Vacuum-assisted breast biopsy: diagnostics and treatment of intraductal lesions.

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Aims and objectives

Breast diseases which show symptoms of pathological nipple secretion are encountered in 7-10% of the cases [1,2,3]. Papillomatosis is one of the most common reasons of the nipple discharge, and it comprises from 40 to 70% of cases [4, 5]. Malignant pathology is the reason for nipple discharge only 1-23% of cases [4,6]. The sensitivity of the cytological examination is 76 %, while specificity here is 17-24% [7,8]. Modern technologies like ultrasound diagnostics, X-ray with or without contrast agent, which provide objective information on the condition of the ducts, have changed the quality of examination procedures and contributed to the development of preserving surgery [9, 10,11]. Invasive methods allowed to receive morphological material which increased diagnostic efficiency up to 96-99% [12, 13]. The options of vacuum aspiration biopsy elevated radiology diagnostics to a much higher level combining examination with treatment. [14, 15, 16] Nevertheless today we do not have a consensus with respect to the examination methods. There is no consistent approach to complex radiology and pathomorphological diagnosing of intraductal alterations. The purpose of this study is to develop efficient system of complex diagnosis and treatment for pathological secretion of the nipple (nipple discharge) based on modern methods and technology.
Methods and materials

During 2001 - 2012 we performed complex examinations for 2742 women with the syndrom of pathological nipple discharge, taking discharge swaps for cytological examination after the clinical check up of the breasts and axillary zones. For palpable lesions we performed mammography in MLO and CC projections using digital scanners Amulet Fuji and Senographe Essential GE, and the images were evaluated using the radiology information system IntegRIS. Ultrasound was performed after the mammograms using EUB 8500 and EUB 900 (HITACHI, Japan) with linear multifrequent sensor 7,5-13 MHz, 40 mm and linear multifrequent sensor 7,5 - 10 MHz, 93 mm, conventional mode, and we also used radial ductal echography. For nipple discharge we performed X-ray ductography with single-use galactography kit Angioteth and non ionising contrast agent (Omnipac 370, Ultravist 370) up to 0,5 ml. For the purposes of specific diagnosis and for the resection of intraductal alterations we used vacuum-assisted biopsy under US guidance in 148 cases and under X-ray guidance in 36 cases.
Results

Clinical examination allowed to reveal breast lumps, alterations in the nipple zone and the character of the nipple discharge the latter being bilateral in 62% of the cases and unilateral in 38%. In 55.4% of the cases the discharge was from a single duct, and in 44.6% they were multiductal. As for its characteristics, the nipple discharge was bloody, serous, colostrum like, pioid and by color it could be distinguished as transparent, amber, white, green, scarlet and reddish brown. It could also be classified by quantity as low, medium and profuse. The correlation between the character of the discharge and the type of intraductal pathology is shown in Table 1.

Table 1. Patients classification on the basis of the intraductal lesions and the color of the discharge

<table>
<thead>
<tr>
<th>Pathology</th>
<th>Cancer</th>
<th>Papillomatosis</th>
<th>Ductal ectasia</th>
<th>Galactoopharit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparent color</td>
<td></td>
<td>164</td>
<td>164</td>
<td>-</td>
<td>339 (12.4%)</td>
</tr>
<tr>
<td>Amber</td>
<td>9</td>
<td>487</td>
<td>-</td>
<td>-</td>
<td>496 (18%)</td>
</tr>
<tr>
<td>Scarlet</td>
<td>39</td>
<td>157</td>
<td>43</td>
<td>-</td>
<td>239 (8.7%)</td>
</tr>
<tr>
<td>Green</td>
<td>3</td>
<td>38</td>
<td>274</td>
<td>301</td>
<td>616 (22.5%)</td>
</tr>
<tr>
<td>White</td>
<td>-</td>
<td>15</td>
<td>425</td>
<td>-</td>
<td>440 (16%)</td>
</tr>
<tr>
<td>Reddish brown</td>
<td>69</td>
<td>335</td>
<td>106</td>
<td>102</td>
<td>612 (22.4%)</td>
</tr>
</tbody>
</table>

As we see from table 1 intraductal alterations are linked to nipple discharge of reddish brown, amber and scarlet color, while ductal ectasia is associated with white and green discharge. The difference between benign and malignant pathology was not statistically proved.

