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Research Article

**PUBLIC HEALTH: MODERN APPROACHES TO EARLY
DIAGNOSTICS OF BREAST CANCER**Rinat Gamirov*^{1,2}, Denis Martyanov¹¹Kazan Federal University, Kremlyovskaya St, 18, Kazan, Respublika Tatarstan, Russia, 420008²Republican Clinical Oncologic Dispensary (Ministry of Health of the Republic of Tatarstan),
Russia**Abstract:**

The article presents an analytical review of modern approaches to the early diagnosis of breast cancer. Solving such an acute and extremely important for the population problem makes a significant contribution to public health and the organization of women treatment. Annually in the world more than 10 million new cases of oncological diseases are registered, and more than 60% of these patients die from cancer. Although the survival rates of patients with breast cancer generally show a gradual improvement trend, several subtypes (such as triple negative breast cancer (TNBC) and inflammatory breast cancer (IBC)) are particularly aggressive and have a high level of drug resistance, which leads to high mortality, so their timely diagnosis is vital.

The article describes Russian and foreign approaches to the diagnosis of breast cancer, discusses the necessity of mass screening, especially mammography, underlines the actuality of interdisciplinary approach to diagnosis (in particular, the importance of working out linguistically valid questionnaires for patients and appropriate descriptors); the attention is paid to the study of breast pain specificity and its verbalization in patients.

The high prevalence of breast cancer in the population as a whole requires continuing research on effective diagnostic methods, treatment options and prevention strategies.

Keywords: *public health, breast cancer, mammography, mass screening, cancer screening*

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INTRODUCTION:

The problem of breast cancer diagnosis at early stages is actively studied in both foreign and Russian scientific research.

In the structure of cancer incidence in the female population of Russia, breast cancer ranks first in the age group of 40-69 years, 85 years and older, and second – in the 15-39 age group [Gamirov, Komarova 2014; Komarova 2015]. In order to timely reveal malignant neoplasms it is necessary to work out screening programs, the main task of which is to identify the signs of breast cancer before the onset of its symptoms.

In 2008, in the Republic of Tatarstan (RT), a massive mammographic examination of women was started to actively detect pre-tumor and tumor diseases of the breast in the early stages of development in order to reduce mortality from breast cancer. So, during the period from 2008 to 2016 63 of every 1,000 women surveyed had breast cancer diagnosed at an early stage, and these results can be comparable with mass screenings in other countries and regions [Gamirov, Komarova 2014].

The article describes different modern approaches to the diagnosis of breast cancer in Russia and abroad in order to discuss problems connected with mass screening and to develop strategies for further analysis of this topical issue.

MATERIALS AND METHODS:

The purpose and objectives of this research have determined the methodological basis for the study. The results were received with the help of the experimental and descriptive methods.

The theoretical basis of the study is presented by materials collected as a result of own research and by the method of continuous sampling from scientific databases: PubMed (<https://www.ncbi.nlm.nih.gov/pubmed>, June 2017), Scopus (<https://www.scopus.com>, June 2017), Web of Science (<https://www.webofknowledge.com>, June 2017), Elibrary (<https://elibrary.ru>, June 2017), Academia.edu (<https://www.academia.edu/>, June 2017).

The results of the study can be used in clinical practice (in diagnosis and treatment of diseases connected with breast cancer).

RESULTS:

Diagnosis of breast cancer is a complex of methods aimed at detecting malignant tumors. The key point of screening is the detection of the disease at an early

stage in order to subsequent treatment could change its prognosis and further clinical course.

Clinical breast examination (CBE). Visual inspection and palpation are necessary to conduct in women even without obvious signs of changes in the breast. In Russia, it is performed by oncologists, specialists in breast cancer, by surgeons, endocrinologists and gynecologists. This stage includes the verbal report of women about the results of *breast self-examination (BSE)* – changes in color and shape of the breast, the presence of any discharge from the nipples, specific sensations in the breast and axillary region which were absent previously, pain complaints, etc.

Mammography. Mammographic screening is one of the most effective methods of early diagnosis of breast cancer in the preclinical stage. The effectiveness of mammography as the main diagnostic tool in screening programs has been tested in many randomized trials conducted around the world. It should be noticed that this diagnostic method has specific features related to age (it is the most sensitive for women over 50 years old). There are several types of mammographic screening. In the population screening for breast cancer, digital or analog mammography is used. *Full-field (conventional) digital mammography (FFDM)* is used for mass screening in Russia and abroad. Also there are other types: *contrast-enhanced spectral mammography (CESM)* which provides information comparable to MRI [Fallenberg 2014], *contrast-enhanced digital mammography (CEDM)* [Francescone 2014], *mammography with tomosynthesis* [Rafferty 2017], *electrical impedance mammography* [Daglar 2016] etc.

Puncture-aspiration biopsy with cytological examination of punctateis carried out when the breast lesion is palpable and the results of mammography according to fifth edition of *The Breast Imaging Reporting and Data System (BI-RADS) lexicon*, available at <https://www.acr.org/Quality-Safety/Resources/BIRADS/Mammography>, see [Mercado 2014] refer to category 2 (Benign (non-cancerous) finding), 3 (Probably benign finding – Follow-up in a short time frame is suggested) or 4 (Suspicious abnormality – Biopsy should be considered), 5 (Highly suggestive of malignancy – Appropriate action should be taken).

