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Magnetic - Resonance Imaging in the Early Diagnosis of Breast Cancer

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Abstract*--MRI is known to give some false positive results which mean more test and/or biopsies for the patient. Magnetic resonance imaging (MRI) of the breast is primarily used as a supplemental tool to breast screening with mammography or ultrasound. A breast MRI is mainly used for women who have been diagnosed with breast cancer, to help measure the size of the cancer, look for other tumors in the breast, and to check for tumors in the opposite breast. For certain women at high risk for breast cancer, a screening MRI is recommended along with a yearly mammogram.*

Keywords*--MRI imaging of the breast, tumors, X- ray mammogram, ultrasound, identify nonresponses.*

I. INTRODUCTION

Breast cancer is the most common malignant tumor and is the leading cause of death from malignant tumors among women [35].

According to the global cancer database GLOBOCAN of the International Agency for Research on Cancer, 1.67 million new cases of breast cancer were diagnosed in 2012 [22].As in the whole world, in the Republic of Uzbekistan breast cancer is in the first place and makes up more than 26% in the structure of the general oncological morbidity.

The incidence of breast cancer in Uzbekistan is 10.3 cases per 100,000 of the total population (RSSPMCOR 2018).

The prognosis for this disease depends on the stage of the process, therefore, it is extremely important to identify breast lesions in the early stages; determination of the nature of the lesion is also of paramount importance, since further tactics of patient management depend on this.

According to studies by the US National Cancer Institute (NCI), breast cancer diagnosed in stage I has 98.8-100% survival, which decreases with increasing stages, 93% for stage II, 72% for stage III and 22% for stage IV [29].

According to the results of the study Sergeev P.V. and others, in the first stage, cancer is detected only in 13% of cases when the chances of an effective cure are highest. Therefore, an important task of radiation diagnosis of breast diseases is the early detection of neoplasms for the selection of therapeutic measures [8].

Tinnemans J.G. et al. in their work demonstrated an inverse relationship between the size of the primary tumor and overall survival [34]. In addition, the size of the tumor affects the presence of regional metastases. With tumors no

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larger than 5.0 mm in size, metastases in the lymph nodes were found in 7.7%, with tumors with a size of 6-10 mm - in 12.5%, with tumors larger than 10 mm - in 29.5%.

The same study shows the relationship between the presence of metastatic lesions of regional lymph nodes and 10-year overall survival: 96.4% for stage N0 and 78.8% for stage N1-3. The literature data indicate that a clinical evaluation of the tumor process allows diagnosis to be made only in 65% of patients, the clinical picture does not correlate well with histological data, and the accuracy of the results of such diagnostics varies greatly [17, 18]. In the early diagnosis of breast cancer, the sensitivity of clinical examination and self-examination varies widely depending on the size of the tumor, the sensitivity of clinical examination is 18.2-69%, specificity is 48.2%, and self-examination does not exceed 20-26% [12,13,14, 26]. Moreover, there is no reliable data on the effect of self-examination and clinical examination on mortality reduction, and it alone cannot serve as a sufficiently effective method for detecting nodular formations of the mammary glands [21].

Currently, X-ray mammography and ultrasound are used to identify and characterize breast lesions.Julian T.B. and Watson L. reported that when using X-ray mammography, the detection rate of breast tumors reaches up to 80% [25].

Some scientific studies point to the fact that X-ray mammography does not always allow to determine the prevalence along the ducts and the presence of multifocal, and in 5-15% it is not possible to detect breast cancer at all [31].

Kemeni M. and Ternova S.K., studied static data in the USA, showing that 8-9 out of 10 biopsies by mammography results are negative for breast cancer [4.9], and this leads to a large number of unnecessary biopsies, false alarm and psychological complications in women. The above leads to the need to use other radiation methods, when in the first stage of radiation examination with suspected neoplasms of the mammary glands, young women may have an ultrasound scan [1].

According to some authors, with the advent of high-frequency sensors, it became possible to obtain more detailed diagnostic information during ultrasound examination of the mammary glands [6].

Two groups of scientists led by Rojkova N.I. and Shevchenko E.P. In their work, they argued that in the differential diagnosis of benign and malignant neoplasms of the mammary gland, an ambiguous assessment of Doppler techniques remains - from a significant contribution to an auxiliary value in the diagnostic process [7,10]. But Fiedler A.V. et al., reported that the use of color Doppler mapping is informative only for tumors with a diameter of more than 1-2 cm [15].

According to the results of D.I. Zernov, X-ray mammography does not allow to unambiguously determine the nature of the revealed changes in the mammary gland. Ultrasound investigation plays an essential role in such a situation, and it is also not always effective [2].

Harvey J.A. and Hollenbeck S., the sensitivity and specificity of mammography decrease markedly with dense X-ray breast tissue, and ultrasound of the mammary glands remains operator-dependent [19,20]. However, due to the limited specificity of these methods, an invasive fine-needle biopsy is mainly used to differentiate breast tumors.

