Comparison of the ultrasound-guided tru-cut biopsy with postoperative histopathology results in patients with breast mass

Ann Ital Chir, 2018 89, 1: 30-35
pii: S0003469X18027537
Epub Ahead of Print - November 29
free reading: www.annitalchir.com

Mehmet Emin Güneş

Bakırköy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey

Comparison of the ultrasound-guided tru-cut biopsy with postoperative histopathology results in patients with breast mass

AIM: *We aimed to compare the tru-cut biopsy and postoperative pathology results of breast lesions with suspicion of malignancy. Furthermore we aimed to determine the efficacy, specificity and sensitivity of the tru-cut biopsy.*
METHODOLOGY: *140 patients who were operated due to breast mass following tru-cut biopsy were retrospectively evaluated. Patients' demographic characteristics, imaging findings, biopsy and histopathology results were compared.*
RESULTS: *The mean age of 140 patients was 51.3 (Ranged: 17-83 ages). Malignancy was statistically more common in patients older than 45 years old. According to tru-cut biopsy results 103 (73.5%) lesions were malign, 32 (23%) benign, and 5 (3,5%) suspicious. Histopathological evaluation established 113 (% 80.7) malign and 27 (19,3%) benign lesions. Tru-cut biopsy had a sensitivity, specifity, positive predictive value, negative predictive value and diagnostic accuracy of 93.5%, 95.4%, 99%, 75% and 80%, respectively in this study.*
CONCLUSIONS: *Our findings have confirmed that tru-cut biopsy is an accurate, reliable and as effective as open surgery for breast cancer diagnosis. The higher success rates may achieve by accordance of triple assessment which includes clinical, radiological and pathological evaluation with tru-cut biopsy.*

KEY WORDS: Breast cancer, Core needle biopsy, Preoperative evaluation, Tru-cut biops

Introduction

Breast cancer is the most common malignancy in women and the second leading cause of cancer death after lung cancer in worldwide [1]. In accordance, breast cancer is the most frequent malignancy in Turkey with the rate of 23.4% [2]. The most prominent risk factors for breast cancer are older age and family history [3].
American Cancer Society secondary to the significant contribution of screening programs into early detection of breast cancer and into reduction of its mortality rates; suggests mammographic screening of every three years for women between ages 20-40 and by annually for >40 aged women [4].
An early, accurate and reliable diagnosis for a breast lesion is vital. It can be achieved preoperatively before an invasive surgical procedure [5]. Diagnosis of breast lesion is based on three assessment including clinical, radiological and pathological examinations [3]. Biopsy materials could be obtained by fine-needle aspiration cytology (FNAC), core needle biopsy (CNB) and surgical biopsy [6]. Core biopsy (thick needle biopsy) is the removal of a long cylindrical tissue sample from the lesion, which is the most common type of pathological evaluation [7].
Since percutan biopsy techniques including FNAC and CNB have developed, studies have shown that these techniques are quite safe with high sensitivity and specificity rates. Moreover, they avoid unnecessary surgery as well as allow appropriate treatment of patients in case of malignancy [8,9].

Pervenuto in Redazione Giugno 2017. Accettato per la pubblicazione Settembre 2017.
Correspondence to: Dr. Mehmet Emin Gunes, Bakırköy Dr.Sadi Konuk Training and Research Hospital Istanbul, Turkey (e-mail: memgunes@hotmail.com)

FNAC have been increasingly utilized as a simple, rapid, cost-effective diagnostic method with lower complication rates. It has relatively high sensitivity (85%-88%) and specificity (55.6%-90.5%) for breast cancer. The diagnostic accuracy rate of FNA varies from 50% to 95% according to sampling quality and experience of cytopathologist particularly in the evaluation of palpable lesions [10]. Despite its long-term utilization, pathological discordance of the lesion with clinical or radiological assessment requires further confirmation by histological evaluation. Since histological examination of the lesion is more valuable rather than a simple cytological examination for cytopathologists. In addition, inadequacy of distinguishing in-situ carcinoma from invasive one leads to replacement of FNAC with CNB in recent years [5].
CNB is found to be superior to FNAC particularly in suspicious cases e.g incompatible findings among clinical, radiological and cytological evaluations. Its sensitivity and specificity rates are 94%-99% and 99%-100%, respectively. Moreover, CNB provides predictive and prognostic information which leads to become preferential diagnostic method preoperatively. Despite that CNB seems to be more expensive than cytological examination, CNB is clearly more reliable than cytology and less invasive than surgical procedure [11,12]. Moreover, it allows placing a marker clip [3].
In this study we aimed to compare the preoperative tru-cut biopsy results and the postoperative pathological outcomes of suspicious breast lesions for malignancy. Furthermore we aimed to determine the efficacy, specificity and sensitivity of the tru-cut biopsy.

