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## Fine-needle versus core-needle biopsy – which one to choose in preoperative assessment of focal lesions in the breasts? Literature review

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### Abstract

**Aim:** The aim of the study was to review two techniques that can be used to verify focal lesions in the breasts: fine-needle aspiration biopsy and core-needle biopsy. **Material and methods:** Fifty-five articles (original papers and reviews), half of them published within the past 5 years, were included in the analysis. The authors also took their own experience into account. **Results:** Pre-operative assessment of focal lesions in the breasts is crucial in the planning of further therapeutic management. The role of fine-needle aspiration biopsy has been reduced lately due to its low sensitivity and specificity as well as a high rate of non-diagnostic, suspicious and false negative results. This method does not enable one to differentiate between *in situ* and invasive disease. Currently, fine-needle biopsy is recommended for cystic lesions, suspected of being recurrences in the chest wall, and lymph node metastases. Core-needle biopsy is the basic diagnostic method of breast lesions. According to the recommendations of the Polish Ultrasound Society and American College of Radiology, BIRADS 4 and 5 lesions should be evaluated histopathologically. Core-needle biopsy makes it possible to establish a final diagnosis more frequently than fine-needle biopsy, both in the case of benign and malignant lesions. It delivers more information about the nature of a tumor (mutation of HER-2, estrogen and progesterone receptors and Ki-67 index). Its limitations include: underestimation of invasion and failure to recognize the components of ductal carcinoma *in situ* in papillary and atypical lesions. Single fine-needle aspiration biopsy is inexpensive, but when considering the cost of further diagnosis due to non-diagnostic, suspicious and atypical results, this method generates high additional costs. **Conclusions:** Microscopic verification of focal breast lesions is crucial for further therapeutic decisions. It has been proven that histopathological verification is more accurate and has more advantages than cytological assessment.

## Introduction

Preoperative verification of focal lesions in the breasts is crucial for further therapeutic decisions. Three most common techniques include: fine-needle aspiration biopsy (FNAB), core-needle biopsy (CNB) and vacuum-assisted biopsy (VAB).

Fine-needle aspiration biopsy was first used in 1930 in New York by Hayes Martin and Edward Ellis. Unfortunately, this method was not popular for the next 25 years. It started to be commonly used in the diagnostic process of palpable breast masses in the 1950s in the Scandinavian Karolinska Institute. FNAB was first used in Poland in the mid-1970s in Szczecin on the initiative of Professor Stanisław Woyke.

Core-needle biopsy was introduced in the 1990s, initially only for clinically silent lesions. However, it rapidly began replacing fine-needle biopsy<sup>(1,2)</sup>. This method owes its growing popularity not only to its accuracy in the diagnosis of benign lesions, but mostly to its capability of distinguishing between *in situ* lesions and invasive carcinoma<sup>(3)</sup>.

Unquestionable advantages of FNAB include: ready availability, simplicity of the technique, low cost and, most of all, low risk of complications. It requires no anesthesia, is minimally-invasive and relatively patient-friendly (associated with little discomfort). Also, it is the most suitable for patients receiving anticoagulant therapy since it does not require its discontinuation. Moreover, the biopsy result is available several days after specimen collection.

Core-needle biopsy is an invasive procedure conducted under local anesthesia and with image guidance (US, MMG, MRI). The equipment needed includes a biopsy instrument and a needle with a large diameter<sup>(4)</sup>. Complications after the procedure include a hematoma (<2%), pain and discomfort<sup>(5)</sup>. Although these complications are more common than after fine-needle biopsy, the percentage is only slightly higher. In the case of a biopsy of a relatively small lesion, it is possible to remove it completely or break it into pieces, which might make surgical excision and histopathological analysis more difficult. In such cases, it is recommended that a tracer should be administered in the region of the lesion to be biopsied.

A lot of authors have compared the sensitivity, specificity and other aspects of FNAB and CNB. Such an assessment is frequently problematic due to differences regarding employed methods, experience in performing biopsy and cytological interpretation.

In a meta-analysis based on over 20 publications, the authors demonstrated varying sensitivity of FNAB that ranged from 35% to 95% and was generally lower than that of CNB (85–100%). Similar results concerned specificity (FNAB 48–100%, CNB 86–100%)<sup>(6)</sup>. These data indirectly show that results of CNB are more reproducible.