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Nevertheless, in some cases, there remains the need to perform on sectoral biopsy, which leads to unnecessary time and economic costs, as well as the likelihood of a second surgical intervention according to the histological examination [32,33].

This necessitates the search for a highly sensitive or highly specific method for examining the mammary glands, which allows avoiding unjustified biopsies and surgical interventions in favor of dynamic observation

Recently, among radiation methods in the diagnosis of breast tumors, magnetic resonance imaging has been of greatest interest [11].

According to foreign authors Irwig L. et. al., Moate P.J. et al. and Bagley F.H. et al., MRI of the mammary glands has high diagnostic efficiency in radiation diagnostics for detecting breast tumors [11,23,28].

Neubauer H. et. al. Using MRI with contrast enhancement, determinations were made in the structure of the mammary gland of carcinoma with a diameter of up to 3 mm [30]. According to most authors, the high diagnostic capabilities of MRI are determined by the ability to differentiate the contrast of various tissue structures, which, combined with the use of different pulse sequences, as well as obtaining images in any plane with high resolution and without radiation exposure, allows us to identify differences in the visualization of normal and pathologically low breast tissue, and the use of paramagnetic contrast medium provides additional opportunities for differential cite pathological foci from normal tissue [3,5,16,23,24]. The use of contrast-enhanced magnetic resonance imaging is based on neo angiogenesis. Tumor associated blood vessels have increased vascular permeability which is responsible for the uptake and washout of gadolinium after its administration. The morphology of the lesions, the enhancement and washout kinetics help distinguish breast cancers from benign lesions. The sensitivity of breast MRI is reported to be very high (over 90%) but the specificity is still low to moderate (72%) making the discrimination between benign and malignant lesions challenging. To ensure a decrease in the recurrence rate of the disease and an increase in the survival of patients with breast cancer, the most accurate assessment of the volume and localization of the pathological process using additional highly sensitive methods of modern radiation diagnosis is necessary, first of all, MR.

Therefore, at present, magnetic resonance imaging is considered the most sensitive diagnostic method [27].The role of MR mammography in the diagnosis of breast pathology changes with the development of technology and the accumulation of clinical experience. Now the advent of new MRI scanners with high dilution ability is contributing to the ever wider use of the method. MR - mammography may be more informative than mammography in isolating tumors in women who have a family or genetic predisposition to develop breast cancer.

With all the undoubted advantages, MR-mammography is an expensive and limitedly accessible method of imaging the mammary glands. Therefore, it does not matter as a primary method for the diagnosis of breast cancer, where X-ray mammography and ultrasound hold a strong position. MR - mammography most likely matters as an additional method of imaging in negative or doubtful cases, X-ray mammography and ultrasound. However, the indication for MR - mammography is still vague and is under study. Thus, the problem of detecting breast tumors, their differential diagnosis, assessing the prevalence and stage of the tumor process remains one of the most important in modern

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oncology. Therefore, the development of new methods for the diagnosis of breast tumors is an urgent task. The diagnostic value of breast MRI is widely discussed in a large number of special foreign studies, but in our country it has not been studied enough.

Discussionto improve the diagnosis of breast cancer using MR - mammography.

II. MATERIAL AND METHODS

To solve the tasks, a clinical and instrumental examination of the main group of 100 women was conducted. Also in the control group, 30 women with benign tumors were examined. Benign formations were more common in the age group from 25 to 45 years (mean age - 39.0 ± 2.5 years). The age of patients in group 1 was 26-75 years (mean age - 49.0 ± 2 years), table 1. The study was conducted in 2017-2019. Patients were examined and treated at the RSSPMCOR.

Table 1. Distribution of patients examined breast cancer by age group

Age (years)	**n=100**	
	abs.	**%**
➢ 29	5	5,0%
30-39	17	17,0%
40-49	32	32,0%
50-59	22	22,0%
60-69	19	19,0%
70 <	5	5,0%
All	100	100,0%

From the data presented in the table 1, it is clear that women aged 40 to 59 years prevailed among the patients, it is noteworthy that a significant proportion of patients were women who were in the active working period.

In the history of patients with neoplasms of the mammary glands, a concomitant gynecological pathology was often encountered. Abortions were in 64 (47.7%) women. Concomitant diseases included: uterine fibroids - (11.5%), endometriosis - (3.8%), adhesions in the pelvis - (9.2%). Thyroid pathology was observed in 26.9% of women. 8.5% of women had relatives who had maternal breast cancer. In 26.9% of women, breastfeeding was up to 3 months, and in 29.2% of women in the period from 3 to 6 months, the rest (43.9%) were in the group for more than 6 months. The majority of 30.7% of women present with complaints of pain in the mammary glands.