Materials and Methods

This study was performed in Istanbul Education and Research Hospital, Department of Surgery between January 2012- June 2013. 140 patients who were operated due to breast mass following tru-cut biopsy were retrospectively evaluated in this study. Patients' demographic characteristics, imaging findings, preoperative tru-cut biopsy and postoperative histopathology results were compared.
According to the preoperative breast USG results, breast masses were evaluated in terms of size and localization. The lesions were classified into three groups according to the size; < 20 mm, 20 to 49 mm and ≥50 mm. As for localization, they were grouped right and left breast lesions in addition to classification as upper lateral quadrant, upper medial quadrant, lower lateral quadrant, lower medial quadrant, retroareolar lesion and a mass completely covering the breast. Histopathological outcomes were defined as; benign, malign, and suspicious. Lesions diagnosed with atypical ductal hyperplasia (ADH), papillary neoplasia, and any lesion with atypia were classified into suspicious malignancy group.
The specificity, sensitivity, positive predictive value, negative predictive value and odd's ratio (OR) of the tru-cut biopsy were estimated. Additionally, prevalance of overall histopathology outcomes was measured.

Statistical analysis

All the data were analysed with SPSS (Statistical Package for the Social Sciences) software for Windows (v21.0; IBM, Armonk, NY, USA). Individual and aggregate data were summarized using descriptive statistics including mean, standart deviations, medians (min-max), frequency distributions and percentages. Normality of data distribution was verified by Kolmogorov-Smirnov test. Comparison of the variables with normal distribution was made with Student t test. Evaluation of categorical variables was performed by Chi-Square test. The kappa statistic was calculated to evaluate the agreement. P-Values of <0.05 were considered statistically significant.

Results

The mean age of 140 patients included this study was 51.26±15.83, and age ranged from 17 to 83 years. USG-guided tru-cut biopsy was performed in 114 patients and tru-cut biopsy with palpation guidance was applied in 26 patients. Most of the patients were older than 45 years (n=95; 67.85%) in this study. Malignancy was statistically more common in > 45 years aged group (p=0,006). The possibility of malignant diagnosis was 3,5 times higher in > 45 years aged group than < 45 years aged (Table I).
Based on the tru-cut biopsy outcomes, 23% (n=32) of lesions were diagnosed as benign, 73.5% (n=103) malignant, and 3.5% (n=5) suspicious. On the other hand postoperatively, 80.7% (n=113) of lesions were diagnosed as malignant and the rest (n=27; 19.3%) was benign. Among suspicous lesions, malignancy was detected in 3.

Table I - *Distribution of postoperative histopathology results according to the age groups.*

Age	Malign	Benign	Benign	Total	P value	OR
<45	29(64.4%)	16	(35.6%)	45(32,1%)	0.006	0.28(0.11-0.70)
>45	84(88.4%)	11	(11.6%)	95(67,9%)	0.006	3.59(1.42-9.06)

TABLE II - *Distribution of tru-cut biopsy results and definitive diagnosis.*

		Definitive Diagnosis		
		Malignant n(%)	**Benign n(%)**	**Total n(%)**
Tru-Cut Biopsy				
	Malignant n(%)	102 (99%)	1(1%)	103(73,5%)
	Benign n(%)	8(25%)	24(75%)	32(23%)
	Suspicous n(%)	3(60%)	2(40%)	5(3,5%)
Total n (%)	113(81%)	27(19%)	140(100%)	

TABLE II - *Comparison of ultrasonographic and pathological lesion sizes.*

	N	%
USG size < Pathological size	92	65,7
USG size > Pathological size	37	26,4
USG size = Pathological size	11	7,9
Total	140	100,0

