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BREAST CANCER STEREOTACTIC BIOPSY UNDER X-RAY CONTROL

Akhmadova Maftun Amin kizi
Bukhara Medical Institute

Abstract:
The issue of the diagnosis of aggressive carcinomas of small size is relevant and timely all over the world, which served as the basis for this study to search for the most characteristic radiological and sonographic signs of microcarcinomas in patients with different biological subtypes of breast cancer. Accumulated by radiation diagnosticians over the past decades, in some cases, the interpretation of the changes detected during mammography is difficult. the possibility of performing stereotactic biopsy of mammary gland formations under X–ray control is one of the important factors for the successful operation of the outpatient polyclinic of a specialized oncological institution. the article presents more than 15 years of experience in performing stereotactic biopsy of mammary gland formations under X-ray control.

Keywords: stereotactic biopsy, breast cancer, mammography.

INTRODUCTION

According to the modern WHO classification, CA refers to benign types of breast epithelial proliferation. There are sclerosing, apocrine and microglandular types of adenosis. Among all benign breast changes, CA accounts for about 28% [3,5,7]. The relationship between this disease and the risk of developing breast cancer has not been established. Haagensen defined CA as a "phenomenon of the phase of the menstrual cycle of life", suggesting that estrogens induce epithelial proliferation, which predisposes to the development of adenosis and other epithelial tumors. There is also evidence that patients with verified SA have a doubled risk of developing breast cancer. Malignant neoplasms are one of the main causes of death and disability of the population, yielding a leading role only to cardiovascular diseases. Breast cancer (breast cancer) is one of the most important socio–economic problems of global and domestic healthcare. In Russia and St. Petersburg, in terms of the incidence of breast cancer, it consistently occupies the leading 1st place. In St. Petersburg in 2019 There were 2,396 primary cases of the disease, of which 12 were in men and 2,184 in women. The "rough" incidence rate was 85.7 per 100 thousand population, the standardized one was 47.14. In 2019, 1132 women died of breast cancer in St. Petersburg [1, 2]. Traditional methods of breast cancer diagnosis are widely known – clinical examination, mammography in women over 39 years old, ultrasound examination in patients under this age [3]. In recent years, magnetic resonance imaging of the mammary glands with dynamic contrast enhancement has become increasingly widespread [4].Verification of the diagnosis becomes a prerequisite determining the tactics of treatment of a patient with a malignant lesion of the breast [5]. In recent years, trepan biopsy of sites suspected of a malignant tumor has been preferred, which allows not only to determine the histological type of the tumor structure, but also to assess its receptor status. In the case of a palpable formation, verification, as a rule, does not present any difficulties, otherwise the case

