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# The Evaluation of Core Needle Breast Biopsy Analyzes Performed with 14 and 18 Gauge Needles: A Single Center Experience for Eight Years

## 14 ve 18 Gauge İğnelerle Yapılan Kor İğne Meme Biyopsisi Analizlerinin Değerlendirilmesi: Sekiz Yıllık Tek Merkez Deneyimi

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**ABSTRACT**

**Aim:** Percutaneous imaging-guided core needle breast biopsy has become widely used as an alternative to incisional biopsy in the diagnosis of breast lesions. In this study, it was aimed to evaluate and report our core needle breast biopsy experiences performed with 14- and 18-gauge needles.

**Material and Methods:** Patients who underwent core needle breast biopsy between March 2012 and December 2019 in our radiology department and whose biopsy specimens were evaluated in the pathology department, of all age groups and both sexes, were included in this study. A total of 628 (615 female and 13 male) patients with breast masses were examined.

**Results:** The mean age of the patients was 52.20±13.94 (median= 51, range, 13-96) years, 90.4% (n=568) of the lesions were masses and the majority of lesions (53.2%, n=334) were 11-20 mm in size. The most of cases (47.2%, n=268) were BI-RADS 5. There was no significant difference between the two needles in terms of gender distribution, age, type of surgery, and core needle breast biopsy results. In 86.5% (n=141) of the patients, there was diagnostic accuracy between the surgical specimen and the core needle breast biopsy result.

**Conclusion:** We demonstrated that the 14-gauge and 18-gauge needles have similar performance of results. Smaller needles should be used for ultrasound-guided breast biopsies, which is less invasive, less painful, and creates less risk of hemorrhage. Moreover, no patient admitted to the emergency department because of the core needle breast biopsy acute complications such as hematoma, bleeding, etc. during this time.

**Keywords:** Core needle breast biopsy; breast masses; biopsy specimens.

**ÖZ**

**Amaç:** Perkutan görüntüleme eşliğinde kor iğne meme biyopsisi, meme lezyonlarının teşhisinde insizyonel biyopsiye alternatif olarak yaygın bir şekilde kullanılmaktadır. Bu çalışmada; 14 ve 18 gauge iğnelerle yapılan kor iğne meme biyopsisi deneyimlerimizin değerlendirilmesi ve sunulması amaçlanmıştır.

**Gereç ve Yöntemler:** Bu çalışmaya, Mart 2012 ve Aralık 2019 tarihleri arasında Radyoloji Anabilim Dalında kor iğne meme biyopsisi uygulanmış olan ve biyopsi örnekleri Patoloji Anabilim Dalında değerlendirilmiş olan, tüm yaş gruplarından ve her iki cinsiyetten hastalar dahil edilmiştir. Meme lezyonu olan toplam 628 (615 kadın ve 13 erkek) hasta incelenmiştir.

**Bulgular:** Hastaların ortalama yaşı 52.20±13.94 (medyan= 51, aralık, 13-96) yıl olup, lezyonların %90,4'ü (n=568) kitle lezyonu şeklindeydi ve lezyonların büyük çoğunluğu (53.1%; n=334) 11-20 mm boyutundaydı. Vakaların çoğu (%47,2; n=268) BI-RADS 5 idi. İki iğne arasında cinsiyet dağılımı, yaş, ameliyat türü ve kor iğne meme biyopsisi sonuçları açısından anlamlı bir farklılık yoktu. Hastaların %86,5'ünde (n=141) cerrahi olarak çıkartılan materyallerin histopatolojik sonucu ve kor iğne meme biyopsisi sonucu arasında tanısal doğruluk vardı.

**Sonuç:** 14-gauge ve 18-gauge iğnelerin benzer sonuç gösterme potansiyeline sahip olduğu tespit edilmiştir. Daha az invaziv, daha az ağrılı ve daha az kanama olma riski içeren ultrason eşliğindeki meme biyopsileri için daha küçük iğnelerin kullanılması daha uygundur. Ayrıca, çalışma süresi içinde hematom, kanama vb. gibi akut kor iğne meme biyopsisi komplikasyonları nedeniyle hiçbir hasta acil servise başvurmamıştır.