Of the 103 malign lesions after tru-cut biopsy, 102 were histologically confirmed as malignant and one lesion was reported as benign according to postoperative results. Of the 32 benign lesions according to tru-cut biopsy, 24 (75%) were detected as benign and 8 (25%) lesions were reported as malign following postoperative histopathological evaluation (Table II). Tru-cut biopsy findings were found to be consistent with postoperative definitive diagnosis, along with 80% of accuracy. (Kappa agreement coefficient-Percentage of accurate result) In this series, the overall sensitivity, specifity, positive predictive value (PPV) and negative predictive value (NPV) of tru-cut biopsy was 93.5%, 95.4%, 99%, and 75%, respectively. The distribution of postoperative malignant lesions was invasive ductal carcinoma in 85 (75,2%) patients, invasive lobuler carsinoma in 6 (5,3%), insitu ductal carsinoma in 3 (2.6%), mixed tumor in 9 (8%), and other types in 10 (9%). As for benign lesions, there were 11 (40,8%) fibroadenoma, 6 (22,2%) fibrocystic changes, 3 (11,1%) adenosis, 2 (7,4%) radial scar, 1 (3,7%) papillary neoplasia, 1 (3,7%) ADH, 1 (3,7%) pleomorfic adenoma, 1 (3,7%) phyllodes tumor, 1 (3,7%) pseudoangiomatous stromal hyperplasia.

In present study, 71 (50.7%) lesions were located in right breast, and 69 (49.3%) lesions in left. Lesions were most frequently located in upper lateral quadrant (n=54, 38,5%). The most frequent location of malignant lesions was also upper lateral quadrant (n=42, 37.2%) followed by upper medial quadrant (n=32, 28.3%). For benign lesions, similarly upper lateral quadrant was the most common site (n=12, 44,4%) followed by upper medial quadrant (n=7.26%).

Mean size of lesions were measured as 24,37±13,04 by USG and 30,24±17,26 by postoperative pathological examination. Distributions of lesions size ranged from 0 to19 mm were 52 (37,3%) patients, 20 to 49 mm 80 (57%), and ≥50 mm 8 (5,7%) by USG. The ultrasonographic tumor size was significantly smaller in 92 patients (65,7%) and larger in 37 patients (26,4%) than the definitive size achieved by postoperative microscopic examination, and equivalent in 11 patients (7.9%) (Table III). The ultrasonographic tumor size measures were found statistically smaller than sizes reported with postoperative microscopic examination ($p<0.05$).

The lesions which were classified into three groups according to ultrasonographic size were evaluated in terms of preoperative tru-cut biopsy and postoperative histopathological results. Tru-cut biopsy findings found to be consistent with postoperative definitive diagnosis in lesions size ranged from 0 to 19 mm and those from 20 to 49 mm. Percentage of accuracy (Kappa agreement coefficient) was found as 84% for both groups. Additionally this rate was found statistically significant ($p<0.05$). On the other hand, there was low accordance between tru-cut biopsy findings and postoperative definitive diagnosis in lesions > 50 mm sized.

Discussion

An accurate and rapid diagnosis of breast cancer is associated with lower morbidity and mortality rates, and increased long term survival as well [4]. In developed countries, breast lesions are detected at early stages via breast screening programs in asymptomatic women. In contrast, women in developing countries often present with symptomatic breast lesions. This delay is mainly attributed to inadequacy of health care infrastructure, sociocultural barriers, economical reasons and lack of education [13]. Fortunately, increased breast cancer awareness among women and widely utilization of mammography for screening programs have resulted in incremental detection of non palpable breast masses [4].

Statistical data show increasing incidence of early stage breast cancer, recently [2]. Additionally, minimally invasive methods supplanted surgical approach in the course of diagnostic and therapeutic interventions. In surgical biopsies of nonpalpable lesions detected by mammography or ultrasonography, malignancy rate varies from 14% to 38% unsatisfactorily. Therefore, percutan biopsy has

become the procedure of choice for breast lesions, along with well recognized advantages such as greater cost-effectiveness, less scarring, faster recovery, and fewer complications [3]. Additionally it doesn't influence following mammographic examinations [14,15].

