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Original Article

Diagnostic Utility of Touch Imprint Cytology of Image Guided Core Needle Biopsy

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Abstract

Background

Touch imprint cytology of image guided core needle biopsy implies gentle rolling of core needle biopsy obtained with the aid of imaging modality from various organs. The aim of the study was to measure the diagnostic accuracy of touch imprint cytology of image guided core needle biopsy in comparison to histopathological diagnosis.

Materials and Methods

A prospective descriptive cross-sectional study was conducted among 47 touch imprint cytology of image guided core needle biopsy in the department of pathology of a tertiary care centre between 1st October 2021 to 30th September 2022 after receiving ethical approval from the institutional review committee. The Papanicolaou and Giemsa-stained slides of touch imprint smear and haematoxylin - eosin-stained slides of core needle biopsy was analysed for adequacy and categorization as non-neoplastic, benign, atypical and malignant. Convenience sampling was done.

Results

The most frequent site of image guided core needle biopsy was lung (40.4%). The adequacy rate of touch imprint cytology of image guided core needle biopsy was 85.1%. Among 40 cases of adequate touch imprint smear, 28 cases (70%) were categorized as malignant. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of touch imprint cytology for categorizing a malignant lesion was 91.18%, 95.45%, 96.88%, 87.5% and 92.86% respectively.

Conclusion

The touch imprint cytology of image guided core needle biopsy is a useful modality for the rapid preliminary diagnosis of lesions of various organs with decreased turnaround time for diagnostic workup and ancillary studies.

Keywords: *Core needle biopsy, Cytology, Malignant*

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Introduction

Touch imprint cytology (TIC) of image guided core needle biopsy (CNB) implies gentle rolling of CNB obtained with the aid of imaging modality from various organs against glass slides to acquire an imprint smear. The method provides a rapid preliminary diagnosis and assess to early planning of ancillary studies required for patient management [1, 2].

The CNB sample should run through a long process of tissue processing resulting in the histopathological diagnosis in the same day practically unfeasible. The constraint availability of resources due to huge difference in the capacity of tissue processer and the number of samples received in the histopathology laboratory further increases the delay. This leads to unnecessary apprehension among patients and delay in definitive workup and treatment of patients. As TIC provided rapid diagnosis of lesions of various organs, this modality has been recently implemented at our centre to decrease the delay in diagnosis and treatment of patients [3, 4].

Thus, the present study was undertaken with an objective to measure the diagnostic accuracy of TIC of image guided CNB in comparison to histopathological diagnosis.

Materials and Methods

This is a prospective descriptive cross-sectional study conducted in the Department of Pathology of B.P. Koirala Institute of Health Sciences between 1st October 2021 to 30th September 2022 after receiving ethical approval from the Institutional Review Committee of B.P. Koirala Institute of Health Sciences (Reference number: IRC/2162/021). All the patients with lesions of any organ where touch imprint cytology of image guided core needle biopsy have been performed was included in the study. The patient unwilling to give consent was excluded from the study.

Convenience sampling was done. The sample size was calculated using the formula,$n = [Z^2 Sen \times (1-Sen)]/d^2$where, n = sample size, Z= 1.96 at 95% Confidence Interval (CI), Sen= 80% (sensitivity taken from published literature) [1], d = 20% of Sen= 16%, resulting in n = 24.01, approximately 25. Now, adding 20% to calculated sample size to reduce bias, the minimum required sample size was calculated as 30. However, a sample size of 47 was taken for the study.

The Papanicolaou and Giemsa-stained slides of TIC smear and haematoxylin and eosin-stained slides of CNB was analysed. The pathologist analysing the imprint cytology was blinded with the CNB diagnosis and vice versa. The imprint cytology smears were considered adequate when TIC slides contained sufficient cells of materials with cytomorphological features compatible with clinical or radiologic findings [4]. The categorical diagnosis nonneoplastic, benign, atypical and malignant and definite diagnosis, wherever possible was given in both imprint cytology and CNB.

