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Original scientific paper

Imaging Features of Triple Negative Breast Cancers – Mammography, Ultrasound and Magnetic Resonance Imaging

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A B S T R A C T

Breast cancer (BC) is a highly heterogeneous disease. Aim was to evaluate imaging features of triple negative breast cancers (TNBC) in comparison to non-TNBC. We reviewed data of 30 patients who had been diagnosed as having TNBC and 37 patients with non-TNBC (control group) using criteria described for mammography (MMG), ultrasound (US) and magnetic resonance imaging (MRI) in Breast Imaging-Reporting and Data System (BI-RADS) lexicon for image interpretation. Age of patients, size of tumor, multifocality, histological type, tumor grade and status of lymph nodes were reviewed. TNBC were more often histological grade 3 and had significantly more positive lymph nodes at the time of diagnosis on pathology reports. On MMG, US and MRI TNBC mostly appeared as regularly shaped masses. On US as hypoechogenic masses with no posterior acoustic features and on MRI as masses with rim type of enhancement, fast wash-in and plateau type of curves. Most frequent category reported after MMG and US was BI RADS 4, and after MRI BI RADS 5. In conclusion, our study confirmed higher histological grade of TNBC, as well as more frequent lymph node involvement in comparation to the non-TNBC. TNBC showed tendency to affect younger women and to be larger than non-TNBC. Although, they most often presented as a mass on mammography and sonography, in a significant number of cases they remained miscategorized, due to the benign imaging features. All cases are recognized on MRI where they appear as rim enhancing masses.

Key words: *triple negative breast cancers, mammography, ultrasound, magnetic resonance imaging*

Introduction

Breast cancer (BC) is a heterogeneous disease, containing distinct disease subgroups that are associated with different morphological and immunohistochemical features and clinical behavior[1]. The historically used BC classification system combines histomorphological information and Tumor, Node, Metastasis (TNM) staging information. BC are classified into at least 17 subtypes according to histopathological characteristics [2]. The largest group of breast tumors (50–80%) are invasive breast carcinoma of no special type (IBC-NST)[3]. In last two decades semiquantitative immunohistochemical classification is increasingly in use, suggested by St. Gallen International Expert Consensus panel, classifying BC into different molecular subtypes based on tumor markers expression sta-

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tus: estrogen receptor (ER), progesterone receptor (PR), human epidermal growth factor receptor-2 (HER2) overexpression, and Ki-67 index[4]. All different BC molecular subtypes have different prognosis and treatment possibilities. Triple-negative breast cancer (TNBC) is a distinctive sub-group of BC without expression of ER, PR or HER2[5]. This BC phenotype demonstrates poor prognosis because of aggressive tumor biology, mutation of the p53 gene and a high degree of correlation with suppressed breast cancer gene (BRCA1) function. It contains 15% of all BC and there is no FDA-approved targeted therapies[6]. TNBC are typically large, high-grade tumors with high rates of recurrence and distant metastasis, and low overall survival rates[7,8]. Additionally, recent literature data suggest that TNBC represent a heterogeneous sub-group of cancers with at least six subtypes. These subtypes are immunomodulatory (IM), luminal androgen receptor (LAR), basal-like 1 (BL-1), basal-like 2 (BL-2), mesenchymal (M), and mesenchymal stem-like (MSL). They are categorized based upon their gene expression portfolio, markers for cytokeratin 5/6 and epidermal growth factor receptor (EGFR)[7,9]. Due to high malignancy potential of TNBC, early detection of this BC subtype is vital.

There are many reports in the literature regarding imaging of a TNBC, but this is to the best of our knowledge, one of the first that will provide facts regarding all three breast imaging techniques with additional second-look US. The aim of this study is to evaluate imaging features of TNBC and to look for some features that can help us to differentiate this type of BC from others.