The suspicious breast lesions are localized by visualisation methods (USG, MR, stereotactic mammography). USG-guided biopsy requires less tissue sample, furthermore enables a real-time view of the lesion by distinguish main lesion from necrotic and fibrotic tissue, which increasing the rate of diagnostic accuracy [6]. Moreover, it was documented that USG-guided CNB method found to be more sensitive than USG-guided FNA [16]. In a study including 424 breast lesions, sensitivity of USG-guided CNB in the diagnosis of breast carcinoma were 93.2% and 99.2% for nonpalpable and palpable masses, respectively [17]. Lacambra [18] reported the sensitivity, and specifity of tru-cut biopsy as 96% and 99%, respectively. In accordance with the literature, its sensitivity and specifity were 93.5% and 95.4%, respectively in our study. Kulkarni et al. [19] reported its diagnostic accuracy as 95.5% in their study. Supportively, in a retrospective study including 275 lesions, tru-cut biopsy achieved 98% of a diagnostic accuracy and with 100% positive predictive value, and 97% negative predictive value [20]. According to our study, tru-cut biopsy procedure revealed 99%, 75% and 80% of a positive predictive value, negative predictive value and diagnostic accuracy, respectively. Over the 5-year period, Dillon et al. [21] performed 2427 tru-cut biopsies consisted of 1279 ultrasound-guided, 739 clinically guided, and 409 stereotactic-guided. Their results showed that the overall false negative rate was as 6.1%, with specific rates for ultrasound-, clinical-, and stereotactic-guided biopsies were 1.7%, 13%, and 8.9%, respectively. Therefore, researchers stated that USG-guided tru-cut biopsy clearly found to be superior than other methods.

Triple assessment represents clinical, radiological and pathological evaluations and this accordance is important in achieving the higher diagnostic accuracy of tru-cut biopsy. In many trials, the rate of surgical upgrade to malignancy was reported as 15- 20% for suspicious breast lesions with atypia in the case of triple assessment discordance [22]. Therefore, clinicians pay special attention to triple assessment concordance in order to decrease false negativity rates of CNB.

Age is most important and independent risk factor for breast cancer. Aging is associated with a greatly increased incidence of breast lesions [23]. The mean age was found 51.26±15.83 in our study. Malignancy rate was statistically higher in > 45 aged group than < 45 aged group (p=0,006). The possibility of malignant diagnosis was 3,5 times higher in > 45 aged group as well.

Benign and malign breast lesions are most frequently localized in upper lateral quadrant since it contains more glandular tissue than other regions [8]. Similarly in our study lesions were most frequently located in upper lateral quadrant (n=54, 38,5%).

Invasive ductal carcinoma is the most common type of breast cancer, with the incidence of approximately 60-80% [3]. In a study of 424 patients who underwent USG-guided CNB for suspicious breast lesion, the frequency of invasive ductal carcinoma was 80% [17]. Similarly, the most frequent malignant lesion was invasive ductal carcinoma (75,2%) in our study. Schoonjans [17] reported fibroadenoma as the most common benign lesion in their study, with a rate of 40%. Fibrocystic changes and fibroadenoma were detected as major benign lesions in the study of Henderson [23], with 65 % of frequency. Consistently the most frequent benign lesions were fibroadenoma (40,8%) followed by fibrocystic changes (22,2%) in this study.

Precise assessment of the tumor size is another relevant issue. Shoma et al. [24] highlighted that mammography and USG tend to decrease the actual size of lesion, besides clinic examination tends to increase the actual size. They found that ultrasonography was more accurate in assessing breast cancer size. Supportively, Pritt at al. [25] reported that ultrasound significantly decreased the actual size of lesion. Another prospective study evaluated malign lesion sizes by clinical palpation, ultrasonographic and mammographic measurements and found that ultrasonography had better correlation with pathological lesion sizes [26]. Consistent with this results, in 65,7% of our lesions ultrasonographic size was statistically smaller than the definitive size.

In present study, the lesions were classified into three groups in terms of their size and diagnostic accuracy of trucut biopsy was compared in these three groups. CNB results found to be consistent with histopathological results in lesions with size ranged from 0 to 19 mm and those from 20 to 49 mm. On the contrary, tru-cut biopsy findings found to be low discordance with postoperative definitive diagnosis in lesions ≥50 mm sized. The small sample size (only 8 lesions ≥50 mm) should take into consideration on interpretation. It is also our limitation. Further trials should be perform with larger study groups to achieve more assuring results.

