DIGITAL MAMMOGRAPHY AND BREAST TYPE

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Keywords: *analog mammography, digital mammography, premepausa, postmenopausa*

Abstract: *Mammography is performed either for diagnostic purposes or in screening programmes, allowing the early detection of breast cancer. The purpose of this study is to analyze analog versus digital mammography in terms of type of breast. Results. For women in premenopausal and diagnosed with analog versus digital methods, the statistical analysis shows no difference in the rate of occurrence of the two forms of breast ACR1 / 2 and ACR3 / 4. In postmenopausal women and diagnosed with analog versus digital methods, the statistical analysis shows significant differences in the rate of occurrence of the two forms of breast ACR1 / 2 and ACR3 / 4. Conclusions. Digital mammography compared to the analogous one changes the type of breast from the ACR type 3 or 4 (non- dense type) in type 1 or 2 ACR breast (adipose type). The clinical implications relate to an increase of sensitivity of digital mammography in breast cancer detection and possible further analysis of the correlation between the type of breast and breast cancer risk.*

Cuvinte cheie: *mamografie analogă, mamografie digitală, premenopauză, postmenopauză*

Rezumat: *Mamografia se efectuează fie în scop diagnostic, fie în cadrul programelor de screening, permiţând o detecţie cât mai precoce cancerului de sân. Scopul acestui studiu este analiza mamografiei digitale comparativ cu cea analoga în ceea ce priveşte tipul de sân. Rezultate. În cazul femeilor aflate în premenopauză şi diagnosticate cu metode digitale versus analogice, analiza statistică nu evidenţiază diferenţe în rata de apariţie a celor două forme de sân ACR1/2 şi ACR3/4. În cazul femeilor aflate în postmenopauză şi diagnosticate cu metode digitale versus analogice, analiza statistică evidenţiază diferenţe semnificative în rata de apariţie a celor două forme de sân ACR1/2 şi ACR3/4. Concluzii. Mamografia digitală comparativ cu cea analogă modifică tipul de sân din tipul ACR 3 sau 4 (de tip dens) în tipul de sân ACR 1 sau 2 (tip adipos). Implicaţiile clinice se referă la o creştere a sensibilităţii mamografiei digitale în detecţia cancerului de sân şi posibil noi analize a corelaţiei între tipul de sân şi riscul de cancer de sân.*

INTRODUCTION

Mammography provides detailed images of the internal structures of the mammary gland, being performed either for diagnostic purposes or within screening programmes, allowing an early detection of breast cancer.(1,2)

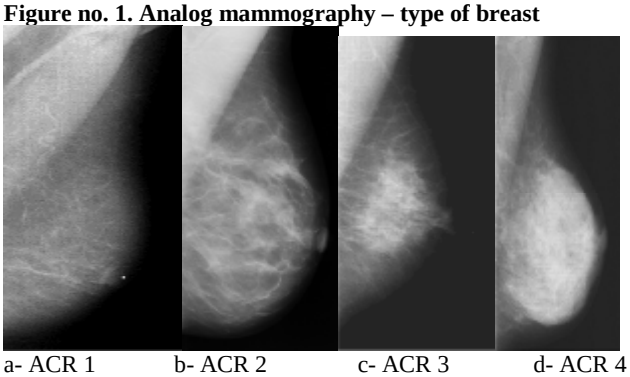
Mammographic appearance is given by the ratio of fibroepithelial and adipose tissue.

There are variations in the normal mammographic appearance that establishes the type of breast whose component involves various factors, namely: genetic, endocrine, reproductive (the appearance of menarche and menopause, parity, age at first pregnancy) but also technical factors.(3)

There have been various classifications of breast types, the most accepted today is published by the American College of Radiology (ACR) in The Breast Imaging Reporting and Data System (BIRADS), which describes four types of breast density, namely: type 1: homogenously adipose-fibroglandular tissue less than 25%; type 2 - fibroadipose - adipose with glandular tissue 25-50 %; type 3 - heterogeneously dense or heterogeneously glandular- fibroglandular tissue 51-75%; type 4 - extremely dense or homogenously glandular-fibroglandular tissue more than 75%.(4,5)

This classification means that the mammogram's ability to detect smaller sized cancer in a dense breast is reduced.(1,3)

Figure no. 1. Analog mammography – type of breast



a- ACR 1 b- ACR 2 c- ACR 3 d- ACR 4

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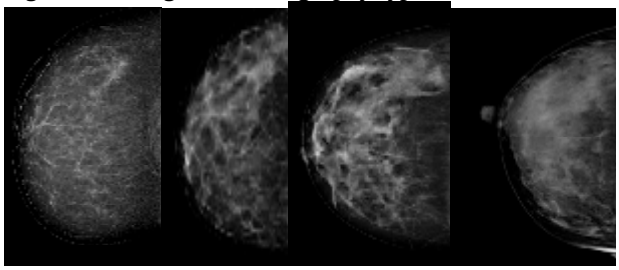
Figure no. 2. Digital mammography-type of breast



a-ACR 1 b-ACR 2 c -ACR 3 d- ACR 4

In addition to analog mammography, digital mammography provides images with good contrast that reduce opacity in case of dense breasts, allowing a more accurate diagnosis.(6,7)

PURPOSE

The purpose of this study is to analyze digital mammography compared to analog mammography in terms of the type of breast.