Data were entered and analysed using Statistical Package for the Social Sciences (SPSS) version 22.0. Percentage was calculated for categorical data and mean, standard deviation, minimum and maximum values were calculated for numerical data. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of TIC of CNB was calculated.

Results

A total of 47 cases of touch imprint cytology of image guided core needle biopsy was studied. The mean age of the patients was found to be 55.53±18.864 years (13-89). Among 47 patients 61.7% (29 cases) were female and 38.3% (18 cases) were male. The most frequent site of image guided core needle biopsy was lung (40.4%) (Table 1).

Table 1: Distribution of cases according to site (n=47)

Site	n (%)
Lung	19 (40.4%)
Liver	8 (17.0%)
Pleura	3 (6.4%)
Retroperitoneal mass	2 (4.3%)
Mediastinum	4 (8.5%)
Ovary	4 (8.5%)
Bone	3 (6.4%)
Lymph node	2 (4.3%)
Kidney	1 (2.1%)
Omentum	1 (2.1%)

The adequacy rate of TIC of image guided CNB was 85.1% with 40 cases among 47 cases having adequate material in cytology smear for diagnosis. Among 40 cases of adequate TIC smear, 28 cases (70%) were categorized as malignant (Table 2).

Table 2: Cytological categorization of TIC smear (n=40)

Cytological category	n (%)
Non neoplastic	5 (12.5%)
Benign	1 (2.5%)
Atypical	6 (15.0%)
Malignant	28 (70.0%)

In contrast to TIC, 43 cases (91.5%) of CNB were diagnostic. Among 43 cases, 33 cases (76.7%)

were categorized as malignant in histopathology. (Table 3)

Table 3: Histopathological categorization of CNB (n=43)

Histopathological category	n (%)
Non neoplastic	8 (18.6%)
Benign	1 (2.3%)
Atypical	1 (2.3%)
Malignant	33 (76.7%)

Among 7 cases of TIC with inadequate material in cytology smears, 2 cases were diagnosed as Squamous cell carcinoma in CNB, 1 case was diagnosed as granulomatous lesion and 4 cases were inadequate even in CNB.

The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of TIC for categorizing a malignant lesion was 91.18%, 95.45%, 96.88%, 87.5% and 92.86% respectively.

Among the 28 cases under malignant category in TIC, definite cytological diagnosis could be rendered in 26 cases. Definite cytological diagnosis of one case of CNB from lung and one case of CNB from ovary was not possible. One of the lesions from mediastinum was diagnosed as Round cell tumor in TIC with differential diagnosis of Small cell carcinoma and Desmoplastic Small Round cell tumor, which was later diagnosed as Small cell carcinoma in CNB (Table 4).

Table 4: Detail of cases under malignant category in TIC

Diagnosis by TIC	Site and No of cases (n)
Metastatic deposit of carcinoma	Retroperitoneal mass (1), Liver (4)
Non-Small cell carcinoma	Lung (3)
Adenocarcinoma	Lung (1)
Adrenocortical carcinoma	Liver (1)
Squamous cell carcinoma	Lung (8), Vertebrae (1)
Hepatocellular carcinoma	Liver (2)
Osteosarcoma	Tibia (1), Femur (1)
Renal cell carcinoma	Kidney (1)
Thymoma	Mediastinum (1)
Round cell tumor	Mediastinum (1)

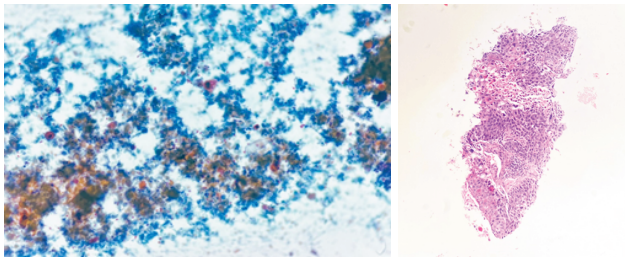

Figure 1: Squamous cell carcinoma of lung (a) Papanicolaou stain of TIC (200x) (b) Hematoxylin and eosin stain of CNB (200x)

