BREAST INFECTIONS: DIAGNOSIS WITH ULTRASOUND AND MAMMOGRAPHY

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(摘要): **Aim:** Evaluation of ultrasonographic and mammographic pattern, etiology and risk factors of breast infections. **Material and methods:** Our study included a group of 66 female patients aged 16 to 71 years, examined by ultrasound and mammography in several medical imaging services in Iași in the interval 2008-2014; ultrasound was performed in all 66 patients and mammography in 22. **Results:** In our study breast infections occurred mostly during breastfeeding and the most frequent causative agent was *Staphylococcus aureus*; ultrasound established the correct diagnosis in 63 cases and detected one or more of the following aspects in case of breast infections: edema of the fatty tissue, hypoechoic areas in the breast tissue, dilated ducts, or fluid collections. Mammography was not necessary in puerperal mastitis and was performed only in women over 40 years old; in most cases we had encountered a focal asymmetric density which had low specificity for the diagnosis of mastitis or breast abscess. **Conclusions:** Our study proved that ultrasound is a valuable method for the diagnosis of mastitis, especially when an abscess is suspected and established a correct diagnosis in most cases; the abscesses appear as inhomogeneous fluid collections, with poorly defined margins, posterior acoustic enhancement, no Doppler signal inside, sometimes associated with enlarged axillary lymph nodes. Mammography was not helpful for the diagnosis. **Keywords:** BREAST INFECTION, ABSCESS, MASTITIS, ULTRASOUND, *STAPHYLOCOCCUS AUREUS*.

Mastitis and breast abscess appear frequently during breastfeeding (puerperal mastitis) (1); the most frequent causative agents of these infections are *Staphylococcus aureus* (which gives rise very quickly to abscess formation) and *Streptococcus pyogenes* (the manifestation being mastitis, the abscess appearing in the advanced stage) (2, 3). The symptoms of breast infections are: fever, breast pain, swelling breast, palpable breast masses inside the breast. Physical examination can suspect a breast infection, but imaging methods are the ones which confirm the diagnosis (4, 5).

Ultrasound is a valuable method for the diagnosis of mastitis, especially when an
abscess is suspected; ultrasonography can localize, measure and follow-up the abscesses during the treatment \((6, 7)\).

Mammography is not recommended in case of puerperal mastitis. Inflammatory changes increase breast density and can impair the visibility of the lesions.

**MATERIAL AND METHODS**

This retrospective study included a group of 66 female patients aged 16 to 71 years presenting with one or more symptoms of breast infection and examined by ultrasound and/or mammography in several medical services in Iaşi between 2008 and 2014.

Data were obtained by reviewing the ultrasound and mammography reports and images; the results were processed and interpreted by statistical methods (p value, trend).

**RESULTS**

All 66 patients were examined by ultrasound and in 20 (30.3%) of them mammography was also performed; 22 (33.3%) abscesses and 44 (66.7%) cases of mastitis, including superficial (30 patients\(\times 45.4\%\)) and severe mastitis (14 patients\(\times 21.3\%\)) were detected.

We diagnosed 32 (48.4%) breast infections occurring during breastfeeding (15 - 22.7% abscesses and 17 - 25.7% cases of mastitis) and 34 (51.6%) breast infections not related to breastfeeding.

Most cases of severe breast infection (15/66 - 22.7%) occurred during breastfeeding, 5 (7.5%) patients had diabetes mellitus, 2 (3%) of them had no apparent risk factors; 27 (40.9%) women who had superficial mastitis (ultrasound findings: fatty tissue edema and skin thickening) did not have any important risk factors (tab. I).

**TABLE I**

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Breastfeeding</th>
<th>Diabetes</th>
<th>No risk factors</th>
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<tbody>
<tr>
<td></td>
<td>Abscess</td>
<td>Mastitis</td>
<td>Abscess</td>
</tr>
<tr>
<td>No. of patients</td>
<td>15</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>% of patients</td>
<td>22.7</td>
<td>25.7</td>
<td>7.5</td>
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In the vast majority of cases breast infections were located on one side: 30 (45.4%) in the left and 35 (53.1%) in the right breast; only one patient (1.5%) had bilateral mastitis.

Breast ultrasound established a correct diagnosis in 63 (95.4%) cases; inflammatory carcinoma was considered in the differential diagnosis in 3 (4.5%) cases.

Mammography was never necessary in puerperal mastitis and was recommended only in women aged over 45-50 years to complete the evaluation of both breasts.

