



# Utility of Liquid Based Cytology in Thyroid Lesions Advantages and Limitations of Liquid Based Cytology in Thyroid Nodules

**Manoli N\***

Former Professor, Department of Pathology, JSSAHER, India

**\*Corresponding author:** Nandini Manoli, Former Professor, Department of Pathology, JSSAHER, Karnataka, India, Email: nandinimanoli65@gmail.com

**Received Date:** January 29, 2025; **Published Date:** February 10, 2025

## Keywords

Thyroid; Liquid Based Cytology; Fine Needle Aspiration Cytology; Ancillary Techniques; Advantages of LBC; Molecular Techniques; BRAF

## Abbreviations

FNAC: Fine Needle Aspiration Cytology; LBC: Liquid Based Cytology; FLUS: Follicular Lesion of Undetermined Significance.

## Introduction

Thyroid fine needle aspiration cytology is advantageous as it cause decreased discomfort with quick reports at the outpatient level. The flus and indeterminate category of Bethesda system 2017 of categorizing thyroid lesions make it difficult to diagnose these cases [1]. The quick procedure using 25 to 27 gauge disposable needle helps to give a quick report. Also cases from 12-2% are increased to 10-14% by radiography assistance [2,3]. The number of malignant thyroid lesions are 2-7% with increase in their incidence following surgery from 14 to 50% with majority of the lesions being benign [4,5]. Thyroid FNA and liquid based cytology residual material help in molecular testing of next generation sequencing for DNA and RNA. This helps in the definitive diagnosis of indeterminate group of lesions.

It has been found that the benign conditions of thyroid in LBC have little background material like the colloid of colloid goitre seen in conventional method. Also the

inflammatory cells of thyroiditis may be increased in lbc due to centrifugation so one must know to identify the features in LBC in benign conditions. In LBC slides the background colloid appears as small droplets in benign nodule while in regular FNAC the background shows sufficient colloid for proper detection and identification. Thyroiditis by LBC method shows increase in the number of lymphocytes which requires a follow up of these patients [6].

Among the follicular pattern lesions of thyroid there can be three categories of the lesions they can be the Bethesda category 3 i.e, FLUS with incidence of 5 to 15%. The follicular patterned lesions of thyroid ranging from follicular adenoma, adenomatous nodule accounting for 70-to 80% of the cases to fvptc on histology lead to surgery. Liquid based cytology as it clears the background and highlights the cell structure helps to put the lesion into category 4 or follicular neoplasm which makes treatment more definite. The third category of lesions are nuclear and cytoplasmic features of follicular variant of papillary carcinoma with psammoma bodies with risk of risk of malignat diagnosis ranging from 50-70%.this requires surgery to confirm follicular variant of papillary carcinoma FVPTC.

LBC in malignant thyroid lesions like papillary thyroid carcinoma, medullary carcinoma, and anaplastic carcinoma helps in identifying the nuclear features in a better way. Also the background amyloid, calcitonin can be stained by immunomarkers in medullary carcinoma. In anaplastic carcinoma the cellular features, background necrosis can be identified better. Large cell variant of non-hodgkins lymphoma relies on lymphoma markers like LCA, CD20,

BCL-6 THUS LC diagnosis can be easily confirmed by these markers [7]. Metastatic deposits from lung, breast, kidney, large bowel and larynx to thyroid can be detected better by LBC even with necrotic debris in the background [8]. As papillary carcinoma has mainly BRAF RET, OR RAS mutations molecular sequencing of BRAF positivity has a prognostic value in the presence of nodal metastasis and braf positivity performances in thyroid malignancies [9].

The possible diagnostic use of molecular markers is reflected in the last guidelines published by the American Thyroid Association. These guidelines indicate that the use of molecular markers such as BRAF, RAS, RET/PTC, and PAX8-PPAR $\gamma$  may be considered (with low recommendation rate) for patients with indeterminate FNA cytology to help guide their clinical management [10].