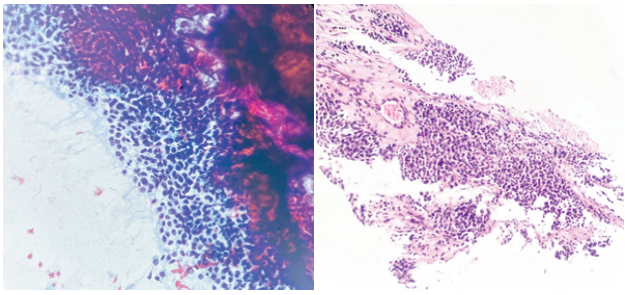

Figure 2: Round cell tumor of mediastinum diagnosed as small cell carcinoma in CNB (a) Papanicolaou stain of TIC (200x) (b) Hematoxylin and eosin stain of CNB (200x)

Discussion

The adequacy rate of TIC of image guided CNB was 85.1% with 70% cases categorized as malignant. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of TIC for categorizing a malignant lesion was 91.18%, 95.45%, 96.88%, 87.5% and 92.86% respectively. Core needle biopsy (CNB) is a minimally invasive, well- approved, inexpensive method of tissue sampling for pre-treatment diagnosis of lesions of various organ system. Image guided CNB takes the aid of various imaging techniques like ultrasonography, computed tomography (CT) or magnetic resonance imaging (MRI) for guiding needles to obtain tissue samples. The tissue sample obtained after CNB should run through a process of tissue fixation, processing, embedding, microtomy and staining in histopathology laboratory before reporting by the pathologist. This long process of tissue processing results in the histopathological diagnosis in the same day practically unfeasible [3, 4].

Cytology has emerged has a valuable diagnostic tool and a supplement to histopathology. With the aid of Fine needle aspiration cytology (FNAC), the diagnosis of lesions of various organ systems can be rapid, however FNAC is less sensitive and specific compared to CNB. The materials obtained for diagnosis is more in CNB compared to FNAC. The difficulty of FNAC of deep-seated lesions, risk of needle tract seeding and dissemination in some tumors and operator dependence confers another drawback of FNAC [3 – 7]. Various studies have highlighted the value of TIC performed on CNB of lesions of organs like prostate, breast, lungs in terms of adequacy and diagnostic yield. The studies have shown supportive role of TIC in diagnosis of gastrointestinal, lung, lymph node and bone marrow tumours and identifying sentinel lymph node metastasis in breast carcinoma. The role of TIC in the lymph node and bone marrow biopsy has already been established. The method provides a rapid preliminary

diagnosis and allows access to early planning of ancillary studies required for patient management with decreased turnaround time [1, 2, 6, 8, 9].

In our study, the most frequent site of TIC of CNB was lung followed by liver, which is similar to a study done in USA. As early determination of primary and secondary malignancies in these sites and planning of treatment modality is quite important, these sites may be the preferred sites for CNB [1]. In our study, 85.1% of TIC had adequate material in cytology smear for diagnosis and 14.9% were deemed non diagnostic. The non-diagnostic rate of TIC was slightly higher in our study than the similar studies done in USA and almost similar to a study done in breast lesions in Germany and UK. The inadequate sample in our study were mainly of low or absent cellularity and some showed extensive drying artefact, thick smear and poor staining quality. The extensive drying artefact and thick smear could be minimized by good operator skill in making the TIC smear and proper staining method. This involves employing accurate methods in touch imprint preparation. Among 7 non diagnostic cases in TIC, 4 cases were also inadequate in CNB. However, 2 cases were diagnosed as Squamous Cell Carcinoma in CNB. In contrast to our study, inadequate TIC smears were found more often in benign lesion in a study done in Germany [1 – 3, 6, 10, 11]. There might be an argument of obscuring cellular detail of CNB because of rolling the tissue in the slide. However, we did not observe any artefact and alteration of cellular detail in CNB after performing TIC. Similar experience has been shared in a study done in breast lesion in UK. The operator performing the TIC should handle the CNB with great precaution to not alter the cellular morphology due to the importance of both TIC smear and CNB specimen in final diagnosis [1, 6, 12].

