18 Diagnosis of Breast Disease

Imaging of the female breast with ultrasound was first performed in the early 1950s by Wild and Neal (1951, 1952), but the method did not gain wide acceptance due to the need for specially designed machines that were not available commercially. Only after ultrasound diagnosis became firmly established in other areas were special breast scanners developed, most notably through the efforts of the Japanese groups of Kobayashi (1974) and Wagai et al. (1967) and the Australian groups of Kossoff and Jellins (from 1971 to 1975). The introduction of the gray-scale technique by the same groups, combined with the use of automated water-bath scanners, provided greatly enhanced images of the female breast. It must be emphasized, however, that while instruments have been specially developed for breast examination, their capabilities are not inherently superior to those of good real-time scanners, because they have the same limitations of resolution. Nevertheless, the overview provided by immersion-type scanners is a definite advantage. There is no one breast scanner that is ideal in all situations. Today ultrasound has two principal applications in the diagnosis of breast disease:

1. The separation of palpable masses into cystic and solid and the guidance of fine-needle aspiration. This can be done with almost any conventional compound and real-time scanner, with or without water coupling.

2. Structural examination of the breast in an attempt to characterize tissues. Only automated water-bath scanners are satisfactory for this purpose. Since so far no instrument can provide true early detection of breast carcinoma, this should be attempted only at specialized centers and on a research basis.

Our own experience is based on real-time examinations performed since 1975 and on systematically evaluated examinations with a modern water-bath scanner since 1979. We use the U.S. Octoson, which has the capability of performing compound scans with one to eight transducers and single scans with one transducer only. During this time we have examined more than 1,400 patients, in whom more than 300 carcinomas and several hundred benign lesions have been histologically confirmed.

18.1 Normal Structures

The immersion method is preferred for the depiction of breast anatomy, as it avoids deformation of the breast (Fig. 18.1). The following structures can be identified:

1. Nipple
2. Skin
3. Subcutaneous fat
4. Glandular tissue
5. Chest wall with pectoralis muscle

Additional breast structures may sometimes be visualized (Fig. 18.2):

1. Lactiferous duct
2. Lactiferous sinus
3. Montgomery’s gland
4. Subcutaneous vein

Based on our experience (Duda and Huneke 1982), four main types of glandular tissue can be demonstrated with ultrasound:

1. Tissue with strong central acoustic absorption (Fig. 18.3a; unfavorable for evaluation)
2. Homogeneously dense tissue (Fig. 18.3b; favorable)
3. Partially involuted tissue (Fig. 18.3c; relatively unfavorable due to fatty infiltration)
4. Involved tissue (Fig. 18.3d; hypoechoic fat hampers detection of pathologic processes)

Our experience also indicates that the majority of women have breasts of the homogeneously dense or partially involuted type, and thus that the conditions for sonographic examination are favorable in most patients.
**18.2 Pathologic Structures**

*18.2.1 Duct Ectasia*

Normal lactiferous ducts are visible with ultrasound (Fig. 18.2a), and ectatic ducts are quite conspicuous. One might assume that carcinomas or other solid masses could be easily identified within the dilated ducts, but this is not the case, because the relatively thick cross-sectional image leads to superimpositions that mimic the appearance of solid structures projecting into the lumina (Fig. 18.4a–c).