Ultrasoundography showed the following:
- in all the cases of superficial mastitis (30 patients\(\times 45.4\%\)); fatty tissue edema and thick skin, which correlated with the symptoms were sufficient for the diagnosis; all these patients were treated with antibiotics no case of abscess formation being recorded;
- in case of severe mastitis (fig. 1), one or more of the following: edema of the fatty tissue (37 patients - 56%), hypoechoic areas in the breast tissue (35 - 53%), dilated retroareolar ducts (34-51.5%), fluid collections (22-33.3%), enlarged axillary nodes (20-30.3%), skin thickness more the 2 mm (19 - 28.7 %), increased vascularisation of the breast tissue (18-27.7%).
Breast infections: diagnosis with ultrasound and mammography

Twenty-two (33.3%) abscesses were detected by ultrasound, which most of the time had a typical pattern: round or oval hypoechoic fluid collections with poorly defined margins, inhomogeneous, with posterior acoustic enhancement, no Doppler signal inside; a fluid-fluid level and internal echoes were identified in one case each; the abscesses were associated with appearances of mastitis in 12 (18.8%) patients and/or enlarged axillary lymph nodes (12 patients-18.8%) (fig. 2 a, b).

![Fig. 1. Ultrasonographic pattern of breast infections](image1)

![Fig. 2 a, b. Breast and axilla ultrasound, B mode: Breast abscess (a), enlarged axillary nodes (b)](image2)

Mammography was performed in 22 cases and the findings were: normal in 3
(13.6%) cases, breast edema (increased density of the breast, with effacement of the normal structures) -2 (9%) cases and thick skin (1 case - 4.5%); only in 1 patient (4.5%) with breast abscess mammography discovered a high intensity, homogeneous, oval mass, with poorly defined, irregular margins; in our study in most cases of breast infections (15 cases - 68.1%) mammography showed a focal asymmetric density (fig. 3, 4).

The treatment of breast infections was antibiotic therapy in 48 (72.8%) cases (the patients with mastitis and 4 of the patients with abscesses), antibiotic therapy, incision and drainage in 17 (25.7%) patients with breast abscesses; in one (1.5%) patient after surgery ultrasound guided fine needle aspiration of the remaining collection was also performed.

Fig. 3. Mammographic pattern of breast infections

Fig. 4 a, b, c. Bilateral mammography, oblique (a, b) and cranio-caudal (c) views: asymmetric density in the inferior quadrants of the right breast
The causative organisms were studied in 39 (59%) breast infections: 22 (56.4%) abscess cultures and 17 (43.6%) breast milk cultures; the results of the cultures were as follows (tab. II): *Staphylococcus aureus* (33 cultures-84.7%), *Streptococcus pyogenes* (5 cultures-12.8%), *Bacteroides spp.* (1 culture - 2.5%).

<table>
<thead>
<tr>
<th>Causative organism</th>
<th>No. of patients</th>
<th>% patients</th>
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<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>33</td>
<td>84.7</td>
</tr>
<tr>
<td><em>Streptococcus pyogenes</em></td>
<td>5</td>
<td>12.8</td>
</tr>
<tr>
<td><em>Bacteroides spp.</em></td>
<td>1</td>
<td>2.5</td>
</tr>
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**DISCUSSION**

In our study, breast infections occurred during breastfeeding (32 - 48.4% patients) and related to diabetes mellitus (5 - 7.5% patients), but 27 (40.9%) women with superficial mastitis and 2 (3%) with breast abscesses had no apparent risk factors for breast infections; less than 50% of breast infections were related to breastfeeding, but this was the most common risk factor in our study. Most infections were caused by *Staphylococcus aureus* (33 infections-84.6%), accordingly to the literature (8, 9).

Ultrasonography showed edema of the fatty tissue and thick skin in all cases of superficial mastitis, which correlated with the symptoms were sufficient for the diagnosis (10, 11).

In case of an extended breast infection one or more of the following signs of mastitis was present: hypoechoic areas (35 - 53% cases) with increased vascularization (18-27.7% cases) in the breast tissue, dilated retroareolar ducts (34-51.5%), axillary lymphadenopatiess (20-30.3%), which along with pain and swelling breast were diagnostic in all cases.

We found at ultrasound 22 (33.3%) abscess, which appeared as hypoechoic collections, with a diameter of 3 to 7 cm; 20 (30.3%) collections were inhomogeneous, with internal echoes and poorly defined, irregular margins; in one case (1.5%) the hypoechoic image was homogeneous and in 1 case (1.5%) had a fluid-fluid level; the lesions were associated with aspects of mastitis in 12 (18.18%) cases and enlarged axillary lymph nodes were present in 12 (18.18%) patients. Only in 3(4.5%) patients the hypoechoic masses appeared to be solid and an inflammatory tumor was suspected (12).

Mammography was performed only in 20 (30.3%) cases and the images were not helpful for the diagnosis; in most cases (15-22.7%) we found a focal asymmetric density with poorly defined, irregular margins which had to be further studied by ultrasound.

**CONCLUSIONS**

Our study proved that ultrasound is a valuable method for the diagnosis of mastitis, especially when an abscess is suspected and makes a correct diagnosis in most cases. The abscesses appeared as inhomogeneous fluid collections with poorly defined margins, posterior acoustic enhancement, no Doppler signal inside, associated with enlarged axillary lymph nodes. Mammog-
raphy was not helpful for the diagnosis; in most cases we found a focal asymmetric density which has low specificity for the diagnosis of mastitis and breast abscess.

REFERENCES