is with non-palpable formations of the mammary glands. Diagnostic sectoral resection of the mammary glands (open biopsy) has for a long time been practically the only diagnostic method that allows obtaining material for histological examination and thus verifying the diagnosis [3, 9, 11]. This method of diagnosis verification has certain disadvantages: high cost, time costs, low sensitivity, a certain percentage of postoperative complications, cosmetic defects, etc. As an alternative to diagnostic sectoral resection, variants of percutaneous puncture biopsy techniques have been developed since the early 1980s. For the first time, the technique of percutaneous biopsy was tested in Sweden. A manually operated device called a "needle gun" was used to obtain tissue samples. The biopsy was performed under ultrasound control [7,13,21]. Attempts to use the stereotactic biopsy system "Mammotest" for aspiration biopsy of non-palpable mammary gland formations under X-ray control have not been widely used due to a number of significant drawbacks. The obtained material was available only for cytological examination, and in 25% of cases it was not possible to obtain enough material to make a final diagnosis [8,15,22]. In 1988 American radiologist S.Parker performed the first stereotactic biopsy of non-palpable mammary gland formation under X-ray control using the "pistol-needle" system [9]. According to various authors, the diagnostic accuracy of stereotactic biopsy of non-palpable mammary gland formations under X-ray control is significantly higher than that of diagnostic sectoral resection [19,23]. Indications for stereotactic biopsy under X-ray control Stereotactic biopsy under X-ray control can be performed both in the case of palpable and non-palpable changes in the mammary glands. Indications for the use of this method in the presence of palpable compaction are: a negative response obtained with traditional trepan biopsy, edematous forms of breast cancer that do not allow to clearly localize the area of interest, the "deep" location of the tumor node. Non-palpable changes suspected of the presence of a malignant neoplasm are the main indication for stereotactic biopsy under X-ray control. Non–palpable breast cancer are tumors that are on the 25-30 th cycle of cellular doubling and have sizes up to 1.5 cm in diameter [6]. In the group of preinvasive tumors, ductal carcinoma in situ (DCIS) or preinvasive ductal cancer and lobular carcinoma in situ (LCIS) or preinvasive lobular cancer are distinguished. Invasive carcinomas are divided into ductal and lobular, as well as rarer forms (mucosal, medullary, papillary, etc.) [5, 12]. Statistical data indicate that non–palpable breast cancer in 21.8% of cases occurs in the form of accumulation of microcalcinates, in 15.6% – heavy restructuring of the structure and in 62.5% - node. V.F.Semiglazov et al. (2001) believe that the "minimal" breast cancer has the same radiological signs as large tumor nodes. At the same time, it is noted that minimal cancers are relatively more common than larger tumors, have the appearance of a rounded formation with smooth, sometimes fuzzy contours [5]. The concept of radiological signs of non-palpable breast cancer is most fully reflected in the domestic literature in the studies of N.I.Rozhkova et al. [6], in foreign literature these signs are summarized in the BI-RADS (Breast Imaging Reporting and Data System) systems adopted in the USA and Re.Co.R.M. (Reporting and Codifying the Results of Mammography) – in Europe. It should be noted that, according to the international descriptive systems BI-RADS and Re.Co.R.M., changes detected on mammograms and classified as categories 4 and 5 are subject to verification by stereotactic biopsy under ultrasound or X-ray control. The technique of stereotactic puncture biopsy The

technique of targeted biopsy on radiographic devices with a stereotactic prefix or digital mammographs is described in detail in the manual "Radiation diagnostics in mammology" edited by Professor N.I.Rozhkova [4]. When using these devices, a biopsy is performed while the patient is sitting. to perform stereotactic biopsy under X-ray control, we use the Mammotest-Mammovision device manufactured by Fisher (USA). This X-ray installation involves horizontal laying of the patient and consists of 3 main parts: "Mammotest" – a lacement with a hole for the breast and a generator, "Mammovision" – an electronic stereotactic system for digital processing and visual evaluation of the image and "AutoGuide" – a system for automatic control and guidance of a biopsy needle. Before performing a stereotactic biopsy, the radiologist evaluates the mammograms presented and makes a final decision on the need for a biopsy. Then, the pathological formation is marked on mammograms in a direct projection using a measuring ruler. In this case, the distance from the pathological formation to the nipple and the medial or lateral edge of the gland is measured. The measurement data is applied to the patient's skin with a marker. After marking, the patient is placed on the lazhement in a position on her stomach, placing the mammary gland in the opening of the table. The mammary gland is fixed with a compression plate in such a way that the previously marked area on the skin is located in the center of the hole of the compression plate measuring 5 * 5 cm. When the pathological formation is located retromammarly or in the axillary process, the patient is positioned in such a way that not only the gland, but also the shoulder and arm from the appropriate side are lowered into the opening of the table. The main stages of stereotactic biopsy include a digital targeted mammogram with an increase in the area of interest and direct sampling of the material by the "pistol-needle" system. For accurate localization of the pathological site, the first approximate 8-fold enlarged image is performed without displacement of the X-ray tube. Then the X-ray tube is shifted at an angle of +15 ° and -15 ° ° and two stereotactic mammograms of 5 * 5 cm in size with an increase of 3.5 times are obtained. The resulting digital images are subjected to postprocessing processing, which allows you to confirm or refute the presence of radiologically reliable suspicion of breast cancer. In the absence of pathology, the study is completed by making an individual decision on the frequency of observation. In other cases, a biopsy is started. To calculate the coordinates of the pathological site on the stereotactic mammogram at an angle of -15 ° °, the cursor marks the area of interest, then moves the cursor to the stereotactic mammogram at an angle of +15 ° ° and also marks the area of interest. Both marked sections should be on the same straight line. On a stereotactic mammogram at an angle of +15°°, the places of the planned sampling of tissue are additionally marked. At the same time, 9 points can be marked, which should be no further than 1 cm from the zone of interest. The coordinates of all marked targets in horizontal, vertical and depth are automatically displayed on the monitor screen. The AutoGuide system confirms that the calculated coordinates allow performing a biopsy. To perform a biopsy, we use an automatic Magnum biopsy gun, a Bard needle with an internal diameter of 14G (2.1 mm), a length of 16 cm and a special spoon for tissue sampling. A sterile needle is inserted into the gun immediately before the biopsy. With an adequate level of compression, the procedure does not require an anesthetic aid. The prepared pistol-needle system is installed in a positioner with a guide and a needle holder (Fig. 2). After setting the first target on the remote control,