**Anahtar kelimeler:** Kor iğne meme biyopsisi, meme kitleleri, biyopsi örnekleri.

## INTRODUCTION

Percutaneous imaging-guided core needle breast biopsy (CNB) has become widely used as an alternative to incisional biopsy in the diagnosis of breast lesions (1-3). For a decade, ultrasound-guided CNB (US-CNB) has been accepted as an alternative method with high sensitivity/specificity for the accurate diagnosis of breast cancers (4-7). It is faster, less invasive, and less expensive. Also, the increasing experience with this procedure makes the technique more preferable (8). Accurate targeting of the needle and adequate size of specimens are the most crucial factors affecting the underestimation rates and false-negative results (9,10).

The size of the needle used for CNB is one of the factors affecting the success of the biopsy. A variety of cutting needles (11-, 14-, 16-, and 18-gauge, respectively) being used by many centers, and the common reason to prefer larger needles is diagnostic quality. However, larger needle sizes have potential to increase complication rates, such as hematoma formation, bleeding, and vasovagal reactions (11,12). While large size needles are recommended for ≤10 mm or non-mass lesions, most physicians in many different centers have been recommended to use smaller needles such as 16-gauge or 18-gauge (13-15). Limited information about the effects of needle size on the accuracy of diagnosis is currently available, and this issue has not been adequately considered. At that point, a question may arise whether smaller or thinner needles (e.g., 18- and 16-gauge) can have diagnostic value for breast lesions or not (15).

US-CNB has been performed by our center for a long time. 14-gauge CNBs from March 2012 to December 2016 and 18-gauge CNBs from December 2016 to December 2019 were performed in our center. In this study, we aimed to evaluate and report our US-CNB experience with 14- and 18-gauge needles.

## MATERIAL AND METHODS

### Study Design and Setting

This study was performed with the approval of the local ethics committee of Düzce University (01.06.2020, 2020/73), and informed consent was waived because of the retrospective design of the study. A total of 665 US-CNBs (14-gauge CNBs from March 2012 to December 2016, and 18-gauge CNBs from December 2016 to December 2019) were performed in our institution. We retrospectively reviewed all the biopsy results and excluded cases that had missing data.

### Participants and Measurements

Patients who underwent CNB between March 2012 to December 2019 in our radiology department and whose biopsy specimens were evaluated in the pathology department in this center, of all age groups and both sexes were included in this study.

Any CNB performed apart from this period, the cases whose biopsy materials were evaluated in another pathology center and patients whose files could not be accessed were excluded from the study.

Patients' data were recruited from the patient registry database system of radiology and pathology departments. The patients who underwent CNB procedure were screened retrospectively and the data of the patients were classified as follows;

- Patients' age, age group and gender
- Breast Imaging-Reporting and Data System (BI-RADS) class of the lesions;
  BI-RADS classification was routinely used for reporting the breast lesions; 0: assessment incomplete; 1: negative; 2: benign finding; 3: probably benign lesions; 4: suspicious of malignancy (possibility 3%-94%); and 5: highly suggestive of malignancy (>95%).
- The type of lesion (mass/non-mass)
- The size of the lesion
- Size of the needle (14-/18-gauge)
- Pathologic diagnosis (benign, malignant, others: borderline, unsatisfactory)
- If the patient has undergone a surgical operation, the type of procedure (total/partial mastectomy, lumpectomy)
- Pathologic diagnosis of the surgical specimen (SS)

Descriptive statistics of the obtained data and differences between two needle types (14- and 18-gauge) were compared.

An ultrasound-guided breast biopsy was performed at our department, and 14-gauge and 18-gauge needles were routinely used in the above-given time intervals. The choice of needle size is generally determined by the radiologist's preference. Two radiologists who have over five years' experience performed the CNBs. Ultrasound examinations were performed using a MicroMaxx HFL 38/13-6 scanner (SonoSite, USA) and a LOGIQ E-R7 (GE, USA). An automated core biopsy device with a 20-mm-long chamber was then used. Generally, at least three core samples were obtained in most of the breast lesions, and the puncture sites were compressed for 5-10 minutes to control bleeding after the biopsy procedure was completed (Figure 1). Pathological examinations were performed by a team of pathologists, and the results were reported as malignant or benign (fibroadenoma, ductal hyperplasia, fibrocystic change, granulomatosis mastitis, and abscess). Figure 2 shows the macroscopic and microscopic appearance of the biopsy material.

