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Pathology

ROLE OF TRU-CUT BIOPSY IN DIAGNOSIS OF BREAST LESIONS

Dr. Yukti Shah Consultant Pathologist, Department of Pathology, HCG Cancer Centre, Ahmedabad.

Dr.Misha Antani* Senior Resident, Department of Pathology, SVP Institute of Medical Sciences, Ahmedabad. *Corresponding Author

ABSTRACT

Background: Tru-cut needle biopsy is a well-tolerated and reliable procedure for providing tissue diagnosis of malignancy before definitive treatment and avoiding the need for excision biopsy of lesions for which there is a low index of suspicion for malignancy. Breast cancer still represents the leading tumor among women and the incidence of the disease is rising all over the world[1].Tru-cut biopsy is the first preferred procedure for the diagnosis of breast lesions prior to operation[2].

Aim:

- To evaluate the frequency of breast lesions in different age groups and to correlate them with clinical parameters.
- To study various histopathological patterns in breast lesions by Tru-cut biopsy, categorize them as per standard criteria and to render the specific diagnosis whenever possible.
- To correlate the Tru-cut biopsy results with the final excision biopsy specimens' diagnoses whenever available.
- To find out the accuracy of Tru-cut biopsy technique, so as to establish the utility and effectiveness of Tru-cut biopsy in the diagnosis of breast lesions.

Method: The hospital based observational analytical study has been carried out retrospectively and prospectively on tru-cut biopsy specimens. Sections were studied histomorphologically and categorised as per standard criteria Each tru-cut biopsy (TCB) result was correlated with the final diagnoses of post-surgical histopathology specimens whenever available.

Result: Tru-cut biopsy is an easy, cost-effective, safe and accurate alternative in diagnosing breast lesions with accuracy. It is also superior in terms of safety, hospital stay, costs, postoperative pain and complications. The tumor type and grade obtained on TCB are highly correlated with subsequent post-surgical histopathology results. The use of TCB also lessens the propensity of complicated surgical procedures and minimises patient stress

KEYWORDS :

INTRODUCTION:

Tru-cut needle biopsy is a well-tolerated and reliable procedure for providing tissue diagnosis of malignancy before definitive treatment and avoiding the need for excision biopsy of lesions for which there is a low index of suspicion for malignancy. The lesion is usually a swelling or thickened area. It may be a suspicious area on an ultrasound scan. The procedure is performed using a specially designed needle. It can be used on majority of the organs as a diagnostic procedure.

Breast cancer still represents the leading tumor among women and the incidence of the disease is rising all over the world[1]. The emergence of the Tru-cut biopsy in the recent years has led a plenty of surgeons to switch to it because it supplies enough tissue for pathologists to establish a correct histological assessments. It is the first preferred procedure for the diagnosis of breast lesions prior to operation[2]. Tru-cut biopsy also provides adequate tissue for the evaluation of immunohistochemistry and molecular markers.

The new concept in breast cancer diagnosis and treatment is based on a less invasive, more accurate and effective strategy, with a multidisciplinary approach in a specialised breast unit.

For small non-palpable lesions detected in screening programs, Tru-cut biopsy has replaced FNA because sample insufficiency is rare for Tru-cut biopsy even for these lesions.[3,4,5,6,7,8,9] . For malignant lesions cancer surgery can be done in a single session.[9,6,10]

MATERIALS AND METHOD:

STUDY DESIGN: Observational Study

METHOD:

The hospital based observational analytical study has been carried out retrospectively and prospectively on tru-cut biopsy specimens to understand its role in the diagnosis of breast lesions. The study included 82 cases of Tru-cut biopsy specimens received in the Department of Pathology, V.S.General Hospital from January 2018 to July 2020.

I) Inclusion Criteria: All tru-cut biopsies

II) Exclusion Criteria: Poorly preserved tru-cut biopsies

Biopsy cores were measured, grossly examined and fixed in 10% Formalin.

The tissues were processed by routine paraffin embedding method. Multiple sections were obtained from paraffin blocks and stained with hematoxylin and eosin.

Sections were studied histomorphologically and categorised as per standard criteria.[11,12]

Each tru-cut biopsy (TCB) result was correlated with the final diagnoses of post-surgical histopathology specimens whenever available.

- **Method of Obtaining TCB[13]:**

The principle is simple. A needle with a gap near its tip is passed into the lesion. A surrounding sheath with a cutting tip is passed down the needle. The sheath cuts a specimen corresponding to the gap in the needle. The needle and sheath, with the specimen, are then removed from the patient. The success rate is user dependent. With a correct technique and attention to detail, the clinician can provide satisfactory tissue samples easily and consistently.

OBSERVATION & RESULTS:

A total of 82 cases of tru-cut biopsy specimens of breast lesions were studied during the period from January 2017 to September 2019 at Sheth V.S. General Hospital.

