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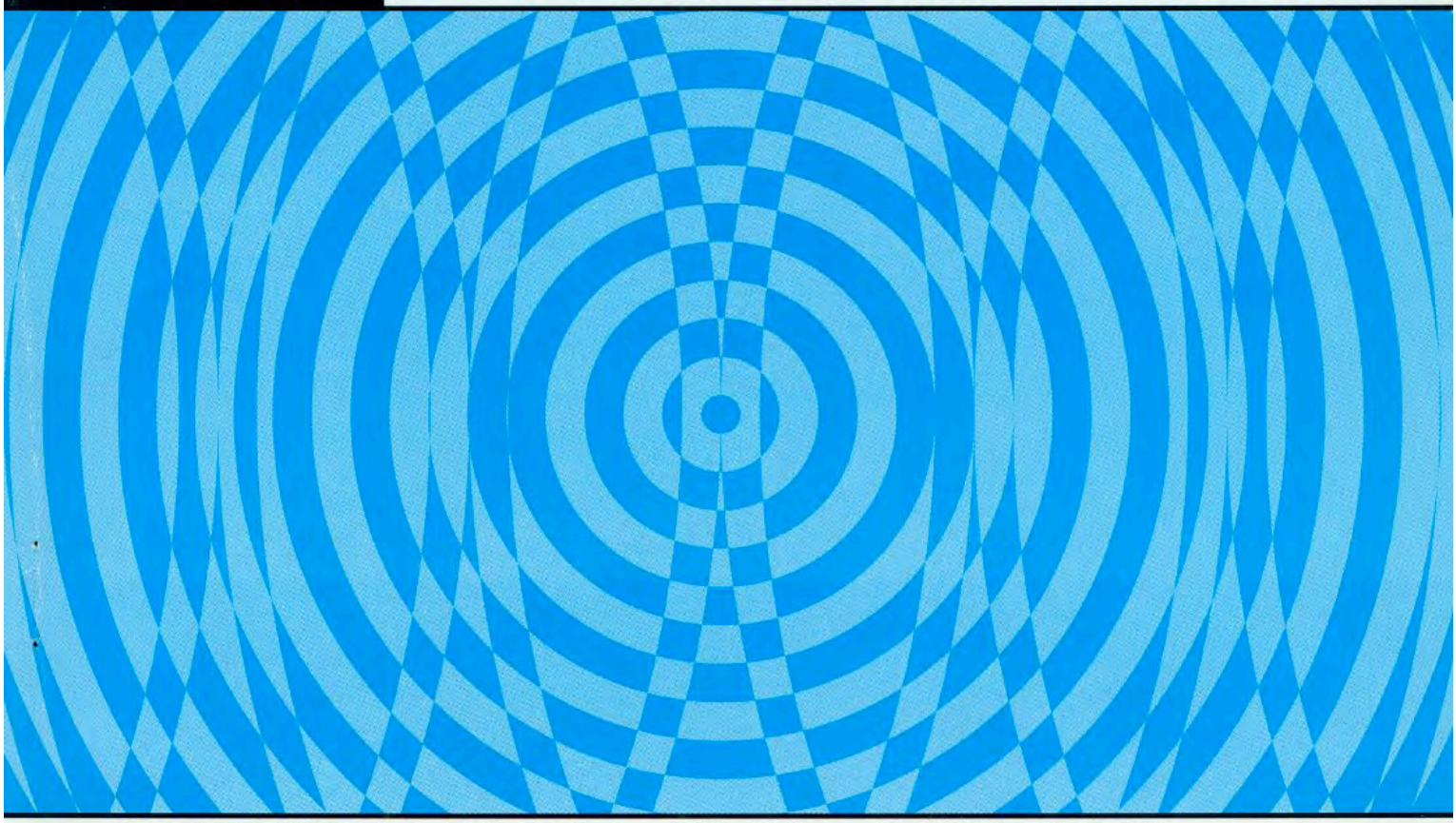

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IBUS GUIDELINES FOR THE ULTRASONIC EXAMINATION OF THE BREAST *

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on behalf of the IBUS International Faculty**

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1. Introduction

The International Breast Ultrasound School (IBUS) was formed in December 1991, and its office is located in Switzerland at the Kantonsspital Baden. IBUS is a multidisciplinary organization with representation from the different medical disciplines dedicated to the detection, diagnosis and management of breast disease. The aims of IBUS are as follows: 1. to improve the standards of breast ultrasound for assessing the breast and its pathology; 2. to provide high-quality seminars and interactive workshops covering ultrasound, X-ray mammography, MR imaging and other investigative techniques; 3. to evaluate the role of conventional and newer imaging techniques; and 4. to promote an international forum for the exchange of scientific and clinical breast imaging information.

In recent years, IBUS has provided teaching programmes in many countries based on formal lectures and interactive workshops at basic and advanced levels covering all aspects of breast imaging. Ultrasonic examination techniques have become an essential tool in assessing patients with breast problems, and when used in the hands of experienced clinicians provides valuable clinical information. The need for guidelines has been recognized in order to assist in standard ultrasound provision, and these guidelines prepared by the International Breast Ultrasound School form the basis of recommendations to improve the quality of ultrasonic breast examinations. A listing of the IBUS International Faculty in included at the end of the guidelines.