If cytologists for various reasons do not diagnose cancer, but clinically the suspicion persists, *sectoral resection of the breast* or *trepan-biopsy* carried out. Puncture of non-palpable lesions in the projection

indicated in the mammographic examination protocol are also possible if the breast size is small and the oncologist is sufficiently experienced. If the lesion is not palpable, *breast ultrasound* is prescribed either for the purpose of puncture under ultrasound guidance or for the purpose of marking for sectoral resection in case if cytological verification is not possible. Ultrasound-negative tumors are sent to *stereoscopic trepan-biopsy* or *total stereoscopic biopsy* on the ABBI apparatus. When the biopsy is impossible for various reasons, in particular when the tumor is close to the chest wall, the patient is sent to a sectoral resection after preliminary topometry.

It is necessary to underline that breast ultrasound is recommended only as a diagnostic method, but not as a means of mass screening. It is not as accurate as screening mammography in revealing microcalcifications which are the earliest sign of in-flow cancer in situ. In women younger than 30, ultrasound is desirable to be performed without prior mammography.

Magnetic resonance imaging (MRI). The mammary glands are irradiated by electromagnetic waves. As a result, electromagnetic energy is registered by special sensors and processed by a computer. The method is very common ([Tadros 2017, Saslow 2017], there are a lot of research where the results of mammography, ultrasound and MRI are compared. Especially the method of magnetic resonance tomography is sensitive and specific when applying contrasting. When diagnosing metastases, *positron emission tomography* is very effective. The method of *galactophoreography* is used quite rarely – it is a diagnostic method which is mainly necessary to confirm intra-cellular tumors (various types of tumors, including benign ones).

DISCUSSION:

Along with undoubted positive results of visualization methods such as lower mortality from breast cancer, early detection of lesions, further less aggressive treatment, improved cosmetic results, there are unfavorable factors such as hyper-diagnosis, false positive results, hyper-treatment in all these methods [Komarova 2015]. It is especially important when it touches upon mass screening – that is why specialists in cancer all over the world try to find different ways to minimize these factors. For instance, to reduce the number of unnecessary biopsies for in MRI-only lesions the researchers worked out the *Tree flowchart* system [Woitek 2017].

According to the data presented by Scandinavian Center of Cochrane in Copenhagen in 2009 [Jorgensen 2009], one case of cancer from three

revealed during population screening can be considered as over diagnosis. The negative side of the screening is presented also by false positive findings when the diagnosis according to mammography is not confirmed after additional examinations. A detailed description of the studies devoted to positive and negative results of screening is given by L.E. Komarova [Komarova 2015]. Both over diagnosis and false positive results can be explained by various reasons: the desire to maximize the detection of the disease, the lack of experience of radiology specialists, technical and apparatus inaccuracies. Since the issue was raised eight years ago, there have been many positive changes in both the individualization of the approach to screening results and in the reduction of the number of additional studies "for reinsurance"; in addition, the quality of visualization is rapidly improving due to the intensification of interdisciplinary research.

The diagnosis of breast cancer requires the new achievements in different branches of science: intelligence systems and computing [Gautam 2018, Dheeba, 2017], genetics [Hassanzarei 2017], pharmaceuticals [Molavi 2017], psychology [van Erkeles 2017], neuroscience [Hermelink 2017], linguistics [Krieger 2017] etc.

CONCLUSIONS:

According to international data, in order to achieve a reliable reduction in mortality from breast cancer, the coverage of the population should be within 75-80% of the population subject to screening in accordance with age. In the Republic of Tatarstan, the problem of coverage of the population with breast screening is problematic which undoubtedly makes the issues of overdiagnosis and false positive results, actively discussed in the world, not very actual for our region and makes the issue of the population's non-enlightenment in the field of caring for health more urgent, especially taking into account the fact that malignant breast tumors are the leading oncological pathology in the female population of Russia (more than 20%). The data on the Republic of Tatarstan in recent years [Gamirov, Komarova 2014] correspond to the worldwide trend towards the growth of breast malignant neoplasms, and the problem of timely diagnosis and caring attitude of people to their own health for the Republic of Tatarstan at the moment is more important than the possible (respectively low – 7-8%) percentage of false positive results and over diagnosis. The association between social context and health is very important. Routine breast examination is necessary when planning pregnancy, when selecting contraceptives, after and during different gynecological diseases and operations, after breast

trauma, but it is quite obvious that women in Russia rarely contact breast specialists in these situations.

It is possible to affirm that screening enables surgeons to operate earlier stages of breast cancer compared with clinically identified formations. The analysis of published works over the past years has shown that with a high degree of certainty it is possible to mark the reduction in mortality from breast cancer as a result of mammographic screening in countries where such programs have been carried out since the late 1980s. The question of the direct contribution of both mammographic screening and modern treatment methods to reducing the mortality from breast cancer still requires a deep understanding with the use of more advanced analytical approaches.

CONFLICT OF INTEREST

The authors confirm that the data presented do not contain conflict of interest.

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