Patients and Methods

We retrospectively reviewed reports and images of thirty patients who have been diagnosed as having TNBC in a three-year period at our Department. Hospital ethical committee approved study under the number IRB-12/2015. All women willing to participate signed an informed consent. Only women, regardless of age, with biopsy proven ER, PR and HER 2 negative tumors that were evaluated with all three breast imaging techniques (mammography (MMG), ultrasonography (US) and magnetic resonance imaging (MRI)) were included in this study and they made the study group. The group consisted of 30 patients who presented with 41 tumors. As a control group, 37 BC patients evaluated with all three breast imaging techniques and with biopsy proven positive ER, PR and negative HER2 or positive ER, PR and overexpression of HER2 were randomly selected in our database in the same period of time. In this non-TN group there were 37 patients with 45 tumors. All women who agreed to participate signed an informed consent form. Women diagnosed with any type of BC earlier in lifetime were excluded from the study, as were women who did not sign informed consent.

We reviewed age of patients, size of tumor, multifocality, histological type, tumor grade and status of lymph nodes that we extracted from patient's pathology reports.

Standard two-view MMG was performed, using full flat-panel detector mammographic scanner (Mammomat Novation DR, Siemens, Erlangen, Germany). Breast US was performed by one well experienced breast radiologist (Aixplorer, Supersonic Imagine, Aix en Provance, France). Contrast enhanced breast MRI was performed by one well-experienced breast radiologists on a 1.5T MRI System (Magnetom Avanto, Siemens, Erlangen, Germany). Turbo-spin echo T2 transverse sequences were performed, followed by five fast 3D T1-weighted sequences performed after application of 0.2 ml/kg of contrast medium, that were subtracted to precontrast T1-weighted images. Dynamic contrast curves from enhancing masses were generated.

Images of 30 patients with TNBC and 37 patients with non-TNBC were reviewed by highly experienced breast radiologists using morphological criteria described for MMG, US and MRI in the American College of Radiology's BI-RADS lexicon for image interpretation[10].

For MMG we used description of presence of tumor (mass, mass and microcalcifications, microcalcifications, asymmetry and architectural distortion, asymmetry and architectural distortion with microcalcifications, no findings – negative report and very dense breasts that obscure any findings), margins (well defined – sharp, circumscribed, distinct; ill defined – lobulated, spiculated, indistinct), shape (regular – oval, round; irregular), multifocality and BI RADS category. For US we used descriptions of presence of tumor (mass, mass and calcifications, calcifications, asymmetry and architectural distortion, asymmetry and architectural distortion with calcifications, no findings – negative report), echo pattern (hypo/hyper/complex lesions), margins (well defined/ill defined), shape (regular/irregular), orientation (parallel/non parallel), multifocality, vascularity on color Doppler, posterior features and BI RADS category. For MRI we used descriptions of presence of tumor (mass, non-mass, mass with non-mass component, focus), margins (well defined/ill defined), shape (regular/irregular), multifocality, internal enhancement characteristics (homogeneous, heterogeneous, rim enhancement) and type of curve in first 2 minutes following intravenous bolus of contrast agent (slow and fast wash in) and after 2 minutes (persistent, plateau, fast wash out).

Statistical analysis

Categorical data are represented by absolute and relative frequencies. Differences of categorical variables were tested by $\chi 2$ test and by Fisher's exact test. The normality of the distribution of numerical variables was tested by the Shapiro-Wilk test. Differences between two independent groups were tested by Mann-Whitney's U test. All p values were two-sided. The level of significance was set to Alpha = 0.05. The analysis was conducted while using the MedCalc® Statistical Software version 19.6 (MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2020) and the IBM SPSS 23 (IBM Corp.Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.)

Results

Selected demographic and clinical characteristics of patients

There was no statistically significant difference in age (p=0.6), presentation as multifocal/unifocal and size of tumors (data not shown). Regarding histological grade, 22% of TNBC were grade 2 and 78% were grade 3. In non-TN group 40% tumors presented as grade 1, 42% as grade 2 and 18% as grade 3 ($\chi 2$; p<0.001, Table 1). TNBC were more often histological grade 3 ($\chi 2$; p<0.001). TNBC had significantly positive lymph nodes on pathology reports ($\chi 2$; p=0.003, Table 1).