Hukkinen *et al.* compared the usefulness of both methods in preoperative diagnosis of focal breast lesions. The values for accurate and reliable diagnosis of malignant lesions were 96% for CNB and 67% for FNAB ( $p=0.001$ ) while the respective values for malignant and suspicious lesions were 99% and 95%. As many as 27% of FNAB results (79/289) were assessed as suspicious and required further histopathological verification<sup>(7)</sup>.

In 1996, Ballo *et al.* presented different results that indicated the superiority of FNAB over CNB<sup>(3)</sup>. Based on a group of 124 patients with palpable masses and suspicious lesions in mammography, the sensitivity of FNAB was higher than that of CNB: 97.5% vs 90% ( $p = 0.004$ )<sup>(8)</sup>. It must be underlined that FNAB was performed with 23–25 G needles and that as many as 6 aspirates were taken, while CNB was performed thrice with 18 G needles.

He *et al.* also demonstrated the usefulness of fine-needle biopsy. Their study involved an analysis of 1238 smears collected from painful and inflamed regions and palpable tumors measuring 10–140 mm. From each patient, 2–3 aspirates were taken using 21 G needles under US guidance or 5 aspirates if biopsy was conducted without radiological guidance. The sensitivity of FNAB was 98%, specificity was 99% and false negative rate was 2.3%. These results are unique amongst similar studies. This might have been caused by patient selection based on criteria assumed by the authors, which is confirmed by a considerable percentage of carcinomas amongst tested lesions (1071/1238)<sup>(9)</sup>. Aker *et al.*, in turn, showed that FNAB and CNB are equivalent, particularly in terms of suspicious lesions<sup>(10)</sup>.

Studies on the relationship between the sensitivity of the method and the number of specimens have confirmed their positive correlation. Fishman *et al.* observed that cells which enabled the final diagnosis were found in the third sample in 96% of cases<sup>(4)</sup>. Bolívar *et al.* analyzed the percentage of normal results in relation to the number of analyzed samples (from 1 to 4): for one sample, it was 73.5%, for two: 88%, for three: 95% and for four: 97.5%<sup>(11)</sup>. According to the current recommendations, at least 3 samples should be collected from a focal lesion and at least 5 samples should be obtained from a lesion with microcalcifications.

The false negative rate for CNB reaches 9.9%<sup>(12)</sup>. Lower sensitivity is linked with the presence of non-diagnostic specimens resulting from difficulties in obtaining the material (sampling error), heterogeneous structure of carcinomas and, more rarely, from an erroneous histopathological assessment (a diagnostic error).

Manual difficulties are associated with a small size of a lesion, deep location, stiffness or movability in relation to the surrounding soft tissues. Technical difficulties, in turn, may be associated with wrong needle bend, problems with visualizing a needle tip and imaging artifacts, e.g. slice-thickness artifact<sup>(13)</sup>. Owing to the heterogeneous structure of cancer, specimens might contain fat necrosis,

desmoplasia or inflammatory cells which can occur between cancer cells. Moreover, slight cancerous lesions in a benign tumor or areas of microinvasion in carcinoma *in situ* might be indistinguishable from the remaining part of the lesion and draw no attention of a doctor conducting the procedure.

CNB delivers information about the features of cancer, which has therapeutic implications. These features include: presence of invasion, histological type and tumor grade, presence of estrogen receptors (ER) and progesterone receptors (PR), HER-2 status and Ki-67 proliferative index. The sensitivity of receptor and marker assessment is 96% for ER, 90% for PR and 87% for HER-2<sup>(14)</sup>.

Despite many advantages of FNAB mentioned previously, this method has also numerous limitations. First, the invasion status cannot be determined if cancer cells are found. ER, PR and HER-2 status assessment is poorly sensitive and relatively expensive. Moreover, this method is characterized by lower sensitivity and specificity as well as a higher rate of non-diagnostic results, particularly in non-palpable lesions; it might be as low as 34–57%<sup>(15,16)</sup>. The quality of the diagnostic workup using FNAB largely depends on competence, skill and experience of the operator and cytopathologist<sup>(17)</sup>. Therefore, the sensitivity of FNAB can be increased and the number of non-diagnostic results can be decreased by: proper patient selection, experience of physicians who perform or assess biopsy as well as accuracy and carefulness during sampling and preparing smears.

Histopathological and cytological assessment of focal lesions is of key significance. However, its results must be confronted with imaging findings and clinical data (a triple test)<sup>(18)</sup>. In the case of discrepancies between imaging findings and biopsy results, surgical resection of the lesion is recommended. This management helps avoid false negative results.

