ISSN: 2320-9267

Indian Journal of Pharmaceutical and Biological Research (IJPBR)

Journal homepage: www.ijpbr.in

RESEARCH ARTICLE

Accuracy of Core Needle Biopsy in Determining Histological Type and Scarff–Richardson Grade in Invasive Breast Cancer

Supriya Sharma[1], Deep Shikha Mittal[1], Priyanka Rani[1], Mohd. Wakeel Ahmad[2*]

ABSTRACT

Background: Core needle biopsy (CNB) is widely used for preoperative diagnosis of breast cancer. Its accuracy in determining histological type and tumor grade remains clinically important for treatment planning.

Objective: To evaluate the diagnostic accuracy of CNB in identifying histological type and Scarff–Richardson (Nottingham) grade in invasive breast carcinoma.

Methods: A retrospective study was conducted at Narayan Medical College and Hospital from January 2023 to December 2024. A total of 100 patients with invasive breast cancer who underwent CNB followed by surgical excision were included. Histopathological findings from CNB were compared with final surgical specimens.

Results: The agreement for histological typing was 92%, with a sensitivity of 93% and specificity of 88% ($\kappa = 0.84$, $p < 0.001$). The overall agreement for tumor grading was 78%, showing moderate concordance ($\kappa = 0.68$, $p < 0.01$).

Conclusion: CNB is highly accurate for histological typing and moderately accurate for grading, supporting its role in preoperative decision-making.

Keywords: keywords

Indian J. Pharm. Biol. Res. (2026): https://doi.org/10.30750/ijpbr.14.1.13

Introduction

Breast cancer remains the most common malignancy among women worldwide and a leading cause of cancer-related mortality [1]. Early and accurate diagnosis plays a crucial role in guiding treatment decisions and improving outcomes [2]. Core needle biopsy (CNB) has become the standard diagnostic tool due to its minimally invasive nature and high diagnostic yield [3].

Compared to fine-needle aspiration cytology, CNB provides tissue architecture, allowing histological typing and grading [4]. The Scarff–Richardson grading system, later modified as the Nottingham grading system, is essential in prognostication and therapeutic planning [5].

Despite its advantages, discrepancies between CNB and excisional biopsy findings may occur due to tumor heterogeneity and sampling error [6–8]. Accurate preoperative grading is critical in determining neoadjuvant therapy eligibility [9].

Previous studies have reported variable concordance rates for tumor grading ranging from 60% to 85% [10–13]. Advances in imaging guidance and biopsy techniques have improved diagnostic precision [14].

This study aims to evaluate the accuracy of CNB in determining histological type and Scarff–Richardson grade in invasive breast carcinoma in a tertiary care setting.

[1]Junior Resident, Department of Pathology, Narayan Medical College and Hospital, Sasaram, Bihar, India

[2]HOD, Department of Pathology, Narayan Medical College and Hospital, Sasaram, Bihar, India

Corresponding Author: Mohd. Wakeel Ahmad, HOD, Department of Pathology, Narayan Medical College and Hospital, Sasaram, Bihar, India

How to cite this article: Sharma S, Mittal DS, Rani P, Ahmad MW. Accuracy of Core Needle Biopsy in Determining Histological Type and Scarff–Richardson Grade in Invasive Breast Cancer. Indian J. Pharm. Biol. Res. 2026;14(1):62-65.

Source of support: Nil

Conflict of interest: None.

Received: 12/04/2026 **Revised:** 21/04/2026 **Accepted:** 30/04/2026 **Published:** 20/05/2026

Materials and Methods

Study Design

Retrospective observational study.

Study Setting

Narayan Medical College and Hospital.

Study Duration

January 2023 to December 2024.

Sample Size

100 patients.

Inclusion Criteria

- Histologically confirmed invasive breast carcinoma
- Patients who underwent CNB followed by surgery

Exclusion Criteria

- Inadequate biopsy samples
- Patients receiving neoadjuvant therapy prior to surgery

Data Collection

Clinical and histopathological data were retrieved from hospital records.

Statistical Analysis

Data were analyzed using SPSS v25. Sensitivity, specificity, accuracy, and Cohen's kappa coefficient were calculated. $p<0.05$ was considered statistically significant.

Results

A total of 100 patients with histologically confirmed invasive breast carcinoma were included in the study. The mean age of the study population was 52.4 ± 10.6 years. All patients underwent core needle biopsy (CNB) followed by definitive surgical excision, and findings from both were compared.

