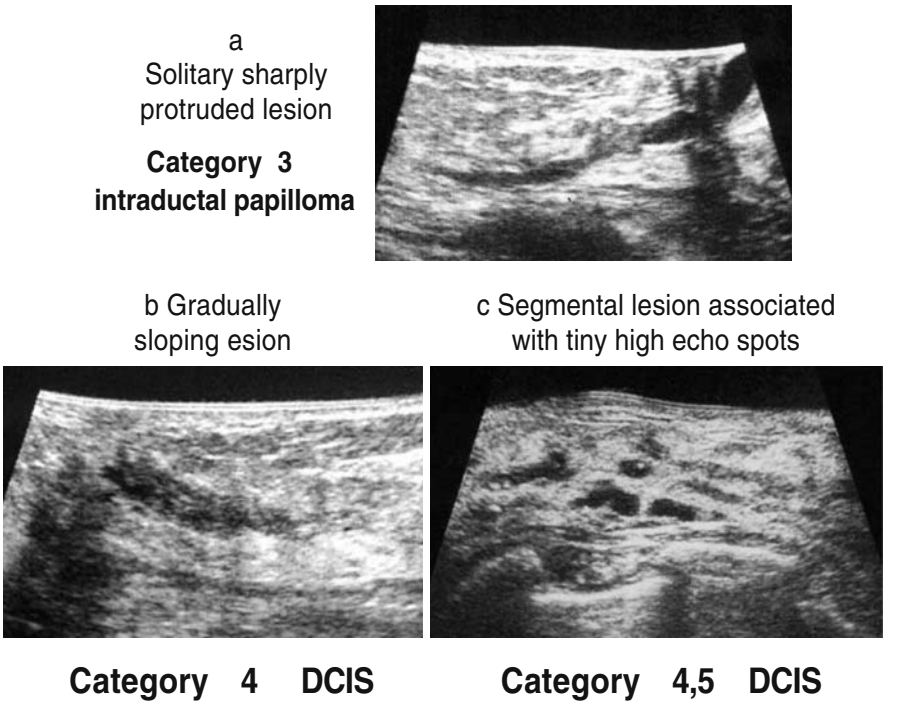


Fig. 4. Dilated ducts with internal solid echoes. *DCIS*, ductal careinoma in situ

Epithelial hyperplasia
Intraductal papillomas, noninvasive ductal carcinoma

*Secondary duct dilatation may be developed from intraductal proliferative lesions.
*When it is difficult to judge whether the internal echoes are there or not, it should be regarded as (b) (below).

Duct Dilation (b): Duct Dilatation with Internal Echoes (Fig. 4)

Intraductal echoes consist of solid echoes, floating echoes, linear high echoes, high echo spots, and fine high echo spots. Solid echoes often result from proliferative lesions; careful observation of the wall is needed. Internal echoes are produced by the floating components in the fluid. Condensed milk or blood is common.

Assessment of Duct Dilatation with Internal Echoes

Shape of the solid echoes

- Sharply protruded: Category 3
  Intraductal papilloma

- Gradually sloping (broad base lesion): Category 3,4,5 (irregularities of the ductal caliber are not rare)
  Intraductal papilloma
  Epithelial hyperplasia
  Noninvasive ductal carcinoma

Distribution of the solid echoes

- Bilaterally and multiple: Category 2
  Condensed milk
- Solitary lesion near the nipple: Category 3
  Intraductal papilloma
- Segmental or chainlike lesions: Category 3,4
  Epithelial hyperplasia,
  Intraductal papilloma
  Noninvasive ductal carcinoma

*Associated with tiny high echo spots suggesting malignant calcifications:
Category 4,5
Noninvasive ductal carcinoma
Invasive ductal carcinoma with a predominant intraductal component
Epithelial hyperplasia
Intraductal papilloma

Multi-Vesicular Pattern (Fig. 5)

Multiple tiny or small cysts in the mammary gland
*Include the lesions whose internal echoes are free or not is difficult to judge.

- Diffuse distribution: Category 2
  Mastopathy
- Regional or segmental distribution: Category 3
  Mastopathy
  Noninvasive ductal carcinoma

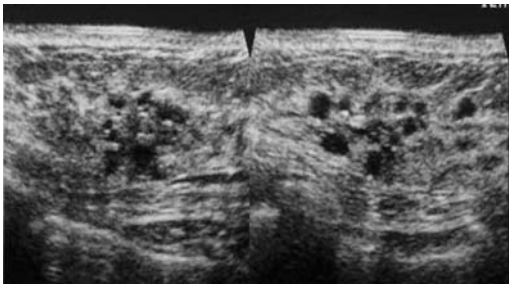
*When high echo spots suspected the calcifications are associated: mastopathy, probably

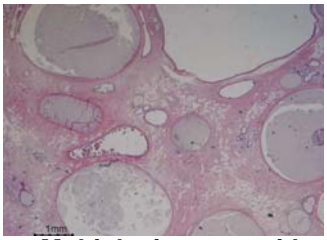
Low Echo Area in the Mammary Gland (Figs. 6, 7, 8, 9)

Low echo area whose character is different from surrounding breast tissue or the same area in the ipsilateral breast

Distribution
The distribution is very important to assess.

