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# THE BREAST IMAGING

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**Summary**

Breast cancer is the most common malignant tumor in women in Croatia. Most of breast surgery in our country is performed in our surgical department. Imaging is essential for the early detection,accurate diagnosis and clinical staging of breast cancer. Population screening with mammography aims to reduce mortality by detecting the disease at an earlier stage, before it has spread beyond the breast. Mammography and ultrasound are the first-line imaging investigations in women with breast symptoms. Magnetic resonance imaging is established as an adjunctive diagnostic tool because of its high sensitivity for invasive breast cancer. Percutaneous image-guided breast biopsy is used for the pathological assessment of breast lesions. It is used also as first stage of treatement for neoadjuvant chemotherapy when breast cancer is in advanced stage.

KEY WORDS: *breast cancer, mammography, ultrasound, magnetic resonance imaging, percutaneous biopsy*

**RADIOLOŠKA DIJAGNOSTIKA DOJKE**

**Sažetak**

Karcinom dojke je najčešći zločudni tumor ženske populacije u Hrvatskoj. Većina operacija dojke u Hrvatskoj obavlja se u Klinici za tumore u Zagrebu. Radiološka dijagnostika je važna za rano otkrivanje, točnu dijagnozu i procjenu kliničkog stadija karcinoma dojke. Svrha mamografskog probira je rano otkrivanje bolesti. U primarne metode dijagnostike spadaju mamografija i ultrazvuk. Magnetska rezonanca se koristi samo kao dodatna metoda zbog svoje visoke osjetljivosti za invazivni karcinom dojke. Perkutana biopsija pod kontrolom ultrazvuka se koristi za patohistološku dijagnostiku ciljane tvorbe u dojci i kao prvi stadij terapije kod uznapredovalog karcinoma koji se liječi neoadjuvantnom kemoterapijom.

KLJUČNE RIJEČI: *karcinom dojke, mamografija, ultrazvuk, magnetska rezonancija, perkutana biopsija*

## INTRODUCTION

Imaging is essential for the early detection, accurate diagnosis and clinical staging of breast cancer. Population screening with mammography aims to reduce mortality by detecting the disease at an earlier stage. Mammography and ultrasound are still the first-line imaging investigations in women with breast cancer symptoms. Magnetic resonance imaging is established as an additional diagnostic tool because of its high sensitivity.

## MAMMOGRAPHY

Breast imaging is used to screen asymptomatic women for early breast cancer and to evaluate breast abnormalities. Screen film X-ray mammography is used for screening. The standard examination for women undergoing either symptomatic mammography or their first screening examination consists of lateral oblique (fig 1.1) and craniocaudal (fig 1.2) view of each breast.

While screening mammograms are routinely used to detect breast cancer in women who have

