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A comparative study of conventional versus manual liquid based cytology in thyroid lesion with Bethesda system: Two year study

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Abstract: Introduction: Thyroid nodules are commonly encountered in clinical practice. The palpable thyroid nodules prevalence in the worldwide population ranges from 4 to 7%. The thyroid lesions are mostly benign (95%) and thyroid cancer is responsible for only 0.4% of all cancer deaths. The Bethesda System for Reporting thyroid Cytopathology (TBSRTC) was done in 2010. The liquid-based cytology (LBC) technique used in exfoliative cells and in non-gynecological aspiration like fine needle aspiration (FNA) samples. Liquid-based cytology (LBC) preparation is a way to improve and refine the fine-needle aspiration (FNA) samples of thyroid lesion. It achieves a diagnostic sensitivity as accurate as conventional preparations, especially for its excellent cell preservation and rapid fixation, lack of background which decrease the number of inadequate diagnoses.

Aims and Objectives: 1) To compare conventional and manual liquid-based cytology in thyroid lesion at tertiary care centre. 2) To find out if there is any significance increase in the positive cases which were negative on conventional smear. 3) Whenever possible correlate the histopathological finding with the Liquid Based Cytology results to make a more confirmed diagnosis.

Material and Methods: This is prospective conducted on 70 patients at Department of Pathology, Mahatma Gandhi Medical College and Maharaja Yeshwant Rao Hospital, Indore, Madhya Pradesh, India for duration of 2 years. Permission was obtained from the departmental scientific committee and the institutional ethical committee at the beginning of the study.

Results: With the help of above thesis work we have observed that manual LBC is also a relatively simple technique.

Keywords: Thyroid lesion; Fine needle aspiration cytology; Liquid based cytology.

1. Introduction

Thyroid nodule is a common clinical problem. It can be palpated in 5% of individuals during thyroid examination and can be detected in up to 60% of people who undergo thyroid ultrasound [1,2]. Most of the nodules are benign [1,3]. The thyroid nodule defined as a discrete lesion within the thyroid gland. It is distinct from the surrounding thyroid parenchyma [4]. Nodules may be solitary, multiple, cystic, or solid [5]. Nodules are found with increasing frequency, likely due to the widespread use of modern imaging modalities, particularly ultrasound but also computed tomography magnetic resonance imaging and positron emission tomography [5]. Approximately more than 90% of detected nodules are clinically benign lesions [6]. Thyroid nodules are clinically important as they may represent thyroid cancer in approximately 4.0% to 6.5% of cases [7]. The population may develop thyroid nodules at a rate of 2% annually [8].

The incidence of malignancy has been documented as high as 20% to 50% in palpable nodules of previously irradiated thyroids glands [9]. Smoking, obesity, metabolic syndrome, alcohol consumption, increased levels of insulin-like growth factor-1, and uterine fibroids [9]. The thyroid nodules risk is increases with age, female gender, iron deficiency and history of thyroid radiation [10]. In the adult population, physical examination alone may show a prevalence of 5% to 7% of thyroid nodules. A 20-year surveillance study estimated a prevalence of 0.8% and 5.3% in men and women, respectively [11].

Fine needle aspiration cytology (FNAC) is well established as the first line diagnostic tool for evaluation of palpable head & neck swelling. FNAC of thyroid lesion is a merely painless, rapid, direct & safe adjunctive procedure for obtaining material for cytologic analysis. The procedure is cost effective, minimally invasive & free of complications, well tolerated by the patient, can be done on an outpatient basis, repeatable and most important aspect & avoidance of surgery in situation, like non-neoplastic or inflammatory conditions [12–14]. Currently this FNAC is practiced worldwide for thyroid lesion. It has got high sensitivity and specificity rates [15]. Diagnosis is usually done by conventional cytopathology. Its diagnostic sensitivity is as accurate as conventional preparations, especially due to its excellent cell preservation (especially cells in suspension and smears) and lack of undesired background. It provides cells in monolayer, superior to direct smear [16,17].

In the year, 2007 the national cancer Institute, Bethesda, Maryland, US, organized the NCI Thyroid Fine Needle Aspiration State of the Science Conference, and an initiative was undertaken to public an atlas and guidelines using a standardized nomenclature for the interpretation of thyroid FNAs, known as the Bethesda system for reporting thyroid cytopathology [18].

