"Imagebox"-a new approach to multicentre radiology reviews using a web-based image review system:pilot validation study

Poster No.:	C-3265
Congress:	ECR 2010
Type:	Scientific Exhibit
Topic:	Breast - Your latest results
Authors:	M. Y. Kataoka[1], P. L. Moyle[1], R. M. L. Warren[1], K. Wheeler[2], I. Warsi[1], M. G. Wallis[1]; [1]Cambridge/UK, [2]Southampton/UK
Keywords:	breast, web, mammography
Keywords:	Breast
DOI:	10.1594/ecr2010/C-3265

Purpose

Prospective study of Outcomes in Sporadic versus Hereditary breast cancer (POSH study) is a nation-wide project recruiting women aged less than 40 years or carrying germline mutations of BRCA 1 or 2 (1). The primary outcome of POSH Radiology review is radiological features of breast cancer in women in this population which may be predictive of genetic, pathological factors or outcomes, and which may impact on patient care or screening. The secondary outcome includes mammographic features of the background breast such as mammographic density. The imaging data can be combined with pathology / genetic data. These analyses will give us clue for breast cancer aetiology and adequate imaging assessments for this young population.

Images of approximately 2500 women from more than 100 hospitals are collected for this review. To overcome the logistical challenge of assembling images from many hospitals and involving many radiologists in the review, a web-based image reviewing system (called "ImageBox") has been developed. Authorized readers can access anonymised images from anywhere via internet. This may be a promising solution to conduct image-related multicentre research project and may be convenient for readers who are often busy with clinical work. The purpose of this pilot study is the diagnostic validation of "ImageBox" comparing the reading results of the web-based reviewing system with those of an analogue film-based review, focusing on key mammographic features.

Methods and Materials

Study population and image preparation

Study population consisted of subgroup of women in the POSH study whose diagnostic analogue images (mammogram films and ultrasound images printed either on films or thermal paper) were available for both digitisation and film-reading by our radiologist. Diagnostic images of eligible women from 29 hospitals were sent to our hospital and digitized. Analogue mammograms and ultrasound films were digitized by an Array laser 2905 film digitizer (Array Corporation USA, Hampton, NH, USA) with following setting; output format: dicom, resolution: 50 micro millimeter, optical density: 4.7.

Diagnostic images were then sent to our radiologist for analogue film-based review. Digitized electronic image data were converted from dicom to bitmap, anonymised, and sent to the study IT centre (Fig.1 on page 5).

Web-based image reviewing system "ImageBox"

At study IT centre, digitized images were securely uploaded to the web-based review system "ImageBox". This system is developed to overcome the logistical challenge of assembling images from many hospitals and involving many radiologists in the review. This system has following features;

1. An image viewer showing 4-view mammograms and ultrasound images if available.

2. An image viewer is linked with a BIRADS-based scoring sheet database.

3. Authorized readers can access anonymised images from anywhere via internet.

4. Unread cases are offered in a random order.

(Fig.1 on page 5 and 2 on page 5)

Images were accessed and reviewed by a consultant radiologist using web-based scoring system, which were based on BIRADS(2,3). For mammogram, each of the right and left breast was assessed using 5-grade categorical system as follows;

Category 1 - Negative

Category 2 - Benign findings

Category 3 - Probably benign

Category 4 - Suspicious abnormality

Category 5 - Highly suggestive of malignancy

In addition, detailed assessment was made when a lesion (mass and/or calcification and/or asymmetry) was identified.

In case of a mass, margin of the mass was classified into 5 categories (microlobulated, obscured, indistinct, spiculated, or circumscribed). Size, shape, density and location of the mass were also recorded.

In case of calcification, type of calcification is classified into a simplified 4-grade categorical system (1.Benign, 2.Punctate/Powder, 3.Granular/Crushed stone 4.Casting/linear).

Film-based review

The same radiologist performed film-based review using the same classification system. Web-based review was performed more than three months after film based review.

