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Special Paper

The Role of Ultrasound in Breast Cancer Screening. A Consensus Statement by the European Group for Breast Cancer Screening

W. Teh and A.R.M. Wilson

Nottingham National Breast Screening Training Centre, City Hospital, Hucknall Road, Nottingham
NG5 1PB, U.K.

The members of the European Group for Breast Cancer Screening have considered the use of ultrasound in breast diagnosis and breast cancer screening. After wide consultation and a detailed literature review, the consensus of the Group on the role of ultrasound is as follows: current evidence indicates that ultrasound of the breast is an important adjunct to mammography and clinical examination in the further assessment of both palpable and impalpable breast abnormalities. However, the use of ultrasound in population screening of asymptomatic women is associated with unacceptably high rates of both false positive and false negative outcomes. At present there is little evidence to support the use of ultrasound in population breast cancer screening at any age. © 1998 Elsevier Science Ltd. All rights reserved.

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INTRODUCTION

THE European Group for Breast Cancer Screening (EGBCS) was founded in 1982 by some of those involved in the early studies of breast cancer screening, to promote research into screening methods and to encourage the widespread introduction of breast cancer screening by mammography. The Group, now with 140 members from 12 different European countries, meets annually in a formal scientific forum to discuss collaborative research and to define consensus statements on current screening issues. At its meeting in September 1996 in Nicosia, Cyprus, the Group discussed in detail the issue of the role of ultrasound in breast cancer screening. The opinions of the assembled members were recorded by the Secretary and the Group agreed that these should be collated, after literature review, into a paper to be circulated to all the members for comment and amendment. All scientific papers involving breast ultrasound in screening and symptomatic assessment published in peer reviewed scientific journals were identified for review. This consensus statement is the product of this process.

Ultrasound has an established role in the further evaluation of clinical and mammographic breast abnormalities at all ages

and is the imaging method of first choice for the assessment of symptomatic breast lesions in younger women (< 35 years of age) [1]. It is reliable in distinguishing cystic from solid lesions and recent improvements in ultrasound resolution and advances in colour Doppler technology have meant that benign and malignant lesions can be identified with some degree of confidence, particularly when used in conjunction with clinical and mammographic assessment [2–4]. Ultrasound guidance is also arguably the most accurate method of performing needle core biopsy and fine needle aspiration of localised breast abnormalities.

Recent technological advances have stimulated a resurgence of interest in the use of ultrasound as a primary screening tool, particularly in younger women in whom the theoretical radiation risks of mammography are most pertinent. In light of this, we reviewed the literature and examined the efficacy of ultrasound as a screening technique.

SCREENING

Breast screening (imaging in asymptomatic women), by detecting the disease earlier and allowing treatment at an earlier stage, can significantly reduce breast cancer mortality [5]. The technique used for screening must have high sensitivity for small breast cancers, high specificity and be cost-effective, safe and acceptable to the population being

Correspondence to A.R.M. Wilson.

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screened. Mammography has been proven in randomised controlled trials to fulfil these criteria within certain age ranges (50–70 years) and is the established screening method [6–8]. For ultrasound to be used for breast screening, it must also satisfy all these criteria. Furthermore, to replace mammography, ultrasound would have to show at least the same sensitivity for small and pre-invasive breast cancers, including the detection of clinically occult solid mass lesions, architectural distortions and microcalcifications.

ULTRASOUND AND MAMMOGRAPHY

Opponents of the use of ultrasound as a screening tool often cite the available literature directly comparing mammography with ultrasound, which demonstrates that ultrasound performs less well, especially when compared with high-quality dedicated mammography. However, most of these studies were published in the early 1980s and used either static or automated ultrasound scanners which were technically inferior to currently available equipment [9–14]. In spite of much improved equipment, the sensitivity of the technique remains highly operator dependent; examination of the whole of both breasts is time consuming and recording of comprehensive 'hard copy' of the images remains impractical and costly.

Even with the use of real-time ultrasonography in more recent studies, ultrasound has not been shown to demonstrate reliably a significant proportion of non-palpable carcinomas detected on mammography [15–19]. This is compounded by the poor detection of microcalcification, an important feature of both ductal carcinoma *in situ* and small invasive cancer [20]. Detection of microcalcification by ultrasound (range 0–62% [16, 17, 21]) to significant levels has only been achieved when the operator has been made aware of the location of the microcalcification shown on mammography [21]. If ultrasound is used as the sole screening technique, significant false negative outcomes are inevitable and will result in false reassurance with delayed diagnosis and treatment.

Very few lesions are detected on ultrasonography which are not also detected on mammography. The majority of these occur in those with mammographically dense breasts and few of these lesions prove to be malignant [15, 22–24]. In a recent retrospective review of malignancies detected only on ultrasound, a total of 12 706 breast ultrasound examinations were performed before 1575 clinically and mammographically occult lesions were detected. Of these, only 44 (2.8% of lesions found or 0.3% of examinations performed) were confirmed as cancers [23]. The high rates of false positive outcomes associated with ultrasound breast screening lead to unnecessary further investigation causing significant morbidity in normal women.

