COMPARISON OF MAMMOGRAPHY AND ULTRASOUND COMBINED VS ULTRASOUND ALONE IN EARLY EVALUATION OF SYMPTOMATIC BREAST CANCERS IN PAKISTAN

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Abstract

Purpose: To detect diagnostic accuracy of mammography and ultrasound combined vs ultrasound alone in early evaluation of symptomatic breast lesions.

Methods: All new patients who presented to the breast clinic with symptomatic breast lesions, during the year 2012 were included in the study. A total of 695 patients were registered. Their clinical findings, mammogram, ultrasound and histopathology were reviewed.

Results: Mammogram and ultrasound combined detected 693(99.71%) lesions in total. Mammogram failed to detect lesions in 1.43% patients whereas failure rate of ultrasound was 0.43%. Incidence of micro-calcifications on mammogram was 19.13%.

Conclusion: Ultrasound is a useful tool in initial evaluation of symptomatic breast lesions. For places like Pakistan where mammogram is not available at every centre, ultrasound can be used as an effective alternative for assessment of symptomatic breast lesions.

Keywords: Mammography, ultrasound, breast cancer

Introduction:

Breast cancer is the commonest cause of cancer related deaths amongst the female gender. Amongst the asian countries, Pakistan has the highest risk of breast cancer, one out of every nine Pakistani women carries risk of breast cancer [1,2]. Breast cancer arises from the inner lining of the ductal system (ductal carcinoma) or it arises from the lobules (lobular carcinoma) [3]. Incidence of breast cancer in Pakistan was 45.9% according to data of a single institution. In a developing country like Pakistan mammography screenings programs are not available due to limited resources, since mammography is costly therefore only affording patients on individual basis can undergo screening mammograms [4]. Presentation is usually with palpable breast lesions, or even locally advanced, this is due to lack of awareness and affordability for diagnosis and treatment [5]. Breast imaging is indicated for screening purposes, evaluation of a symptomatic breast lumps, and planning for management of breast cancer. Mammogram and ultrasound are the most common modalities; magnetic resonance imaging (MRI) is used less commonly. Other modalities include Scinti mammography, single photon emission computed tomography (SPECT), and positron emission tomography (PET) [6,7].

The aim of breast imaging is to detect breast cancer in its earliest stage, so that curative treatment can be planned. The earlier the detection, the better the survival. Mammogram and ultrasound are the commonest investigations for screening and evaluation of breast lesions. Incidence of breast cancer related deaths can be reduced by 30%, in screening of patients. Screening mammogram can detect suspicious lesions like micro calcifications, architectural distortion, asymmetry, even before the lump becomes palpable [8].

Breast Imaging Reporting and Data System (BIRADS) is a risk assessment tool in mammography, ultrasound or MRI. There are 6 categories of BIRADS as follows [10]:

- **BIRADS 0 – Incomplete**
- **BIRADS I- Negative**
- **BIRADS II-Benign findings**
- **BIRADS III-Probably benign**
- **BIRADS IV- Suspicious abnormality**
  - IV A-Low suspicion of malignancy
  - IV-B-Intermediate suspicion
  - IV C-Moderate suspicion
- **BIRADS V- Highly suggestive of malignancy**
- **BIRADS VI- Known biopsy proven malignancy**

Mammography uses low energy X-rays to examine the breast. Ultrasound differentiates between solid and cystic lesions. When mammogram is combined with ultrasound the diagnostic accuracy increases [8,9]. However...
mammography is expensive and not commonly available in Pakistan. Ultrasound on the other hand is a more commonly available modality for detecting breast lesions. The purpose of our study is to compare the diagnostic accuracy of mammogram and ultrasound versus mammogram alone versus ultrasound alone.

**Materials Methods**

Permission from the ethical committee of the hospital was taken for retrieving and publication of data. We retrospectively reviewed the data of all the registered female breast cancer patients during the year 2012 at our institute. Only patients with symptomatic breast lesions and proven cancers on final pathology were included. The clinical findings, their mammogram and ultrasound at initial presentation were reviewed from the hospital records. Patients who had undergone incisional or excisional biopsies without prior mammogram were excluded. We also excluded patients who underwent screening breast imaging and were asymptomatic. Patients who visited breast clinics for the evaluation of palpable lumps, lumpiness breast, Nipple discharge, skin changes, and nipple changes of recent onset were included.

