The Egyptian Journal of Radiology and Nuclear Medicine (2016) 47, 1151–1157

Egyptian Society of Radiology and Nuclear Medicine

The Egyptian Journal of Radiology and Nuclear Medicine

www.elsevier.com/locate/ejrnm
www.sciencedirect.com

ORIGINAL ARTICLE

Role of diffusion weighted imaging and dynamic contrast enhanced MR mammography to detect recurrence in breast cancer patients after surgery

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Received 10 October 2015; accepted 10 April 2016
Available online 2 May 2016

KEYWORDS

DWI;
DCE-MRI;
Breast cancer recurrence

Abstract *Objective:* To assess role of Diffusion weighted imaging (DWI) in addition to dynamic contrast-enhanced magnetic resonance mammography (DCE-MRM) in detection of breast cancer recurrence after surgery.

Patients and methods: Sixty female patients who underwent breast surgery were included in this prospective study. Patients were examined by sonomammography followed by DCE-MRI to exclude recurrence. DWI was performed using *b* values of 0, 50, and 850 s/mm^2. Patients with suspected recurrence were subjected to histopathological confirmation.

Results: Twenty seven patients had pathologically proven recurrence and thirty three patients showed spectrum of post operative changes. DCE-MRI was superior to DWI with 2 false positive (FP) cases and no false negative (FN) cases, while DWI showed 3 (FN) cases and 4 (FP) cases. DCE-MRI & DWI showed sensitivity (100%, 88.9%), specificity (93.9%, 87.9%), positive predictive value (PPV) (93.1%, 88.9%), negative predictive value (NPV) (100%, 90.6%) & accuracy (96.7%, 88.3%) respectively.

Conclusion: Our study showed better diagnostic performance for DCE-MRI compared to DWI in post operative breast assessment. However, DWI can provide an alternative diagnostic tool to contrast administration "if interpreted in association with conventional MR sequences" thus can be used when contrast media is contraindicated.

1. Introduction

Breast cancer is the most frequent cancer in women, where it accounts for 27% of all female cancers. It is considered to be the second after lung cancer as the most prevalent cause of

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Peer review under responsibility of The Egyptian Society of Radiology and Nuclear Medicine.

http://dx.doi.org/10.1016/j.ejrnm.2016.04.008

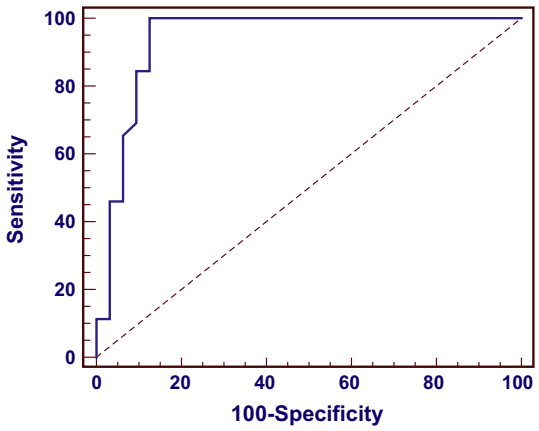

Fig. 1 Receiver operating characteristic (ROC) curve of ADC value in the studied group.

death due to cancer in women (1). After surgical treatment of breast cancer and radiation, the incidence of local recurrence is between 1% and 2% per year, with most of the recurrences occurring in the first 5 years (2).

Early detection and proper treatment of recurrent disease is of high importance as it still may present without distant metastases. Also, second ipsilateral primary carcinomas in the treated breast can occur at every site and develop on average 7 years after the first primary tumor (3).

For many years, magnetic resonance imaging (MRI) examination has been widely accepted as a diagnostic tool for evaluation of breast cancer (4). One of its indications, is the differential diagnosis between cancer recurrence and surgical scar in surgically treated patients (5). Both breast surgeries and radiotherapy can produce scarring with architectural distortion. Thus differentiating those expected post operative and related treatment changes from true recurrence on physical examination as well as on post-treatment breast imaging can be sometimes challenging (6).

Over the past decade, many new MR techniques and interpretation strategies have been developed aiming to improve the specificity and positive predictive value (PPV) of breast MRI. Of these diffusion weighted imaging (DWI) (7) is an unenhanced MRI sequence that measures the random motion of free water protons (Brownian motion) and characterizes different tissue properties, and thus can provide complementary information to dynamic contrast enhanced MRI (DCE-MRI) (8,9).

2. Patients and methods

2.1. Patients

Our study was a prospective one, approved by the Faculty of Medicine Ethics committee of the Cairo University; cases had given informed consents for their used data. The study was performed at least 6 months after the operation on sixty breast cancer female patients who underwent CBS (n = 29) or MRM (n = 31) where two of them had reconstructive surgery. The study was conducted at radiology department of Kasr El Aini hospital and National Cancer institute – Cairo University in the period from March 2013 until March 2015. The patients underwent full history taking and clinical examination. Digital mammography, US and MRI examinations were performed for all patients.

Patient preparation: Renal laboratory function tests were done for all patients before contrast enhanced MRI. An I.V. cannula was inserted in the patients' contralateral arm to the side of breast surgery whenever possible. After lying in prone position with a dedicated bilateral breast coil, Magnevist (gadopentetate dimeglumine) was injected as 0.2 mL/kg (0.1 mmol/kg) intravenously by power injector.

2.2. Methods

MR imaging was performed for all cases with high field strength 1.5 T (*Gyroscan Intera Phillips, medical system Netherland*) with the following protocol:

- *Precontrast sequences: T1 weighted fast spin echo sequence* (TR = 500 ms, TE = 5.3 ms) in axial orientation with slice thickness = 4 mm, matrix = 512 × 192, flip angle = 90° and FOV = 34–37 cm. *T2 weighted fast spin echo sequence* (TR = 120 ms, TE = 4.9 ms) in axial & sagittal orientation with slice thickness = 4 mm, matrix = 512 × 192, flip angle = 90° and FOV = 34–37 cm. *T2-weighted inversion recovery* (IR) (TR = 80, TE = 6.5 ms) in axial orientation with slice thickness = 4 mm, matrix = 512 × 192, flip angle = 90° and FOV = 34–37 cm.

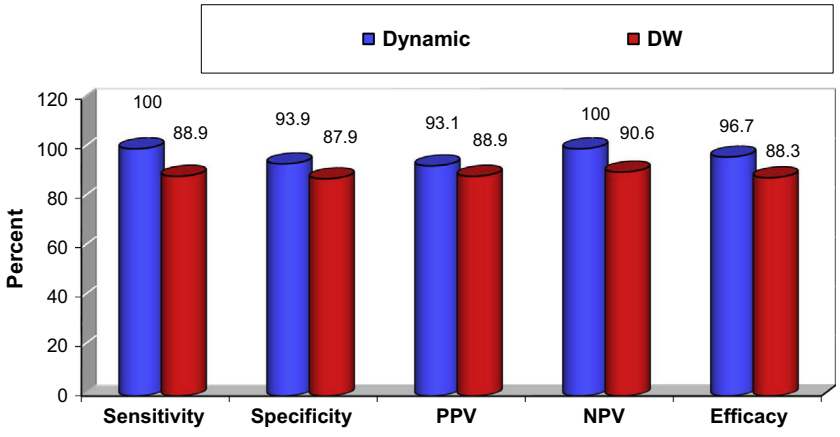

Fig. 2 Shown is the diagnostic performance for DCE-MRI & DWI.