

Clinical importance of ^{99m}Tc -MIBI mammoscintigraphy in multifocal breast lesions

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Abstract

BACKGROUND: This paper describes the case of a 57-year-old woman. During self examination the patient discovered a palpable lesion in the left breast. Mammography and USG revealed a single lesion with suspicion of proliferative aetiology. The consulting surgeon stated two palpable lesions in the left breast. Divergence of standard imaging modalities (RTG, USG) and palpation results convinced the surgeon to qualify the patient for mammoscintigraphy.

MATERIAL AND METHODS: Examination was carried out with a single-headed gamma camera Nucline TH (Mediso, Hungary). The patient was given 740 MBq ^{99m}Tc -MIBI intravenously. Acquisition began ten minutes after radiotracer administration. The patient was in prone position, and the head of the camera was positioned in a lateral view. Data acquisition for a single view lasted 15 minutes. Examination, according to the same protocol, was repeated after surgical treatment.

RESULTS: The scintigraphic image showed two foci of pathologically increased radiotracer uptake in the left breast raising serious suspicion of multifocal breast cancer. Following present guidelines the authors desisted from mammotomic biopsy and

the patient underwent Patey's mode mastectomy. Histological examination of the material confirmed preliminary diagnosis. Control images obtained over the three months after surgery revealed homogenous tracer disposition within the remaining tissue.

CONCLUSIONS: 1. Mammoscintigraphy is a sensitive and specific method of visualizing palpable lesions. 2. Mammoscintigraphy seems to be a valuable and potentially decision-influencing method of evaluation of palpable lesions, when commonly used tests give divergent results. 3. Use of mammoscintigraphy in diagnostic protocol allows the lowering of the number of unnecessary biopsies, which reduces the risk of possible complications and improves the cost effectiveness of the diagnostic procedure.

Key words: breast mass evaluation, mammoscintigraphy, scintimammography, breast cancer

Introduction

Breast cancer is the main cause of death from malignant neoplasm in women. About 10,000 new cases are diagnosed in Poland per year. Every year 5,000 women die of breast cancer. Contemporarily used imaging modalities play a crucial role in early detection of focal abnormalities, assessing probability of malignancy and in treatment planning. The generally accepted and routinely used techniques are mammography and mammosonography. One of the relatively new breast lesion imaging approaches is mammoscintigraphy. Despite its limitations mammoscintigraphy is capable of delivering information of the utmost importance into diagnostic process.

Case presentation

A 57-year-old woman performed regular mammographic examinations since she was 45 years old. In October 2004 during self examination the patient revealed a single, painless, skin motile tumour in the left breast. Mammographic examination showed a single proliferative lesion 1.5×2.0 cm. on the border of the external quadrants, as shown in Figure 1.

The single tumour lesion was also visible in ultrasound study as a lesion with 14 mm diameter localized as an RTG lesion. On the basis of imaging examination results the patient was qualified

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Figure 1. Mammography. Medial view of the left breast.



Figure 2. Mammoscintigraphy. Lateral view of the left breast.

for surgical biopsy. The surgeon performing palpation stated the presence of two tumours. This divergence of information from imaging modalities (RTG and USG) and palpation led the surgeon to perform mammoscintigraphy — sensitive and specific in evaluating palpable lesions procedure [1–10]. The radiotracer disposition image shown in Figure 2 strongly suggested the presence of two lesions with the same uptake intensity in the left breast. The localization of foci meant that diagnosis of multicentric cancer had to be considered, which disqualified the patient from the previously planned mammotomic biopsy. The woman underwent Patey's mode mastectomy. The surgeons confirmed intra-operatively the presence of two tumours, diagnosed in histopathological examination as invasive ductal carcinoma, partial comedo type with diameters of 3.0 cm and 1.2 cm. The surgeons found 21 lymphatic nodules, 12 of them with metastases. After the surgery, the woman was qualified for adjuvant chemotherapy according to the "AC" program. Chemotherapy began 3 weeks after the surgery, with subsequent courses administered every 3–4 weeks. After six courses of chemotherapy, radiotherapy was applied. When chemotherapy was completed (four and a half months after the surgery), but before radiotherapy, control mammoscintigraphy was carried out (Figure 3). The image shows homogenous radiotracer disposition within the remaining tissue, which suggests the absence of local recurrence.

