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An assessment of the value of Stereotactic Mammotomy Biopsy (SMB) in the diagnosis of impalpable breast lesions

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Summary

Background Breast cancer is the most common malignancy for women in Poland and represents 19.7% of all neoplasms diagnosed in this group. It is also the most frequent cause of cancer related deaths among women (14.1% of total).

An improvement in these results has been achieved by the popularisation of prophylactic mammography. An increase in awareness among women, of the dangers of breast cancer, and an increase in the availability of mammography testing has resulted in impalpable breast lesions being diagnosed increasingly frequently. These diagnoses require histopathological verification.

Aim To demonstrate the usefulness of stereotactic mammotomy biopsy (SMB) in the diagnosis of impalpable breast lesions, and its effects on the processes of diagnosis, classification and treatment of pre-invasive growths within the breast.

Materials/Methods Stereotactic mammotomy biopsy is a minimally invasive method for the collection of tissue from impalpable changes in the breast which are visible in mammography images and require histopathological diagnosis. The procedure may be carried out on an ambulant patients, under a local anaesthetic.

Between April, 2000, and August, 2003, the First Surgical Department carried out 2000 SMB procedures. Changes suitable for biopsy fall into three groups: clusters and areas of microcalcification – 929 (46.45%), small tumours and soft tissue density – 975 (48.75%), radial structures – 96 (4.80%).

Results 365 patients (18.25%) required surgery for the purpose of obtaining a histopathological diagnosis, including 150 (7.50%) with invasive cancer, 120 (6.00%) with pre-invasive cancer – DCIS and 95 (4.75%) with atypical ductal hyperplasia – ADH.

Among the remaining 1635 patients (81.75%) changes were found to be benign and the patients avoided surgery.

Conclusions It is demonstrated that stereotactic mammotomy biopsy is the method of choice for the diagnosis of mammographically detected, inpalpable lesions of the breast, and furthermore, contributes to the process of diagnosis, classification and treatment of pre-invasive growths in the breast.

Key words **stereotactic biopsy • subclinical breast cancer**

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Background

Breast cancer is the most common malignancy for women in Poland and represents 19.7% of all neoplasms diagnosed in this group. It is also the most frequent cause of cancer related deaths among women (14.1% of total).

An improvement in these results has been achieved by the popularisation of prophylactic mammography. An increase in awareness among women, of the dangers of breast cancer, and an increase in the availability of mammography testing has resulted in impalpable breast lesions being diagnosed increasingly frequently. These diagnoses require histopathological verification.

Methods currently used for the collection of material for microscopic analysis include fine needle aspiration, tru-cut biopsies (under ultrasound or mammography guidance)and open surgical biopsies after needle localisation. These methods have proven to be disappointing and imperfect. There remained a need for a diagnostic method, of high sensitivity and specificity, which could be performed on ambulant patients, under local anaesthetic. In order to meet this need, stereotactic mammotomy biopsies were developed and introduced into clinical practice in the United States during the 90s. The method was also quickly adopted in Europe.

In Poland there are several facilities working in this area, one such facility is in the Great Poland Cancer Centre in Poznań.

Patients qualifying for mammotomy biopsy have mammographically detected impalpable changes in the breast, requiring histopathological verification. The change must be of defined character (clusters or areas of microcalcification, small tumours or soft tissue density, radial structures)and must be visible in two mammograms.

The mammotomy procedure requires no special preparation and may be carried out on ambulant patients using a local anaesthetic.

Aim

To demonstrate the usefulness of stereotactic mammotomy biopsy (SMB)in the diagnosis of impalpable breast lesions, and its effects on the processes of diagnosis, classification and treatment of pre-invasive growths within the breast.

Materials and Methods

The equipment consists of: a digital mammograph – which produces images of selected areas of the breast, of size 5×5 cm and of 8 × magnification, a stereotactic table with a moveable frame which holds a biopsy needle and a computer to control the whole system.