80% of TNBC were invasive ductal cancer of NST, 7% were IDC with ductal in situ component, 2% were ductal carcinoma in situ (DCIS), 2% were ductolobular type and 7% was ductal medullar histological type. There was statistically significant difference ($\chi 2$; p=0.03) comparing to non-TN group in which there were 53% of ductal NST, 9% ductal cribriform type, 4% ductal tubular type, 13% IDC with DCIS component, 4% DCIS, 4% ductal comedo type, 2% ductolobular, 9% ductolobular invasive with ductal in situ component and no medullar type (Table 1).

Mammographic features of TNBC

Mammography (MMG) appearance of tumor, according to American College of Radiology's BI-RADS lexicon for image interpretation, was devided into seven categories. There was no statistical significant difference in MMG appearance between TNBC and non-TNBC ($\chi 2$; p=0.43, Table 2).

Regarding tumor margins, 39% of TNBC presented as a mass with well defined margins (Fisher exact test; p=0.03) and 61% of TNBC had ill defined margins. Abovementioned was significantly different comparing to the control group with 94% of non-TNBC with ill defined margins (Fisher exact test; p=0.03, Table 2).

There was a statistical significant difference in lesion/mass shape between TN and non-TN group. TNBC had significantly more regular shape compared to control group (Fisher exact test; p=0.03, Table 2).

Compared to control group TNBC were significantly more multifocal (Fisher exact test; p<0.001).

There was no statistical significant difference in BI-RADS categorization regarding MMG presentation between TN and non-TN group ($\chi 2$; p=0.34, Table 2).

TABLE 1

SELECTED DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF BC PATIENTS BY PATHOLOGY REPORTS

	Control n (%)	TNBC n (%)	p value
Number of patients	37 (55)	30 (45)	
Number of tumors	45 (52)	41 (48)	
Age , years [Median (25%–75%)]	56 (47-61)	52 (45–61)	0.60†
HISTOLOGICAL GRADE			
1	18 (40)	0	<0.001*
2	19 (42)	9 (22)	
3	8 (18)	32 (78)	
MULTIFOCAL/UNIFOCAL PRESENTATION			
Multifocal	17 (38)	21 (51)	0.17*
Unifocal	28 (62)	20 (49)	
Number of BC with positive lymph nodes	15 (33)	27 (66)	0.003*
PATHO-HISTOLOGICAL DIAGNOSIS			
Ductal NST	24 (53)	33 (80)	0.01*
Ductal cribriform	4 (9)	0	0.12*
Ductal tubular	2 (4)	0	0.50*
Ductal invasive with in situ component	6 (13)	3 (7)	0.49*
Ductal carcinoma in situ	2 (4)	1 (2)	> 0.99*
Ductal comedo	2 (4)	0	0.49*
Ductolobular	1 (2)	1 (2)	> 0.99*
Ductolobular invasive with in situ component	4 (9)	0	0.12*
Ductal medullar	0	3 (7)	0.10*

BC – breast cancer, TNBC – triple negative breast cancer, PhD – patho-histological diagnosis; NST – no special type

*χ^2 test; †Mann Whitney U test

TABLE 2

MAMMOGRAPHIC FINDINGS OF BC PATIENTS

	Control n (%)	TNB n (%)	p value
Number of tumors	45 (52)	41 (48)	
APPEARANCE ON MAMMOGRAPHY			
Mass	17 (38)	19 (47)	0.43*
Mass with microcalcifications	1 (2)	4 (10)	
Microcalcifications	7 (16)	4 (10)	
Asymmetry and architectural distortion	7 (16)	4 (10)	
Asymmetry and architect. distortion with microcalcification	1 (2)	2 (5)	
Negative for suspect lesions	10 (22)	8 (20)	
Very dense breasts – further examination required	2 (4)	0	
MARGINS			
Well defined	1 (6)	9 (39)	0.03†
Ill defined	17 (94)	14 (61)	
SHAPE			
Regular	3 (17)	12 (52)	0.03†
Irregular	15 (83)	11 (48)	
MULTIFOCAL/UNIFOCAL PRESENTATION			
Multifocal	2 (7)	10 (30)	0.02*
Unifocal	29 (94)	23 (70)	
BI RADS categorization			
0	2 (5)	0	0.34*
1	1 (3)	2 (6)	
2	3 (7)	0	
3	3 (7)	5 (14)	
4	18 (46)	17 (49)	
5	12 (31)	11 (31)	