The patients presented with variable symptoms.

The age range of study group was from 16 years to 75 years, with a mean age of 45.5 years. The maximum number of cases were seen in 4th and 5th decade with 28.04% and 26.82% respectively.

Out of 82 cases, the malignant lesions were predominantly observed in 5th & 6th decades; while majority of benign breast lesions were observed in the 3rd & 4th decades.

Table 1: Histopathological diagnoses reported on Tru-cut biopsy

CATEGORY	No of cases(100 %), n=82	Specific diagnosis	No of cases (%)
(1) B1:Normal/Inadequate	7(8.59%)	-	-
(2) B2:Benign	30(36.58%)	Fibroadenoma	14(21.21%)

		Benign Proliferative Breast Lesion		03(4.54%)
		Inflammatory lesions	Acute/Chronic mastitis (n=11)	13(19.69%)
			Granulomatous mastitis (n=2)	
(3) B3:Uncertain malignant potential	03 (4.87%)	Chronic Active Inflammation with Degenerative Atypical Cells (n = 1)		01(1.51%)
		Phyllodes Tumor (n=2)		02(3.03%)
(4) B4: Suspicious of malignancy	03 (4.87%)	Possibility of Invasive Breast Carcinoma		03(4.54%)
(5) B5:Malignant	39(46.34 %)	In situ comedo carcinoma		01(1.51%)
		Invasive ductal carcinoma		37(56.06%)
		Squamous Cell Carcinoma (Metaplastic Carcinoma)		01(1.51%)

Out of total 82 cases of TCBs, post-surgical histopathological correlation was obtained in 66 cases. Cases reported to be B1 category on TCBs were excluded for comparison purpose. The diagnostic comparison and category wise comparison of TCB and post-surgical histopathology studies were depicted in following table.

Table 2: Correlation of diagnosis on Tcb & post-surgical histopathology

Diagnosis on TCB ↓	**HISTOPATHOLOGICAL DIAGNOSIS →**				
	Inflammatory (Acute/Chronic/Granulomatous Mastitis)	**Fibroadenoma**	**Phyllodes Tumor**	**Invasive Ductal Carcinoma**	**Metaplastic Carcinoma (Squamous Cell Carcinoma)**
Inflammatory (Acute/Chronic/Granulomatous Mastitis)	07				
Fibroadenoma		14			
Phyllodes Tumor			02		
Chronic Active Inflammation with Degenerative Atypical	01				
Possibility of Invasive Ductal Carcinoma				03	
In-situ Comedo Carcinoma				01	
Invasive Ductal Carcinoma				37	
Metaplastic Carcinoma (Squamous Cell Carcinoma)					01

Table 3: Comparative analysis of TCBs and postsurgical histopathology results

TCB		**Histopathological study of post surgical specimens**		**TP**	**TN**	**FP**	**FN**
CATEGORY	**Number of cases**	**Benign**	**Malignant**				
B1:Normal/Inadequate**	7	-	-	-	-	-	-
B2:Benign	21	21	-	00	21	00	00
B3:Uncertain Malignant Potential	3	3	-	00	03	00	00
B4:Suspicious of Malignancy	03	-	03	00	00	00	03
B5:Malignant	39	-	39	39	00	00	00
Total	**66**	**24**	**42**	**39 (59.09%)**	**24 (36.36%)**	**00 (00%)**	**03 (4.54%)**

(TP- True Positive, TN – True Negative, FP- False Positive, FN – False Negative)

Of 66 cases, 39 cases which were diagnosed as malignant on TCB, were diagnosed as malignant on post-surgical histopathological examination. The 21 cases which were categorised as benign(B2) on TCB were found to be benign. Out of 3 cases of uncertain malignant potential category (B3), 1 of them was given the diagnosis of chronic active mastitis and 2 were confirmed to be phyllodes tumor. 3 cases which fell into suspicious malignant category (B4) on TCB were found to be malignant. 1 case which was diagnosed as in-situ comedo carcinoma on TCB was diagnosed as invasive ductal carcinoma

The statistical analysis showed the following results:

- Sensitivity: 92.86%
- Specificity: 100%
- Positive Predictive Value: 100%
- Negative Predictive Value: 88.89%
- Overall Diagnostic Accuracy: 95.45%

On Correlation of tumor grades between tru-cut biopsy and post-surgical specimens 84.61% agreement with overall grade between TCB and post-surgical specimens. Only 76.92% of grade II carcinomas showed concordance, whilst 100% of grade I and grade III showed agreement between core biopsy and excision biopsy results respectively.

DISCUSSION

In this observational study, 82 breast tru-cut biopsies received in V.S general hospital during the period from June 2018 to September 2020 were analysed.