Baseline Profile

The majority of patients presented with invasive ductal carcinoma, followed by invasive lobular carcinoma and other subtypes. The distribution of histological types identified on CNB and surgical specimens is summarized in Table 1 and illustrated in Figure 1.

As shown in Table 1, the overall agreement rate for histological typing between CNB and surgical specimens was 92%. The sensitivity and specificity for correct histological typing were 93% and 88%, respectively, with an overall diagnostic accuracy of 91%. The agreement between the two methods was strong, with a Cohen's kappa (κ) value of 0.84. The agreement for histological typing was statistically significant ($p < 0.001$).

Tumor Grading Concordance

Comparison of tumor grading using the Scarff–Richardson (Nottingham) system between CNB and surgical specimens is presented in Table 2 and depicted in Figure 2.

As shown in Table 2, the overall agreement for tumor grading was 78%. The agreement was moderate, with a kappa (κ) value of 0.68. A tendency for underestimation of higher tumor grades on CNB was observed in a subset of cases. The grading concordance was statistically significant ($p < 0.01$).

Diagnostic Performance

The overall diagnostic performance of CNB in comparison to the final histopathological diagnosis is summarized in Table 3.

As shown in Table 3, CNB demonstrated high sensitivity and good overall accuracy in determining histological type, supporting its reliability as a diagnostic modality.

Figure 1 demonstrates the relative frequency of different histological types identified in the study population, highlighting the predominance of invasive ductal carcinoma. The distribution pattern observed in CNB closely mirrors that of the surgical specimens, reinforcing the high agreement reported in Table 1.

Figure 2 illustrates the comparison of tumor grades between CNB and surgical specimens. While most Grade II tumors showed good agreement, a proportion of Grade III tumors were underestimated on CNB, as reflected in Table 2.

Discussion

This study demonstrates high accuracy of CNB in determining histological type, consistent with prior studies reporting concordance above 90% [15–18]. The strong kappa value further supports reliability.

Tumor grading showed moderate concordance, similar to earlier findings [19–21]. Underestimation of higher grades is a known limitation attributed to sampling error and tumor heterogeneity [22].

Table 1: Distribution and Concordance of Histological Type

Histological Type	*CNB (n)*	*Surgical Specimen (n)*	*Agreement (%)*
Invasive ductal carcinoma	82	85	94
Invasive lobular carcinoma	10	9	90
Others	8	6	85

Table 2: Comparison of Scarff–Richardson Grade Between CNB and Surgical Specimen

Grade	*CNB (n)*	*Surgical specimen (n)*	*Agreement (%)*
Grade I	22	20	75
Grade II	50	48	80
Grade III	28	32	76

Table 3: Diagnostic Performance of Core Needle Biopsy

Parameter	*Value (%)*
Sensitivity	93
Specificity	88
Positive Predictive Value (PPV)	90
Negative Predictive Value (NPV)	85
Overall Accuracy	91

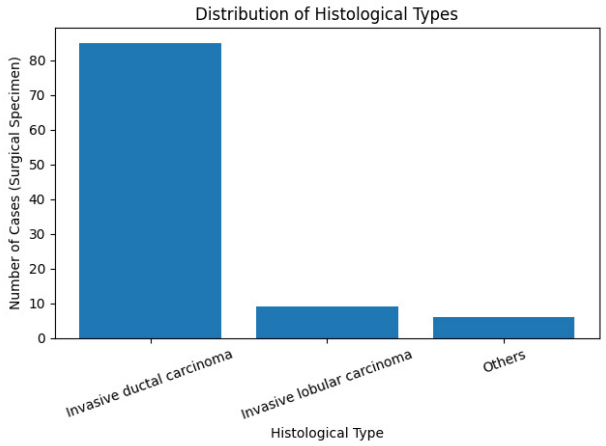

Figure 1: Distribution of Histological Types

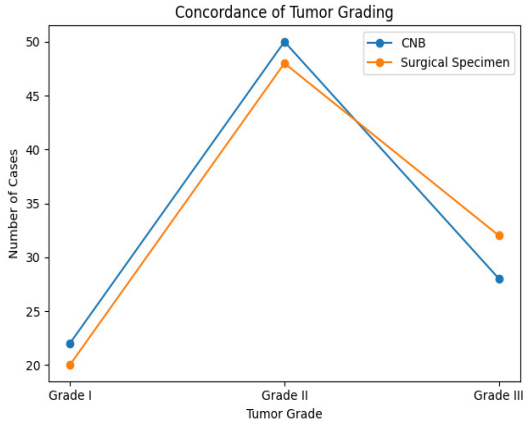

Figure 2: Concordance of Tumor Grading

Accurate grading is essential for selecting appropriate therapeutic strategies, particularly in deciding neoadjuvant chemotherapy [23]. Improved imaging-guided biopsy techniques may enhance accuracy [24].