### Statistical Analysis

The compliance of the data to normal distribution was tested with the Kolmogorov-Simirnov test. Student t test was used to compare normally distributed variables between two independent groups, and Mann-Whitney U test was used to compare non-normally distributed variables between two independent groups. Pearson chi-square or Fisher's exact tests were used to analyze categorical data. As descriptive statistics, mean±standard deviation, median, and minimum-maximum values for numerical variables, and number and percentage values for categorical variables were given. SPSS v.21.0 package program was used for statistical analysis and $p<0.05$ was considered statistically significant.

## RESULTS

A total of 665 US-CNBs were performed in our center. Total 628 patients with breast masses were examined, 37 patients who had insufficient samples have excluded from the study. CNBs were performed with 14-gauge needles in 428 patients, while 200 were made with 18-gauge needles. The mean age was 52.20±13.94 (median= 51, range, 13-96) years, and most of patients (28.3%, n=178) were in 40-49 age group. 90.4 % (n=568) of the lesions were masses and

the majority (53.2%, n=334) of lesions were 11-20 mm in size. The BI-RADS score of 47.2% (n=268) of the patients was 5, and 14-gauge needles are mostly used in lesions size of >20 cm. Meanwhile the data of 14-gauge and 18-gauge needles were compared, no significant difference was found in terms of gender distribution, age, age distribution, lesion type, and BI-RADS class (Table 1).

Invasive breast carcinoma was the most frequent pathology results in total and in both needle groups (Table 2).

Total of 163 (25.9%) of the patients were underwent surgery in our center. Most of the operated patients were female (n=161, 98.8%) and the mean age was 57.40±12.66 (median= 56, range, 21-94) years. Total mastectomy was performed in 56.4% (n=92) of the patients, 80.4% (n=131) of these patients had malignant CNB results. When SSs

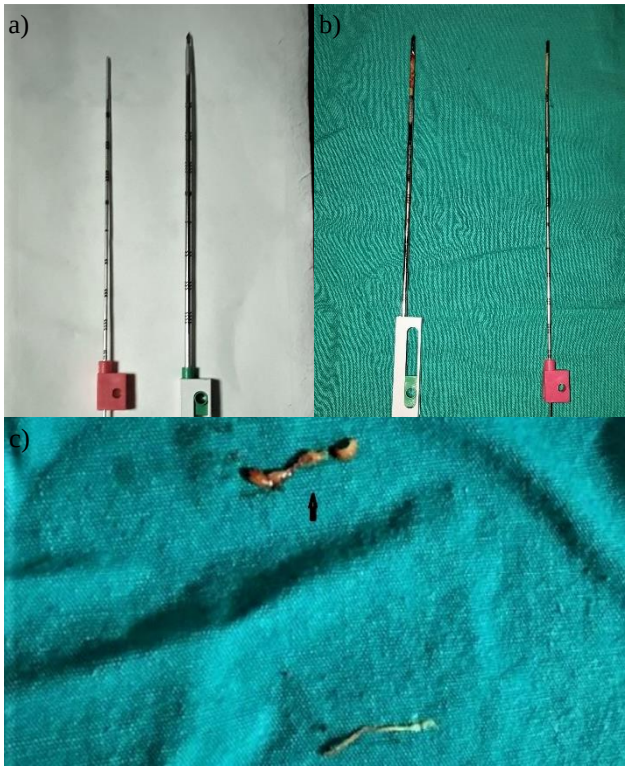


**Figure 1. a)** 14- and 18-gauge core biopsy needles, **b)** 14- and 18-gauge core biopsy needles with tissue, **c)** the arrow shows tissue sample taken with a 14-gauge needle and the other one is the tissue sample taken with a 18-gauge needle