Redness of the skin in 12 (12.0%) and burning of the mammary glands in 11.5% of women. Skin retraction occurred in 10 (10.0%) women. Local compaction was observed in 23.0% of women. Distribution of patients depending on menstrual status

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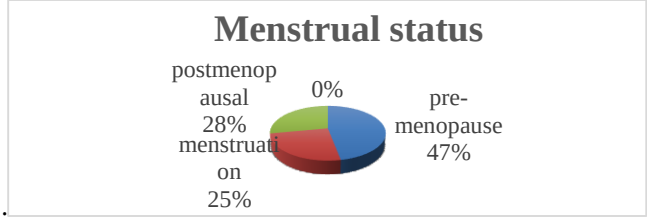

Diagramm 1

In our work, of all the examined, unilateral enlargement of axillary lymph nodes was detected in 46.1% of women, in 23.0% on both sides.

The examination of women was complex and included: a comprehensive examination, visualization of the breast using noninvasive methods and pathological studies with biopsy and/or after surgical material.

Defeat of the right mammary gland was noted in 52 (52.0%) cases, of the left - 48 (48.0%).

Table 2. The distribution of patients depending on the localization of education in the mammary gland

	Right breast	**Left breast**	**all**
upper outer	18	17	35
upper inner	12	12	24
lower-outer	10	9	19
lower inner	8	6	14
central	4	4	8
All	52	48	100

According to the histological forms of the revealed pathology, women with breast neoplasms were distributed as follows (table 4).

Table 3. The histological forms of breast cancer

		Breast cancer n=100	
		abs.	%
1	Ductal cancer	68	68,0
2	Invasivelobular cancer	12	12,0
3	Ductal invasive cancer	10	10,0

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4	DCIS	6	6,0
5	Mucinosis cancer	2	2,0
6	Medullary cancer	2	2,0

The average size of breast tumors was 2.8 ± 1.2 cm. Tumor masses up to 1.0 cm in size were detected in 18 (18.0%), from 1.1 to 2.0 cm - 22 (22.0) %, above 2.0 cm - in 60 (60.0) % of women.

Table 4. Distribution of patients by stages and TNM system

Стадия	**TNM**	**n=100**	
		абс	**%**
Stage 0	Tis situN0M0	6	6,0%
StageI	T1N0M0	20	20,0%
StageIIa	T1N1M0	21	21,0%
	T2N0M0	24	24,0%
StageIIb	T2N1M0	29	29,0%
All		100	100,0%

III. RESULT

Analysis of the data in Table 4 shows that with the first stage of the disease, there were 20 (20.0%) patients; with the second stage - 74 (74.0%) patients. The number of patients with metastatic lesions of regional lymph nodes was revealed: N1 - 50 (50.0%). In the remaining 50 (50.0%) patients, regional lymph nodes were intact.

The results of the study

In this work, mammographic (RMG, ultrasound and MRI) signs of breast cancer are presented. Breast cancer accounted for most of the observations in our study.

The X-ray signs of breast cancer were characterized by the presence of a tumor on the mammograms (79.0%), in the form of a focal asymmetric density (17.0%) and microcalcifications (17.0%).

The tumor differed from the surrounding tissues in increased density and was visualized in 2 projections. Figure 1 shows that the mammograms of a patient with breast cancer circumscribed visualize the formation with uneven and fuzzy contours in two projections, on the border of the upper quadrants in the right breast, high density.

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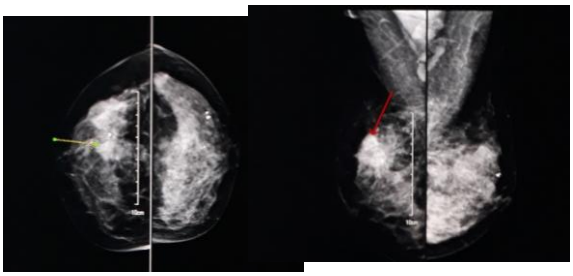

Figure 1. X-ray mammography of patient I., 48 y. Cancer of the right breast; the formation is located on the border of the upper quadrants.

The asymmetric density "black star" section in breast cancer was represented by a violation of the correct radial orientation of the stromal pattern and its architectonics (Figure 2). Figure 2 shows mammograms of both mammary glands of a patient with breast cancer, in which the tumor process is presented as local changes in architectonics.

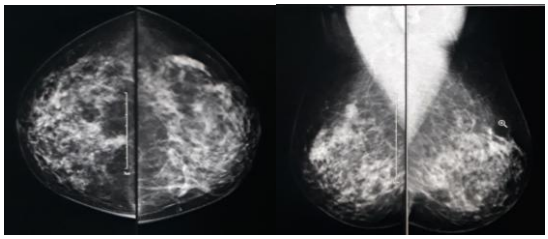

Fig 2. Patient M., 45 l. X-ray mammography. Cancer of the right breast. The tumor is located on the border of the upper quadrants.

A detailed analysis of the obtained mammograms was carried out. In this regard, we paid great attention to the shape and contours of the shadow of the formation on mammograms, which was met by breast cancer from 100 cases, as well as to radiological signs such as the presence of microcalcifications in the projection of the formation, area of asymmetric density, thickening of the skin, retraction of the skin, "track" to the skin, deformation of subcutaneous fat over the formation and architectural distortion (table 5).