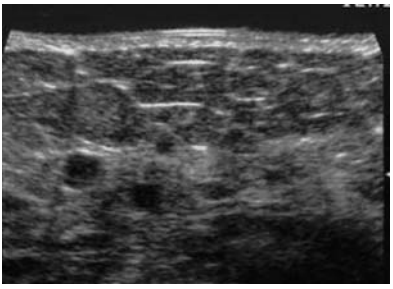
- Diffusely or scattered
- Focal
- Segmental
- Unilateral whole breast





a Multiple tiny cyst with high echo spots Category 3 mastopathy

b Segmental distributed multiple cyst Category 4 DCIS



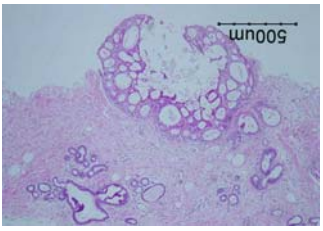
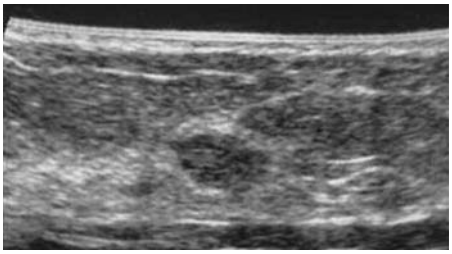
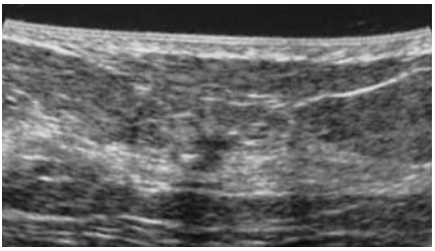
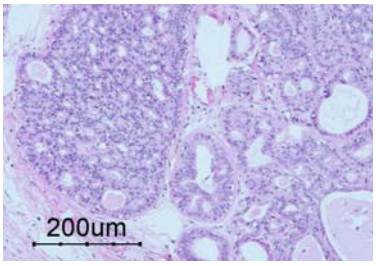


Fig. 5. Multiple tiny or small cysts





Spotted low echo lesion Category 3 DCIS

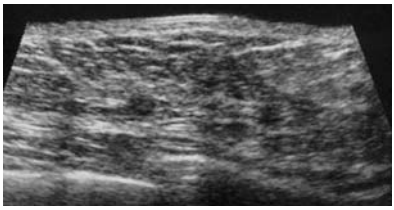


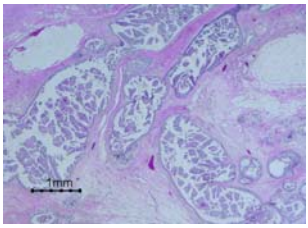
Ipsilateral breast Category 2 old fibroadenoma

Fig. 6. Spotted low echo area

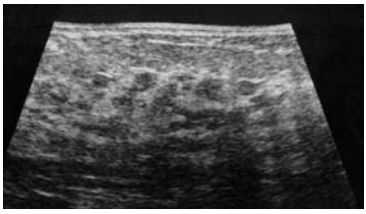
a Diffusely distributed
Category 2 mastopathy

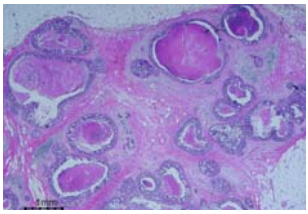
b
Segmental
distribution
Category 4
DCIS



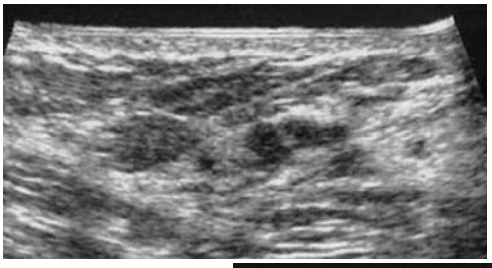


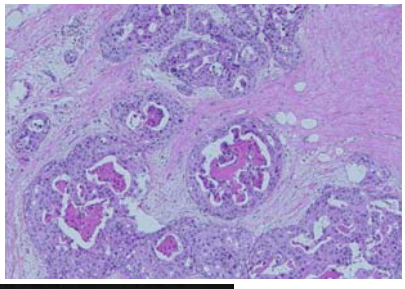
c
Segmental lesion
associated with
high echo spots
Category 5
DCIS





d Segmental Mottled low echo lesion
associated with faint high echo spots
Category 4 DCIS