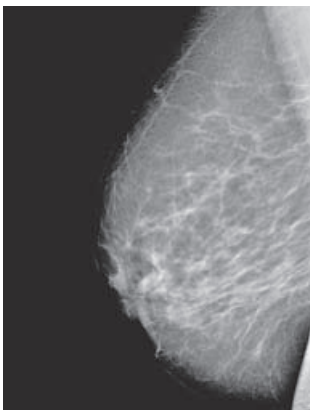

*Fig 1.1. The lateral oblique mammogram.*

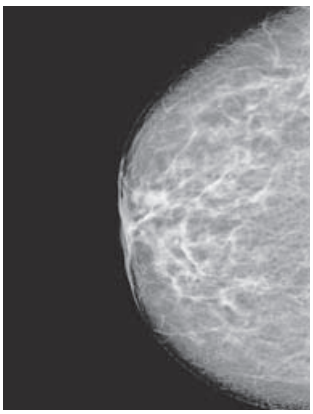

*Fig 1.2. The craniocaudal mammogram.*

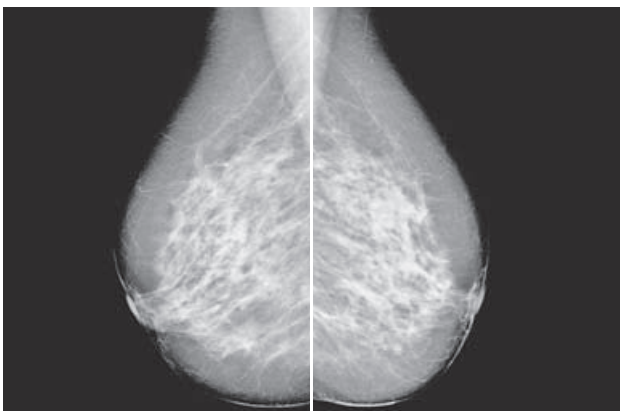

*Fig 1.3. The mirror-image configuration.*

no apparent symptoms, diagnostic mammograms are used after suspicious results on screening mammogram or after some signs of breast cancer such a lump, breast pain, thickening of skin and changes in size or shape of breast. For interpretation lateral oblique and craniocaudal mammograms should each be viewed together in a mirror-image configuration (fig 1.3) which will allow radiologist to scan the breast for asimetry.

Women with personal or close history of breast cancer are at greater risk for development of malignancy, andthe interpretation of mammographic findings should be tailored accordingly. Other informations such as previous surgical biopsies or hormone replacement terapy must also be taken into account during interpretation of the mammogram. Special views can image palpabile lesions that occur in location not included on standard mammography. Classic signs of malignancy are spiculated masses or pleomorphic cluster of

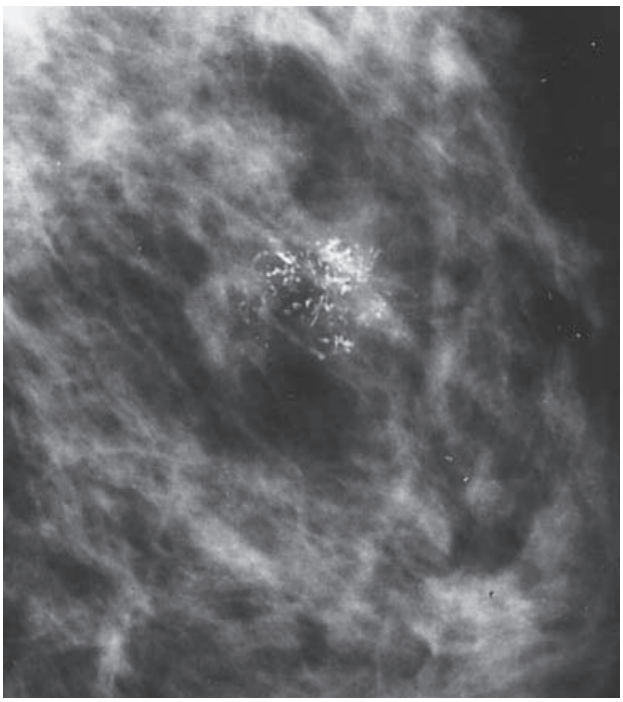

*Fig 1.4. The pleomorphic cluser of microcalcifications.*

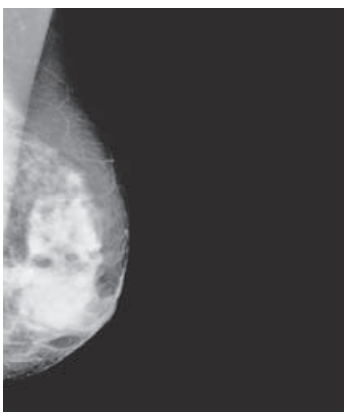

*Fig 1.5. The mammogram of young women.*

microcalcifications (1.4), however only about 40% of all occult breast carcinoma present in this ways.

The ability of mammogram to detect breast cancer may depend on the size of the tumor, density of the breast tissueand the skill of radiologist. Mammography is less likely to reveal breast tumor in younger women (less than 50 years old) in comparison to older women. This is due to a fact that younger women have denser breast tissue which can obscure the tumorbecause breast tissuehas similar density (apperas white on mammograms, fig 1.5) as tumors or some other lesions,making them harder to detect.