The low sensitivity and specificity of ultrasound in the screening setting and the implications of its high false positive and false negative rates mean that it cannot be considered as a cost-effective or clinically acceptable primary screening method. Although rapid improvements of both ultrasound resolution and colour Doppler technology are continuing, it remains to be seen whether these will transform ultrasound into an effective screening modality.

CONCLUSION

Ultrasound of the breast is an important adjunct to mammography and clinical examination in the further assessment of both palpable and impalpable breast abnormalities. The use of ultrasound to screen asymptomatic women is associated

with unacceptable false positive and false negative outcomes. At present there is little evidence to support the use of breast ultrasound in routine primary population breast cancer screening.

1. Stavros AT, Thickman D, Rapp CL, Dennis MA, Parker SH, Sisney GA. Solid breast nodules: use of sonography to distinguish between benign and malignant lesions. *Radiology* 1995, **196**, 123–134.
2. Taylor KJW. Can complementary ultrasound reduce the number of biopsies of benign breast masses? (Abstr). *Radiology* 1993, **189**(P), 179.
3. Meritt CRB. Breast nodules: sonographic characterisation. In Bluth EI, Arger PH, Hertzberg BS, Middleton WD, eds. *Syllabus: A Special Course in Ultrasound*. Oak Brook, Illinois, U.S.A. RSNA publications, 1996, 331–337.
4. Ciatto S, Rosselli Del Turco M, Catarzi S, Morrone D. The contribution of ultrasonography to the differential diagnosis of breast cancer. *Neoplasma* 1994, **41**, 341–345.
5. Moskowitz M. Screening is not diagnosis. *Radiology* 1979, **133**, 265–268.
6. United Kingdom Trial of Early Detection of Breast Cancer Group. Specificity of screening in United Kingdom Trial of early detection of breast cancer. *Br Med J* 1992, **304**, 346–349.
7. Nystrom L, Rutqvist LE, Wall S, *et al.* Breast cancer screening with mammography: an overview of the Swedish randomised trials. *Lancet* 1993, **341**, 974.
8. Roberts MM, Alexander FE, Anderson TJ, *et al.* Edinburgh trial of screening: mortality at seven years. *Lancet* 1990, **355**, 241.
9. Cole-Beuglat C, Goldberg BB, Kurtz AB, Rubin CS, Patchefsky AS, Shaber GS. Ultrasound mammography: a comparison with radiographic mammography. *Radiology* 1981, **139**, 693–698.
10. Bassett LW, Kimme-Smith C, Sutherland LK, Gold RH, Sarti D, King III W. Automated and hand-held breast US: effect on patient management. *Radiology* 1987, **165**, 103–108.
11. Kimme-Smith C, Bassett LW, Gold RH. High frequency breast ultrasound. Hand-held versus automated units; examination for palpable mass versus screening. *J Ultrasound Med* 1988, **7**(2), 77–81.
12. Kopans DB, Meyer JE, Lindfors KK. Whole breast imaging: four year follow-up. *Radiology* 1985, **157**, 505–507.
13. Sickles EA, Filly RA, Callen PW. Breast cancer detection with sonography and mammography: comparison using state-of-the-art equipment. *Am J Roentgenology* 1983, **140**, 843–845.
14. Sickles EA, Filly RA, Callen PW. Benign breast lesions: ultrasound detection and diagnosis. *Radiology* 1984, **151**, 467–470.
15. Jackson VP. The role of ultrasound in breast imaging. *Radiology* 1990, **177**, 305–311.
16. Pamilo M, Soiva M, Anttinen I, Roiha M, Suramo I. Ultrasonography of breast lesions detected in mammography screening. *Acta Radiol* 1991, **32**, 220–225.
17. Potterton AJ, Peakman DJ, Young JR. Ultrasound demonstration of small breast cancers detected by mammographic screening. *Clin Radiol* 1994, **49**(11), 808–813.
18. Rissanen TJ, Makarainen HP, Apaja-Sarkkinen MA, Lindholm EL. Mammography and ultrasound in the diagnosis of contralateral breast cancer. *Acta Radiol* 1995, **36**(4), 358–361.
19. Boetes C, Mus RD, Holland R, *et al.* Breast tumours: comparative accuracy of MR imaging relative to mammography and US for demonstrating extent. *Radiology* 1995, **197**(3), 743–747.
20. Evans AJ, Pinder SE, Snead DRJ, Wilson ARM, Ellis IO, Elston CW. The detection of ductal carcinoma *in situ* at mammographic screening enables the diagnosis of small, grade 3 invasive tumours. *Br J Cancer* 1997, **75**(4), 542–544.
21. Leucht WJ, Leucht D, Kiesel L. Sonographic demonstration and evaluation of microcalcifications in the breast. *Breast Disease* 1992, **5**, 105–123.
22. Fung HM, Jackson FI. Clinically and mammographically occult breast lesions demonstrated by ultrasound. *J R Soc Med* 1990, **83**, 696–698.
23. Gordon PB, Goldenberg SL. Malignant masses detected only by US. A retrospective review. *Cancer* 1995, **76**, 626–630.
24. Jackson VP, Hendrick RE, Feig SA, Kopans DB. Imaging of the radiographically dense breast. *Radiology* 1993, **188**, 297–301.