Vacuum-assisted biopsy, which was introduced in the 1990s, is used for removal of clusters of suspicious microcalcifications under mammographic guidance. Soon after its introduction, it started to be used in the diagnostic workup of lesions under US or MRI guidance. As with CNB, it is performed with needles of various gauges<sup>(19)</sup>, but it helps obtain a greater amount of tissue from a single slight incision (e.g. 14 G VAB delivers 40 mg of tissue, whereas CNB delivers only 17 mg)<sup>(19)</sup>.

Numerous studies have revealed a lower number of false negative results for VAB than for CNB<sup>(20)</sup> as well as its higher sensitivity and specificity when diagnosing ADH-type lesions (ADH – atypical ductal hyperplasia) and DCIS (ductal carcinoma *in situ*)<sup>(21,22)</sup>. This results from a greater amount of tissue obtained with this method. Lower costs, reduced patient burden and slight scars associated with healing make VAB seem more beneficial than surgical biopsy. Lesions that do not exceed 3 cm can be removed fully during vacuum-assisted biopsy using an 8 G needle<sup>(23)</sup>. As for cancerous lesions, however, VAB is

not equivalent to surgical resection after which margins of the resected tissue undergo careful assessment. That is why surgery is unavoidable in this case<sup>(24)</sup>. The situation when the tissue breaks into pieces during sampling is unfavorable from the histopathological point of view as it might prevent reliable assessment. VAB is characterized by greater cost compared to CNB (it is 10–15 times more expensive than CNB)<sup>(25)</sup>.

## The usage of FNAB, CNB and VAB in given breast diseases

At present, FNAB is considered a diagnostic method for cystic lesions and lesions suspected of lymph node metastases. It can also be conducted for lesions located near the chest wall (concerns about patient's movement and the risk of causing pneumothorax), superficial palpable lesions and in order to rule out local recurrence within the chest wall<sup>(5)</sup>. The diagnostic workup for solid tumors (including atypical, papillary, lobular and fibrous lesions, such as radial scar) with this method is a challenge.

Despite the limitations in the histopathological assessment of CNB specimens, this technique helps establish a correct preoperative diagnosis much more frequently than FNAB (78% vs 55%)<sup>(26)</sup>. CNB is performed for BI-RADS 4 and 5 focal lesions. It is characterized by a very high negative predictive value, reaching even 99.4%<sup>(13)</sup>.

The indications for vacuum-assisted biopsy can be divided into diagnostic and therapeutic ones<sup>(25)</sup>. VAB is recommended for slight lesions (<5 mm), clusters of suspicious microcalcifications and for verification of non-diagnostic results of other biopsy methods. Therapeutic indications include: removal of BIRADS 3 and 4a lesions (low risk of malignancy, e.g. fibroadenoma, intraductal papilloma) and benign lesions causing troublesome symptoms (pain, discomfort etc.) or anxiety, and if the patient wishes to have them removed.

## Atypical lobular and ductal hyperplasia (ALH and ADH)

Both ALH and ADH belong to proliferative breast diseases of the ductal and lobular epithelium. Although they are not considered pre-cancerous, they increase the risk of breast malignancy by 2–4 times. As shown by Hartmann *et al.*, ADH concerns 2.7% of women, and ALH is identified in 2.6% of women<sup>(27)</sup>. Both ADH and ALH may present no characteristic signs on mammography and ultrasonography. They usually present as focal lesions or clusters of microcalcifications. Among patients with abnormal epithelial proliferation, the most common cancer was invasive cancer (81%) with predominance of ductal carcinoma (78% with ADH, 77% with ALH).

Two problems must be considered in the diagnostic workup of ADH using CNB: first, the incidental nature of obtained material resulting from the limited volume of

Authors	CNB result	Results after surgical resection		Total number of upgraded cases
	ADH	DCIS	IDC	
Polat <i>et al.</i> (2012) <sup>*(29)</sup>	320	38		38 (11.5%)
McGhan <i>et al.</i> (2012) <sup>** (30)</sup>	114	14	6	20 (17.5%)
Hsu <i>et al.</i> (2010) <sup>*** (31)</sup>	134	46	7	53 (40%)
Mesurole <i>et al.</i> (2014) <sup>*** (32)</sup>	50	13	15	28 (56%)

\* Results of stereotactic 9–11 G CNB (88.5%), US-guided 12–18 G CNB (11.5%).  
 \*\* Results of stereotactic 9–11 G CNB (79%), US-guided 12–16 G CNB (19%).  
 \*\*\* Results of US-guided 14 G CNB.  
 ADH – atypical ductal hyperplasia; CNB – core-needle biopsy; DCIS – ductal carcinoma in situ; IDC – invasive ductal carcinoma

**Tab. 1.** Comparison of histopathological assessment of atypical lesions based on CNB and postoperative specimens

tissue that can be sampled, and second, ADH and DCIS histopathological criteria which are based on quantitative rather than qualitative assessment (in the case of lesions greater than 2 mm or when more than 2 ducts are involved, DCIS will be diagnosed)<sup>(28)</sup>. ADH shares certain (but not all) features with DCIS.