Table 5. The X-ray mammography signs with breast tumors

X - ray signs		**Malignant lesions n=100**		**Benign lesions n=30**	
		abs	%	abs	%
Shape	round and/or oval	14	24,0	13	43,3
	lobed	10	10,0	11	36,7
	irregular	69	69,0	3	10,0

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	focal asymmetry	7	7,0	3	10,0
Margin	circumscribed	13	13,0	16	53,3
	obscured or partially	7	7,0	9	30,0
	indistinct or microbulated	58	58,0	5	16,7
	spiculated	22	22,0	-	-
Density	low density	14	14,0	5	16,7
	equal density	21	21,0	21	70
	high density	65	65,0	4	13,3
Calcifications	are visualized	37	37,0	10	33,3
	are absent	63	63,0	20	66,7
Associated features	skin thickening	12	12,0	-	-
	nipple retraction	10	10,0	1	3,3
	deformation of subcutaneous fat over the formation	12	12,0	2	6,6
	"Path to the pacifier"	8	8,0	-	-
	architectural distortion	12	12,0	7	23,3

Table 5. shows that the static reliable X-ray signs of breast cancer were microbulated 58 (44.6%) and spiculated 22 (16.9%), irregular shape 69 (53.1%) and high intensity 65 (%).Also, thickening of the skin 12 (9.2%) and retraction of the skin 10 (7.7%), deformation of subcutaneous fat over the formation of 12 (9.2%). Of the microcalcifications that were detected in the tumor process in 47 (36.1%) cases: pleomorphic (78.7%), scattered (6.4%), and macrocalcifications (14.9%) prevailed.In our observations, we revealed the following peculiarity of mammographic signs of breast cancer - this is the clarity of the shape (24.0%) and contours (12.0%) of the tumor, which was visualized in large numbers, despite the fact that the clarity of the shape and contours was significantly more revealed in our study with benign processes (43.3% and 53.3%). These signs impeded the mammographic diagnosis of breast cancer and was a reflection of the complexity and diverse X-ray picture of breast cancer. Of the 130 observations of our study, a discrepancy between X-ray and histopthatological data was observed in 21 patients: of these, 12 patients had a false-positive and 9 a false-negative picture. All false-positive results were due to the presence of X-ray symptoms pathognomonic for breast cancer - the wrong form of education, the margin indistinct or microbulated of the node. In our studies, these roentgen signs simulated the tumor process in 7 cases of local fibrosis's, 3 observation with fibrolipoma's, and in 2 cases with fibroadenomas. It should be noted that the so-called "radiar scar", described as local fibrosis, most often simulates breast cancer in mammograms, as it has an irregular shape and margin spiculated.Interpretation difficulties arose with atypical mammographic manifestations of fibrolipoma's, which had an irregular shape and margin microlobulated, which was located in the retro mammary region. In 2 cases of our study, fibroadenomas had shape irregular and microlobulated margin, which, in our

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opinion, was due to their intracanalicular development, as well as the presence of proliferative changes surrounding the tissue that layered on the tumor's shadow, which was confirmed by pathomorphological data.

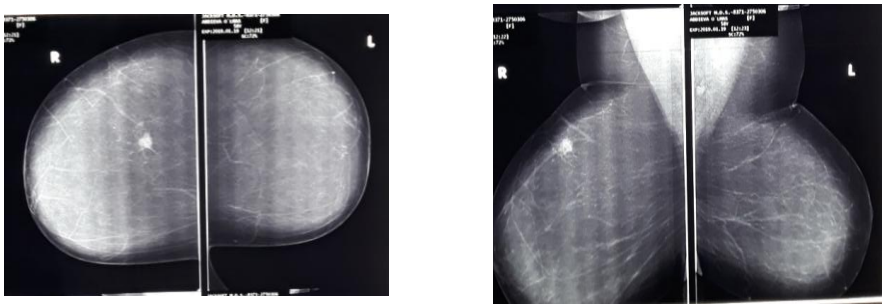

Figure 3. Patient A., 53 y. X-ray mammography.

On the border of the upper quadrants of the left breast, a formation is determined with dimensions of 10x9 mm with uneven margins. Histopathological: fibrolipoma.

False -negative results in 6 women were due to the high and heterogeneous density of breast in X-ray mammograms. In another 3 patients, the shadow of the tumor node had a smooth shape, margin circumscribed and, uniform structure, was not accompanied by additional changes (skin retraction and thickening of the skin) and was regarded as fibroadenoma.

Thus, radiological signs of breast cancer are: shape irregular (53.10%), indistinct or microbulated (44.6%) and spiculated (16.9.0%) margin, thickening of the skin (9.2%) and retraction of the skin (7.7%), deformation of subcutaneous adipose tissue (9.2%), the presence of microcalcifications (pleomorphic) in the projection of formation (78.7%). The sensitivity of X-ray mammography in detecting and determining the prevalence of breast cancer in our work was 83,4%, specificity 60,0%.