2. Material and methods

Aims of our study was to compare conventional and manual liquid-based cytology in thyroid lesion at tertiary care centre, to find out if there is any significance increase in the positive cases which were negative on conventional smear and to correlate the histopathological finding with the Liquid Based Cytology results to make a more confirmed diagnosis (wherever possible). A Prospective study of sample size 70, conducted in Department of Pathology, MGM medical college and M.Y Hospital, Indore in 02 years duration. Patients of both sex of age 11 to 70 years presenting with thyroid swelling in any lobe of thyroid selected by clinical palpation or patients with already diagnosed thyroid lesion or confirmed by clinical evaluation and laboratory parameters and patients with recurrent thyroid swelling after a previous thyroid surgery were included in study. Patient presenting with any other neck swelling, bleeding disorders, vascular swelling were excluded from study. Cytopathological reporting was done based on 'Bethesda System for Reporting [19]. Histopathological reporting done based on WHO classification [20].

3. Results and observations

Table 1. Age Wise Distribution of Cases.

S.No	Age Group	No. Of Cases	Percentage
1	15 – 25 YEARS	16	22.85
2	26 – 35 YEARS	20	28.57
3	36 – 45 YEARS	13	18.57
4	46 – 55 YEARS	8	11.4
5	56 - 65 YEARS	10	14.2
6	> 65 YEARS	3	4.2
	TOTAL	70	100

Table 2. Distribution of Cases As Per Cytological Diagnosis:

S.No	Cytomorphological Diagnosis On Conventional Smear	No. Of Cases	Percentage
1	Benign Cystic Lesion/ Benign Thyroid Lesion	29	41.40%
2	Inflammatory	3	4.20%
3	Colloid Goiter	14	20.00%
4	Thyroid Adenoma	3	4.28%
5	Follicular Neoplasm	5	7.14%
6	Malignant/metastatic	1	1.42%
8	Hemorrhagic	10	14.20%
9	Other(Cyst Fluid, Thyroglossal Cyst)	5	7.14%
	Total	70	100.00%

Table 3. Comparison Between Conventional and Liquid Based Cytology as Per Bethesda

Category	Criteria	Conventional Smear	LBC
1	Non Diagnostic/Unsatisfactory	15	2
2	Benign	49	53
3	Atypia Of Undetermined Significance	0	1
4	Follicular Neoplasm	5	10
5	Suspicious For Malignancy	0	1
6	Malignant	1	3
	Total	70	70

P value =0.0114 and chi square value -14.7647

Table 4. Correlation of Cases Between Histopathology and Liquid Based Cytology.

Diagnostic categories	Liquid based cytological correlation	Histological diagnosis	
		Benign	Malignant
Non diagnostic /Unsatisfactory	0	0	0
Benign	6	5	1
Atypia of undetermined significance/Follicular lesion of undetermined significance	1	1	0
Follicular neoplasm/Suspicious for malignancy	1	0	1
Suspicious for malignancy	0	0	0
Malignant	1	0	1
Total	9	6	3

4. Discussion

In present study,70 cases were screened and their interpretation by both methods was compared. Most of the symptomatic patients who were screened belonged to the age group 26-35 years (28.57%) followed by 15-25 years (22.85%) with M:F ratio of 1:7.7 Which is almost like study done by Sumit Gupta et al. in which the ages of study group ranged from 11-70 years, with the mean age of 39.18 (\pm 13.65) years. Females were affected more than males with M: F ratio of 1:6.5. [21].

In one of the study done by Richa Bhartiya et al. found that out of 238 patients with thyroid swelling, majority were females (196) and in younger age group (n = 104 [43.6%], 21–40 years) and 42 were males (M:F = 1:4). The age ranged from 7 to 78 years with mean age of 36.8 years, which is comparable to our study as females are most affected with age range of 25 to 36 year [22].

In present study the majority of cases are of benign cystic lesion or benign thyroid lesion (41.4%) followed by colloid goiter (20.0%) and follicular neoplasm (7.1%). We have found 1.4% of malignant cases. Similarly, 4.2% cases are of thyroid adenoma and inflammatory lesions results observed by Mamatha et al. and Hershman et al. with the percentages of cases in the benign category being higher (73.3% by CS and 78.3% by LBC) and Suspicious for neoplasm category being lower [21].

Mehra et.al. observed that out of 225 cases of thyroid nodules only 7.2% were ND/UNS and the majority (80.0%) were benign. Malignant cases were limited to 2.2%, and suspicious for malignancy were 3.5%. 4.9% were AUS/FLUS, and 2.2% FN. Another study conducted by Mamoon et al. (n=327) had inconclusive results in 18 (5.5%), benign in 230 (70.3%), suspicious in 64 (19.6%) and malignant in 15 (4.6%) cases which is like our study as benign cases are most common. [23,24] Biscotti et al. found that in LBC slides cell types and cellular arrangements were well preserved were well preserved in LBC slides and the diagnostic accuracy. The diagnostic accuracy of both Liquid based cytology and Conventional Smear was same [25]. Similar results were observed by Mesonero and Sickel [26]. The above work were in concordance with present our work.

