

ELECTROIMPEDANCE MAMMOGRAPHY – NEW POSSIBILITIES OF EXAMINATION OF THE BREAST GLAND?

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Abstract

The occurrence of malignant tumours is increasing worldwide. The breast cancer is the most frequently occurring cancer by the female population. Diagnostics of this disease is relatively complicated. Today the most commonly used and depicted diagnostic methods such as the native mammography, digital mammography and ultrasonography have neither high sensitivity nor the specificity of the examination. For this reason new methods in diagnosis of the breast cancer have been initiated. In our study we have examined 149 women with help of impedance mammography. Mathematic evaluation calculated the sensitivity of about 90,4% and a specificity of about 86,9% for breast cancer smaller than 20 mm.

Key words

breast cancer, diagnosis, sensitivity, specificity, electroimpedance mammography

Introduction

Numbers of new cases of oncological diseases are still increasing worldwide not only in absolute but also in relative numbers. Unfortunately also the total mortality of the oncologic patients is increasing in both absolute and relative numbers. By women the most frequent occurrence of cancer is the malignant tumour of the breast. By women in the most-developed countries of the world the probability of breast cancer formation is from 1:7 to 1:10. In the countries of Central Europe the probability is lower - approximately each twentieth women has the theoretical possibility to fall ill on breast cancer.

Diagnostic of a surface organ in the female body looks relatively simple. But the practice shows other experience. Huge expectations have been put into examining with by digital mammography. Even if it's a distinguished method of diagnosis of the breast cancer nowadays,

this method has unfortunately some restrictions. The sensitivity of the native mammography in the publications worldwide is varying between 40 and 98%. Lower sensitivity is occurring mainly by younger women with dense types of breasts and also by usage of hormonal substitute therapy. In literature with the increased value of sensitivity there is a clear decrease of the value of the given examination specificity. By increased detection of breast cancer also the number of false positive results with the consequence of successional examinations and "needless" biopsical examinations increasing.

Because of this lacks other diagnostic methods are examined. This methods are able to detect the mammary gland carcinoma with high sensitivity and by preserved high specificity, or are even able to diagnose the breast cancer even earlier as native mammography.

New diagnostic methods are based on the metabolic and on the morphological principle.

One of the new methods of examination is also the method of measurement of the electroimpedance of the mammary gland tissue which will be probably used in the current practice by diagnosis of breast cancer. The electroimpedance computer mammography is in the way to the practice mainly in USA, western countries of the world and Russia.

The diagnostic electroimpedance mammograph device MEIK uses 256 golden electrodes. With the computerized device on the basis of conductivity of single healthy and pathological changes in the breast gland it is possible to display electrical conductivity.

Advantages of EI mammography:

- non-invasive examination
- the possibility of frequent revision of diagnostic – control
- non-harmful examination
- a relatively economic and cheap device
- non-expensive operation of the device
- high sensitivity especially by young women

Target of our study

To find out the sensitivity and specificity of the breasts examination by the electroimpedance mammograph MEIK.

Composition and method

Into our prospective study we put 149 women by whom the classic method of the breast examination (clinical examination, native mammography, ultrasonography) has been realised and except of that also an examination with the aid of the electroimpedance mammography has been carried out. The examination has been relised from 2006 until 2007. From the set we took out 13 patients with clearly clinical and later verified breast carcinoma with size over 20 mm. 136 women remained in the study.

Arithmetic average age of the examined women was 46,3 years. In the set were 21 women with later histologically confirmed breast cancer smaller than 20 mm and 115 women without signs of breast cancer.

We have executed the examination with the aid of the electroimpedance mammography similarly to the conclusions used by the thermovision examination:

E1 and E2 - without signs of oncological disease

E3 - suspicion on breast cancer

E4 - high suspicion on breast cancer

E5 - clear depicting of breast cancer

We have compared the correlation of the electroimpedance mammography results with the number of women by whom breast cancer was histologically confirmed and with the number of women without evidence of breast cancer (clinical examination and native mammography without evidence of breast cancer) until 1 year after the examination.

We have calculated the sensitivity and specificity of the examination mathematically (conclusion E3 we have accepted as statistically positive).

Results

In our retrospective study we have put in and examined 136 women. Diagnose of breast cancer was histologically confirmed after examination by 21 women and breast cancer was not confirmed by 115 women. In the set of 21 women with breast cancer a positive finding on the electroimpedance diagnosis was indicated by 19 and by 2 the findings were negative. By healthy women a negative finding was indicated by EI mammography by 94 and a false positive result by 21 (see table No. 1)

After the total examination and statement of the diagnose on the basis of the diagnose results we have find out by mathematical calculation a sensitivity of about 90,4 % and a specificity of about 86,9 % (see table No. 2) for the electroimpedance mammography. Breast cancer was diagnosed on the basis of positive electroimpedance mammography result by two patients with negative results from the native mammography.

Discussion

Through the examination of women with the aid of electroimpedance mammography we have found out a relatively high specificity and sensitivity of examination. The value of specificity of the method can be theoretically higher, if by so-called false positive results (21 women) breast cancer will be found after a fixed time. Breast cancer, which is impossible to detect at present neither through the native mammography, ultrasonography nor magnetic resonance has been detected. It's probable, that after longer experience with this method and mainly by a set with higher number of female patients, the values of sensitivity and specificity can change.

Conclusion

Because our results coincide with other data in literature, we recommend to execute the examination of the breasts with the aid of new method, electroimpedance mammography,

mainly by young women and also in the framework of differential diagnosis. The method maybe also has a perspective as a screening method by young women, by women with dense breasts as also by women with high risk of carcinogenesis (BRCA1, BRCA2 genes).

Examination of breasts with the aid of electroimpedance mammography is probably well-founded in the algorithm of breast diseases diagnosis.

Table 1

Results of examinations of women with the aid of EI mammography

Number of women	Breast cancer	Without breast cancer
EI positive	19	21
EI negative	2	94
Total	21	115

Table 2

Sensitivity and specificity of the EI mammography

	EI
Sensitivity (%)	90,4
Specificity (%)	86,9

Summary

Clinical results of the producer, and already a relatively high number of studies worldwide as well as the results of our study, take for granted the usage of EI mammography mainly in:

- screening of women, especially young women, with fixation to high risk groups,
- as complement examination to the native mammography and ultrasonography.

There are studies, where the EI mammography complements the native mammography, mainly by conclusion of examinations: BIRADS 4. By this women with negative EI mammography result a dispensation will be carried out. This way there is an effort to reduce the "needless biopsy" of breasts.

- possibilities of monitoring of radio-chemotherapy,
- possibilities of monitoring of dysplastic changes, and in the menopause the effects of the substitutional hormonal therapy
- in some cases it is possible to monitor and realise the diagnosis of the state of axillary lymphatic nodes.