METHODS

Breast density was subjectively analyzed and classified in accordance with the ACR classification in types ACR1 or ACR2 for fat and fat with scattered fibroglandular tissues, respectively in types ACR 3 or 4 for dense breasts.

The study was conducted in two stages. First, we analyzed the breast type in a group of 185 asymptomatic premenopausal and postmenopausal women (average age 54 +/ - 8 years) who underwent a digital mammography with Giotto and in a control group of 268 women (average age 55 +/ - 8 years) who underwent the examination with an analogue device Mammomat 3000 manufactured by Siemens. In the second stage, we analyzed the breast type in a group of 86 asymptomatic premenopausal women aged 42-52 years who were examined both with the analogue mammography machine and with the digital one in a period of time of two years.

Data analysis was performed with the statistical software package SPSS 17.00.

The chosen statistical method was the chi square test since the variables analyzed by us are nominal (type of evaluation - digital or analogue, type of breast - ACR1 or ACR3 and category of women - premenopausal and postmenopausal) dichotomous, allowing us to determine only the number of patients who fall into a certain category or the frequency with which certain pathologies occur.

RESULTS

In the group of premenopausal women, we identified fatty breasts of ACR 1 or 2 type in 21 (representing 36%) of the 58 women who underwent a digital mammographic examination and in 33 (representing 30%) of the 109 women who underwent an analogue mammographic examination. 37 (representing 64%) of the women who underwent the digital mammographic examination and 76 (representing 70%) of the women who underwent the analogue mammographic examination had ACR 3 or 4 type of breast (table no. 1 and 2, figure no. 3).

Table no. 1. Distribution by type of premenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital

			Breast type		**Total**
			ACR1/2	ACR3/4	
Evaluation-type	digital	count	21	37	58
		Expected Count	18.8	39.2	58.0
		% within type ev.	36.2%	63.8%	100.0%
	analogue	Count	33	76	109
		Expected Count	35.2	73.8	109.0
		% within type ev.	30.3%	69.7%	100.0%
Total		Count	54	113	167
		Expected Count	54.0	113.0	167.0
		% within type ev.	32.3%	67.7%	100.0%

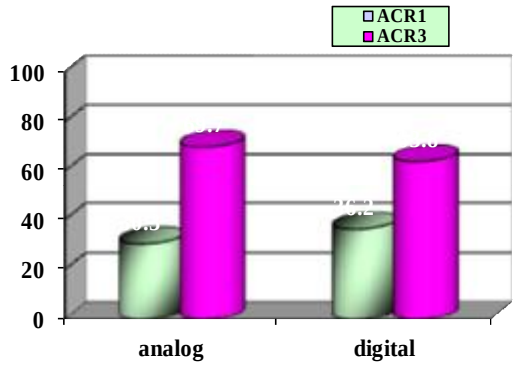
a woman type = premenopausal

Table no. 2. Statistical analysis Chi-square test for premenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	**.609(b)**	**1**	**.435**		
Continuity Correction(a)	.368	1	.544		
Likelihood Ratio	.604	1	.437		
Fisher's Exact Test				.488	.271
Linear-by-Linear Association	.605	1	.437		
N of Valid Cases	167				

For the premenopausal women diagnosed with digital methods versus the analogue ones, the statistical analysis shows no difference in the rate of occurrence of the two types of breast ACR1 / 2 or ACR3 / 4; $X^2(1)=.609$ p=.435 (table no. 2, figure no. 3).

Figure no. 3. The percentage of premenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital.



$X^2(1)=.609$ p=.435

In the group of postmenopausal women, we identified fatty breasts of type ACR 1 or 2 in 109 (representing 86%) of the 127 women who underwent a digital mammographic examination and in 110 (representing 69%) of the 159 women who underwent an analog mammographic examination; 18 (representing 14%) of the women who underwent the digital method and 49 (representing 31%) of women who underwent the analog examination had ACR 3 or 4 type of breast (table no. 3, figure no. 4).