Most studies that compare the results of preoperative assessment of lesions using CNB with postoperative results have shown a high percentage of upgrading to carcinoma (Tab. 1).

Since DCIS and invasive ductal carcinoma frequently co-occur with ADH and they tend to be underestimated in CNB, it is recommended to resect all ADH lesions found in CNB.

Atypical lobular hyperplasia is frequently discussed together with lobular carcinoma *in situ* (LCIS) as a spectrum of disease entities called *lobular neoplasia* (LN) that derive from terminal ductal and lobular units. As ALH, LCIS is not a pre-cancerous lesion and increases the risk of invasive ductal/lobular carcinoma in both breasts. In the study of Zhao *et al.*, 30% of LN patients had a history of invasive carcinoma and DCIS<sup>(33)</sup>. Similar results concerning invasive cancer and carcinoma *in situ* (38%) were reported by Murray *et al.*<sup>(34)</sup>

The diagnosis of lobular neoplasia in CNB is associated with similar difficulties to the diagnosis of ADH and DCIS. The upgrading percentage of LN in CNB after surgical resection is 3–4.6% (3.1% for ALH and 8.1% for LCIS)<sup>(33,34)</sup>. That is why the Polish Society of Clinical Oncology guidelines from 2014 state that surgical resection should be considered in all LCIS cases diagnosed based on CNB<sup>(35)</sup>.

### Ductal carcinoma *in situ* (DCIS) and invasive ductal carcinoma (IDC)

DCIS accounts for approximately 20% of all breast cancers detected in mammography. In the case of delayed diagnosis or treatment, 20–50% will transform into invasive ductal carcinoma (currently *not otherwise specified* type, NOS)<sup>(36)</sup>. DCIS is characterized by clusters of ab-

normal microcalcifications. Detection of cancer cells is possible in both FNAB and CNB. However, Leifland *et al.*, showed in 2003 that the latter is superior in the diagnosis of *in situ* cancers<sup>(37)</sup>. These authors diagnosed 78% of DCIS cases (or 82% including lesions highly probable of being malignant) with CNB while FNAB detected 47% of all cancers (or 56% including lesions highly probable of being malignant). By contrast with the analysis of a tissue specimen, stromal invasion cannot be detected in cytological assessment.

In a meta-analysis conducted by Brennan *et al.*, 1736 of 7350 lesions diagnosed in CNB as DCIS were verified as invasive cancers after postoperative specimen examination<sup>(38)</sup>. This accounts for as many as 24% of false negative results (the study investigated both 11 G VAB and 14 G CNB).

Similar results have also been reported by other authors (Tab. 2).

When invasive cancer is not diagnosed in CNB, the sentinel lymph node procedure is not conducted during the surgery, which leads to delayed diagnosis of lymph node invasion. Lymph node metastases are not typical features of DCIS, in which case the presence of cancer cells is restricted by the ductal basal membrane. Visualization

Authors	False negative results in CNB	
Schulz <i>et al.</i> (2013) <sup>*(39)</sup>	37/205	18%
Caswell-Smith <i>et al.</i> (2016) <sup>** (40)</sup>	59/287	20.6%
Park <i>et al.</i> (2014) <sup>*** (41)</sup>	21/69	30.4%
Lee <i>et al.</i> (2013) <sup>**** (42)</sup>	116/248	46.8%

\* Results of US-guided 14 G CNB – for lesions detected in ultrasonography (25%), and stereotactic 9–11 G VAB – for lesions detected only in mammography (75%).  
 \*\* Results of 14 G CNB; the study also included 30 cases of stereotactic 11 G VAB with upgrading of 20% (6/30) – not included in the table.  
 \*\*\* Results of US-guided 14 G CNB  
 \*\*\*\* Results of CNB; the study also included 122 cases of VAB with upgrading of 0.6% (7/122) – not included in the table; total upgrading rate: 24.9%.

