Review Article

Diagnostic superiority of MRI over mammography in evaluating suspicious breast lesion – study from a tertiary level teaching hospital

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ABSTRACT:

Background: Worldwide, breast cancer comprises 10.4% of all cancer incidences among women. Early diagnosis is most effective measure for reducing breast cancer deaths. The conventional diagnostic tools like mammography, mammosonography, and physical examination are limited in their sensitivity for detecting disease and their specificity for distinguishing between benign and malignant lesions. The purpose of our study is to evaluate whether performing contrast enhanced breast MRI in addition to mammography and/or ultrasound in patient with palpable suspicious breast lesion will improve breast cancer diagnosis. Methodology: Patient with suspicious breast lesion (palpable/non palpable) of any age attended OPD or breast clinic. Women with palpable/non palpable breast lesions (BI-RADS category 3,4, or 5) detected on mammography or breast ultrasound were subjected to MRI. All detected lesions were biopsied to confirm the diagnosis. The sensitivity, specicificitiy and other diagnostic statistics of Mammography, Ultrasound and MRI was done individually. Results: Mammography was able to detect only 2/9(22.2%) of malignant cases successfully. The rate of detection of benign cases correctly was 2/6(33.3) by mammography. The suspicious cases detected by mammography need a further conformation to be decided as malignant or benign. Thus mammography had both low sensitivity and low specificity unless suspicious or borderline cases are confirmed by some other diagnostic utility. Among less invasive techniques (FNAC) was able to detect only 4/9 (44.4%) of histological proven malignancy. FNAC also differentiates the suspicious subjects into benign, suspicious and malignant categories. MRI had 100% sensitivity, diagnosing all the 9 cases of histologically proven malignancy correctly. Conclusion: MRI of breast is a highly accurate radiological tool for evaluation a breast lump. However a multicentric large sample size study is still required to asses its diagnostic and screening tool for breast lump. Key words: Breast Cancer, Diagnostic evaluation, Histopathology.

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INTRODUCTION

Worldwide, breast cancer comprises 10.4% of all cancer incidences among women, making it the most common type of non skin cancer in women and the fifth most common cause of cancer death. In 2004 breast cancer caused 519,000 deaths worldwide (7% of cancer deaths; almost 1% of all deaths). Breast cancer is about 100 times more common in women than in men, although males tend to have poorer outcomes due to delay in diagnosis. Continuous effort is being practiced to enhance the understanding of the breast cancerpathophysiology, and also to develop new modalities of diagnosis and treatment. Early diagnosis is most effective measure for reducing breast cancer deaths. The conventional diagnostic tools like mammography, mammosonography, and physical examination are limited in their sensitivity for detecting disease and their specificity for distinguishing between benign and malignant lesions. Mammography, a screening tool, reduces mortality in women between the ages of 40

to 75 is well documented. Screening mammograms at any age, including those in early patients, enable detection of tumors at a significantly earlier stage.Limitation with mammography is that it is less sensitive than MRI, potential risk for radiation exposure and low accuracy with fair number of false positive results. Thus there is a great need for non invasive diagnostic tool for both screening and early detection of the disease.Magnetic Resonance Imaging (MRI) of breast is being used increasingly because of its high sensitivity, but its reported specificity is widely variable. The purpose of our study is to evaluate whether performing contrast enhanced breast MRI in addition to mammography and/or ultrasound in patient with palpable suspicious breast lesion will improve breast cancer diagnosis, i.e. to reduce the member of diagnostic surgical procedures and/or the number of large core needle biopsies.

REWIEW OF LITERATURE

The introduction of breast cancer screening has changed the type and stage of disease at presentation, specific therapeutic and poses challenges. Mammography has long been used for early detection of and screening for breast cancers. With optimal technique and patient conditions, it has a reported sensitivity between 69% and 90% and specificity between 10% and 40%. Many factors, including density of breast tissue (i.e., younger patients, implants and post surgical state) can affect these values. Ultrasound has been used as an adjunct to mammography, with particular value in differentiating cystic from solid lesions and in facilitating guided biopsy of suspicious areas. However, ultrasound has limitations, including the possibility of missing micro calcifications (associated with ductal carcinoma in situ (DCIS) and difficulty in ensuring that the entire breast was imaged with the transducer(1).MRI has been shown to be more accurate compared with mammography or ultrasound in detecting the size and extent of the lesion. In addition, MRI is useful in identification of multicentric disease, which may have an impact on the type of therapeutic interventioni.e. radical mastectomy versus more conservative surgery.2, 3

The sensitivity of MRI in detecting multicentric disease ranges from approximately 89% to 100% with unilateral imaging. The specificity of excluding multicentric disease ranges from 82% to 97 % (4-8). Note that the specificity of MRI for multicentricity is actually less than mammography, meaning that there are more false positive. MRI is helpful in detecting pectoral muscle and chest wall involvement of breast cancer. Although involvement of pectoral muscle does not increase the stage from T_3 (T_4 is when the serratus or intercostals muscles are involved), is might affect surgical therapy. Nipple involvement, which is important to know well planning subcutaneous mastectomy or breast conserving surgery, can also be clarified with MRI.Ohmenhauser demonstrated a sensitivity of 80% with regards to MRI identification of nipple involvement.9-11