Table no. 3. Distribution by type of postmenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital

			Breast type		Total
			ACR1/2	ACR3/4	
Type ev.	digital	Count	109	18	127
		Expected Count	97.2	29.8	127.0
		% within type ev.	85.8%	14.2%	100.0%
	analogue	Count	110	49	159
		Expected Count	121.8	37.2	159.0
		% within type ev.	69.2%	30.8%	100.0%
Total		Count	219	67	286
		Expected Count	219.0	67.0	286.0
		% within type ev.	76.6%	23.4%	100.0%

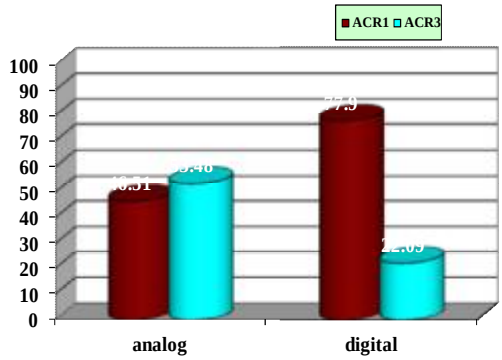
a woman type = postmenopausal

Table no. 4. Statistical analysis Chi-square test for postmenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	**10.904(b)**	**1**	**.001**		
Continuity Correction(a)	9.996	1	.002		
Likelihood Ratio	11.321	1	.001		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	10.866	1	.001		
N of Valid Cases	286				

In postmenopausal women diagnosed with digital versus analog methods, the statistical analysis shows significant differences in the rate of occurrence of the two types of breast ACR1 / 2 and ACR 3 / 4 $X^2(1)=10.904$ p=.00, statement that we can make with an assumed risk of error of 1 to 1000 which allows us to conclude that for this group of women - in postmenopause- the use of digital diagnostic methods significantly increases the accuracy in establishing the diagnosis and the chances of favourable further developments for the women (table no. 4, figure no. 4).

Figure no. 4. The percentage of postmenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital



In the group of asymptomatic premenopausal women who underwent both digital and analogue mammographic examination, we found ACR 1 or 2 type of fatty breast in 40 (representing 47%) of the women when they underwent the analogue method and in 67 (representing 78%) when they underwent an examination carried out by digital methods.

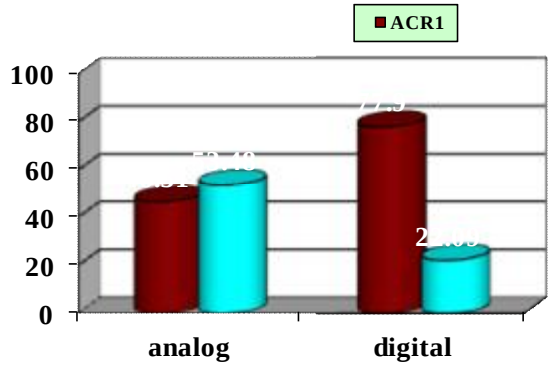
Table no. 5. Distribution by type of premenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital

			Breast type		Total
			ACR1/2	ACR3/4	
type ev.	digital	Count	67	19	86
		Expected Count	38.95	11.04	
		% within type ev.	77.90%	22.09%	100.0%
	analog	Count	40	46	86
		Expected Count	23.25	26.74	
		% within type ev.	46.51%	53.48%	100.0%
Total		Count	107	65	172
		% within type ev.	62.20%	37.79%	100.0%

$X^2(1)=18.03$ p<.0001

The study on the same sample of premenopausal women diagnosed with analogue versus digital methods reveals significant differences in the rate of occurrence of the two types of breast ACR1 / 2 and ACR3 / 4 $X^2(1)=18.03$ p<.0001, statement that we can make with an assumed risk of error of 1 to 10000 which allows us to conclude that for this group of women - in premenopausal group- the use of digital diagnostic methods significantly increases the detection rate of ACR1 / 2 type of breast (figure no. 5).

Figure no. 5. The percentage of premenopausal women diagnosed with breast ACR1/2 and ACR ¾ depending on the type investigation used: analog or digital- intragroup study



CONCLUSIONS

1. Digital versus analog mammography changes the ACR 3 or 4 type of breast (dense type) in ACR 1 or 2 type of breast (fatty type).
2. Clinical implications refer to an increasing sensitivity of digital mammography in breast cancer detection and possible new analysis of correlation between the type of breast and the risk of breast cancer.

REFERENCES

1. Fischer U, Baum F, Luftner-Nagel S. Breast Imaging, Direct Diagnosis in Radiology, Thieme; 2008.
2. Recommandations pour la pratique Clinique. Cancer du sein in situ. INCa Oct; 2009.
3. Perry N, et al. European guidelines for quality assurance in mammography screening. EUREF, European Commision; 2006.
4. American College of Radiology. BI-RADS Breast Imaging Reporting and Data System. Breast Imaging Atlas: Mammography, Breast Ultrasound, Breast MR Imaging. Virginia: Reston; 2003.
5. Fischer U, Helbuch T. ACR BI-RADS. Illustrierte Anleitung zur einheitlichen Befunderstellung von Mammographie.Mammosonographie, MR Mammographie.2nd ed.Stuttgart: Thieme; 2006.
6. Fischer U, et al. Digital mammography: current state and future aspects. Eur Radiol 2006;16:38-44.
7. Pisano ED, et al. Diagnostic performance of digital versus film mammography for breast cancer screening. N Engl J Med 2005;353:1773-1783.