**Tab. 2.** False negative results concerning stromal invasion in CNB

Authors	CNB result	Results after surgical resection			Upgrading to malignant cancer
	IDP without atypia	Atypia (ADH or LN)	DCIS	IDC/ILC	
Wiratkapun <i>et al.</i> (2013) <sup>(47)</sup>	52	17 (33%)	0	0	0
Pareja <i>et al.</i> (2016) <sup>(48)</sup>	171	39 (22.8%)	2	2	4 (2.3%)
Rizzo <i>et al.</i> 2012 <sup>(49)</sup>	234	42 (17.9%)	19	2	21 (9%)
Bianchi <i>et al.</i> 2015 <sup>(50)</sup>	68	19 (27.9%)	5	4	9 (13.2%)

\* Results of 14 G CNB (for 94% of lesions) and 11 G VAB – only cases verified postoperatively were included (results for all 120 cases: upgrading of IDP to atypia: 19%, IDP with atypia to malignant cancer: 31%).  
 \*\* Results of automatic CNB (41.5%) and VAB: 9–18 G needles.  
 \*\*\* Results for CNB (no data on the needle size).  
 \*\*\*\* Results for semi-automatic 14 G CNB.  
 AADH – atypical ductal hyperplasia; CNB – core-needle biopsy; DCIS – ductal carcinoma in situ; IDC – invasive ductal carcinoma; IDP – intraductal papilloma; ILC – invasive lobular carcinoma; LN – lobular neoplasia

**Tab. 3.** Results showing the percentage of benign IDP verified as atypical or malignant in a postoperative examination after surgical resection

of suspicious lymph nodes in US suggests invasive carcinoma. Suspicious lymph nodes should be examined in FNAB before surgery<sup>(41,43)</sup>. In the case of a positive FNAB result, breast tumor resection and axillary lymphadenectomy can be conducted simultaneously, which reduces the risks associated with additional surgical procedures and anesthesia as well as decreases patient’s psychological discomfort and lowers total costs. Unfortunately, lymph nodes with microinvasion may present as normal on US<sup>(41)</sup>.

A lower rate of false negative results was noted for CNB conducted with needles of a greater diameter<sup>(38,39,42)</sup>. Brennan *et al.* obtained false negative results in 19% of cases examined with 11 G VAB and in 30% of cases after the procedure conducted with a 14 G needle ( $p = 0.001$ )<sup>(38)</sup>. A greater amount of material collected in VAB helps reduce the number of false negative results.

### Papillary breast lesions (PBL)

PBL make up a diversified group of lesions which includes: intraductal papilloma (IDP), IDP with an ADH

or DCIS component, papillary DCIS, solid papillary carcinoma, invasive papillary carcinoma and encapsulated papillary carcinoma. They constitute approximately 10% of all benign lesions and 0.5–2% of malignancies<sup>(44)</sup>. Owing to considerable differentiation between individual lesions from this group, the elements of benign and malignant character may coexist. In PBL, both FNAB and CNB have their own limitations, but cytological assessment is much more difficult and frequently yields non-diagnostic results. This is due to the similarity of PBL morphological features to other lesions, both benign and malignant, and to limitations linked with sampling<sup>(44)</sup>. Due to their delicate structure, these lesions frequently break during CNB.

Intraductal papilloma is the most common type of PBL. It encompasses lesions with and without atypia. Lewis *et al.* demonstrated that an increased risk of cancer refers only to multifocal IDP<sup>(45)</sup>. This risk is doubled in central papilloma and tripled in peripheral papilloma<sup>(46)</sup>.

Studies comparing IDP diagnosed in CNB with a postoperative specimen analysis have revealed a higher percentage of upgrading (Tab. 3, 4).

Authors	CNB result	Results after surgical resection		Upgrading to malignant cancer
	IDP with atypia (ADH/ALH)	DCIS	IDC/ILC	
Wiratkapun <i>et al.</i> (2013) <sup>(47)</sup>	32	10	2	12 (38%)
Rizzo <i>et al.</i> (2012) <sup>(49)</sup>	42	14	2	16 (38%)
Bianchi <i>et al.</i> (2015) <sup>(50)</sup>	46	7	15	22 (48%)

\* Results of 14 G CNB (for 94% of lesions) and 11 G VAB – only cases verified postoperatively were included (results for all 120 cases: upgrading of benign IDP to atypia: 19%, upgrading of IDP with atypia to malignant cancer: 31%).  
 \*\* Results of CNB (no data on needle size).  
 \*\*\* Results of semi-automatic 14 G CNB  
 ADH – atypical ductal hyperplasia; ALH – atypical lobular hyperplasia; CNB – core-needle biopsy; DCIS – ductal carcinoma in situ; IDC – invasive ductal carcinoma; IDP – intraductal papilloma; ILC – invasive lobular carcinoma