Study protocol

Examination was carried out with a single-headed gamma camera Nucline TH (Mediso, Hungary). 740 MBq of ^{99m}Tc -MIBI (2-Methoxy-isobutyl-isonitrile) was administered to the antecubital vein of the arm contra lateral to the suspected breast. Acquisition started ten minutes after injection. The patient was in a prone position lying



Figure 3. Mammoscintigraphy. Lateral view of the tissues remaining after left sided mastectomy.

on a special mattress, and the breasts were in a dependent position. The head of the camera was positioned in a lateral view. Single acquisition lasted ten minutes. The study was elaborated with the use of filters and colour scale. An examination was repeated according to the same protocol after surgical treatment.

Discussion

Mammoscintigraphy is a very sensitive and specific technique in evaluating palpable lesions. Recently conducted studies have reported sensitivity, specificity, positive predictive value and negative predictive value in the evaluation of palpable lesions as follows: 82.9–100%, 30–91%, 61–82.1%, 95–100% [1–10].

^{99m}Tc-MIBI (2-Methoxy-isobutyl-isonitrile) is the most commonly used radiotracer. Sestamibi uptake and retention in neoplastic cells depends on several factors: blood flow, plasma and mitochondrial membrane potential (which blocks reverse diffusion, angiogenesis and tissue metabolism) [11]. The main advantage of mammoscintigraphy is its functional basis [11]. Mammoscintigraphic images are usually unaffected by structural changes resulting from previous surgery, biopsy, irradiation, degenerative diseases or augmentation [3, 12]. The main disadvantage of this technique is its significantly lower sensitivity in detecting tumours smaller than 1 cm. This is a result of the properties of the standard Anger camera, with its relatively poor intrinsic spatial resolution and sub-optimal detection geometry, related to the distance between the detector and the imaged breast [11]. False positive and false negative images are a significant problem. MIBI may accumulate in desmoplastic or stromal reactions as well as in the tumour. Tumours with minimal desmoplastic reaction, such as lobular carcinoma, may be difficult to image. MIBI may also be rapidly extruded from cells [13]. False positive images can be seen in patients with fibrocystic changes [13], fibroadenoma [13], Paget's disease, ductal metaplasia, benign phylloid tumours or steatonecrosis. The clinical role of scintimammography is still being discussed. Recent reports indicate the value of scintigraphic imaging as a "second line" modality applied to patients with inconclusive diagnosis after standard examinations [1, 7, 14]. This paper describes a situation in which the results of routine imaging modalities and palpation appeared to be divergent. Qualifying the patient for mammoscintigraphy changed the previous diagnosis and evoked a strong suspicion of multicentric breast cancer. The value of mammoscintigraphy as a useful tool for detecting multicentric breast cancer has been previously raised [1, 5, 15]. Mammoscintigraphy can identify almost three times the number of multifocal tumours than mammography or ultrasonography separately. Disqualified from previously planned surgical biopsy and following obligatory standards the surgeon referred the patient for Patey's mode mastectomy. Mathieu et al. evaluated the impact of mammoscintigraphy on the management of patients with dubious or discordant triple diagnosis. The authors evaluated 118 lesions in 104 patients and reported that mammoscintigraphy changed the management in 49% of cases [14].

Mammoscintigraphy seems to be a valuable, complementary method in patients with discordant or difficult to interpret results of previous diagnostic modalities. Scientific reports consider this method as an important tool in clarifying diagnostic information and allowing modification of management in a significant number of such patients.

Conclusions

1. Mammoscintigraphy is a sensitive and specific method of visualizing palpable lesions.
2. Mammoscintigraphy seems to be a valuable and potentially decision influencing method of evaluation of palpable lesions, when commonly used tests give divergent results.
3. Reasonable use of mammoscintigraphy in diagnostic protocol reduces the number of unnecessary biopsies, lowers the risk of complications and improves cost effectiveness of the diagnostic procedure.

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