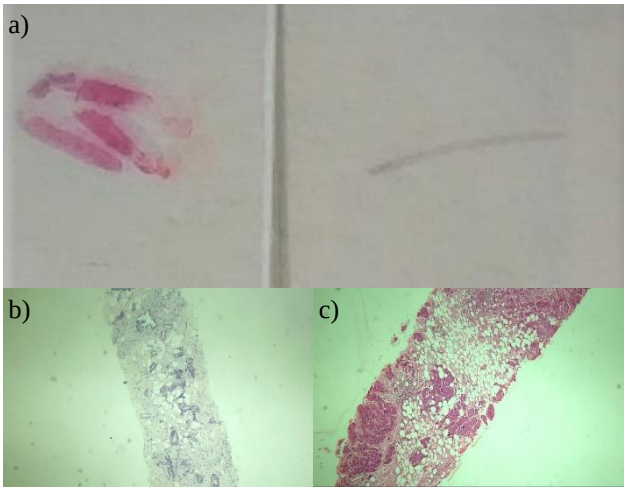


**Figure 2. a)** core biopsy breast specimens obtained using 14-gauge (left) and 18-gauge (right) needles, **b)** and **c)** photomicrographs show tumor cells infiltrating breast tissue with desmoplastic stroma (4x H&E)

**Table 1.** Descriptive and clinical characteristics of the patients

| | **Total (n=628)** | **14-gauge (n=428)** | **18-gauge (n=200)** | **p** |
|---|---|---|---|---|
| **Age (years)**, mean±SD | 52.20±13.94 | 52.29±13.47 | 51.99±14.93 | 0.899 |
| median (Q1-Q3) [min-max] | 51 (42-61) [13-96] | 51 (42-61) [21-96] | 52 (42-61.5) [13-88] | |
| **Age groups**, n (%) | | | | |
| <40 | 123 (19.6%) | 81 (18.9%) | 42 (21.0%) | |
| 40-49 | 178 (28.3%) | 123 (28.7%) | 55 (27.5%) | |
| 50-59 | 155 (24.7%) | 109 (25.5%) | 46 (23.0%) | 0.876 |
| 60-69 | 108 (17.2%) | 74 (17.3%) | 34 (17.0%) | |
| ≥70 | 64 (10.2%) | 41 (9.6%) | 23 (11.5) | |
| **Gender**, n (%) | | | | |
| Female | 615 (97.9%) | 419 (97.9%) | 196 (98.0%) | 0.933 |
| Male | 13 (2.1%) | 9 (2.1%) | 4 (2.0%) | |
| **Lesions type**, n (%) | | | | |
| Mass | 568 (90.4%) | 390 (91.1%) | 178 (89.0%) | 0.399 |
| Non-mass | 60 (9.6%) | 38(8.9%) | 22 (11.0%) | |
| **Lesions size (mm)**, n (%) | | | | |
| ≤10 | 196 (31.2%) | 125 (29.2%) | 71 (35.5%) | |
| 11-20 | 334 (53.2%) | 222 (51.8%) | 112 (56.0%) | **0.005** |
| 21-50 | 73 (11.6%) | 58 (13.6%) | 15 (7.5%) | |
| >50 | 25 (4.0%) | 23 (5.4%) | 2 (1.0%) | |
| **BI-RADS***, n (%) | | | | |
| | **n=568** | **n=390** | **n=178** | |
| 1 | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | |
| 2 | 4 (0.7%) | 4 (1.0%) | 0 (0.0%) | 0.610 |
| 3 | 40 (7.0%) | 28 (7.2%) | 12 (6.7%) | |
| 4 | 256 (45.1%) | 176 (45.1%) | 80 (44.9%) | |
| 5 | 268 (47.2%) | 182 (46.7%) | 86 (48.4%) | |

SD: standard deviation; Q1-Q3: 1st - 3rd quartile, min-max: minimum-maximum, BI-RADS: breast imaging-reporting and data system, *: BI-RADS classification was not made for the pre-diagnosis of some lesions such as abscess and granulomatous mastitis