Images for this section:

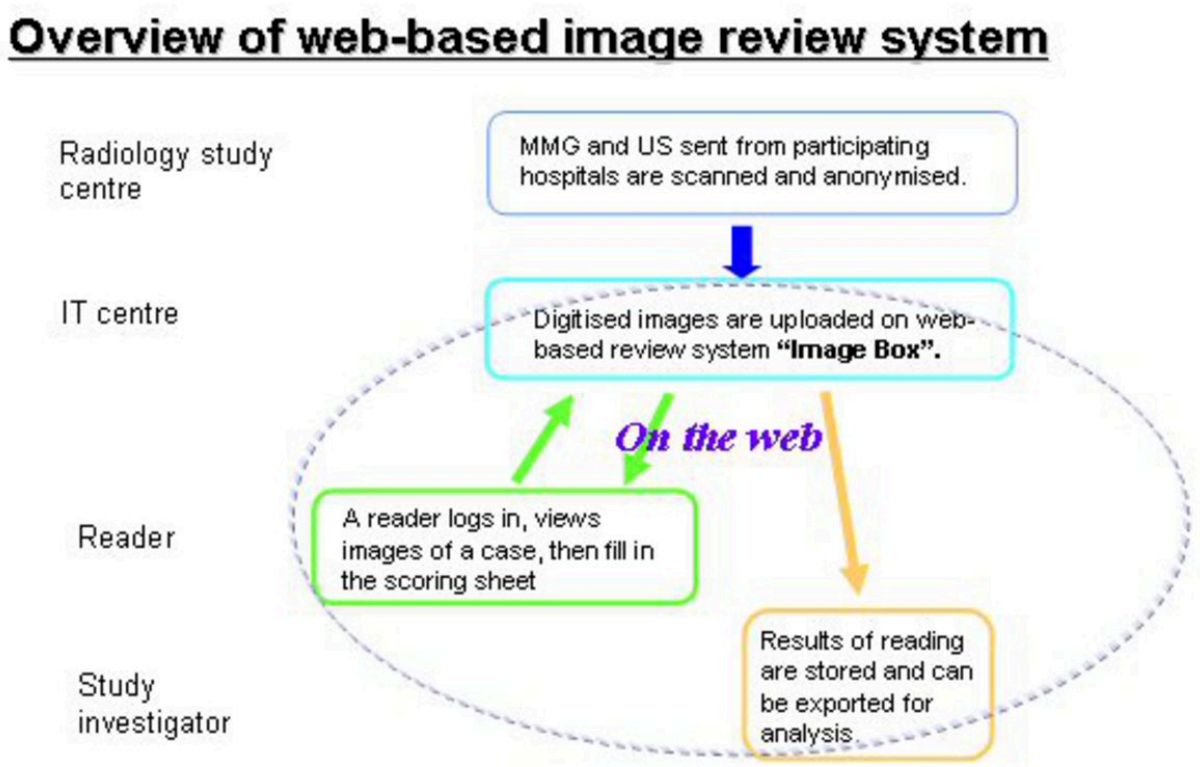

Fig. 0: Overview of web-based image review system

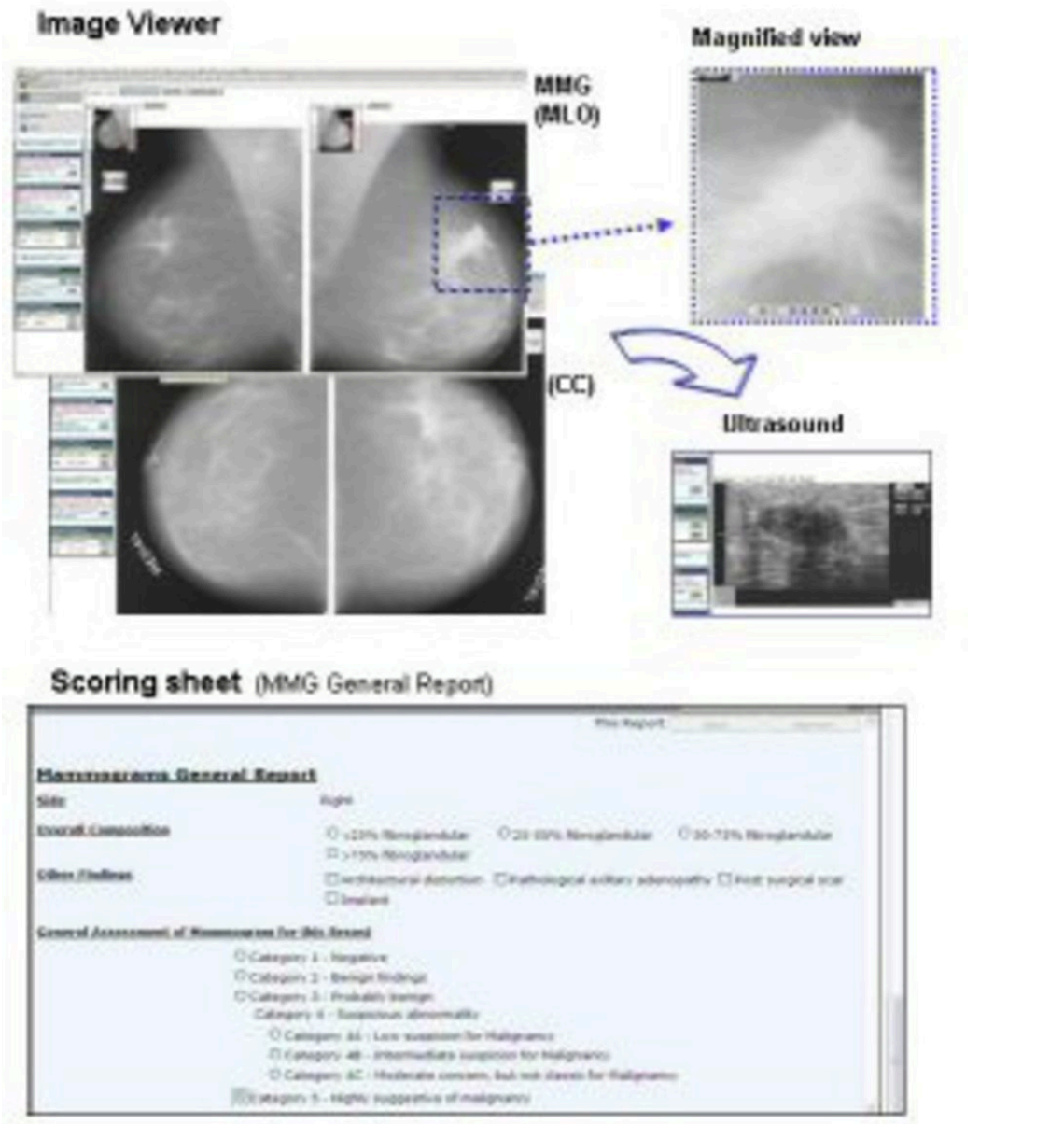

Fig. 0: Reader interface of Web-based image review system "ImageBox"

© Department of Radiology, University of Cambridge - Cambridge/UK

Results

This pilot analysis included mammograms from 77 patients (154 sides). Final category of web-based and film-based reading agreed completely in 122 out of 154 breasts (79%, weighted kappa value, 0.82). Margin of the mass agreed in 34 out of 48 breasts (71%) . Although calcification type disagreed in 11out of 23 breasts, 7 were of adjacent categories (See table on page 8).

Images for this section:

Agreement of MMG findings between web and film (77 cases, 154 breasts)		
	No. of breasts	
5-category assessment of the breast	122/154	(79%)
Margin of the mass (5 categories)	34/48	(71%)
Calcification type (1-4 categorical order)	12/23	(52%)

Fig. 0: Table. Agreement of MMG findings between web and film

Conclusion

Final 5-grade assessment of the web-based reviewing system showed good agreement with those of film-based review, although there were variations in description of mass or calcification. Web-based reading is comparable to film review and is a promising tool for multicentre radiology research.

References

1) Eccles D. et al. Prospective study of Outcomes in Sporadic versus Hereditary breast cancer (POSH): study protocol BMC Cancer 2007,7:160

2) Reston,VA ,American College of Radiologists .BI-RADS: mammography. Breast imaging reporting and data syatem: BI-RADS atlas, 4th ed.American College of Radiology, 2003.

3) Reston,VA ,American College of Radiologists .BI-RADS: ultrasound. Breast imaging reporting and data system: BI-RADS atlas, 4th ed.American College of Radiology, 2003.

Personal Information

Demonstration version of "ImageBox" is available at http://152.78.9.156/imageboxdemo/

(username: demo, password :demo) .

Acknowledgements

We appreciate Prof. Diana Eccles and Ms. Sue Gerty (Southampton) for their help in data and image collection. Funding for the POSH Radiology Review has been provided by Breast Cancer Campaign.