Cytological diagnosis of the nipple discharge is one of the most crucial components of complex examination. If the swab contains red blood cells, hemosiderophages and epithelium cells, intraductal lesions may take place. Cytological diagnosis helps to determine atypia, hyperplasia or malignance of the cells of the epithelium. Our data shows that the sensitivity of cytological diagnosis of the intraductal papillomatosis was 69% and the specificity was 85%. However, the sensitivity of the method for intraductal breast cancer was just 28%, and 98% for high specificity.
It was impossible to visualize intraductal growths on standard mammogram, which, however, allowed to exclude non-palpable lesions, micro calcifications prone to form clusters. Biopsy on stereotactic device was performed for pleomorphic, pulverulent or linear calcifications to exclude intraductal cancer. (Fig.1)

Classical ultrasound also failed to provide accurate results for intraductal pathology. Only where there the intraductal alterations were large (from 7 mm) they could be visualized in central or substantially dilated ducts. Radial ductal echography increases the sensitivity of the method by 10-15% due to the lateral position of the sensing device which allows to visualize the duct throughout its length, and lack of compression on the breast tissue. (Fig.2)

With respect to few options of non-invasive X-ray methods in differential diagnosis of intraductal pathology we have evaluated efficiency for ductography and vacuum-assisted biopsy.

Ductography is the most common method of visualization of intraductal lesions and alterations which allows to detect the most frequent characteristics of intraductal pathology, such as defects in inflation in ductal lumens associated with ductal growths, ductal distortion, ductal stenosis and obturation. (Fig.3)

Ductography showed lack of change of the ducts in 13,6% of the cases and various pathological processes in 86,4%, of which 52,2% were ductal ectasia in mastopathy, were 43% papillary growths and 4,8% were ductal cancer. The sensitivity of the method at diagnosing ductal alterations was 90,4%. The level of detection for intraductal papillomatosis was 89%, however it was 76% for ductal cancer.

We applied the technology of vacuum aspiration biopsy in 167 cases to detect morphologically the nature of ductal alterations and their resection for the patients with benign ductal lesions (Fig.4). 17 patients (10%) underwent bilateral procedure. Depending on the conditions of the visualization of the alteration in question VAB was performed under US guidance for 131 patients (78,4%), and under X-ray guidance for 46 patients (21,6%).

All patients with diagnosed malignant alterations have undergone surgical treatment in relevant scope (radical sectoral resection of the breast tissue, radical mastectomy). The following hystology showed traces of malignant tissues in the zone of the biopsy in 5 patients. US or X-ray control each 3 months was prescribed for total removal of benign formations. Where the initial lesion was more that 20 mm residual tumor was diagnosed after the remove of fibroadenoma was detected in 6 cases. The efficiency of surgical treatment of intraductal papillomatosis was evaluated on the basis of continuation of the discharge and their cytological examination in 6 months. Our data shows that nipple discharge persisted in 34 cases, while morphological examination of the secretion showed red blood cells, hemosiderophages and cubical epithelium cells. We explain such
A large number of inefficient procedures by multiple character of the ductal lesions and low level of visualization of pathological areas due to their small size.
Fig. 1: Patient I. aged 42. Mammograms of the left breast in MLO. Pleomorphic calcification clusters 1 # 1,5 sm in the upper outer quadrant. DCIS.

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Fig. 2: Patient V. aged 38. Sonograms of the right breast in the central area show dilated ducts and intraductal papilloma with its own blood stream (1 - radial ductal echography, #-mode, 2 - The colored- Doppler, 3 - 3D-reconstruction.)

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**Fig. 3:** X-ray indications for relevant ductal pathology.

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Fig. 4: Structure of breast diseases

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Conclusion

Early detection of intraductal changes among patients with nipple discharges can be carried out only with application of multimodality clinical-radiology-pathomorphological examination. The studies of thousands of patients with nipple discharges helped us to develop efficient system of complex radiological examination which allows to diagnose the patient correctly in 96% of cases. However the usage of VAB in treating intraductal papillomas shows low efficiency due to the risk of missing the smallest changes in ducts in cases where the latter have multiple character.
References