Cytologically 70% cases of TIC were categorized as malignant. The exact cytological diagnosis could be rendered in all the TIC from bone, and mediastinum. In lung, we could not give definite diagnosis in all the cases and could categorise only as non-small cell carcinoma. Similarly in liver, we could not give the definite opinion regarding primary origin of tumor in metastatic deposit of carcinoma. However, the preliminary diagnosis was helpful for quick diagnostic workup of the patient until the dispatch of the final histopathology report. The distinction between non-small cell carcinoma and small cell carcinoma of lung is quite important therapeutically as well. Regarding kidney, the definite variant of renal cell carcinoma could not be assigned both in TIC and CNB [11]. In our study, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of TIC for categorizing a malignant lesion was 91.18%, 95.45%, 96.88%, 87.5% and 92.86% respectively. Our findings are comparable to different studies done in UK, Germany, USA, Kuwait, Taiwan and India [1 – 3, 6, 9 – 11, 13 – 17].

The TIC smear of CNB in our study was made by the radiologist involved in the CNB procedure. The smear was evaluated by the pathologist in the cytopathology laboratory. The onsite evaluation of the smear was not possible in our setting due to constraint availability of resources and manpower. Various studies have depicted the usefulness of onsite evaluation of TIC cytology smear for assessment of adequacy of CNB and number of passes required and minimising the need of repeated procedure [1, 2].

The limitation of our study was that the majority of TIC of image guided CNB was from lung, thus compromising the evaluation of diagnostic utility of TIC of other organs. Onsite evaluation of TIC cytology smear was also not possible in our setting, minimising its adequacy rate.

Conclusion

The TIC of image guided CNB is a useful modality for the rapid preliminary diagnosis of lesions of various organs with decreased turnaround time for diagnostic workup and ancillary studies.

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Conflict of interest: None

References

[1] Kubik MJ, Bovbel A, Goli H, Saremian J, Siddiqi A, Masood S, Diagnostic value and accuracy of imprint cytology evaluation during image-guided core needle biopsies: Review of our experience at a large academic center, Diagn Cytopathol. 43:10 (2015) 773–9. PMID: 26119885. DOI:10.1002/dc.23300.

[2] Masood S, Feng D, Tutuncuoglu O, Fischer G, Bakhshandeh M, Bertholf RL, et al, Diagnostic Value of Imprint Cytology During Image-Guided Core Biopsy in Improving Breast Health Care, Ann Clin Lab Sci. 41:1 (2011) 8–13. PMID: 21325248

[3] Kehl S, Mechler C, Menton S, Weiss C, Wasgindt S, Sütterlin M, et al, Touch imprint cytology of core needle biopsy specimens for the breast and quick stain procedure for immediate diagnosis, Anticancer Res. 34:1 (2014) 153–7. PMID: 24403456