the pistol-needle system is automatically positioned to the designated coordinates. The depth of the needle passage is fixed manually on the ruler of the depth limiter. After the preparation of the "pistol-needle" system, a scalpel incision of the skin and subcutaneous tissue is made in the projection of the needle location with a size of about 5 mm. The needle is inserted into the incision of the skin to the limiter. Then two preliminary stereotactic mammograms are performed in order to make sure that the needle is positioned correctly. Then a "shot" is fired from a biopsy gun. After that, the X-ray tube is again installed at an angle of +15 °, and then -15 ° and two additional stereotactic mammograms are obtained, which allow confirming the sampling of material from the area of interest. After the "shot" from the gun, the needle is removed and the tissue sample is placed in a container with a 10% formalin solution. During one procedure, an average of 7-9 biopsies are obtained for histological examination. The number of biopsy samples is determined by the size and shape of the pathological site. At the end of the biopsy, the X-ray tube is placed in its original position and a control digital sighting mammogram is made with an image magnification of 8 times to assess the condition of the pathological site and determine the size of the internal hematoma. After the procedure is completed, the skin around the incision is treated with a ball soaked in an alcohol solution and covered with a bactericidal patch. Then a rubber heating pad with ice is applied to the biopsy site for 30 minutes. The obtained tissue samples are sent to the histological laboratory for verification. In most women, after stereotactic biopsy under X-ray control, subcutaneous hematomas form, regressing independently after a few days. The stereotactic biopsy apparatus is also used for marking non–palpable formations when planning organ–preserving operations (Fig. 3). For this purpose, a special mandrel made of wire with curved tips - a harpoon (Hook) - 13.7 and 10.7 cm long, with a diameter of 20G (0.9 mm) is used. The technique of interstitial marking differs from the technique of stereotactic biopsy in that for the installation of a marker on stereotactic mammograms, one goal is noted in the center of pathological education. The coordinates are calculated automatically. After installing a localization repositional needle – a guide in the area of interest – control stereotactic mammograms are performed. Surgical intervention is carried out on the same or the next day after the installation of the mandrel. Contraindications to stereotactic biopsy under X-ray control on Mammothest-Mammovision devices are disorders of the blood coagulation system, the inability to maintain a horizontal position in patients with musculoskeletal disorders, artificial immobilization of the shoulder girdle from the side of interest, recently suffered acute cerebral circulatory disorders and acute myocardial infarction. statistical data From 1996 to 2014 10,133 puncture biopsies and 3,001 stereotactic mammograms without biopsy were performed in the radiology department (see table). The increase in the number of studies performed is clearly demonstrated by Fig. 4. The largest number of women surveyed belonged to the age category of 50-70 years (50.6%). The distribution of patients by age is shown in Fig. 5. Breast cancer was verified in 73% of cases, in 27% there were no signs of a malignant process during histological examination (Fig. 6). In the overwhelming majority of cases, according to the results of biopsy, infiltrating ductal cancer was morphologically diagnosed, which was detected in 89% of patients with malignant lesions of the mammary glands (Fig. 7). Radiologically, breast cancer manifested itself in the form of nodular formation with heavy contours without associated calcifications – 62.9%; in