**Table 2.** Histopathological results of CNB materials

| | Total (n=628) | 14-gauge (n=428) | 18-gauge (n=200) |
|---|---|---|---|
| Invasive breast carcinoma* | 217 (34.6%) | 153 (35.7%) | 64 (32%) |
| Invasive lobular carcinoma | 18 (2.9%) | 12 (2.8%) | 6 (3%) |
| Fibroadenoma | 96 (15.3%) | 66 (15.4%) | 30 (15%) |
| Adenosis and fibrosis | 70 (11.1%) | 47 (11.0%) | 23 (11.5%) |
| Abscess | 30 (4.8%) | 18 (4.2%) | 12 (6%) |
| Granulomatous mastitis | 30 (4.8%) | 20 (4.7%) | 10 (5%) |
| Ductal hyperplasia | 19 (3%) | 12 (2.8%) | 7 (3.5%) |
| Fibrocystic disease | 56 (8.9%) | 37 (8.6%) | 19 (9.5%) |
| Reactive lymph node | 15 (2.4%) | 9 (2.1%) | 6 (3%) |
| Fat necrosis | 11 (1.8%) | 7 (1.6%) | 4 (2%) |
| Gynecomastia | 9 (1.4%) | 5 (1.2%) | 4 (2%) |
| Normal breast tissue | 13 (2.1%) | 9 (2.1%) | 4 (2%) |
| Others | 44 (7%) | 33 (7.7%) | 11 (5.5%) |

CNB: core needle breast biopsy, *NOS: not otherwise specified

were examined, 86.5% (n=141) of the patients were consistent with the CNB result (Table 3). When the data of 14-gauge and 18-gauge needles are examined; there was no significant difference between the two groups in terms of gender distribution, age, type of surgery, and CNB biopsy results. Considering the results of SS and CNB biopsy, no significant difference was found between the two needles (Table 3).

During this time, no patient applied the emergency department owing to the CNB complication such as hematoma, bleeding, etc.

## DISCUSSION

In this study, our eight years of CNB experiences were presented. CNB has become a standard alternative to excisional biopsy (2). CNB enables the evaluation of suspicious lesions with a reliable, fast, inexpensive, and less traumatic method (2). The BI-RADS is a scale that has been used for many years to standardize the reporting

**Table 3.** Descriptive and clinical characteristics of the patients operated

| | Total (n=163) | 14-gauge (n=94) | 18-gauge (n=69) | p |
|---|---|---|---|---|
| **Age (years)**, mean±SD | 57.40±12.66 | 56.68±11.61 | 57.91±13.41 | 0.541 |
| median (Q1-Q3) [min-max] | 56 (47-68) [21-94] | 56 (48-70) [21-94] | 55.5 (46-64) [37-81] | |
| **Gender**, n (%) | | | | |
| Female | 161 (98.8%) | 92 (97.9%) | 69 (100.0%) | 0.509 |
| Male | 2 (1.2%) | 2 (2.1%) | 0 (0.0%) | |
| **Type of procedure**, n (%) | | | | |
| Total mastectomy | 92 (56.4%) | 58 (61.7%) | 34 (49.3%) | 0.114 |
| Partial mastectomy | 71 (43.6%) | 36 (38.3%) | 35 (50.7%) | |
| **Histopathological results of CNB materials**, n (%) | | | | |
| Benign | 28 (17.2%) | 16 (17.0%) | 12 (17.4%) | 0.999 |
| Malignant | 131 (80.4%) | 76 (80.9%) | 55 (79.7%) | |
| Others | 4 (2.4%) | 2 (2.1%) | 2 (2.9%) | |
| **Conformity between the CNB and SS**, n (%) | | | | |
| Yes | 141 (86.5%) | 81 (86.2%) | 60 (87.0%) | 0.885 |
| No | 22 (13.5%) | 13 (13.8%) | 9 (13.0%) | |