Procedure

The patient is positioned on their stomach on a Fischer stereotactic table. The breast to be biopsied is positioned at an opening in the table. Based on assessment of existing mammograms, the changes are localized and a holding plate with an opening measuring 5×5 cm holds the breast such that the changes are in its centre. A radiogram, of 0 degrees projection, is made and a check is made on a monitor screen to ensure that the sought focus of changes is visible. If not, a further attempt is made. If the change is visible, two further radiograms are made with projections of (+)15 degrees and (–)15 degrees. On screen the result is views of the same change through 30 degrees of perspective. The cursor is used to mark the same point on both images. Marking only this single altered element guarantees sampling of the proper material. Further procedures leading to the choice of parameters of the biopsy are made by the computer programs and are shown on the horizontal, vertical and depth axes of the on-screen display. The horizontal and vertical axes are automatically introduced into the device guiding the biopsy needle. The depth to which the needle is to be inserted into the immobilized breast is determined, by the surgeon, on a scale on the guidance device and in accordance with indications from the computer. The invasive part of the method follows. The fragment of skin visible in the window of the guide plate is disinfected. The area where the needles are to be introduced is anaesthetised using 1% Xylocaine with Adrenalin and the skin is incised to a length of 3 to 5 mm. The biopsy needle is introduced to the breast, to the depth indicated on the guide scale. In this position, the tip of the needle touches the determined target. After the blockade is removed, the trigger button is pushed and we make a “shot” which introduces the needle in such a way that the biopsy chamber will be in the area of the change. The collected material, which consists of 10–30 cylinders of tissue (30–100 mg of tissue), is withdrawn by around 1 cm using a clockwise and outward motion. After the collection of material is completed, we make images of the area in order to assess the extent of tissue removal. The site

Table 1. Radiological character of lesions undergoing SMB.

Radiological character of the lesion	Microcalcification cluster	Area of microcalcification	Tumour or soft tissue density	Tumour or density with microcalcifications	Radial structures
Number	504	425	682	293	96
Percentage [%]	25.20	21.25	34.10	14.65	4.80

Table 2. Amount of histopathological changes which required surgical treatment.

Number operated	Invasive cancer	DCIS	ADH
365	150	120	95
Percentage operated [%]	41.10	32.88	26.03

Table 3. Comparison of applied surgical procedures.

Type of surgical treatment	DCIS	Ca duct. invasiv.	Ca lobul. invasiv.	ADH	Total
Radical mastectomy	32	79	29	–	140
Mastectomy with the first floor lymph nodes	11	–	–	–	11
Simple mastectomy + SNB	28	–	–	–	28
BCT + RADICAL LYMPHADENECTOMY + RADIATION	7	41	1	–	49
BCT + SNB + RADIATION	7	–	–	–	7
BCT + SNB	35	–	–	–	35
Wide excision	–	–	–	95	95

of the biopsy may be marked using special metal clips. Before the removal of the biopsy needle, the area is evacuated. After the procedure, the patient is laid on their back and is asked to hold gauze against the injury site for 10 minutes. The injury is then stuck with 'steri-strip' and bound up with compression to protect it for a further 24 hours. After a week, during follow-up, the patient is informed of the results of the histopathological investigation and is offered recommendations.

Between April, 2000, and August, 2003, the Mammotomy Suite within I st Surgical Department, Great Poland Cancer Centre, Poznań, carried out 2000 mammotomy procedures.

Results

In our material the dominating changes were masses, together there were 975 (48.75%) of such cases. Among these we differentiated a group of changes accompanied by macro, micro and mixed forms of calcification, in total 293 cases (14.65%). The second largest group was microcalcification, in total 929 cases (46.45%). Among these, 504 (25.20%) were small clusters which could be completely removed and 425 (21.25%) with areas from which samples were taken. The least common changes were radial structures – 96 cases (4.80%) (Table1).

150 invasive cancers were diagnosed, as well as 120 cases of DCIS and 95 cases of ADH. These patients underwent further surgical treatment. Also detected were 16 cases of LCIS, and the patients, as a group at increased risk of malignant invasion, were qualified for close oncological observation (Table 2).

Amongst 270 patients operated for breast cancer, diagnosed by mammotomy biopsy, the

breast was saved in 90 cases (33.33%). In 70 cases (25.93%) the axillary lymph nodes were saved, and in 11 cases (4.07%) only first floor of the axillary lymph nodes was removed.

In 95 cases a diagnosis of ADH resulted in wide excision, protecting the patient from histological progression and development of a malignant tumour (Table 3).