In conclusion, at preoperative period tru-cut biopsy is commonly accepted as a preferential diagnostic method for breast lesions with high positive predictive value and low false negativity. Triple assessment accordance which includes clinical, radiological and pathological results also increases its diagnostic accuracy.

Acknowledgements

We would like to thank the staff of the Istanbul Education and Research Hospital, Department of Surgery for their kind help and advice in the course of the present study. The authors declare that there is no conflict of interests.

Riassunto

Scopo dello studio è di confrontare i referti ago bioptici di lesioni mammarie sospette di malignità ed i risultati anatomo-patologici postoperatori, e dunque di determinare efficacia, specificità e sensibilità della metodica. La casistica studiata retrospettivamente si riferisce a 140 pazienti sottoposte ad intervento per tumefazione mammaria precedentemente studiate con ago-niopsia, mettendo a confronto caratteristiche demografiche, referti dell'maging, referti bioptici e risultati isto-patologici.
L'età media delle pazienti era di 51,3 anni (tra 17 e 83). Le neoplasie sono risualtate statisticamente più frequenti nelle donne superiori ai 45 anni. Dai risultati bioptici 103 referti indicavano malignità (73,5%), 32 (23%) benignità, e 5 (3,5%) sospetti. I riscontri istopatologici deinitivi hanno accertato 113 casi di malignità (80,7%) e 27 casi di benignità (19,3%) .
La tecnica dell'ago-biopsia ha dimostrato sensibilità, specificità, valore predittivo positivo e negativo ed accuratezza diagnostica rispettivamente del 93.5%, 95.4%, 99%, 75% e 80%.
Da questi risultati si conferma che la ago-biopsia è accurata, affidabile e di effetto paragonabile al prelievo chirurgico per la diagnosi di cancro della mammella. Il maggior successo può ottenersi con la associazione di un triplice approccio clinico, radiologico ed istopatologico su biopsia tru-cut.

References

1. Moore MA, Eser S, Igisinov N, Igisinov S, Mohagheghi MA, Mousavi- Jarrahi A, et al.: *Cancer epidemiology and control in North-Western and Central Asia past, present and future.* Asian Pac J Cancer Prev, 2010; 11:17-32.

2. T.C. Ministry of Health, Cancer Control Programme and Cancer Statistical in Turkey. (Ed. Gultekin M, Boztas G.) 2014; 618.

3. Moy L, Heller SL, Bailey L, D'Orsi C, DiFlorio RM, Green ED, Holbrook AI, Lee SJ, Lourenco AP, Mainiero MB, Sepulveda KA, Slanetz PJ, Trikha S, Yepes MM, Newell MS: *ACR appropriateness criteria palpable breast masses. expert panel on breast ımaging.* J Am Coll Radiol, 2017; 14:203-24.

4. Aksoy YE, Turfan EÇ, Sert E, Mermer G: *Barriers on breast cancer early detection methods.* J Breast Health, 2015; 11:26-30.

5. Kurita T, Tsuchiya SI, Watarai Y, Yamamoto Y, Harada O, Yanagihara K, et al.: *Roles of fine-needle aspiration and core needle biopsy in the diagnosis of breast cancer.* Breast Cancer, 2012; 19(1):23-29.

6. Bruening W, Schoelles K, Treadwell J, Launders J, Fontanarosa J, Tipton K: *Comparative effectiveness of core needle and open surgical biopsy for the diagnosis of breast lesions.* Rockville, MD: Agency for Healthcare Research and Quality, 2009; 21-70.

7. McMahon AJ, Lutfy AM: *Needle core biopsy of a breast wıth a spring-loaded device.* Br J Surg, 1992; 79:1042.

8. Al-Attar MA, Michell MJ, Ralleigh G, Evans D, Wasan R, Bose S, et al.: *The impact of image guided needle biopsy on the outcome of mammographically detected indeterminate microcalcification.* The Breast, 2006; 15(5), 635-39.