In the present study no case was diagnosed as category AUS in conventional smear which is similar to the findings of Vasudha M Bhagat et al. [27].

In one the study of Mary Ann Liebert et al. the smears with corresponding histological diagnoses, inadequate smears of LBP and CS had a low likelihood of malignancy: 0/2 (0%) in LBP and 8/109 (7.5%) in CS. For the AUS category,26.7% of LBP and 37.5% of CS were malignant on histology. Among the cases diagnosed as SFN/SHCH, 80% of LBP and 28.4% of CS were malignant on histology; in SFM, 83.3% of LBP and 80.6% of CS were malignant on histology which is almost similar to our study [28].

In study of Soo-Yeon Kim et al. found that the non-diagnostic rate, the AUS rate, and the diagnostic performances for malignancy were similar. The benign lesion of thyroid lesion rate increased from 51.4 to 57.0%. Combined CS and LBP increased benign diagnoses compared to CS with comparable non-diagnostic

rates and AUS or FLUS rates, and comparable diagnostic performances which to almost to our study in benign lesions are more [29].

5. Conclusion

In present study we have found that manual LBC is also a relatively simple technique. It reduces the number of slides and area per slide to be screened than the conventional preparation. In present study we have found that females are most affected with age range of 26 to 35 years. On conventional smear as per Bethesda 15 cases were categorized as unsatisfactory which were when processed through manual liquid-based cytology reduced to 2 cases. We have observed that the role of manual liquid-based cytology is more in diagnosing those cases which were diagnosed as hemorrhagic on conventional smear. The cases which were diagnosed on conventional were equally diagnosed on manual liquid-based cytology. We have done our study over 70 cases in which Bethesda category 2 is most common category which encountered followed by 1. When radiological aspect is compared it shows that there is no difference between TIRADS grading and diagnosis on conventional smear or MLBC. Most of the cases presented to us with midline neck swelling.

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Conflicts of Interest: The authors declare that they do not have any conflict of interests.

References

- [1] Esmaili, H. A., & Taghipour, H. (2012). Fine-needle aspiration in the diagnosis of thyroid diseases: An appraisal in our institution. *International Scholarly Research Notices*, 2012.
- [2] Muratli, A., Erdogan, N., Sevim, S., Unal, I., & Akyuz, S. (2014). Diagnostic efficacy and importance of fine-needle aspiration cytology of thyroid nodules. *Journal of Cytology/Indian Academy of Cytologists*, 31(2), 73.
- [3] Larijani, B., Aghakhani, S., Haghpanah, V., Mosavi-Jarrahi, A., & Bastanagh, M. (2005). Review of thyroid cancer in Iran. *Austral-Asian J Cancer*, 4(4), 199-203.
- [4] Haugen, B. R., Alexander, E. K., Bible, K. C., Doherty, G. M., Mandel, S. J., Nikiforov, Y. E., ... & Wartofsky, L. (2016). 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on thyroid nodules and differentiated thyroid cancer. *Thyroid*, 26(1), 1-133.
- [5] Pelayun, T. G. D. (2017). Current diagnosis and management of thyroid nodules. *Acta Medica Indonesiana*, 48(3), 247-257.
- [6] Durante, C., Costante, G., Lucisano, G., Bruno, R., Meringolo, D., Paciaroni, A., ... & Filetti, S. (2015). The natural history of benign thyroid nodules. *Jama*, 313(9), 926-935.
- [7] Popoveniuc, G., & Jonklaas, J. (2012). Thyroid nodules. *Medical Clinics*, 96(2), 329-349.
- [8] Welker, M. J., & Orlov, D. (2003). Thyroid nodules. *American family physician*, 67(3), 559-566.
- [9] Yeung, M. J., & Serpell, J. W. (2008). Management of the solitary thyroid nodule. *The oncologist*, 13(2), 105-112.
- [10] Dean, D. S., & Gharib, H. (2008). Epidemiology of thyroid nodules. *Best practice & research Clinical endocrinology & metabolism*, 22(6), 901-911.
- [11] Vanderpump, M. P. J., Tunbridge, W. M. G., French, J., Appleton, D., Bates, D., Clark, F., ... & Young, E. T. (1995). The incidence of thyroid disorders in the community: a twenty-year follow-up of the Whickham Survey. *Clinical endocrinology*, 43(1), 55-68.
- [12] Afroze, N., Kayani, N., & Hasan, S. H. (2002). Role of fine needle aspiration cytology in the diagnosis of palpable thyroid lesions. *Indian journal of pathology & microbiology*, 45(3), 241-246.
- [13] Handa, U., Garg, S., Mohan, H., & Nagarkar, N. (2008). Role of fine needle aspiration cytology in diagnosis and management of thyroid lesions: A study on 434 patients. *Journal of cytology*, 25(1), 13-17.
- [14] Kumar, S., Aqil, S., & Dahar, A. (2008). Role of fine needle aspiration cytology in thyroid diseases. *Journal of Surgery Pakistan (International)*, 13(1), 23.
- [15] Guhamallick, M., Sengupta, S., Bhattacharya, N. K., Basu, N., Roy, S., Ghosh, A. K., & Chowdhury, M. (2008). Cytodiagnosis of thyroid lesions-usefulness and pitfalls: A study of 288 cases. *Journal of cytology*, 25(1), 6-9.
- [16] Ljung, B. M. (2008). Thyroid fine-needle aspiration: Smears versus liquid-based preparations. *Cancer Cytopathology*, 114(3), 144-148.
- [17] Fadda, G., & Rossi, E. D. (2011). Liquid-based cytology in fine-needle aspiration biopsies of the thyroid gland. *Acta cytologica*, 55(5), 389-400.