After detailed clinical examination the patients were subjected to mammogram and ultrasound, and ultrasound guided core biopsy of the suspicious lesion, or ill-defined density. These patients had two view mammogram, medio-lateral and cranio-caudal followed by ultrasound evaluation of breasts and axillae. Ultrasound examination was performed in supine position with ipsilateral arm raised. All Ultrasound examinations were performed by dedicated breast radiologists. Core biopsy was performed on all patients under ultrasound guidance. At the same occasion fine needle aspiration cytology of borderline and suspicious axillary lymph nodes was performed. Age range was 32 years to 68 years. Patients were divided into two age groups, less than 50 years, and 50 and above. Reports of these patients were reviewed by two investigators. Clinical examination, mammograms and ultrasound findings of these patients were compared. Patients who had a mammogram were further divided into five subgroups; patients who had well defined lesion on mammogram; mass and micro calcifications; only micro calcifications; patients who had ill-defined density, asymmetry, architectural distortion, vague density, or area of thickening; and negative mammogram. Sonographic findings were grouped into positive and negative ultrasounds.

**Results**

A Total of 695 patients constitute the study population, Age range was 32 yeast to 68 years, 365 (51.6%) patients were less than 50 years of age, while 330 (46.7%) were greater than 50 years. Combined ultrasound and mammogram detected lesions in 693 patients (99.7%). Mammogram failed to detect a lesion among 10 patients (1.43%) where ultrasound failed to detect a lesion in 3 of the patients (0.43%). Or in other words mammogram was positive in 685 (98.56%) patients whereas ultrasound was positive in 692 or (99.5%) patients.

Of the 10 patients missed on mammogram 8 were picked up by ultrasound. Only 3 patients had failure to demonstrate lesion on ultrasound, one of which was demonstrated on mammogram. Both mammogram and ultrasound were negative in 2 cases, but these patients had Paget’s disease of nipple.

Details of mammogram and ultrasound findings in both the age groups is illustrated in table 1. Mammogram was a better modality for detecting lesions in the elderly as it missed 7 (1.0%) lesions in younger age group and only 3 (0.43%) lesions in old age group. Younger patients had dense breast and when subjected to additional ultrasound, lesions were well demonstrated in all the patients, therefore in dense breast ultrasound was more useful.

In incidence of micro calcifications was 19.13%. Patients who had only micro calcifications but no lesion on mammogram, presented with mastalgia and heaviness in breast, showed an associated mass when subjected to additional ultrasound (Figure 1). Sensitivity of mammogram alone was 98.84% ultrasound 99.8% and mammogram combined modality had sensitivity of 100%. Mammogram and ultrasound combined has high detection rate (99.71%), Failure rate of USG was (0.43%), while that of mammogram was (1.43%).

**Table 1: Mammogram and ultrasound findings according to age groups**

<table>
<thead>
<tr>
<th>Imaging Modality</th>
<th>Age &lt;50 years</th>
<th>Age &gt;50 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammogram Findings:</td>
<td></td>
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</tr>
<tr>
<td>Mass Only</td>
<td>254(36.54%)</td>
<td>241(34.67%)</td>
</tr>
<tr>
<td>Mass &amp; Microcalcifications</td>
<td>628(92.92%)</td>
<td>639(90.69%)</td>
</tr>
<tr>
<td>Asymmetry / Architectural distortion</td>
<td>37(5.32%)</td>
<td>20(2.87%)</td>
</tr>
<tr>
<td>Microcalcifications Only</td>
<td>37(5.32%)</td>
<td>30(4.33%)</td>
</tr>
<tr>
<td>Negative</td>
<td>7(1%)</td>
<td>3(0.43%)</td>
</tr>
<tr>
<td>Ultrasound Findings:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>364(52.3%)</td>
<td>326(47.19%)</td>
</tr>
<tr>
<td>Negative</td>
<td>10(1.44%)</td>
<td>20(2.86%)</td>
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</tbody>
</table>

**Table 2: Mammogram vs ultrasound**

<table>
<thead>
<tr>
<th>Mammogram &amp; Ultrasound</th>
<th>680(97.84%)</th>
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<tbody>
<tr>
<td>Positive</td>
<td></td>
</tr>
<tr>
<td>Mammogram Negative</td>
<td>10(1.43%)</td>
</tr>
<tr>
<td>Ultrasound Negative</td>
<td>3(0.43%)</td>
</tr>
<tr>
<td>Both Negative</td>
<td>2(0.28%)</td>
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Discussion
Breast cancer is the most common malignant tumours of females. It is one of the five leading cause of cancer related deaths in women all over the world [11]. Breast cancer is the most common malignancy in Pakistani women, and its incidence is highest amongst the Asian countries, 2.5 times higher as compared to India and Iran [12]. Patients usually present at advanced stages due to lack of awareness or resources. Only few patients can afford or have access to mammography for detecting breast lesions [5]. About 63% patients usually present at stage III or IV. There are few leading hospitals in the country dedicated for cancer treatment [13]. Our institution has a dedicated breast surgery unit. Since most of our patients are those who have symptomatic breast lesions our study could not be done on generalized population. Therefore our study included only those patients who presented with symptomatic breasts lesions.