the form of local asymmetry – 10.9%; clusters of pleomorphic microcalcinates with a high density per unit area (more than 10 pieces per 0.5 cm2) – 9.3%; rounded formation – 7%; in the form of heavy restructuring – 6.6%; nodular formation with inclusions of calcinates – 3.3%. In 9.1% of cases, the established changes were accompanied by breast edema. With a retrospective analysis of the conducted studies, it was possible to detect radiological signs that are most common with a certain histological picture of the tumor. Thus, infiltrating ductal cancer was most often manifested in the form of nodular formation with radiant contours, non–infiltrating ductal cancer - clusters of microcalcinates. For lobular cancer, regardless of the form, radiologically determined areas of severe restructuring of the structure and local asymmetry were more characteristic. Accumulations of microcalcinates in our study with approximately equal frequency were a morphological reflection of the malignant process and sclerosing adenosis. The probability of cancer detection, regardless of the variant of the X-ray picture, increased in patients with a mastectomy or a family history of cancer. When analyzing false negative results, it was found that the accuracy of stereotactic biopsy directly depends on the correctly selected target on digital sighting mammograms with image magnification and a sufficient number of biopsy samples for each specific case. D.I.Kuplevatskaya recommends taking at least 7 biopsy samples in the case when the pathological site has dimensions less than 0.5 cm in diameter and does not less than 9 tissue samples if the pathological site contains microcalcinates [13]. Thus, targeted stereotactic mammograms allow us to characterize in detail the detected changes in the structure of the mammary glands, to assume their nature and to determine the need for stereotactic biopsy under X-ray control. High qualification of a radiologist is the key to successful work of the office. Some diagnostic cases require an individual approach, taking into account the ultrasound data. We believe that stereotactic biopsy under X–ray control is a necessary and crucial component of modern complex diagnostics of non-palpable breast cancer. Conclusion Volumetric mammary gland formations detected by palpation, as a rule, do not pose difficulties for verification by fine needle aspiration biopsy or trepan biopsy followed by histological examination of the obtained material. Non–palpable volumetric formations, areas of local asymmetry or heavy rearrangement, clusters of pleomorphic calcinates are the spectrum of pathology that is available only during diagnostic studies and cannot be verified without the participation of a radiation diagnostician. Surgical interventions in the presence of non-palpable benign changes (except proliferative forms of diffuse fibroadenomatosis) are not justified in terms of consequences for the patient and economic costs. That is why it is especially important to equip specialized oncological institutions with devices for stereotactic biopsy under X-ray control. Puncture biopsy on Mammotest-type devices is economically more profitable compared to diagnostic sectoral resection. Stereotactic biopsy under X-ray control is performed on an outpatient basis, does not require hospitalization of the patient and a special anesthetic aid. The cost of the procedure under compulsory medical insurance is almost 7 times lower than the cost of diagnostic sectoral resection. Secondary prevention of breast cancer involves the widespread use of X-ray mammography for the purpose of early detection of a malignant tumor. The establishment of minimal changes on mammograms and the verification of the diagnosis using stereotactic biopsy make it possible to carry out the required range of therapeutic and diagnostic measures

at the earliest stages of the development of the tumor process. Early diagnosis of neoplasms in combination with well–chosen therapy tactics make it possible to achieve stable clinical remission, reduce the economic costs of therapy and, in the future, reduce mortality rates from breast cancer.

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