In malignant formations of the mammary glands, the tumor process was detected sonographic in 74 of 130 women (table 6).

Table 6. The US – signswith breast tumors

US - lexicon		**Malignant lesions n=100**		**Benign lesions n=30**	
		abs	%	abs	%
Echogenicity	heterogeneous	8	8,0	10	33,3
	hypoechoic	71	71,0	5	16,7
	hyperechoic	21	21,0	15	50,0
Shape	round and/or oval	11	11,0	19	63,3

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	lobed	17	17,0	8	26,7
	irregular	72	72,0	3	10,0
margin	circumscribed	15	15,0	20	66,7
	microlobulated	11	11,0	7	23,3
	spiculated	74	74,0	3	10,0
Calcifications	in mass	17	17,0	5	16,7
	outside mass	83	83,0	25	83,3
Associated features	skin thickening	12	12,0	-	-
	skin retraction	10	10,0	2	6,7
	enhacement	21	21,0	9	30,0
	shadowing	-	-	16	53,3

When analyzing the indicators (table 6), it is c that for circumscibed breast cancer, the characteristic sonographic signs were hypoechoic formation (71%); irregular shape (72%) with microlobulated margin (74%). Tumors of a hypoechoic structure were less common. In all cases, when the shape was round, the size of the tumor did not exceed 2.5 cm, its borders were also circumscribed.

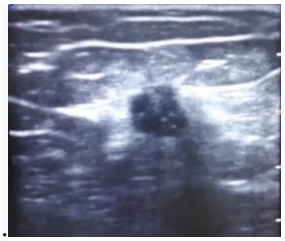

Figure 4. Patient M., 51 y. US of breast.

In the upper-outer quadrant of the left breast, a hypoechoic formation is visible, 10x9 mm in size, with fairly even margin. Inside the formation there is hyperechoic inclusions (calcifications) and an acoustic shadowing.

Of the 100 (breast cancer) cases of our study, the difference in sonographic and histopthatological data was observed in 29 patients: of these, 13 patients had an echographic picture of false-positive and 17 - false negative.

False negative results in 15 women were the formation was located between the fibrous and glandular lobules, also had a smaller size of 15 mm (Fig. 3.5). Another 2 tumor nodes had an even and circumscribed and shape; soft consistency, pathologically were medullary forms of breast cancer, which resembled fibroadenoma. An increase in the intensity of reflection of ultrasonic waves behind a tumor of a medullary form was due to the predominance of the epithelial component in it. The presence of a massive connective tissue component caused the attenuation of ultrasonic waves, and a decrease in the effectiveness of ultrasound was also noted during the involution period.

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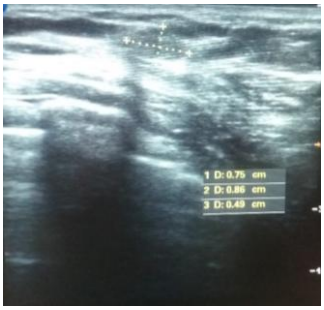

Figure 5. Patient I., 48 y. US of breast.

In the upper-inner quadrant, the formation is determined, with dimensions of 8x9 mm, oval in shape with smooth margin, which was located between the parenchyma of breast and fibrous lobules.

All false positives are due to the differential diagnosis of mixed nodes: tumors with a cystic component and intracystic tumors; benign and malignant solid nodes, especially they were small in size. Thus, the sensitivity of ultrasound in the detection of breast cancer and the determination of prevalence on own material was – 86,4%, specificity – 44,8%.

On the MR - mammogram, 86 (86.0%) women had irregular formations in the rest of the cases, in the remaining cases their form was round and lobed, respectively 9 (9.0%) and 5 (15.0%); with microlobulated - 59%, also hilly (10.0%) and spiculated margin were at - 20 (20.0%). Less often, their margins were even in 11 (11.0%) cases. In 90.0% of women, education was characterized by an infiltrating type of growth and was most often characteristic of ductal carcinoma. Expansive growth was found in patients with medullary cancer (10%).We obtained the basic information about the presence of breast in the case of post-contrast images.He intensity of the MR signal from tumors with dynamic contrast enhancement increased in the first minutes >100% compared with the pre-contrast series in 39 (97.5%) cases. When plotting the curves, the signal intensity - time - malignant nodular formations of the mammary glands in patients of the studied type III -leaching curve with a pronounced maximum and a rapid decrease in the amplitude of the MR signal in 87 (87.0%), less often II type plateau - 13 (13.0%) In our observations of breast MRI, the sensitivity was 97.5%, specificity 87.2%.