We compared sensitivity of mammogram and ultrasound alone, and in combination of both modalities. The aim of combining ultrasound with mammogram is to increase the cancer detection rate in early stages. Our results showed that sensitivity of combined modalities is greater in detection of breast lesions. However ultrasound was more effective in detecting these lesions as compared to mammogram. For a developing country like Pakistan where the facility of mammography is not easily available, ultrasound may be used as primary imaging modality because it is cost effective and easily available. Osaka T et al showed that sensitivity of ultrasound is 100% in clinically palpable lesions [15].

The results of our study are supported by Gonzaga MA, et al, who studied the accuracy of ultrasound in evaluation of palpable breast lesions, overall sensitivity of ultrasound was 92.5%, while it was 57.1% in detection of breast cancers, positive predictive value 68.1%, and negative predictive value in 99.5%, and proposed that ultrasound may be used as primary imaging modality in patients under age of 30 years with palpable lesions.[16] Therefore it is a reliable tool for evaluation of palpable breast lesions. Ultrasound is easily assessable for patients, and ultrasound guided core biopsies are better representatives than blind cores, now days it has become a popular modality in evaluation of symptomatic breast lesions.

The results of our study are also supported by findings of Mc Cavert M et al who compared clinical findings with pathology in patients undergoing triple assessments, their results showed higher sensitivity of mammogram and ultrasound combined as compared to mammogram alone [17].

Moss HA et al assessed the ability of mammography and ultrasound in combination to predict whether breast abnormality is benign or malignant in patients with symptomatic breast lesions, they found that extensive use of ultrasound increases the detection of cancer rate by 14% in the selected group of patients [18].

Our study was retrospective so only histopathology proven cancers were included. Only a single lesion was missed on ultrasound which was detected by mammogram, and stereotactic core was done for biopsy.

Devolli-Disha E et al compared accuracy of mammography and ultrasound in women with breast symptoms according to age and breast density, their results also support our study, sensitivity and specificity of ultrasound was greater than mammography in patients in younger symptomatic patients with dense breasts [19].

In our study population ultrasound sensitivity was higher as compared to mammography in patients less than 50 years. Therefore ultrasound can be used not only in evaluation of symptomatic breast lesions, but it can be used as screening tool in selected group of patients, in order to conserve resources in a developing country like Pakistan. Thomas M et al compared performance of screening mammography, physical examination and ultrasound in 11, 130 patients, they concluded that sensitivity of mammography declines with increasing breast density addition of ultrasound screening significantly increases the detection of small cancers [20].The detection benefits of screening ultrasound in high risk women is now well validated. [21-24].

Mammography is very sensitive in the detection of micro calcifications, but because benign calcifications cannot always be distinguished from those malignant, the specificity of mammography remains low. Only 20%–35% of the cases will prove to be cancerous after stereo wire
localization biopsy of clustered micro calcifications. High frequency ultrasound can detect masses associated with micro calcifications. Benign micro calcifications are not detected on ultrasound because they occur in breast parenchyma. Woo Kyung Moon et al carried out a prospective study to determine whether ultrasound performed with a high-frequency transducer can demonstrate breast masses associated with mammographically detected clustered micro calcifications without mass density. At ultrasound breast masses associated with mammographically detected micro calcifications were seen in 45 (45%) of 100 cases, 23% in benign and 82% in malignant micro calcifications [25].

In our study only eight patients had clustered microcalcifications but no mass on mammogram; however ultrasound in addition to mammogram detected these calcifications with well-defined mass. Ultrasound guided core biopsy was performed and these were biopsy proven carcinomas.

**Conclusion**

Ultrasound has a higher sensitivity for detecting breast lesions as compared to mammogram in younger age group (less than 40 years). Micro-calculcations seen on mammogram need careful evaluation by an additional ultrasound by experienced radiologist to rule out associated masses. In developing countries like Pakistan, ultrasound may be used as primary screening modality especially in younger patients with symptomatic breast lesions.

**References:**