TNBC – triple negative breast cancer, BI RADS – breast imaging reporting and data system,

*$\chi 2$ test, †Fisher's exact test

Sonographic features of TNBC

Ultrasound appearance (US) of tumors, according to American College of Radiology's BI-RADS lexicon for image interpretation, was divided in six categories. There was no statistical significant difference in ultrasound appearance between TN and non-TN group ($\chi 2$; p=0.26, Table 3).

Regarding tumor margins, TNBC have had significantly more often circumscribed margins in regards to non-TN tumors, out of which 94% have had not circumscribed margins, (Fisher exact test; p<0.001, Table 3).

Regarding shape of tumors, TNBC more often have had regular shape (53%) (Fisher exact test; p=0.004, Table 3).

There was no statistical significant difference in orientation, echo pattern, posterior features, vascularity and unifocal/multifocal presentation between TN and non-TN group ($\chi 2$; p=0.3) (Fisher exact test; p=0.8, Table 3).

There was no statistical significant difference according to BI RADS category after ultrasound examination between TN and non-TN group ($\chi 2$; p=0.29, Table 3).

MRI features of TNBC

Tumor appearance on MRI, according to American College of Radiology's BI RADS lexicon for image interpretation, was divided in four categories. In TN group 83% tumors presented as an enhancing masses ($\chi 2$; p=0.03, Table 4).

Well defined borders on MRI showed 41% of TNBC (Fisher exact test; p=0.008) (Table 4). There was no statistically significant difference in lesion/mass shape between TN and non-TN group (Fisher exact test; p=0.24, Table 4).

TNBC most often presents as lesion with rim enhancement after bolus of intravenous contrast admission (Fisher exact test; p<0.001, Table 4). There was a statistically significant difference in tumors type of curve in first 2 minutes

TABLE 3

ULTRASOUND FINDINGS OF BC PATIENTS

	Control n (%)	TNBC n (%)	p value
Number of tumors	45 (52)	41 (48)	
APPEARANCE ON ULTRASOUND			
Mass	25 (56)	29 (71)	0.26*
Mass with microcalcifications	8 (18)	3 (7)	
Microcalcifications	0	0	
Asymmetry and architectural distortion	5 (11)	1 (2)	
Asymmetry and architect. distortion with microcalcification	2 (4)	3 (7)	
Negative for suspect lesions	5 (11)	5 (12)	
MARGINS			
Circumscribed	2 (6)	16 (50)	<0.001†
Not circumscribed	31 (94)	16 (50)	
SHAPE			
Regular	6 (18)	17 (53)	0.004†
Irregular	27 (82)	15 (47)	
ORIENTATION			
Paralel	9 (27)	8 (25)	>0.99†
Non paralel	24 (73)	24 (75)	
ECHO PATTERN			
Hyperechoic	1 (3)	0	0.30*
Complex lesions (cystic and solid)	9 (24)	5 (14)	
Hypoechoic	27 (73)	31 (86)	
POSTERIOR FEATURES			
Without any	18 (49)	19 (53)	0.82†
Shadowing	19 (51)	17 (47)	
VASCULARITY			
Visible	26 (67)	25 (71)	0.80†
Absent	13 (33)	10 (29)	
MULTIFOCAL/UNIFOCAL PRESENATION			
Multifocal	7 (18)	14 (39)	0.07*
Unifocal	32 (82)	22 (61)	
BI RADS CATEGORIZATION			
1	2 (5)	1 (3)	0.29*
3	1 (2)	2 (5)	
4	15 (36)	20 (54)	
5	24 (57)	14 (38)	

TNBC – triple negative breast cancer, BI RADS – breast imaging reporting and data system

* $\chi 2$ test; †Fisher's exact test

after contrast admission between TN and non-TN group (Fisher exact test; p=0.02, Table 4). In first 2 minutes after contrast admission majority (83%) of TNBC have had fast wash in type of curve, that is 17% of TNBC showed slow wash in, while 98% non-TNBC have had fast wash in type of curve. There was no statistical significant difference in type of dynamic MRI curve after first two minutes after contrast admission between TN and non-TN group ($\chi 2$; p=0.06, Table 4).