[4] Li Z, Tonkovich D, Shen R, Impact of touch imprint cytology on imaging-guided core needle biopsies: An experience from a large academic medical center laboratory, Diagn Cytopathol. 44:2 (2016) 87–90. PMID: 26592851. DOI: 10.1002/dc.23389.
[5] Chang YC, Yu CJ, Lee WJ, Kuo SH, Hsiao CH, Jan IS, et al, Imprint cytology improves accuracy of computed tomography-guided percutaneous transthoracic needle biopsy, Eur Respir J. 31:1 (2008) 54–61. PMID: 17928311. DOI: 10.1183/09031936.00038907.
[6] Jones L, Lott MF, Calder CJ, Kutt E, Imprint cytology from ultrasound-guided core biopsies: Accurate and immediate diagnosis in a one-stop breast clinic, Clin Radiol. 59: 10 (2004) 903–8. PMID: 15451349. DOI: 10.1016/j.crad.2004.02.016.
[7] Maity N, Das C, Mukhopadhyay M, Parvin T, Saha AK, Mukhopadhyay B, Evaluation of diagnostic utility of imprint cytology in paediatric renal tumours with special references to Ki 67 proliferative marker, J Lab Physicians. 10: 4 (2018) 437–42. PMID: 30498318. DOI: 10.4103%2FJLP.JLP_157_17
[8] Choudhary PK, Nepal N, Shrestha R, Adhikari U, Diagnostic utility of imprint cytology of endoscopic gastric biopsy: A cyto-histo correlation study,Journal of Pathology of Nepal. 9:2 (2019) 1542–4. DOI: 10.3126/jpn.v9i2.24861
[9] Hussein S, Kapila K, Francis IM, George SS, Kehinde EO, The value of touch imprint cytology of prostate core needle biopsy specimens – Kuwait experience, African Journal of Urology. 21:4 (2015) 220–4. DOI: 10.1016/j.afju.2015.07.002
[10] Qureshi NA, Beresford A, Sami S, Boparai R, Gosh S, Carmichael AR, Imprint cytology of needle core-biopsy specimens of breast lesions: is it a useful adjunct to rapid assessment breast clinics? Breast. 16: 1 (2007) 81–5. PMID: 16952454. DOI: 10.1016/j.breast.2006.07.002.
[11] Paulose RR, Shee CD, Abdelhadi IA, Khan MK, Accuracy of touch imprint cytology in diagnosing lung cancer, Cytopathology. 15: 2 (2004) 109–12. PMID: 15056172. DOI: 10.1111/j.1365-2303.2004.00136.x
[12] Moghadamfalahi M, Podoll M, Frey A, Alatassi H, Impact of immediate evaluation of touch imprint cytology from computed tomography guided core needle biopsies of mass lesions: Single institution experience, Cytojournal. 11 (2014) 15. PMID: 25071857 DOI:10.4103/1742-6413.134437
[13] Klevesath MB, Godwin RJ, Bannon R, Munthali L, Coveney E, Touch imprint cytology of core needle biopsy specimens: a useful method for immediate reporting of symptomatic breast lesions, Eur J Surg Oncol. 31: 5 (2005) 490–4. PMID: 15922884. DOI: 10.1016/j.ejso.2005.01.004.
[14] Adhya A, Kar M, Mohanty R, Diagnostic utility of touch imprint cytology in the evaluation of intraabdominal tumors, Oncology Journal of India. 2: 3 (2018) 47-50. DOI: 10.4103/oji.oji_25_18
[15] Schulz-Wendtland R, Fasching PA, Bani MR, Lux MP, Jud S, Rauh C, et al, Touch Imprint Cytology and Stereotactically-Guided Core Needle Biopsy of Suspicious Breast Lesions: 15-Year Follow-up, Geburtshilfe Frauenheilkd. 76: 1 (2016) 59–64. PMID: 26855442. DOI: 10.1055/s-0041-110395.
[16] Liao WY, Jerng JS, Chen KY, Chang YL, Yang PC, Kuo SH, Value of imprint cytology for ultrasound-guided transthoracic core biopsy, Eur Respir J. 24: 6 (2004) 905–9. PMID: 15572530. DOI: 10.1183/09031936.04.00030404.
[17] Gore CR, Singh BK, Chandanwale SS, Gurwale SG, Kumar H, Bawikar R, et al, Imprint cytology: A boon in tissue diagnosis, Med JDY Patil Univ. 10 (2017) 58–63. DOI: 10.4103/0975-2870.197924