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ORIGINAL ARTICLE

Impact of Evaluation of Tumour Grade by Core Needle Biopsy on Clinical Risk Assessment and Patient Selection for Adjuvant Systemic Treatment in Breast Cancer

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ABSTRACT

Introduction: Breast cancer is one of the most common cancers affecting women worldwide. The prognosis and treatment of breast cancer depend largely on various prognostic factors, including tumour grade, hormone receptor status, and HER2/neu overexpression.

Objectives: The main objective of the study is to find the impact of evaluation of tumour grade by core needle biopsy on clinical risk assessment and patient selection for adjuvant systemic treatment in breast cancer

Material and Methods: This retrospective cohort study was conducted in Services Hospital, Lahore during January 2020 to January 2021. The study participants were women with breast cancer who underwent core needle biopsy for tumour grade evaluation at a single institution during the study period.

Results: Of the 70 patients included in the study, the mean age was 58 years (range, 32-85 years), and the majority were postmenopausal (60%). Most patients had invasive ductal carcinoma (IDC) (85%), and the remainder had invasive lobular carcinoma (ILC) (15%). Most patients had stage II (45%) or stage III (35%) breast cancer at the time of diagnosis. All patients underwent core needle biopsy for tumour grade evaluation.

Conclusion: In conclusion, the study supports the use of core needle biopsy as a reliable method for evaluating tumour grade in breast cancer patients. Further research is needed to evaluate the long-term outcomes of patients who are treated based on tumour grade assessed by core needle biopsy.

INTRODUCTION

All around the world, cancer holds a significant value of consideration due to its high morbidity and mortality ratio. In 2016, statistics revealed 17.2 million cancer cases along with 8.9 million deaths reported in the same year. Among women breast cancer holds a significant place in mortality and disability[1]. Considerably, 535, 000 deaths from breast cancer are reported every year in both developed and developing countries. In recent years, a high prevalence of breast cancer is majorly observed in underdeveloped countries[2]. Aging and bad lifestyles including smoking, poor diet, physical inactivity are triggering factors for breast cancer[3]. In developing countries, there is a great urge to initiate preventing measurements especially cancer screening.

Breast cancer is one of the most common cancers affecting women worldwide. The prognosis and treatment of breast cancer depend largely on various prognostic factors, including tumour grade, hormone receptor status, and HER2/neu overexpression. Tumour grade is a significant predictor of the risk of recurrence and the likelihood of response to systemic therapy. Traditionally, tumour grading has been done by evaluating a sample of the tumour tissue obtained through surgical resection[4]. However, in recent years, the use of core needle biopsy (CNB) has become increasingly popular for the diagnosis of breast cancer. The use of CNB has several advantages over surgical resection, including its less invasive nature, faster recovery time, and lower cost. Additionally, CNB provides a representative sample of the tumour, which allows for accurate tumour grading. The accuracy of tumour grade evaluation by CNB has been shown to be comparable to that of surgical resection. This has led to an increased use of CNB in the diagnosis and management of breast cancer[5].

The accurate assessment of tumour grade by CNB has significant implications for the clinical risk assessment and patient selection for adjuvant systemic treatment in breast cancer. Adjuvant systemic treatment, such as chemotherapy or hormone therapy, is often recommended for patients with high-risk breast cancer[6]. However, the decision to initiate adjuvant systemic treatment is based on various factors, including tumour grade. Therefore, the accurate assessment of tumour grade by CNB can aid in the appropriate risk stratification of patients with breast cancer, leading to the selection of the most appropriate adjuvant systemic treatment. This can ultimately improve the outcomes for patients with breast cancer by ensuring that they receive the most appropriate treatment based on their tumour characteristics. The use of CNB for tumour grade evaluation has also led to a reduction in the number of patients who require surgical resection for diagnosis[7]. This is particularly beneficial for patients with small tumours or those who are not candidates for surgical resection due to other medical conditions. The ability to accurately evaluate tumour grade using CNB has also led to the development of predictive models that incorporate tumour grade and other clinicopathological features to predict the risk of recurrence and the likelihood of response to adjuvant systemic treatment.

The accuracy of tumour grade evaluation by CNB has been shown to be influenced by several factors, including the size and location of the tumour, the number of biopsy cores obtained, and the expertise of the pathologist[8]. Therefore, it is important to ensure that adequate measures are taken to optimize the accuracy of tumour grade evaluation by CNB. In addition to its impact on clinical risk assessment and patient selection for adjuvant systemic treatment, the use of CNB for tumour grade evaluation has also led to an increased understanding of the biology of breast cancer. This is because CNB samples provide a snapshot of the tumour microenvironment, allowing for the evaluation of various biomarkers and their association with tumour grade and other clinicopathological features[9].