There was no statistical significant difference in tumors presented as a unifocal/multifocal according to MRI between TN and non-TN group (Fisher exact test; p=0.28, Table 4).

There was no statistical significant difference according to BI RADS category after MRI examination between TN and non-TN group ($\chi 2$; p=0.18, Table 4).

TABLE 4

MRI FINDINGS OF BC PATIENTS

	Control	TNBC	p value
Number of tumors	45 (52)	41 (48)	
APPEARANCE ON MRI			
Mass enhancemenet	26 (58)	34 (83)	0.03*
Mass enhancemenet + non mass component	8 (18)	3 (7)	
Non mass enhancemenet	10 (22)	2 (5)	
Focus	1 (2)	2 (5)	
BORDERS			
Well defined	4 (12)	15 (41)	0.008†
Ill defined	30 (88)	22 (59)	
SHAPE			
Regular	13 (38)	20 (54)	0.24†
Irregular	21 (62)	17 (46)	
INTERNAL ENHANCEMENT CHARACTERISTICS			
Homogeneous	22 (50)	12 (31)	<0.001†
Heterogeneous	21 (68)	11 (28)	
Rim enhancement	1 (2)	16 (41)	
FIRST 2 MINUTES AFTER CONTRAST ADMISSION			
Slow wash in	1 (2)	7 (17)	0.02†
Fast wash in	44 (98)	34 (83)	
AFTER FIRST 2 MINUTES AFTER CONTRAST ADMISSION			
Persistent	1 (2)	7 (17)	0.06*
Plateau	27 (60)	20 (49)	
Fast wash out	17 (38)	14 (34)	
MULTIFOCAL/UNIFOCAL PRESENTATION			
Multifocal	17 (38)	21 (51)	0.28†
Unifocal	28 (62)	20 (49)	
BI RADS MRI			
3	1 (2)	5 (12)	0.18*
4	23 (51)	17 (42)	
5	21 (47)	19 (46)	

MRI – magnetic resonance imaging; TNBC – triple negative breast cancer,

BI RADS – breast imaging reporting and data system

*$\chi 2$ test; †Fisher's exact test

Discussion

We demonstrated importance of MRI in confident detection of TNBC and characteristics of tumors when diagnosing with currently available methods. Generally, TNBC occurred in younger patients. The average size of TBNC tumors was bigger and they tend to be multifocal. This trend did not reach statistical significance, mainly due to limited sample size. In line with our finding, previous studies showed that TNBC were associated with younger age and bigger size[11]. TNBC more often appear as ductal medullar type than non –TN, and medullar type is the most common after IDC NST among TNBC. The results of our study regarding TNBC being more often histological grade 3 are in line with previously published research, which is a consequence of the more aggressive biologic behavior of TNBC[11].

We had four patients with TNBC with DCIS component, three of them were invasive cancers with in situ component, while one case was DCIS only. This is consistent with the observation that TNBC rarely appear as DCIS only [12], because of their aggressive behavior and rapid carcinogenesis that bypasses the in situ stage. Because of that, MMG as screening method, as we demonstrated, has limited value in diagnosing patients who are