**Tab. 4.** Results presenting the percentage of IDP with atypia classified as in situ or invasive cancers upon surgical resection

As shown in the aforementioned publications, a change in the histopathological diagnosis occurred markedly more frequently in atypical papillomas ( $p < 0.0001$ )<sup>(49)</sup>. By contrast with the recommendation to resect IDP with atypia, there are no clear management guidelines for benign IDP (in practice, such lesions are also mostly resected). Numerous authors emphasize that areas of atypia or malignant cells have been located in the vicinity of PBL<sup>(48,50)</sup>.

Other factors associated with a higher risk of a malignant component in papilloma were the presence of symptoms (nipple discharge, a palpable lesion) and a higher BI-RADS grade<sup>(47)</sup>.

## Fibroepithelial lesions

This group includes two types of lesions: fibroadenoma (FA) and phyllodes tumor (PHT). Fibroadenoma is the most common tumor in young women (20–30 years of age) and constitutes the largest group of benign lesions to be biopsied (49.9%)<sup>(13)</sup>. Most of them are classified as BI-RADS 3 after the first examination. The peak incidence of phyllodes tumor is observed at 45–49 years of age. These tumors are larger than fibroadenomas and tend to grow rapidly. They form a broad spectrum of tumors with benign, borderline and malignant features. They are capable of producing local recurrences and distant metastases (in the case of malignant tumors).

The differentiation between fibroadenoma and phyllodes tumor is significant from the clinical point of view. FA can be treated conservatively and regularly controlled in US (if there is no increase in size and no increased risk of breast cancer)<sup>(51)</sup>. In the case of surgical resection, simple tumor enucleation is usually sufficient.

Phyllodes tumor must be resected with a margin of healthy tissues in order to prevent local recurrences. As for large tumors or in small breasts, mastectomy might be necessary<sup>(52)</sup>.

In most cases, it is impossible to distinguish between hypercellular fibroadenoma and benign phyllodes tumor based on CNB. In the work of Lawton *et al.*, only 2 of 21 cases of selected problematic fibroepithelial tumors were uniformly diagnosed by 10 pathologists specializing in breast pathologies<sup>(53)</sup>. In the study conducted by Choi *et al.*, a retrospective analysis of phyllodes tumors diagnosed after surgical resection demonstrated that the agreement between CNB and the postoperative result was about 60%<sup>(52)</sup>. In FNAB, however, these two types of fibroepithelial tumors cannot be distinguished at all<sup>(48)</sup>.

## Cost of breast biopsy

Hukkinen *et al.* proved that despite a low cost of FNAB, the need to frequently conduct additional examinations (including CNB) due to non-diagnostic results makes the total cost of fine-needle biopsy exceed that of CNB<sup>(7)</sup>. The authors estimated the cost of FNAB at EUR 150, and CNB at EUR 176. However, when the cost of additional examinations was added, FNAB cost EUR 294, and CNB: EUR 233. The diagnosis with CNB is therefore 24% cheaper than that with FNAB.

Similar conclusions were drawn by Gruber *et al.* who compared the cost of ultrasound-guided CNB with surgical resection<sup>(54)</sup>. Biopsy lowered the cost by 30% compared to tumorectomy. Moreover, as many as 60% of women were not operated on after considering the result of CNB.

One must not forget that additional procedures prolong the time from the first visit to final diagnosis, which delays treatment.

## Cancer cell dissemination due to breast biopsy

Although there is histological evidence for the movement of cancer cells from the site of the primary lesion to the biopsy route, it has been proven that these cells do not survive in the new location. Moreover, there is no evidence to support the fact that preoperative breast biopsy might cause cancer cell movement to sentinel lymph nodes<sup>(55)</sup>.

## Conclusion

Cytological and histological verification of breast lesions is crucial for treatment planning. When selecting a diagnostic method, one should consider a range of factors to choose either CNB or FNAB. A multidisciplinary approach, i.e. cooperation between oncologists, radiologists and pathologists, has a positive influence on the quality of both diagnosis and treatment. Currently, core-needle biopsy is the method of choice in the diagnosis of focal breast lesions. Fine-needle biopsy is used in the diagnostic workup of cystic lesions and suspicious axillary lymph nodes in patients with breast tumors.

## Conflict of interest

*Authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.*

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