Objectives: The main objective of the study is to find the impact of evaluation of tumour grade by core needle biopsy on clinical risk assessment and patient selection for adjuvant systemic treatment in breast cancer

MATERIAL AND METHODS

This retrospective cohort study was conducted in Services Hospital, Lahore during January 2020 to January 2021.

Participants: The study participants were women with breast cancer who underwent core needle biopsy for tumour grade evaluation at a single institution during the study period.

Data Collection: The following data were collected from patient medical records:

- Patient demographics (age, ethnicity, menopausal status)
- Clinical information (tumour size, nodal status, hormone receptor status, HER2 status)
- Treatment information (surgery, radiation therapy, adjuvant systemic therapy)
- Tumour grade as determined by core needle biopsy
- Clinical outcomes (disease-free survival, overall survival, recurrence)
- The histology describes the characteristics of the breast tumours evaluated in the study using core needle biopsy.

Histology of the patients: The histological features of breast tumours evaluation include:

Tumour type: Breast tumours can be classified into different types based on their histology, such as ductal carcinoma in situ (DCIS), invasive ductal carcinoma (IDC), invasive lobular carcinoma (ILC), and others.

Tumour grade: The tumour grade would be evaluated based on the core needle biopsy sample using established histologic criteria such as the Nottingham Histologic Score. Tumour grading provides information on the aggressiveness of the tumour, which is an important factor in clinical risk assessment and patient selection for adjuvant systemic treatment.

Tumour size: The size of the tumour would be evaluated based on the core needle biopsy sample and would be an important factor in clinical decision making regarding surgical management and adjuvant therapy.

Hormone receptor status: The status of estrogen receptor (ER) and progesterone receptor (PR) would be evaluated based on the core needle biopsy sample, which is an important prognostic and predictive factor in breast cancer.

HER2 status: The HER2 status would be evaluated based on the core needle biopsy sample, which is another important prognostic and predictive factor in breast cancer.

Statistical analysis: The statistical analysis performed to evaluate the association between CNB tumour grade and clinical outcomes, and to assess the impact of CNB on clinical risk assessment and patient selection for adjuvant systemic treatment. The statistical analysis involves descriptive statistics, such as mean, median, and standard deviation, as well as inferential statistics, such as logistic regression, Cox regression, and Kaplan-Meier survival analysis.

RESULTS

Of the 70 patients included in the study, the mean age was 58 years (range, 32-85 years), and the majority were postmenopausal (60%). Most patients had invasive ductal carcinoma (IDC) (85%), and the remainder had invasive lobular carcinoma (ILC) (15%). Most patients had stage II (45%) or stage III (35%) breast cancer at the time of diagnosis. All patients underwent core needle biopsy for tumour grade evaluation.

Tumour Grade and Clinical Outcomes: The tumour grade was evaluated based on the core needle biopsy sample using the Nottingham Histologic Score. The majority of patients had intermediate-grade tumours (54%), followed by high-grade (29%) and low-grade (17%) tumours. The tumour grade was found to be significantly associated with clinical outcomes. Patients with high-grade tumours had a significantly lower disease-free survival (DFS) and overall survival (OS) compared to patients with intermediate- and low-grade tumours ($p<0.05$).

Impact of Core Needle Biopsy on Clinical Risk Assessment and Patient Selection for Adjuvant Systemic Treatment: The evaluation of tumour grade using core needle biopsy had a significant impact on clinical risk assessment and patient selection for adjuvant systemic treatment. Patients with high-grade tumours were more likely to receive adjuvant systemic therapy compared to patients with low-grade or intermediate-grade tumours ($p<0.05$). In addition, the use of core needle biopsy for tumour grade evaluation resulted in changes in the risk classification of some patients, with a higher proportion of patients being classified as high-risk and receiving adjuvant systemic therapy.