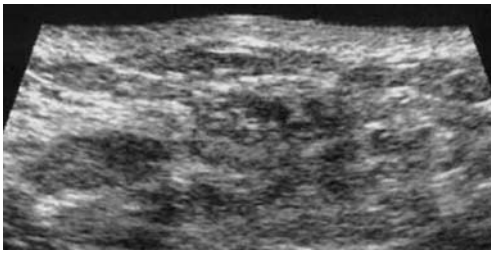


Fig. 7. Mottled low echo area

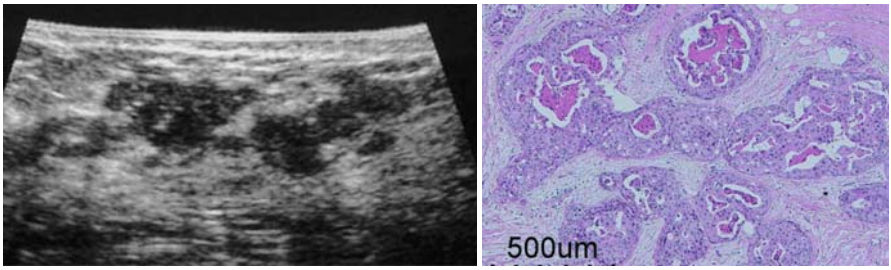


Fig. 8. Geographical low echo area

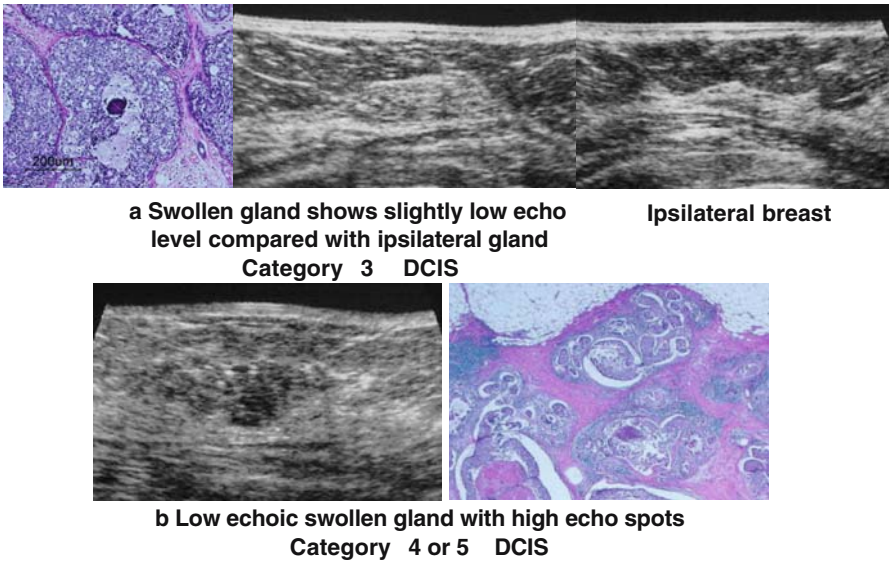
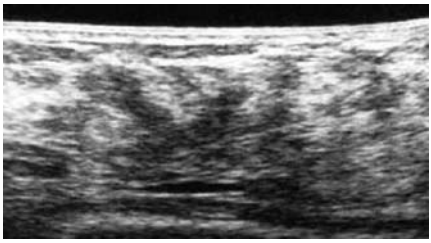
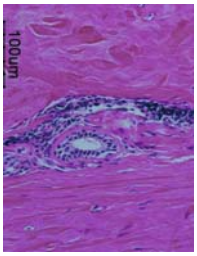


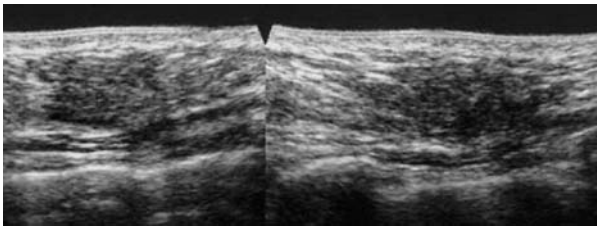
Fig. 9. Low echo area with indistinct margin