- [18] Baloch, Z. W., LiVolsi, V. A., Asa, S. L., Rosai, J., Merino, M. J., Randolph, G., ... & Frable, W. J. (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.
- [19] Cibas, E. S., & Ali, S. Z. (2017). The 2017 Bethesda system for reporting thyroid cytopathology. *Thyroid*, 27(11), 1341-1346.
- [20] Lloyd, R. V., Osamura, R. Y., Klöppel, G., & Rosai, J. (2017). *WHO classification of tumours of endocrine organs*. (No Title).
- [21] Gupta, S., Kumar, A., Verma, R., Kalra, R., Gupta, V., & Gill, M. (2018). Comparative Evaluation of Conventional Smear and Liquid Based Cytology in Diagnosis of Thyroid Lesions Using Bethesda System. *J Cytol Histol*, 9(4), 1-6.
- [22] Bhartiya, R., Mallik, M., Kumari, N., & Prasad, B. N. (2016). Evaluation of thyroid lesions by fine-needle aspiration cytology based on Bethesda system for reporting thyroid cytopathology classification among the population of South Bihar. *Indian journal of medical and paediatric oncology*, 37(04), 265-270.
- [23] Mehra, P., & Verma, A. K. (2015). Thyroid cytopathology reporting by the bethesda system: a two-year prospective study in an academic institution. *Pathology research international*, 2015.
- [24] Mamoon, N., Jamy, R., & Khan, A. H. (2013). Evaluation of fine needle aspiration cytology as a screening tool in thyroid lesions. *J Pak Med Assoc*, 63(9), 1120-1123.
- [25] Biscotti, C. V., Hollow, J. A., Toddy, S. M., & Easley, K. A. (1995). ThinPrep versus conventional smear cytologic preparations in the analysis of thyroid fine-needle aspiration specimens. *American journal of clinical pathology*, 104(2), 150-153.
- [26] Mesonero, C. E., & Sickel, J. (1993). Thyroid fine needle aspiration: a comparison of thin-layer slide preparation with conventional smears. *Acta Cytol*, 37, 795.
- [27] Bhagat, V. M., Tailor, H. J., Kaptan, K. R., Baladawa, V., Prasad, G. H., & Saini, P. K. (2014). Diagnostic role of the Bethesda system for reporting thyroid lesions: Effective tool for managing thyroid lesions. *Global J of Medical Research (C)*, 14(1), 12-8.
- [28] Nagarajan, N., Schneider, E. B., Ali, S. Z., Zeiger, M. A., & Olson, M. T. (2015). How do liquid-based preparations of thyroid fine-needle aspiration compare with conventional smears? An analysis of 5475 specimens. *Thyroid*, 25(3), 308-313.
- [29] Kim, S. Y., Kim, E. K., Moon, H. J., Yoon, J. H., Kwon, H. J., Song, M. K., & Kwak, J. Y. (2016). Combined use of conventional smear and liquid-based preparation versus conventional smear for thyroid fine-needle aspiration. *Endocrine*, 53, 157-165.



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