at increased risk of developing TNBC. According to our findings TNBC often presented on MMG as mass of regular shape with well-defined margins (47%, 52%, 39% respectively) (Figure 1). Most important, negative MMG finding was every fifth examination, possibly due to the proportion of multifocal tumors that were not visualized on MMG, and as a consequence of benign appearance and dense breast tissue in women median age of 52. Third most common appearance on MMG was the mass with microcalcifications, microcalcifications only and asymmetry or architectural distortion. Less common appearances were calcifications only or asymmetry maybe due to the small incidence of in situ carcinoma, as we mentioned earlier. Most common MMG category was BIRADS 4 (48.6%), then BI RADS 5 (31.4%) and BIRADS 3 (14.3%). Large number of BIRADS 3 and BIRADS 4 findings was due to benign appearance of breast lesions, which were well defined and have regular shape on MMG. Data from this study suggested that MMG alone is suboptimal method for diagnosing TNBC, consistently with other studies[13,14]. Wen et al. reported that TN group of tumors detected by MMG were characterized with smooth margins and, when rarely represented as calcifications, these calcifications were benign[15].

On US half of TNBC appeared as hypoechogenic mass with regular shape and well-defined borders, without posterior acoustic features. Majority had non parallel orientation and visible blood flow on color Doppler examination. Similar benign and intermediate US findings were demonstrated previously [16, 17]. US report was negative for suspicious lesions in 12% of cases, which is better than MMG but still many cancers could be overlooked.

With "second look" targeted US after MRI all cancers found on MRI were visualized by US. This is an advantage of US in comparison to MMG. On the initial US examinations some tumors with very subtle findings were missed, in spite of examinations being performed by experienced sonologists, these lesions were noted only on targeted, second look examination. Statistical analysis confirmed as sonographic discriminators for TNBC: regular shape and well-defined margins (Figure 2).

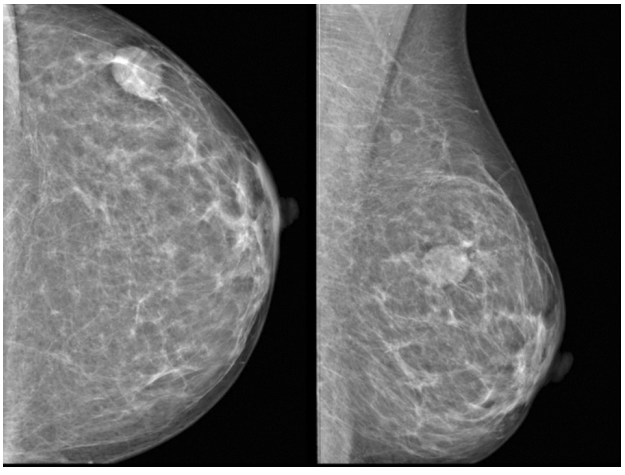

Fig. 1. Mammographic features of TNBC: mass with regular (oval) shape and well-defined margins in one part and ill-defined borders in one smaller part of lesion.

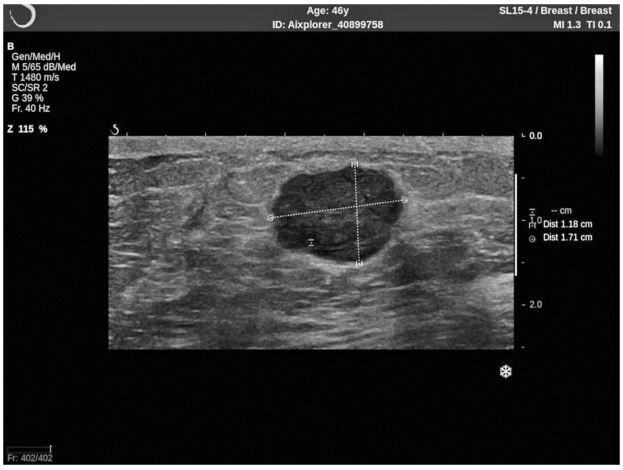

Fig. 2. Ultrasound features of TNBC: mass with regular shape and well defined margins.

Our results regarding MRI presentation of TNBC are in line with previously published emphasizing TNBC appearance as regular shaped masses with rim enhancement, fast wash in, followed by plateau[18, 19]. Interestingly, 17% of cases showed slow wash in and 17% presented with persistent type of curve (benign dynamic features) after first two minutes, which was not the case in non-TNBC group. We had similar proportion of cases reported as BI RADS 4 and 5 (more than 40% each) but also considerable number of cases was reported as BI RADS 3 (12%), presumably consequence of benign features of TNBC[18]. Our study showed MRI signature of TNBC as regular shaped mass, with rim type of enhancement and fast wash in type of dynamic curve in first two minutes after contrast admission (Figures 3 and 4).