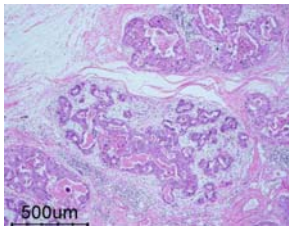


c Diffuse distribution
Category 2 mastopathy

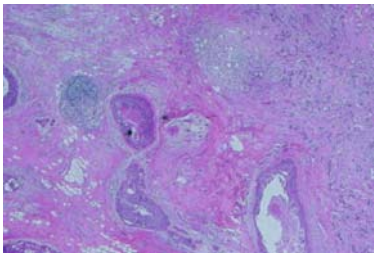


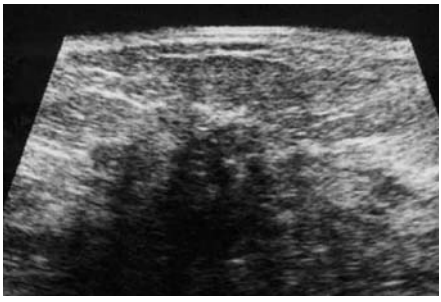
d Focal distribution
Category 4
lymphocytic mastitis





e Focal distribution
Category 4 DCIS





f Focal lesion
Category 5
invasive ductal carcinoma

FIG. 9. *Continued*

Types
(a) Spotted or mottled low echo area, geographical low echo area (Fig. 6, spotted low echo area; Fig. 7, mottled low echo area; Fig. 8, geographic low echo area)
(b) Low echo area with indistinct margin (Fig. 9)
Assessment of the low echo area in the mammary gland
- Diffusely or scattered: Category 2
  Mastopathy (inflammation)
- Focal: Category 3
  Mastopathy (inflammation)
  Noninvasive ductal carcinoma

*When the lesion is associated with the high echo spots, suspected intraductal calcifications: Category 4, 5
  Noninvasive ductal carcinoma
  Invasive ductal carcinoma with a predominant intraductal component
  Invasive carcinoma
- Segmental: Category 4
  Noninvasive ductal carcinoma
  Mastopathy
  Invasive lobular carcinoma

*When the lesion is associated with the high echo spots, suspected intraductal calcifications: Category 5
  Noninvasive ductal carcinoma
  Invasive ductal carcinoma with a predominant intraductal component
  Invasive carcinoma
- Unilateral whole breast: Category 2–5
  Normal variation
  Mastopathy
  Locally advanced breast cancer

Architectural Distortion (Fig. 10)

Distorted breast tissue without mass image formation
  *Architectural distortion associated with mass image forming lesion is the secondary one.

It is the distortion and/or retraction of the normal tissue inside and/or outside of the breast tissue:

- Associated with scar: Category 2
  Surgical scar
- Without scar: Category 4
  Invasive carcinoma (scirrhous carcinoma, invasive lobular carcinoma)
  Noninvasive ductal carcinoma
  Radial scar/complex sclerosing lesion
  Surgical scar

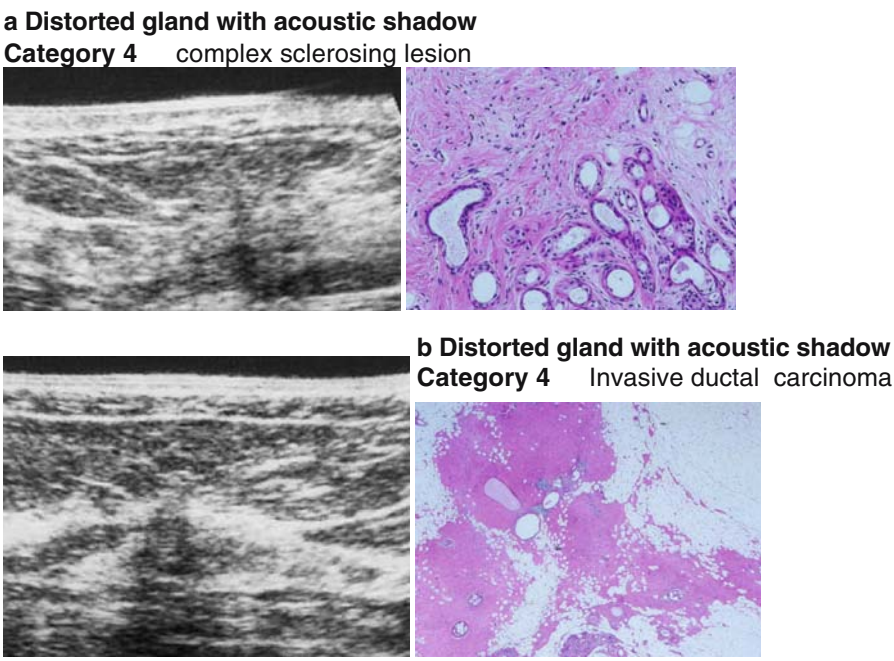


Fig. 10. Architectural distortion

Conclusions

We have reported the Diagnostic Guidelines for Non-Mass Image-Forming Lesions. These have been discussed in the subcommittee of the Japan Association of Breast and Thyroid Sonology (JABTS) and the Japan Society of Ultrasonics in Medicine.

This report is now the draft. We will discuss it further, and it will become a useful guideline for the ultrasonic diagnosis of breast cancers.

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