## ULTRASOUND

When a suspicious finding is detected in breast through a breast self-examination or on a mammogram, the attendingphysician may request an ultrasound of the breast tissue. Ultrasound is also a primary tool for investigation of breast lesions in younger women or women with dense breast tissue. A breast ultrasound is anexamination that uses high frequency sound waves. Higher frequency ultrasound using 10-13 MHz probes with elastography is becoming more widely available and allows higher resolution imaging which gives more information.

Elastography is objective deep palpation of breast tissue. It maps elastic properties of soft tissue in scale and color. Cancerous tumors will often be harder than the surrounding soft tissue (harder tissue is red in this picture) or benign tumors such a fibroadenoma (softer tissue is blue in this picture). The subcutaneous fat layer is demonstrated anteriorly as a low-reflective tissue compared to the glandular tissue.

The ultrasound appearence of the breast tissue depends on how much involution of the glandular tissue has taken place. The pregnant or lactating breast is almost entirely composed of high-reflecting glandular tissue due to the glandular proliferation. The breast tissue defects ultrasound waves causing echoes which computer uses to make an image of what is going inside the breast tissue.A mass filled with liquid shows up diffrently than a solid mass, so breast ultrasound can provide evidence about whether the lump is a solid mass, a cyst filled with fluid, or a combination of the two. While cysts are tipically not cancerous, a solid mass may be a fibroadenoma or a cancerous tumor. Ultrasound is also used tu measure exact size and location of the lump and surrounding tissue.

Ultrasound guided percutaneous breast biopsy is a widely used tehnique for an accurate histopatological assessment of suspected breast pathology. It is a fast and safe procedure.

## MAGNETIC RESONANCE IMAGING (MRI)

Dynamic contrast-enhanced magnetic resonance imaging (MRI) of the breast has been shown