A repeated FNAC is required for molecular testing, because it is usually applied with fresh FNAC material before fixation. Molecular analysis using residual LBC material takes advantage to avoid repeated FNA or needle biopsy. This approach could enhance cost-effectiveness. The nucleic acids are stable in the preservative solution for up to 6 months after sampling [8,11,12].

### Limitations of LBC in Thyroid Lesions

Thyroid FNAC helps in diagnosing the regular categories of Bethesda. It shows the background material in most benign conditions like colloid goitre, thyroiditis. It requires expertise in identifying the lesions by liquid based cytology [13].

### Conclusion

Liquid based cytology is better than regular FNAC in thyroid FNAC as it offers testing even after 6 months after the sampling. It helps in ancillary tests like immunocytochemistry and molecular diagnosis which helps in a better management of thyroid cases.

### References

1. DS C (2009) American Thyroid Association (ATA) guidelines taskforce on thyroid nodules and differentiated thyroid cancer. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. *Thyroid* 19: 1167-1214.
2. Menon U, Sundaram KR, Unnikrishnan AG, Jayakumar RV, Nair V, et al. (2009) High prevalence of undetected thyroid disorders in an iodine sufficient adult south Indian population. *Journal of the Indian Medical Association* 107(2): 72-77.
3. Frates MC, Benson CB, Charboneau JW, Cibas ES, Clark OH, et al. (2006) Management of thyroid nodules detected at US: Society of Radiologists in Ultrasound consensus conference statement. *Ultrasound quarterly* 22(4): 231-238.
4. Schoder H, Gonen M (2007) Screening for cancer with PET and PET/CT: potential and limitations. *J Nuclear Med* 48(1): 4S-18S.
5. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, et al. (2007) Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. *Cancer Cytopathology: Interdisciplinary Inter J Am Cancer Society* 111(6): 508-516.
6. Das DK (2006) Marginal vacuoles (fire-flare appearance) in fine needle aspiration smears of thyroid lesions: Does it represent diffusing out of thyroid hormones at the base of follicular cells? *Diagnostic Cytopathology* 34(4): 277-283.
7. Baloch ZW, LiVolsi VA, Asa SL, Rosai J, Merino MJ, et al. (2008) Diagnostic terminology and morphologic criteria for cytologic diagnosis of thyroid lesions: a synopsis of the National Cancer Institute Thyroid Fine-Needle Aspiration State of the Science Conference. *Diagnostic cytopathology* 36(6): 425-437.
8. Rossi ED, Zannoni GF, Monceli S, Stigliano E, Santeusano G, et al. (2012) Application of liquid-based cytology to fine-needle aspiration biopsies of the thyroid gland. *Frontiers in Endocrinology* 3: 57.
9. Nikiforova MN, Nikiforov YE (2009) Molecular diagnostics and predictors in thyroid cancer. *Thyroid* 19(12): 1351-1361.
10. Fadda G, Rossi ED, Martini M, Lombardi CP, Zannoni GF, et al. (2011) February. BRAF Mutation (V600E) in Papillary Carcinoma Identified on LBC-Processed Thyroid Aspiration Biopsies. In *Laboratory Investigation* 91(75): 89A.
11. Kwon H, Kim WG, Eszlinger M, Paschke R, Song DE, et al. (2016) Molecular diagnosis using residual liquid-based cytology materials for patients with nondiagnostic or indeterminate thyroid nodules. *Endocrinology and Metabolism* 31(4): 586-591.
12. Fadda G, Rossi ED (2011) Liquid-based cytology in fine-needle aspiration biopsies of the thyroid gland. *Acta cytologica* 55(5): 389-400.
13. Sharma R, Zaheer S, Ahluwalia C (2022) Diagnostic utility of conventional and liquid-based cytology in the management of thyroid lesions; an institutional experience. *Cytojournal* 19: 36.