Table 7. MR – signs ofbreast tumors

MR – signs		**Malignant lesions n=100**		**Benign lesions n=30**	
		abs	%	abs	%
The pre-contrast					
education was characterized	infiltrating type	90	90,0	7	23,3
	expansive type	10	10,0	23	76,7
Shape	round\oval	9	9,0	18	60,0
	lobulated	15	15,0	9	30,0
	irregular	76	76,0	3	10,0
Margin	smooth	11	11,0	21	70,0

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	microbulated	10	10,0	4	13,3
	irregular	20	20,0	5	16,7
	spiculated	59	59,0	-	-
Enhancement pattern	homogeneous	20	20,0	24	80,0
	heterogeneous	80	80,0	6	20,0
MR signal - T1WI	moderate	28	28,0	24	80,0
	low	70	70,0	4	13,3
	high	2	2,0	2	6,7
MR signal -T2WI	moderate	24	24,0	24	80,0
	low	73	73,0	6	20,0
	high	3	3,0	-	-
Associated findings	skin involvement	12	12,0	-	-
	nipple retraction	10	10,0	-	-
	nipple involvement	12	12,0	2	6,7
The post-contrast					
Enhancement pattern of a mass	Dark internal septations	-	-	2	6,7
	low	-	-	18	60,0
	moderate	13	13,0	8	26,6
	high	87	87,0	2	6,7
Enhancement pattern of a mass	Central enhancement	28	28,0	26	86,7
	Enhancing internal	72	72,0	4	13,3
Temporal resolution kinetic analysis	Type 1	-	-	21	70,0
	Type 2	13	13,0	9	30,0
	Type 3	87	87,0	-	-

When analyzing the data (table 7) in the control group, it was noted that benign formations accumulate insignificantly and evenly, in some cases, the accumulation of HF was not performed. In most women of this group, the average values of accumulation of HF by glandular tissue did not exceed 100% and had the first type of graphic dependence. The second type of accumulation was much less common - 9 (30.0%). We determined that uneven focal accumulation of CV by glandular tissue was found in young women (up to 35 years old).False positive and false negative results were associated with the differential diagnosis of the localized form of FAM and breast cancer, intracanacular fibroadenomas and breast cancer.With high sensitivity and specificity, MR can be considered an effective technique for differentiating benign and malignant tumors, as well as determining prevalence.

In the radiological diagnosis of breast cancer, the use of MRI allows us to assess morphology and vascularization: to predict the likelihood of a malignant nature of the formation and to detect metastases in the lymph nodes with a diagnosis of breast cancer.

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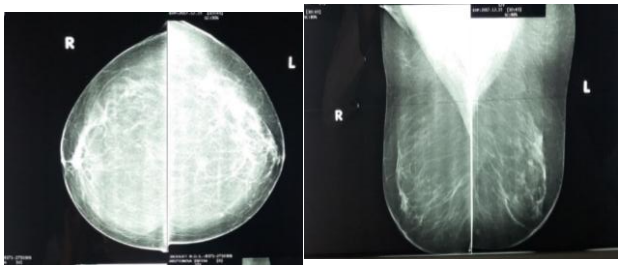
MRI is the most highly sensitive method for detecting breast cancer at small sizes, regardless of their location and type of structure. Although it is expected that this will lead to lower rates of re-removal and overall survival.

Clinical examples.

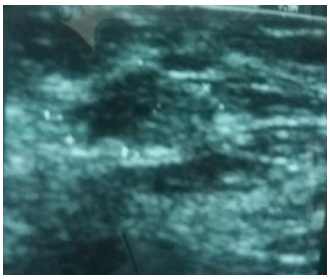
Clinical example No. 1.

Patient I., 59 y. There are no complaints. From the anamnesis it is known that, according to X-mammography, in the right breast was revealed a focal asymmetric density (BI-RADS 0).



а) б)

X-ray mammography. Fat involution of mammary glands (category A according to ACR classification), a - cranio-caudal projection (CC); b - lateral-medial projection (MLO). In the area of the areola of the right breast, there is a section of asymmetric density (arrow) without circumscribed of 11x9 mm in size.Performed an ultrasound of the mammary glands



US of the right breast. Right - in the area of the areola, breast reconstruction (arrow) with moderate vascularization (BI-RADS 0).

Given the presence of severe rearrangement in the right breast, to clarify the diagnosis, MRI contrast enhancement was recommended.

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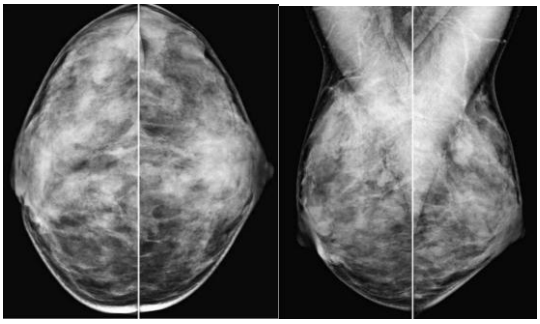
On the MR - mammography in the area of the areola of the right breast, a formation was detected, with even partially margins, with intravenous contrasting, a pronounced gain of up to 186% of the node in the first 2 minutes, after intravenous amplification, the formation of the contrast medium unevenly, type 3 - washout curve with a pronounced maximum and a rapid decrease in the amplitude of the MR signal.

