E16. Update on diagnostic imaging: the role of digital mammography

Marco Rosselli Del Turco[1], Rita Bonardi[2], Barbara Lazzari[2]

[1]Centro per lo Studio e la Prevenzione Oncologica (CSPO),
[2]U.O. Fisica Sanitaria – Azienda Ospedaliera Careggi, Firenze, Italy

Imaging technology for breast cancer detection and diagnosis has changed rapidly over the last 30 years. Among the newer imaging techniques for early detection of breast cancer, Digital Mammography (DM) is expected to have a major impact on the quality and organisation of breast diagnostic and screening units.

The principal theoretical advantage of DM comes from decoupling the image display from the image receptor. This permits the digital image to be captured, stored electronically, and then manipulated, analysed, and displayed allowing each step to be optimised. Many physical measurements have shown that DM performs better in the visualisation of very low contrast details and at least equally well for high contrast details, even when details smaller then the pixel size are presented [1].

Two major trials have been carried out, mainly in screening populations, in the United States of America (USA) – University of Colorado and of Massachusetts [2] – and in Europe – the Oslo Trial [3] – with the aim of evaluating the performance of Full Field Digital Mammography (FFDM) with soft copy reading compared with conventional screen-film mammography (SFM). These trials showed that FFDM with soft-copy reading compared with SFM have comparable detection rates in population-based screening.

We have evaluated the diagnostic accuracy of conventional film-screen (FSM) and DM (Fuji Computed Radiography 5000 MA System: FCR) in the assessment of 100 breast lesions consecutively detected in the Florence screening programme, with a low expected positive predictive value.

Physical measurements showed overall a better performance for FCR in comparison to FSM (Fig. 1), whilst receiver operating curve (ROC) analysis did not show significant differences in the radiologist's performance on FSM, digital Hard Copy or Soft Copy (Fig. 2). We concluded that FCR may be safely introduced in the routine screening practice for the assessment of screen-detected lesions, after an adequate training of radiologists at the workstation. On the other hand, we know that the performance of radiologists currently involved in mammography reporting is far from optimal when measured with proficiency tests [4]. In our experience, single-reading together with Computer-Aided Detection (CAD) was as effective as conventional double reading and its current use in screening with a dedicated digital system could compensate for the lack of skilled radiologists [5,6]. An adequate evaluation of the use of CAD in a large prospective study in a screening population is needed in order to estimate the potential improvement of radiological performance. Furthermore, in asymptomatic women, the role of ultrasounds in radiologically-dense breasts and of contrast-enhanced magnetic resonance (CE-MR) in young women at high risk is now under study.

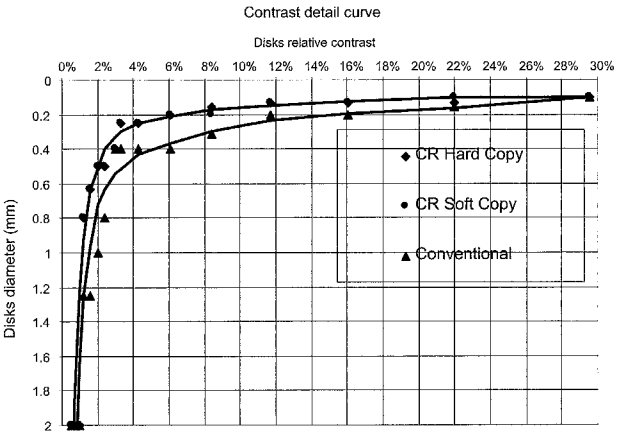

Fig. 1. Contrast/detail curves for conventional screen-film mammography (SFM), Fuji 5000 MA Computed Radiography (CR) Hard Copies and Soft Copies.

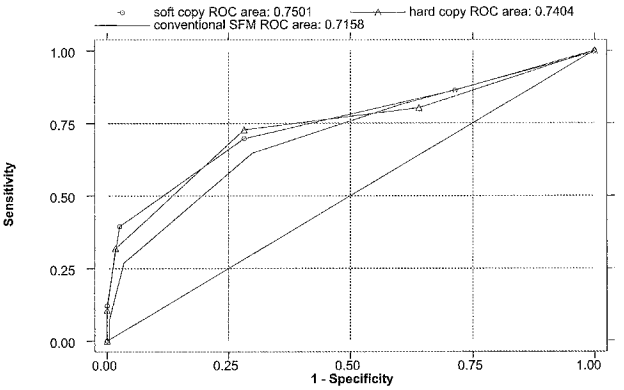

Fig. 2. Receiver operating curve (ROC) analysis for conventional SFM, Fuji 5000 MA Computed Radiography Hard Copies and Soft Copies.

1359-6349/$ – see front matter

In symptomatic patients, CE-MR and Scintimammography may be useful in selected cases as complementary tools to improve the accuracy of clinical examination, mammography and ultrasounds. New techniques such as contrast-enhanced ultrasonography, 3-dimensional (3D) ultrasonography and 3D-Mammography, new thermography applications or electrical impedance scanning are all experimental and do not have any clinical application at this stage.

References

[1] Thijssen M, Veldkamp W, van Engen R, Swinkels M, Karssemeijer N, Hendriks J. Comparison of the detectability of small details in a film-screen and a digital mammography system by the imaging of a new CDMAN-Phantom. In Martin J. Yaffe, eds. *Digital Mammography IWDM 2000. 5th International Workshop on Digital Mammography.* Madison, Wisconsin, Medical Physics Publishing. 2001. 666–672.

[2] Lewin JM, Hendrick RE, D'Orsi CJ et al. Comparison of full-field digital mammography with screen-film mammography for cancer detection: results of 4,945 paired examinations. Radiology 2001, 218(3), 873–875.

[3] Skaane P, Young K, Skjennald A.: Population-based Mammography screening: comparison of screen-film and full-field digital mammography with soft-copy reading – Oslo I Study. Radiology. 2003 Oct 23.

[4] Ciatto S, Ambrogetti D, Catarzi S, Morrone D, Rosselli Del Turco M. Proficiency test for screening mammography: results for 117 volunteer italian radiologists. J Med Screen 1999, 6, 149–151.

[5] Ciatto S, Rosselli Del Turco M, Risso G, Catarzi S et al.: Comparison of standard reading and computer aided detection (CAD) on a national proficiency test of screening mammography. Eur J Radiol. 2003 Feb; 45(2): 135–8.

[6] Ciatto S, Rosselli Del Turco M, Burke P, Visioli C, Paci E, Zappa M.: Comparison of standard and double reading and computer-aided detection (CAD) of interval cancers at prior negative screening mammograms: blind review. Br J Cancer. 2003 Nov 3; 89(9): 1645–9.