The tru-cut biopsies of 82 female patients who presented with clinically palpable breast lump were studied and compared with post-surgical specimen diagnoses whenever available.

In the current study, age distribution ranged from 16 to 75 years (mean age 45.5 years). Breast lesions were predominantly observed in 4th decade with benign lesions in 3rd and 4th decade and malignant lesions in 5th and 6th decade. The age distribution for benign breast lesions ranged from 23 to 51 years (mean age 32.37 years). The age distribution of malignant breast lesions ranged from 34 to 76 years (mean age 50.74 years). In the study done by A. Khenka et al[13], the age range was 14 to 61 years with mean age being 37.5 years. Peak incidence for the benign lesion was observed in 2nd and 3rd decade and that for malignant lesions was noted above the age of 40 years with the peak incidence in between 40 – 44 years. Studies by Homesh et al,[14] Tiwari,[15] and Ghimire et al[16] showed similar age patterns.

Out of 82 TCBs in the present study, 39 cases fell into the B5 (Malignant category) followed by 30 cases in the B2 category. 7 cases were noted in B1, (Normal/Inadequate) category. This might be due to not obtaining breast parenchymal cells and obtaining only fibroadipose stroma in received specimens. Cases of categories B3(Uncertain malignant potential) & B4 (Suspicious of Malignancy) are considered in grey zone as they may pose problem & they frequently give most false results. In our study, 7 cases were reported in Uncertain Malignant Potential category (category-B3). 2 of them were given the diagnosis of possibility of phyllodes tumor. 1 out of the three was due to the presence of degenerative atypical cells along with chronic mastitis. However, due to limited sampling it was not possible to render confirmed benign diagnosis on TCB. These cases finally proved to be phyllodes tumor and chronic active mastitis in final excision specimen. 3 cases which fell into suspicious malignant category (Category-B4) on TCB, proved to be invasive ductal carcinoma on post-surgical specimen. Again, due to limited sampling they were diagnosed as suspicious malignant lesions on TCBs. All malignant categorized lesions (Category-B5) were diagnosed as malignant lesions on final excision specimens. Thus, limited sampling is the principal cause of false results on TCBs. Sometimes, crushing artefacts may also pose problem in reporting TCBs as they distort the cell morphology. A study by Francisco Javier Andreu[17] reported the categories of Tru-cut biopsies such as B5 category (37.1%) followed by B2 (50.9%), B4 (0.5%), B3(7.6%) and B1 (3.9%).

The current study showed 92.86% sensitivity, 100% specificity, 100% positive predictive value and 88.89% negative predictive value. The overall diagnostic accuracy was 95.45%. In majority of the studies including ours, specificity is higher as compared to sensitivity. This suggests that, the rate of true negative results is high with low false positive results.

Most authors have reported results for Sensitivity, Specificity, PPV & NPV that are comparable to our findings.

Table 4: Comparative analysis of results between the current study and various studies:

Authors	Year	No. of Cases	Sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy
Present Study	2019	82	92.86%	100%	100%	88.89%	95.45%
Dobromir et al[23].	2016	79	98.67%	100%	100%	80%	98.73%
Lacambra et al.[18]	2011	464	96%	99%	99%	94%	-
Ahmed et al.[19]	2010	80	94.64%	91.3%	-	-	94.87%
Brunner et al.[20]	2009	120	95%	100%	100%	90%	-
Kulkarni et al.[21]	2009	819	97.7%	94.2%	93.1%	98.1%	95.5%
Homesh et al.[22]	2005	296	92.3%	94.8%	100%	100%	93.4%

The concordance rate between TCBs & final excision specimen reports shows 84.61% agreement with overall grade between TCB and post-surgical specimens. The concordance rate observed for grade 2 is 76.92%, while that for grade-1 and grade-3 carcinomas was 100% each. Gavin C. Harris[24] et al noted 67% overall agreement with tumour grade. In the study of Gavin C. Harris et al, only 60% of grade-1 & grade-2 carcinomas showed concordance while 84% of grade-3 carcinomas showed agreement between the core & excision results. These findings well correlated with our results.

CONCLUSION

Tru-cut biopsy is an easy, cost-effective, safe and accurate alternative in diagnosing breast lesions with accuracy. It is also superior in terms of safety, hospital stay, costs, postoperative pain and complications. The tumor type and grade obtained on TCB are highly correlated with subsequent post-surgical histopathology results. The use of TCB also lessens the propensity of complicated surgical procedures and minimises patient stress. It has a few limitations such as inadequacy, non-representative samples and crushing artefacts; but it proves to be an essential part of management for palpable breast lesions that can guide surgeons. Therefore, it is proposed that TCB is an accurate alternative for the preoperative diagnosis of breast lesions.

Thus, we recommend Tru-cut biopsy is extremely useful investigation for breast lesions.

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