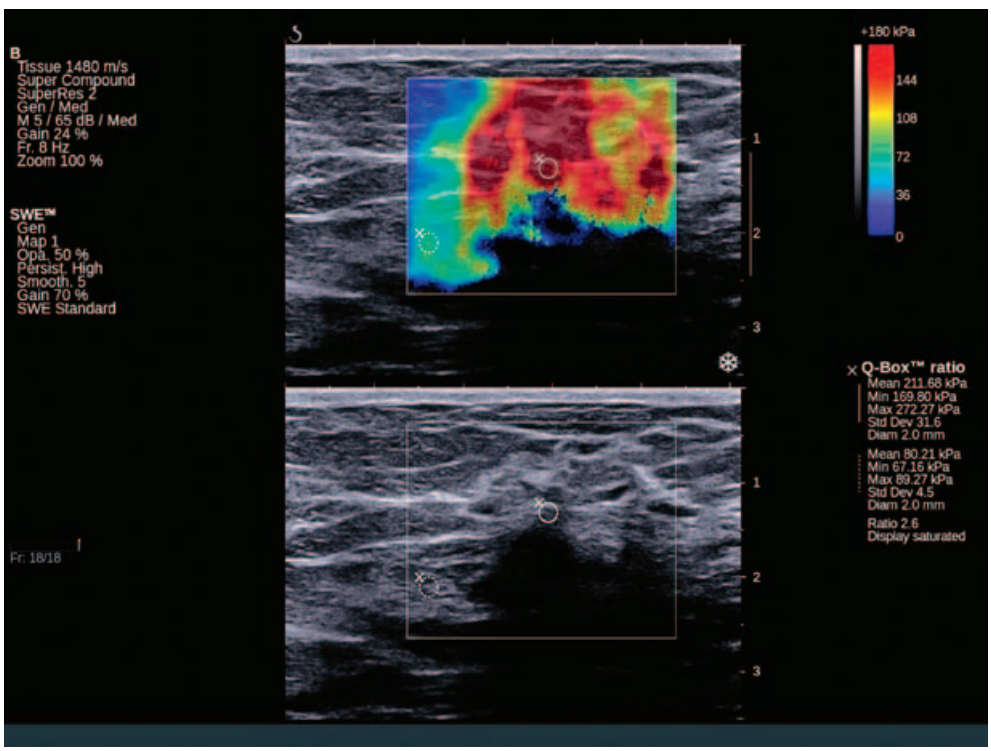


*Fig 2.1. The elastography of the breast tissue.*

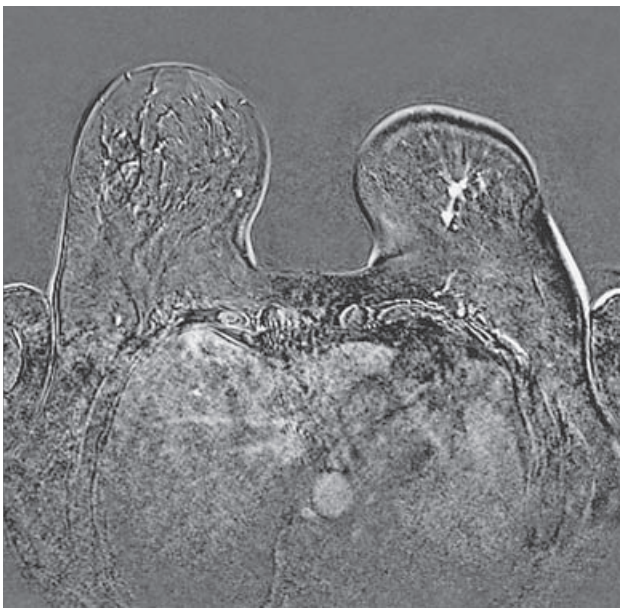

*Fig 3.1.The dynamic contrast-enhanced MRI of the breast.*

to be extremely sensitive in the detection of invasive breast cancer and is not limited by breast tissue density (fig 3.1). Enhanced means that in this procedure intravenous contrast is always used. Current indications include high-risk screening, evaluation for an unknown primary carcinoma, postoperative evaluation in patients with known breast cancer 6 months after surgery or follow up one year after radiation therapy, evaluating response to neoadjuvant therapy, and suspected recurrence. However, the utility of MRI has been limited by its variable sensitivity for ductal carcinoma in situ (DCIS). In general, the role of MRI as a problem-solving tool in the evaluation of suspicious imaging or clinical findings is unclear. A negative MRI should not be used to avoid biopsy of suspicious findings on mammography or ultrasound or suspicious clinical finding

## EVALUATION

The Breast Imaging Reporting and Data System (BI-RADS) lexicon is a classification scheme used to help standardize the description and disposition of breast lesions seen on mammography, ultrasound, and MRI. BI-RADS categories 1 and 2 are used to describe a negative study and a study in which there are benign findings. Category 3 is used to describe probably benign findings, with a less than 2% chance of malignancy, which can be followed in 6 months. Patients with new or enlarging solid masses or increasing clustered microcalcifications that are not classically benign require biopsy. Category 4 is used to describe suspicious findings (greater than 2% chance of malignancy) that require biopsy. BI-RADS category 5 lesions are highly suspicious findings, having a 95% or higher likelihood of malignancy. Category 6 is used in patients with a known breast cancer who are undergoing neoadjuvant chemotherapy or additional imaging studies. If mammography is described with BI-RADS 3 or 4 additional imaging with ultrasound is required. If ultrasound is scored with BI-RADS3 or 4 than fine needle aspiration or percutaneous image-guided breast biopsy is recomended. With BI-RADS 5 biopsy is warranted. BI-RADS clasification should be a part of every radiologist report in an effort to standarize image reporting and to reduce confusion in report interpretation between physicians.

In our radiology department more than 12000 breast ultrasound, over 12000 mammographies and two thousand breast MRI are preformed each year, most of which are used for pre and postoperative evaluation. These enable us to confidently work as a part of well establishe dmultidisciplinary trem. We consider that expirience, volume and multimodal aproach is most important in evaluating breast patology.

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