According to a histopathological study in the right breast: ductal cancer, grade of malignancy G2.

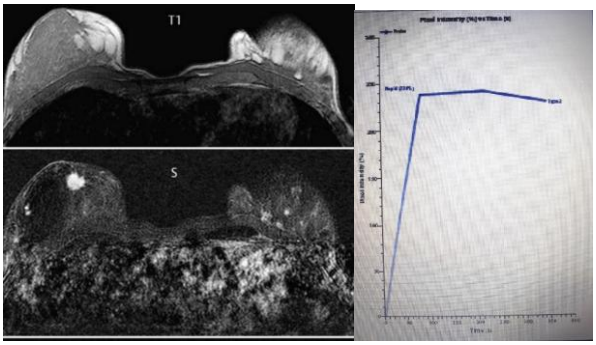
Clinical example No. 2.

Patient S., 39 y. Complaints of discomfort and pain in the right breast.

X-ray mammography. Breast tissue density D type. BI-RADS 0.



Given the young age of the patient and the suspicion of a malignant process, was performed MRI, according to which a nodular formation in the left breast with type II of the dynamic curve “intensity-time” was revealed. Installed category BI-RADS 4b.



A fine trepan biopsy of the formation of the left breast was performed: DCIS

Clinical example No. 3.

Patient N., 65 y. No complaints.

Appealed to RSSPMCSOR for a routine examination. Given the age, mammography and ultrasound of the mammary glands were performed. According to X- ray mammography on a dense background (category C), an architectural distortion with an accumulation of amorphous microcalcifications (BI-RADS 0), 9.5x7.0 mm in size, was detected on the left breast in the upper-outer quadrant.

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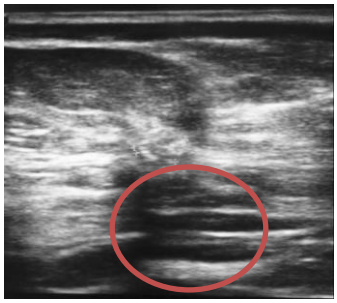
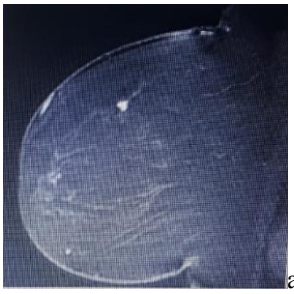
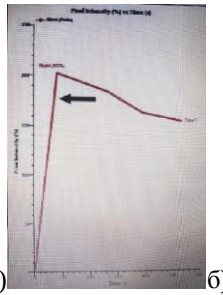


US of the breast. The zone of heterogeneity in the left mammary gland is determined on the border of the upper quadrants between the parenchyma and the fat lobule.

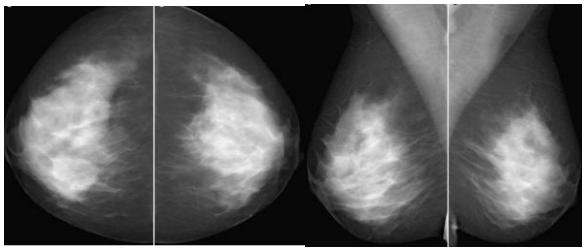

а)

б)

A breast MRI. After contrast enhancement, pronounced strengthening of the knot in the first 2 minutes. the picture is characteristic of the malignant process; the graphic display is type III (accumulation at high speed with fast elimination). Histopathological examination: invasive lobular carcinoma.

Clinical example No. 4.

Patient M., 44 y. No complaints.

Appealed to RSSPMCSOR for a routine examination. Given the age, X-ray mammography and US of the mammary glands were performed.



X-ray mammography. Densities of glandular tissue type D. Educational and architectural distortion are not visualized.

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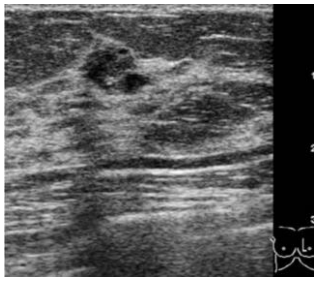
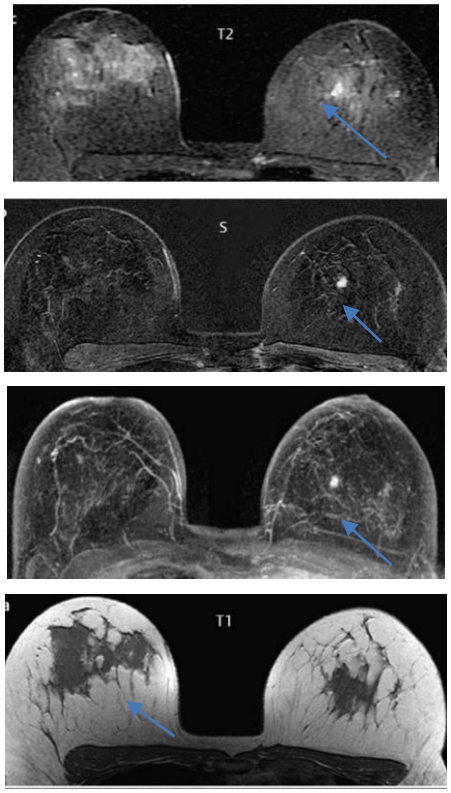