A major limitation of our study is small number of patients, which could cause discrepancies with other studies, for example age and size of TNBC when comparing them to non-TNBC. Additionally, retrospective design of study aggravated objective assessment of BI RADS category. However, to the best of our knowledge, this is one of the first studies that utilized all three breast imaging techniques with second-look US and had a control group of non-TNBC. Given the accelerated development of artificial intelligence, in further research US texture analysis could be included. Recent study showed that US texture analysis provided an objective adjunct diagnostic tool, improving the diagnostic efficiency in the differential diagnosis of TNBC from non-TNBC[20].

In conclusion, TNBC tend to affect younger women and are bigger in size than non-TNBC. They are mostly IDC NST or medullar type, and histological grade 3. Most com-

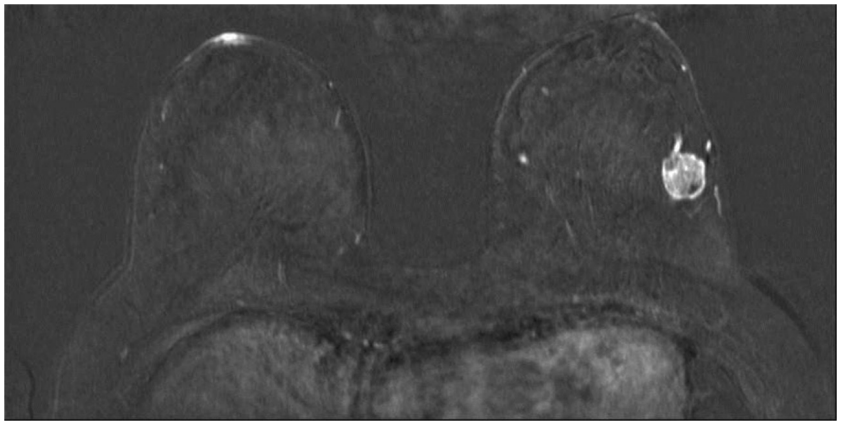

Fig. 3. MRI features of triple negative breast cancer: regular shaped mass with rim type of enhancement.