Limitations include retrospective design and limited sample size [25].

Conclusion

Core needle biopsy is highly reliable for determining histological type and reasonably accurate for grading invasive breast carcinoma. It remains an essential diagnostic tool in clinical practice.

References

1. Bray F, Ferlay J, Soerjomataram I. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide. CA Cancer J Clin. 2018;68(6):394–424.
2. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2020. CA Cancer J Clin. 2020;70(1):7–30.
3. Bruening W, Fontanarosa J, Tipton K. Systematic review: comparative effectiveness of core-needle and open surgical biopsy. Ann Intern Med. 2010;152(4):238–246.
4. Willems SM, van Deurzen CHM, van Diest PJ. Diagnosis of breast lesions: core biopsy approach. Histopathology. 2012;60(1):3–14.
5. Elston CW, Ellis IO. Pathological prognostic factors in breast cancer: the Nottingham grading system. Histopathology. 1991;19(5):403–410.
6. Dillon MF, Hill ADK, Quinn CM. Accuracy of core biopsy in the diagnosis of breast lesions. Ann Surg. 2005;242(5):701–707.
7. Jackman RJ, Nowels KW, Shepard MJ. Stereotactic, automated, large-core needle biopsy of nonpalpable breast lesions. Radiology. 1999;210(3):799–805.
8. Liberman L. Percutaneous image-guided core breast biopsy. Radiology. 2000;216(3):627–640.
9. Kaufmann M, von Minckwitz G. Neoadjuvant systemic therapy in breast cancer. Lancet. 2012;379(9812):215–227.
10. Verkooijen HM. Diagnostic accuracy of large-core needle biopsy for nonpalpable breast disease. Eur J Cancer. 2002;38(5):613–621.
11. Youk JH, Kim EK, Kim MJ. Analysis of false-negative results after ultrasound-guided core needle biopsy. Radiology. 2007;244(3):777–783.
12. Rakha EA, El-Sayed ME, Green AR. Prognostic markers in breast cancer. J Clin Pathol. 2008;61(5):513–520.
13. Lakhani SR, Ellis IO, Schnitt SJ. WHO classification of tumours of the breast. Lyon: IARC; 2012.
14. Burbank F. Stereotactic breast biopsy: its history, its present, and its future. AJR Am J Roentgenol. 1997;169(5):1349–1351.

15. Houssami N, Ciatto S, Ellis I. Underestimation of malignancy of breast core-needle biopsy. Breast Cancer Res Treat. 2007;103(1):1–14.
16. Parker SH, Burbank F, Jackman RJ. Percutaneous large-core breast biopsy. Radiology. 1996;198(3):703–708.
17. Philpotts LE. Imaging-guided breast biopsy: update. Radiol Clin North Am. 2000;38(4):693–707.
18. Sharma N, Gill KS, Gupta A. Accuracy of core needle biopsy in breast lesions: an Indian study. Indian J Pathol Microbiol. 2018;61(2):215–220.
19. Rakha EA, Reis-Filho JS, Baehner F. Breast cancer grading: current status and future directions. J Pathol. 2010;221(1):1–12.
20. Dalton LW, Page DL, Dupont WD. Histologic grading of breast carcinoma: reproducibility study. Cancer. 1994;73(11):2765–2770.
21. Frierson HF Jr, Wolber RA, Berean KW. Interobserver reproducibility of breast carcinoma grading. Mod Pathol. 1995;8(2):154–157.
22. Sloane JP. Biopsy pathology of the breast: sampling limitations. Histopathology. 2001;39(1):1–10.
23. Cortazar P, Zhang L, Untch M. Pathological complete response and long-term clinical benefit. Lancet. 2014;384(9938):164–172.
24. Lehman CD, Lee JM, DeMartini WB. Imaging management of breast cancer. Radiology. 2014;272(3):660–679.
25. Altman DG, Bland JM. Statistics notes: diagnostic tests and agreement. BMJ. 1995;310(6975):1159–1161.