SD: standard deviation; Q1-Q3: 1st - 3rd quartile, min-max: minimum-maximum, CNB: core needle breast biopsy, SS: surgical specimen

of breast lesions, strengthen communication between physicians and reduce confusion about findings (16). BI-RADS 1-2 indicates that the lesion has no malignant potential, BI-RADS 3 score indicates a low (2%) risk of malignancy, but false-negative cases with CNB applied and detected malignancy are also shown (16,17). In a study including 9,068 cases, Jung et al. (2) reported 68.6% of the cases were BI-RADS 4 and the lesion size was less than 10 mm. In Wu et al.'s (7) study, most of the lesions were <20 mm and most of the cases were BI-RADS 4 (54.6%). In another study, 59.5% of the cases were BI-RADS 4 and most of the lesions were 21-50 mm in size (15). In our study, the majority (47.2%) of the patients were BI-RADS 5 and most (53.2%) of the lesions were 11-20 mm in size. Some patients had lesions BI-RADS 2 and underwent CNB for various reasons (such as transportation and follow-up difficulties, family history, suspicion, and insistence of the patient or surgeon). In field studies conducted in our country, it has been found that awareness of breast cancer and the number of women who undergo periodic breast control is low (18,19). We think that majority of our cases were identified as BI-RADS 5 due to this reason.

It is necessary to reduce the risk of complications and increase the accuracy of breast biopsies. It is well-known by most practitioners that large-gauge needles are related to higher complications (such as pain, hemorrhage, bruising, hematoma, infections), as a post-procedural complication (20,21). Pain is one of the most common complications and is related mostly to the depth of the lesion and the duration of the procedure (22). Patients do not need follow-up unless complications such as vasovagal syncope or persistent bleeding are seen (20). Large hematomas can be seen every 1/1000, but rarely require surgical drainage (21). Although it has been reported that the risk of complications is higher in thick needles, it is also argued that thick needles and thin needles have similar complication rates (23). Nguyen et al. (24) reported that 0.5% of the patients presented to the emergency service within 30 days after the non-vascular biopsy, the most common reason for application is bleeding. In this study, no serious complications and emergency applications have been identified among cases where CNB is applied.

Several studies at the literature examine the efficiency of needle size on biopsy success. Appropriate imaging of the

breast lesion, appropriate sample taking and histopathological diagnostic accuracy of the CNB material with SS is expected from a successful CNB procedure (15,25). The caliber of the needle, the size of the lesion, whether the lesion is mass or non-mass, and micro calcifications in the breast tissue are factors affecting the success of CNB (13,14,26-29). Many studies reported that 14-gauge long-throw biopsy needles provide the highest quality/quantity of biopsy samples than smaller needles (28,29). Giuliani et al. (25) has shown that thin needles have a similar performance with the thick (14-gauge) needles except for lesions under 10 mm and non-mass lesions in the breast. However, it has been shown that thin needles do not give the same results either in non-mass or mass lesions, but are more unsuccessful in non-mass lesions (15). Although CNB has high sensitivity and low false negativity rates, sometimes it may cause misleading results in borderline cases and biopsies with ductal carcinoma in situ (30). In such lesions, the false estimation rate can be up to 10-40% (30,31). Linda et al. (17) reported histopathological compliance in 87% of the CNB applied cases. It has been shown that CNB results obtained with 14-gauge, 16-gauge, and 18-gauge needles have similar diagnostic accuracy to the SS (25). It has also been found that the diagnostic accuracy is low, especially in non-mass lesions (15). The general characteristics of the cases performed biopsy with 14-gauge and 18-gauge needles are similar, and besides, the histopathological compatibility of the SS with the CNB result in cases undergoing surgery is also similar in this study. But it has been determined that the number of unsuitable samples is higher at biopsies taken with 14-gauge needles. This may be due to the use of a 14-gauge needle in 38 of 60 non-mass lesions. However, this result supports that it would be more appropriate to use thin needles.

## CONCLUSION

Previous studies showed that US-CNBs had a high sensitivity, specificity, and accuracy using 14-gauge needles. However, we demonstrated that the 14-gauge and 18-gauge needles have similar performance. Smaller needles can be used for ultrasound-guided breast biopsies which is less invasive, less painful, and creates less risk of hemorrhage. However, no patient admitted to the emergency department because of the CNB acute complications such as hematoma, bleeding, etc., during this time.

**Ethics Committee Approval:** The study was approved by the Ethics Committee of Düzce University Faculty of Medicine (01.06.2020, 2020/73).

**Conflict of Interest:** None declared by the authors.

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