Warner et al, studying 236 women with BRCA mutations demonstrated that MRI combined with ultrasound and mammography had a sensitivity of 95% compared with only 45% when using clinical breast exams and mammography alone (16). Kriege et al demonstrated that MRI in high risk women (i.e., those with a familial or genetic risk of breast cancer) had a higher sensitivity but lower specificity than mammography. Mammography, however, had a higher sensitivity than MRI for detecting DCIS< suggesting that a combination approach may be best. Rijnsburger et al have demonstrated no adverse effect of increased surveillance on anxiety, depression, distress, and quality of life. Except for in patient with breast implants, both mammography and ultrasound should be performed in all patients, even if an MRI examination is performed(17). Fischer et

al compared the recurrent cancer rate in patient who did and did not undergo preoperative staging of breast with MRI (18). The reported recurrent cancer rate was indeed lower in the MRI group (1.2% (1/86)) than in non MRI group (6.5% 9/138)) after a mean follow up time of 41 months. The percentage of collateral tumors was lower in MRI group as well: 1.7 %(2/121) versus4.0% (9/225). These differences found to be statistically significant were (p<0.05)(18). The recurrent cancer rate will also be assessed in the MONET - study:5 years after completion of the MONET - study, the difference in recurrent cancer rate between patients from the MRI group and the control group will be assessed. Another study evaluated the change in surgical treatment after preoperative staging with MRI in patients with breast cancer (19). Of the 267 patients that were scheduled for breast conserving therapy, the surgical plan of 69 patients (26%) was altered to more extensive surgery based on information obtained from pre operative staging with MRI. In 44 of these patients (64%) the alteration was considered to be appropriate based on pathological verification of malignancy in surgical specimens (19). Both authors advise preoperative staging with contrast-enhanced MRI in patients with breast cancer(18, 19).

MATERIALS AND METHODS

Patients with suspicious palpable breast lesionsof all ages attended OPD breast clinic in the department of General Surgery between September 2009 and August 2010.Women with clinically suspicious palpable breast lesions and BI-RADS category 3,4, or 5 on mammogram were subjected to MRI. Clinically suspicious were those lesions who were hard on palpation, some forms of fixity to the surrounding tissues, advanced age, palpable suspicious axillary nodes, family history, and other constitutional symptoms, Incisional biopsies were done in all cases. Patients having prior breast surgery or radiation therapy of the breast, pregnancy or lactation, claustrophobia, severe obesity (>130kg), general contraindications of MRI (i.e.; cardiac pacemaker, metal implants or history of severe allergic reaction after administration of contrast agent), inability to maintain in prone position for one hour, medically unstable patients and severe coagulopathies or use of anti-coagulants that cannot be discontinued were excluded from the study.

OBSERVATION AND DISCUSSION

Fifteen patients with suspicious palpable lumps were enrolled during the period of one year in the study. Majority of patients were between 35 and 70 years of age group.Incisional biopsy was performed in all cases. Datainterpretation were done in reference to the final histopathology report. On mammogram 13.3% subjects were diagnosed as benign lesions, 73.3% suspicious and only 13.3% malignant. MRI findings were in favor of malignant lesions in 10 subjects(66.6%) and only 33.3% were benign. Comparison of histopathology and mammography showed that mammography was 100% sensitive and 33.3% specific. The positive predictive value was 69.2% and negative predictive value was 100%, thus the diagnostic accuracy was 73.3% only. MRI correlation showed only one false positive case and none was false negative. The sensitivity of the technique was 100%, specificity 83.3%, PPV 90%, and NPV 100%. Overall diagnostic accuracy was 93.3%. The findings in present study are suggestive of high accuracy of MRI. The results are quit promising but need further collaboration as the present study had a limitation of small sample size. Before routine clinical use, the findings of MRI should be confirmed in a larger sample size.MRI is relatively new diagnostic tool for breast lesion imaging, providing a three dimensional view with very high accuracy. MRI is based on nuclear magnetization without ionizing radiation in contrast to CTbetter contrasting property between normal and abnormal tissues. The most useful MRI technique for breast imaging uses a contrast material called Gadolinium DTPA, which is injected into a vein in before or during the examination to improve the quality of images. This contrast agent helps to produce stronger and clearer images and "highlight" abnormalities. Enhancement depends upon the presence of tumor induced angiogenesis. increased density An of microvasculature will increase blood flow, thereby causing contrast enhancement. In addition tumor induced micro vessels often demonstrate structural abnormalities, which give rise to leakage of contrast agent. This cause characteristic malignant contrast enhancement so called WASH OUT phenomenon. Morphological features of malignancy are scored by a scoring system called BI-RADS. The onset of suspicious breast lesions is generally in late thirties and forties. The rate of malignancy among suspects was found to be 66.7% in present study. Mammography was able to detect only 2/9(22.2%) of malignant cases successfully. The rate of detection of benign cases correctly was 2/6 (33.3) by mammography. Thus mammography has low sensitivity and low specificity. Fine Needle Aspiration Cytology was able to detect only 4/9 (44.4%) of the lesions correctly. FNAC also differentiates the suspicious subjects into benign, suspicious and malignant categories. MRI had 100% sensitivity, diagnosing all the 9 cases of histologically proven malignancy correctly. In terms of diagnostic accuracy, mammography had a diagnostic accuracy of 53.3% as against 93.3% by MRI.

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