In the remaining 1635 patients, in whom benign changes were diagnosed, thanks to minimally invasive method, unnecessary surgical treatment was avoided. In 981 cases the change, verified as mild, was removed radical in mammotomy, which saved the patients from worry and oncological control.

Discussion

Malignant tumours of the breast are the most common cause of early death amongst women from the world's developed countries [1–3].

While many factors that increase the risk of malignancy have been described, many early prevention possibilities remain unknown. Early diagnosis and the earliest possible treatment are definitely significant in the fight against breast cancer. In Scandinavia it was found that such an approach may reduce mortality by as much as 20–30%. In Poland, since the 1940s, factors that led to mortality from breast cancer had remained stable but, since 1980, these factors have been further slowed and have stabilised. This tendency falls into the same time period as the development, and growth in popularity, of mammography tests [4–6].

The popularisation of prophylactic mammography has been helpful in the diagnosis of non-palpable changes within the breast. In the literature it is noted that as many as 20% of such cases definitely require surgical intervention as they are pre-cancerous states, pre-invasive malignancies and invasive malignancies and our test material has confirmed this finding. Patients in whom very small and non-invasive changes were identified have the greatest chances for full recovery and have improved the applicable statistics [1–3].

A new problem concerning the verification of on-screen testing arose. The existing methods used for the collection of tissue for microscopic analysis proved to be unreliable. In the first place, material must be collected after visual localization of the change: by ultrasonography if the change is visible in ultrasound images or by mammography if the change is visible only in mammograms.

Secondly, cytological material in very early changes proved to be insufficient for differentiation and for giving a therapeutic diagnosis [7–11].

Until now, the collection of such changed material for histopathological analysis required a surgical procedure and a general anaesthetic. An open biopsy was performed in which a fairly large portion of the mammary gland was removed (from 20 to 250g of tissue). The siting of the biopsy was orientated on the basis of mammography images in two projections or on the basis of a previously installed J-needle. Intra-operative radiograms confirmed the presence of any pathological change in the material. In the event that the expected changes were not found in the sample, the area of excision was widened. This method required hospitalisation of the patient in order to prepare for the procedure, and a general anaesthetic. This approximate localization method required the removal of too large a fragment of breast tissue which often led to imperfect cosmetic effects and sometimes to local complications such as haematoma or inflammation of the wound.

Based on both, the statistics and from our material, around 80% of verified impalpable lesions are benign and do not require such an extensive procedure.

With the increase of mammographically detected impalpable breast lesions and with improvement of sampling methods for the collection of material for histopathology analysis, a new problem concerning differentiation and classification of borderline changes arose.

As it turned out, this is a very heterogeneous group and many factors must be properly defined in order to predict the disease process and appropriate therapy [12,13].

In the pre-mammography era, the proportion of DCIS cases amounted to 1% of newly discovered breast cancers. Presently, in the United States, it amounts to 17% of all newly diagnosed breast cancers and 40% of all impalpable breast lesions [14,15].

In our material, 120 cases of DCIS were diagnosed, amounting to 44.44% of all cancers recognized in the biopsy material.

Stereotactic mammotomy biopsy is a very efficient, modern and safe method, for both personnel and patients, for the collection of material for microscopic analysis of impalpable changes in the breast.

The procedure should be carried out in a specialist oncology unit which can guarantee assessment of the biopsy material, by a histopathologist with experience of breast disease, and which is able to offer further complex treatment where need be.

As the procedure has become more popular in the United States, in Western Europe and now in Poland, it has become the method of choice for the diagnosis of impalpable lesions of the mammary glands [8,9,16–19].

The borderline character of discovered changes and their frequency in biopsy material has helped to define the size of the problem and has driven development of histopathological assessment and new systems of classification.

Conclusions

1. SMB is an efficient and the least invasive method of all heretofore use methods of obtaining tissue mass for histopathological verification in impalpable lesions in the mammary gland.

2. SMB makes it possible to avoid operation for approximately 80% of patients subjected to biopsy, while for 20% of them enables accurate diagnosis and application of proper and most favourable treatment.

3. SMB allows verification of very early changes in the breast, offering a chance for complete recovery with a limited and sparing operation.

4. SMB aids development in the area of diagnosis, classification and treatment of borderline lesions in the breast.

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