9. Williams RT, Yao K, Stewart AK, Winchester DJ, Turk M, Gorchow A, et al.: *Needle versus excisional biopsy for noninvasive and invasive breast cancer: Report from the National Cancer Data Base, 2003-2008.* Annals of surgical oncology, 2011; 18(13), 3802-810.

10. Aytaç B, Yerci Ö, Şehitoğlu İ, Arici A, Tolunay Ş: *Comparison of fine needle aspiration cytology and biopsy results in 34 patients diagnosed as invasive ductal carcinoma cytologically.* Journal of Uludağ University Medical Faculty, 2010; 36 (1):19-21.

11. Brancato B, Crocetti E, Bianchi S, Catarsi S, Risso GG, Bulgaresi P, et al.: *Accuracy of needle biopsy of breast lesions visible on ultrasound: Audit of fine needle versus core needle biopsy in 3233 consecutive samplings with ascertained outcome.* Breast 2012; 21:449-54.

12. Nassar A: *Core needle biopsy versus fine needle aspiration biopsy in breast. A historical perspective and opportunities in the modern era.* Diagnostic cytopathology, 2011; 39(5), 380-88.

13. Agarwal G, Pradeep PV, Aggarwal V, Yip CH, Cheung PS: *Spectrum of breast cancer in Asian women.* World J Surg, 2007; 31:1031-40.

14. Liberman L: *Percutaneous image-guided core breast biopsy: State of the art at the millenium.* AJR 2000; 174:1191-199.

15. Morrow M, Venta L, Stinson T, Bennet C: *Prospective comparison of stereotactic core biopsy and surgical excision as diagnostic procedures for breast cancer patients.* Ann Surg, 2001; 233:537-41.

16. Damera A, Evans AJ, Cornford EJ, Wilson ARM, Burrell HC, James JJ, et al.: *Diagnosis of axillary nodal metastases by ultrasound-guided core biopsy in primary operable breast cancer.* British Journal of cancer, 2003; 89(7):1310-313.

17. Schoonjans JM, Brem RF: *Fourteen-gauge ultrasonographically guided large-core needle biopsy of breast masses.* Journal of ultrasound in medicine, 2001; 20(9):967-72.

18. Lacambra MD, Lam CC, Mendoza P, Chan SK, Yu AM, Tsang JY, et al.: *Biopsy sampling of breast lesions: comparison of core needle- and vacuum-assisted breast biopsies.* Breast Cancer Res Treat 2012; 132(3):917-23.

19. Kulkarni D, Irvine T, Reyes RJ: *The use of core biopsy imprint cytology in the 'one-stop' breast clinic.* Eur J Surg Oncol, 2009; 35(10):1037-040.

20. Rikabi A, Hussain, S: *Diagnostic usefulness of tru-cut biopsy in the diagnosis of east lesions.* Oman medical Journal, 2013; 28(2):125.

21. Dillon MF, Hill AD, Quinn CM, O'Doherty A, McDermott EW, O'Higgins N: *The accuracy of ultrasound, stereotactic, and clinical core biopsies in the diagnosis of breast cancer, with an analysis of false-negative cases.* Annals of surgery, 2005; 242(5):701-07.

22. Linsk A, Mehta TS, Dialani V, Brook A, Chadashvili T, Houlihan MJ, Sharma R: *Surgical upgrade rate of breast atypia to malignancy: An academic center's experience and validation of a predictive model.* Breast J, 2017.

23. Henderson B, Ross R, Bernstein L: *Estrogen as a cause of human cancer: The Richard and Hinda Rosenthal Award Lecture.* Cancer Res, 1988; 48:246-53.

24. Shoma A, Moutamed A, Ameen M, et al.: *Ultrasound for accurate measurement of invasive breast cancer tumor size.* The breast Journal, 2006; 12(3): 252-56.

25. Pritt B, Ashikaga T, Oppenheimer RG, et al.: *Influence of breast cancer histology on the relationship between ultrasound and pathology tumor size measurements.* Modern pathology, 2004; 17(8):905-10.

26. Dauway EL, Gouliano R, Haddad F, Pendos S, et al.: *Lymphatic mapping in breast cancer.* Hematol Oncol Clin North Am, 1999; 13:350-71.