2. IBUS Guidelines

The quality of ultrasonic imaging depends on:-

Equipment

Examination technique

Interpretation

3. Equipment requirements

Only high resolution instrumentation producing high quality images should be used. Important parameters include spatial, contrast, temporal and vascular resolutions.

Linear array or annular array transducer configurations are suitable for high quality images. The dominant transducer frequency should be 7.5 MHz or higher, preferably of a broad bandwidth construction. However, high frequency on its own is not a sufficient parameter to ensure quality.

A field of view greater than 4 cm is preferable for large area examinations, and smaller fields are suitable for detailed examination of specific findings.

A penetration depth of at least 4 cm with selectable focal regions is required.

The transducer dead zone should be minimal, and limited to a distance of less than 2-3 mm to clearly display superficial structures.

When colour Doppler imaging is included in the examination procedure, the colour display only provides an estimate of vascularity.
High sensitivity for low amplitude and low signal flow detection requires Doppler frequencies above 5 MHz. Low flow velocity detection requires wall filter settings in the range of 50 to 100 Hz, and low pulse repetition frequency (PRF) around 1000 Hz.

4. Examination technique

In order to evaluate breast anatomy and not to miss subtle pathology, the examination should be:-

Systematic

Comprehensive

Reproducible

• **systematic**: A planned approach for performance and documentation of the examination is required. When a specific lesion is examined, its precise position should be noted on the image and its correlation with the clinical and mammographic findings recorded. When the total breast volume needs to be assessed, overlapping scans will ensure complete examination.

• **comprehensive**: All breast structures must be completely displayed, and particular care taken in the area of interest to ensure that normal anatomical and/or pathological findings are recognized and recorded.

• **reproducible**: The imaging results must be readily reproducible, and ultrasonic findings should be clearly identified on the stored images. It should be possible to confirm the same appearances on different types of high resolution ultrasonic scanning systems.

As the acquisition of ultrasonic images is very operator dependent, a thorough understanding of the physical principles of ultrasound and of the normal anatomy are essential to achieve high quality images.

Supine oblique or supine position is recommended to reduce breast thickness and to improve visualization of deeper tissues. The reduced thickness allows optimization of focusing.

One or both arms should be elevated behind the head or neck to stretch the pectoralis muscle for better fixation and immobilization of the breast.

When scanning the transducer should always be perpendicular to the skin surface.

Transducer coupling to the skin surface should be gentle and should give complete contact.

Strong compression pushes lesions out of the scanning plane below the transducer and should be avoided as it deforms tissue structures making interpretation more difficult.

Compression is useful to avoid refraction and scattering from normal anatomical structures when sound penetration is insufficient, and to examine tissue elasticity of benign and malignant findings.

The scanning procedure should involve overlapping scanning planes. These may be parasagittal, transverse, radial, or antiradial. Radial and antiradial scans follow normal anatomical patterns, assisting the recognition of abnormalities and better demonstrating ductal structure and changes.

5. Interpretation.

Ultrasonic examination of the breast is difficult and requires:-

a) detailed knowledge of anatomy, physiological changes and benign and malignant pathology.

b) correlation of findings with other imaging results, clinical information and examination

Imaging features to be assessed:

Lesion features	**Adjacent features**
Shape (including depth/width ratio)	Architectural pattern
Boundaries, margins (including edge refraction)	Fibroglandular echogenicity
Internal echo texture	Fat echogenicity
Through transmission (enhancement, shadowing)	Cooper's ligament thickness
Calcifications	Skin thickness
	Ductal alterations

The minimum report should include:-

• The indications for the examination

• A description of any lesion(s) and adjacent features including the size of the maximum diameter(s) or extent

• The position of the lesion(s) as represented on a clock face, and its distance from the nipple

• Correlation with clinical and/or mammographic or other imaging findings

• Opinion regarding provisional diagnosis(es) and significance of finding(s)

6. Interventional procedures

Guided interventional procedures include:-

1) Cytology and core biopsy

2) Abscess drainage

3) Preoperative localization: hookwire placement, carbon tracking,
and radionuclide marking

4) Intraoperative localization
or localization

5) Radionuclide injection for sentinel node identification

6) Specimen imaging for verification of lesion removal

Ultrasound guidance, either free hand or with mechanical guidance, is best performed with the needle shaft parallel with the transducer length so that the full extent of the needle and the tip can be visualized at all times.

Free hand puncture enables the angle of approach to be optimized. Where practical, the angulation between the needle shaft and the transducer contact surface should be kept to a minimum. A horizontal angle of approach, with the needle positioned approximately parallel with the chest wall, is required for safety reasons and also for better angulation of the needle to the beam, improving the needle display.

Experience with interventional procedures is required for expertise.

7. Accuracy and confidence.

Accuracy and confidence in interpretation requires experience.

Continuous education and follow up are essential to improve and maintain skills in technique and interpretation.

Recommendations by the International Breast Ultrasound School (IBUS) to achieve accuracy and confidence:-

a) performance of a minimum of 500 examinations in a multidisciplinary environment with at least 300 cytology or histology correlation cases, and

b) performance of at least 50 interventional procedures with appropriate follow up.

8. IBUS International Faculty (1998-2000)

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