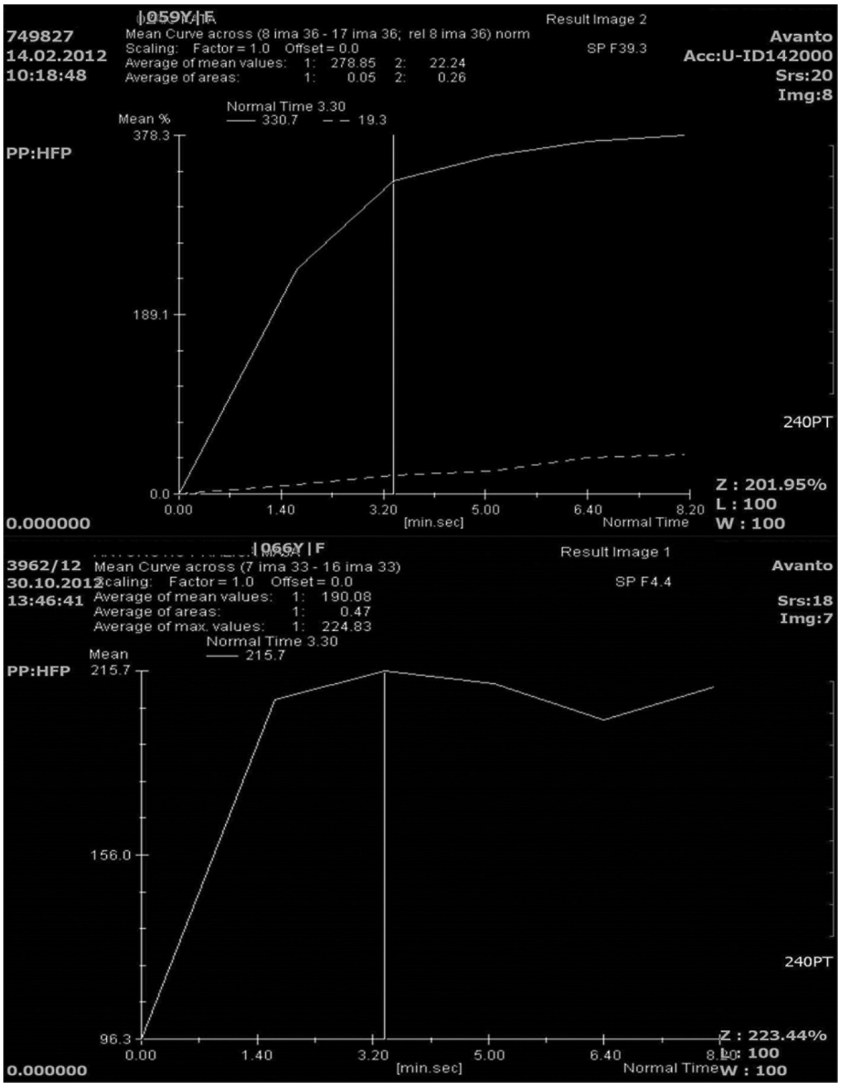

Fig. 4. Features of MRI dynamic curves that are more often associated with triple negative breast cancers: in first 2 minutes after contrast admission fast wash in and after first 2 minutes persistent and plateau type of curve.

mon presentation of TNBC is a regular shaped mass with slightly more often ill-defined margins. In many cases they are not recognized on MMG and US. However, all tumors are visible on MRI, appearing typically as mass with ill-defined margins, regular shape and rim type of enhancement.

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ZNAČAJKE SNIMKI TROSTRUKO NEGATIVNIH KARCINOMA DOJKE – MAMOGRAFIJA, ULTRAZVUK I MAGNETSKA REZONANCIJA

S A Ž E T A K

Rak dojke (RD) vrlo je heterogena bolest. Cilj istraživanja bio je procijeniti slikovne značajke trostrukog negativnog karcinoma dojke (TNRD) u usporedbi s ne-TNRD-om. Pregledali smo podatke 30 pacijenata kojima je dijagnosticiran TNRD te 37 pacijenata s ne-TNRD-om (kontrolna skupina) koristeći kriterije opisane za mamografiju (MMG), ultrazvuk (US) i magnetsku rezonancu (MRI) u Breast Imaging-Reporting and Data System (BI-RADS) za interpretaciju slike. Analizirana je dob pacijenata, veličina tumora, multifokalnost, histološki tip, gradus tumora i status limfnih čvorova. TNRD-i su češće bili histološki gradus 3 i znatno su više imali pozitivne limfne čvorove u vrijeme dijagnoze na patohistološkim izvješćima. Na MMG-u, US-u i MRI-u TNRD-i su se uglavnom pojavljivali kao pravilno oblikovane mase, na US-u kao hipoehogene mase bez stražnjih akustičnih značajki, a na MRI-u kao mase koje rubno nakupljaju kontrasno sredstvo, uz dinamičke krivulje s brzim nakupljanjem i platoom. Najčešća kategorija zabilježena nakon MMG-a i US-a bila je BI RADS 4, a nakon MRI-a BI RADS 5. U zaključku je naša studija potvrdila viši histološki gradus TNRD-a, kao i češće zahvaćanje limfnih čvorova u odnosu na kontrolnu skupinu. Pokazali smo tendenciju pojavljivanja kod mlađih žena, kao I veće dimezije u odnosu na kontrolnu skupinu. Iako su se najčešće predstavljali kao tvorba na MMG-a i US-u, u određenome broju slučajeva pogrešno su kategorizirani zbog benignih slikovnih značajki. Svi su slučajevi na MRI-u dijagnosticirani kao masa koja rubno nakuplja kontrastno sredstvo.