US of the breast. In the upper-inner quadrant of the left mammary gland between the parenchyma and adipose tissue, a hypoechoic formation with uneven contours, with a diameter of 8 mm, is determined.



A breast MRI. In the left mammary gland in the upper inner quadrant, the formation of a rounded shape, 8x7 mm, heterogeneous structure, hypointensive on T1WI is determined. With dynamic contrast enhancement, its intense accumulation of HF is determined at the periphery of the formation up to 116%, followed by reaching a "plateau".

Histopathological: ductal hyperplasia.

Clinical example No. 5.

Patient L., 35 y. Complaints of pain in the mammary glands. Women at the first stage performed an ultrasound of the mammary glands.

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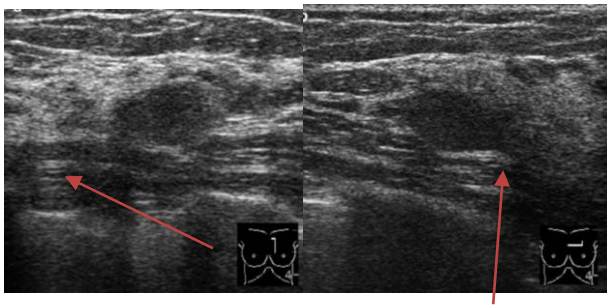
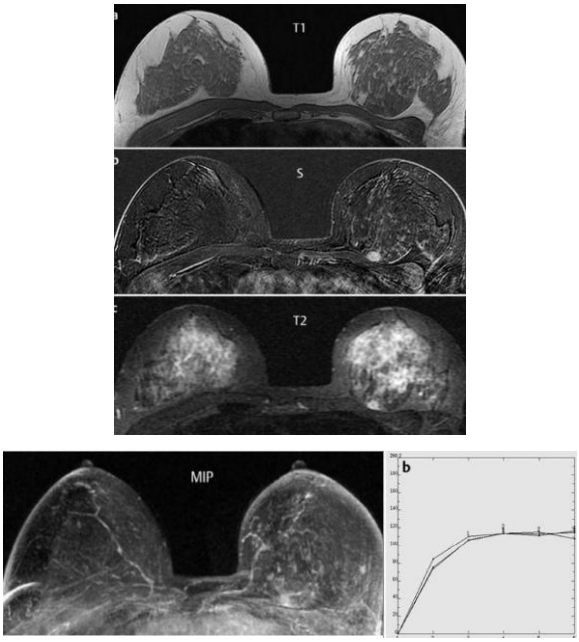


US of the breast. In the upper-inner quadrant of the left breast, a rounded shape with smooth margin that is closed above the pectoralis major muscle (BI-RADS 0) is determined.

X-ray mammography. According to digital mammography on a dense background (category D), a focal asymmetric density with the presence of amorphous microcalcifications, about 9.5x5.7 mm in size, was revealed on the left in the upper-outer quadrant.



On the MR - mammogram, a rounded shape with smooth contours, hypo intensive on T1 WI, was revealed. With contrast enhancement, a uniform accumulation is determined up to 110% and subsequent exit to the “plateau”.

Histopathological examination: mucinous cancer.

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IV. CONCLUSION

MRI is superior to X-ray mammogram and ultrasound in high-risk breast cancer screening. The use of pre-operative MRI continues to be controversial with wide variations in practice. In a neo-adjuvant setting, MRI breast is useful to identify the non-responders early. A breast MRI is mainly used for women who have been diagnosed with breast cancer, to help measure the size of the cancer, look for other tumors in the breast, and to check for tumors in the opposite breast. For certain women at high risk for breast cancer, a screening MRI is recommended along with a yearly mammogram. Malignant tumors of the mammary gland have characteristic MR-signs: an infiltrating type of growth; violation of the internal architectural distortion of the gland; irregular shape; microlobulated margin; heterogeneous internal MR structure; predominantly iso-hypo-intensive MRI - signal on pre-contrast T1 WI and T2 WI; intensive accumulation of contrast medium; centripetal nature of contrast; high degree of MR signal; III - type of curve "signal intensity-time", less often II - accumulation type; the presence of its own supply vessel. MR is highly sensitive, specific, and accurate in assessing the prevalence and differential diagnosis between a benign and malignant process. This technique has its diagnostic value only with the use of contrast enhancement.

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