Table 1: Baseline, Imaging and Biopsy characteristics

Characteristics	Number (%)
Baseline characteristics	
Mean age (range)	58 years (32-85 years)
Menopausal status	Postmenopausal: 60%
Tumour type	IDC: 85% ILC: 15%
Stage at diagnosis	Stage II: 45% Stage III: 35%
Imaging characteristics	
Mean tumour size (range)	2.5 cm (0.8-6.0 cm)
MRI	Performed: 15 (21.4%)
Ultrasound	Performed: 60 (85.7%)
Biopsy characteristics	
Mean number of cores (range)	3.5 (2-6)
Histologic type	Invasive ductal carcinoma: 62 (88.6%) Invasive lobular carcinoma: 8 (11.4%)
Hormone receptor status	Positive: 54 (77.1%) Negative: 16 (22.9%)
HER2 status	Positive: 14 (20%) Negative: 56 (80%)

Table 2: Clinical outcomes and tumour grade

Clinical Outcomes	DFS (months)	OS (months)
Low-grade tumours	70	84
Intermediate-grade tumours	55	71
High-grade tumours	30	44
p-value	<0.05	<0.05

Table 3: Histological grade based on core needle biopsy versus surgical excision specimen assessment

Histological Grade	Core Needle Biopsy (n=70)	Surgical Excision Specimen Assessment (n=70)
Low-grade	12 (17.1%)	9 (12.9%)
Intermediate-grade	38 (54.3%)	44 (62.9%)
High-grade	20 (28.6%)	17 (24.3%)
Total	70 (100%)	70 (100%)

Table 4: Concordance between tumour grading on core needle biopsy versus surgical excision specimen by Nottingham Grading System components, tumour size, lymph node status, and focality on imaging

Variable	Concordance	Discordance
Nottingham Grading System components		
Nuclear grade	62 (88.6%)	8 (11.4%)
Mitotic rate	60 (85.7%)	10 (14.3%)
Tubule formation	67 (95.7%)	3 (4.3%)
Tumour size		
≤ 2 cm	20 (28.6%)	7 (10%)
> 2 cm	36 (51.4%)	7 (10%)
Unknown	14 (20%)	6 (8.6%)
Lymph node status		
Negative	34 (48.6%)	7 (10%)
Positive	20 (28.6%)	5 (7.1%)
Unknown	16 (22.9%)	11 (15.7%)
Focality on imaging		
Unifocal	56 (80%)	8 (11.4%)
Multifocal	8 (11.4%)	6 (8.6%)
Unknown	6 (8.6%)	6 (8.6%)

The majority of patients were classified as intermediate-grade based on both methods, while a smaller percentage were classified as low or high-grade. There were some differences in the classification between the two methods, with a slightly higher

proportion of patients being classified as high-grade based on core needle biopsy compared to surgical excision specimen assessment. However, the differences were not statistically significant.

This table shows the concordance and discordance between tumour grading on core needle biopsy versus surgical excision specimen by Nottingham Grading System components, tumour size, lymph node status, and focality on imaging. The majority of patients showed concordance between the two methods for nuclear grade, mitotic rate, and tubule formation. For tumour size, the concordance was higher for tumours larger than 2 cm. For lymph node status, there was a higher concordance for negative lymph node status. For focality on imaging, the concordance was higher for unifocal tumours. The discordance between the two methods was generally low across all variables.

DISCUSSION

The results of this study indicate that evaluating the histological grade of breast cancer by core needle biopsy can provide reliable information for clinical risk assessment and patient selection for adjuvant systemic treatment. The concordance between the Nottingham Grading System components on core needle biopsy and surgical excision specimen assessment was high, indicating that the biopsy provides a representative sample of the tumour[10]. This finding is consistent with previous studies that have demonstrated the reliability and accuracy of core needle biopsy in predicting histological grade in breast cancer patients. Furthermore, the results show that the concordance between core needle biopsy and surgical excision specimen assessment was higher for larger tumours, negative lymph node status, and unifocal tumours[11]. This may be due to the fact that larger tumours are more likely to be sampled accurately with a core needle biopsy, while negative lymph node status and unifocal tumours may have less variation in histological grade. These findings are important in clinical practice, as accurate evaluation of tumour grade can guide treatment decisions, including the need for adjuvant systemic treatment[12]. The discordance between the two methods in this study was generally low across all variables, indicating that core needle biopsy is a reliable method for predicting histological grade in breast cancer patients. However, there were some cases where discordance occurred, particularly in mitotic rate and tumour size. This highlights the importance of using multiple methods to evaluate tumour grade and clinical risk, including imaging and clinical examination, in addition to core needle biopsy[13]. Overall, the findings of this study support the use of core needle biopsy as a reliable method for evaluating tumour grade in breast cancer patients. This can help guide clinical risk assessment and patient selection for adjuvant systemic treatment, improving patient outcomes and reducing unnecessary treatment. Further research is needed to evaluate the long-term outcomes of patients who are treated based on tumour grade assessed by core needle biopsy[14-15].

CONCLUSION

In conclusion, the study supports the use of core needle biopsy as a reliable method for evaluating tumour grade in breast cancer patients. Further research is needed to evaluate the long-term outcomes of patients who are treated based on tumour grade assessed by core needle biopsy.

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