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Correlation of fine needle aspiration and final histopathology in thyroid disease: a series of 702 patients managed in an endocrine surgical unit

***Chandrasekaran Maharajan * Himagirish Rao**

***Madras Medical College**

Abstract

Introduction: Thyroid nodules are a common clinical entity found among the adult general population. With increasing use of imaging investigations like ultrasonography, there has been a significant rise in the detection of non-palpable thyroid nodules that require further evaluation and management. The routine use of FNAC has reduced the number of unnecessary surgical procedures for thyroid nodules. Taking a decision as to whether to operate on a thyroid nodule is dependent on accurate FNAC testing. This study describes the experience with FNAC in a consecutive series of patients with thyroid nodules who underwent thyroidectomy at a tertiary care hospital in the department of endocrine surgery.

Patients and methods: Clinical and pathologic data of patients with thyroid nodules or diffuse goitre who were operated in a single endocrine surgical unit between January 2008 and December 2010 were prospectively collected and retrospectively reviewed. The anatomical lesion of the thyroid (solitary nodule, STN, multinodular goitre, MNG or diffuse

goitre, DG) was recorded. The functional status of the thyroid was assessed for each patient at presentation. All patients included in the study underwent fine needle aspiration cytology (FNAC) followed by surgery. Patients with solitary toxic nodules underwent hemithyroidectomy, while others underwent total thyroidectomy. Final histopathology (HPE) was then compared with initial FNAC results.

Results: Out of the total number of 702 patients, 119 (17%) were men and the remaining 583 (83%) were women. With regards to solitary thyroid nodules, FNAC had a sensitivity of 86.9%, specificity of 99.1%, false negative rate of 13.1%, false-positive rate of 0.9%, positive predictive value of 97,6% and negative predictive value of 94.9% for diagnosis of malignancy. FNAC had a sensitivity of 76.9%, specificity of 98.8%, false negative rate of 23.1%, false-positive rate of 1.2%, positive predictive value of 94.6% and negative predictive value of 93.8% for diagnosis of malignancy with respect to diffuse and multinodular goitre. Overall, FNAC had a sensitivity of 80.2%, specificity of 98.9%, false negative rate of 19.8%, false-positive rate of 1.1%, positive predictive value of 96.6% and negative predictive value of 94.1% for diagnosis of malignancy.

Conclusion: FNAC was more accurate in patients with solitary thyroid nodules than in those with multinodular or diffuse goitre. While false negativity could be due to misrepresentative sample or misinterpretation of the sample, false positivity could be ascribed to hyperplasia of thyrocytes in the functioning thyroid as a result of TSH stimulation.

Introduction

Thyroid nodules are a common clinical entity found among the adult general population. The frequency of non-palpable thyroid nodules may be as high as 50% or more by the age of 50 years.[1,2] With time, ultrasonography has come to be used with increasing regularity in clinical practice. As a result, there has been a significant rise in the incidence of non-palpable thyroid nodules that require further evaluation and management. Since 1986, when fine needle aspiration cytology (FNAC) was first reported from Sweden, it has been widely accepted as the most accurate, cost-effective, and safe screening test for rapid diagnosis of thyroid nodules.[3, 4, 5]

The routine use of FNAC has reduced the number of unnecessary surgical procedures for thyroid nodules.[2, 6] In addition; it has enabled the detection of thyroid cancer at earlier stages.[7, 8] Taking a decision as to whether to operate on a thyroid nodule is dependent on accurate FNAC testing. Assessment of false positive and false negative FNAC results assumes importance in this context.[9]

Indeterminate FNAC results that include follicular and Hurthle cell neoplasms and those that indicate a suspicion of papillary thyroid cancer (PTC) without actually diagnosing PTC, represent a continued diagnostic and treatment challenge to pathologists and surgeons alike. The diagnosis of follicular thyroid carcinoma (FTC) or Hurthle cell carcinoma (HTC) requires the presence of capsular or vascular invasion on final histopathological examination (HPE), findings that cannot be assessed by FNAC. Sometimes, patients with indeterminate thyroid nodules who undergo hemi-thyroidectomy are found to have malignancy on final pathology. Such cases necessitate completion thyroidectomy.[3, 6]

This study describes the experience with FNAC in a consecutive series of patients with thyroid nodules who underwent thyroidectomy at a tertiary care hospital in the department of endocrine surgery.

Methods

Clinical and pathologic data of 702 consecutive patients with thyroid nodules or diffuse goitre who were managed in a single endocrine surgical unit between January 2008 and December 2010 were prospectively collected and retrospectively reviewed. The anatomical lesion of the thyroid (solitary nodule, STN, multinodular goitre, MNG or diffuse goitre, DG) was recorded. The functional status of the thyroid was assessed for each patient at presentation with the help of free thyroid hormone (FT3 and FT4) and thyroid stimulating hormone (TSH) levels. Levels of anti-microsomal and anti-thyroglobulin antibodies (AMA and ATG) were estimated. Those who were hypothyroid or hyperthyroid at presentation were started on appropriate drug therapy.

All FNAC slides were classified into 1 of 4 main categories: non-diagnostic, benign, indeterminate, or malignant. The indeterminate group included specimens further classified as follicular neoplasm (FN), Hurthle cell neoplasm (HN), or suspicious for papillary thyroid cancer (SPTC). Specimens were classified as follicular neoplasms when cytology aspirates were very cellular, with scant or no colloid, and uniform microfollicular cells were present. The interpretation of Hürthle cell neoplasm was made when FNAC aspirates consisted of microfollicles formed by cells with abundant eosinophilic cytoplasm lacking lymphocytes. The diagnosis of ‘suspicious for PTC’ (SPTC) was made when cellular aspirates revealed nuclear grooving, intranuclear pseudo-inclusions, or Psammoma bodies, but no papillae and little colloid.

Papillary microcarcinomas, defined as malignant lesions smaller than 1 cm, were considered in the final analysis of this study.

Patients with non-toxic solitary thyroid nodules (including FN, HN and PTC), DG and MNG underwent total thyroidectomy. Those with a solitary toxic adenoma underwent hemithyroidectomy. All patients with pre-operative diagnosis of malignancy underwent total thyroidectomy (TT) and central compartment neck lymph-node dissection (CCLND), if indicated. Those patients with lateral cervical node metastases diagnosed preoperatively underwent a modified radical neck dissection (MRND) of the involved side.

Indications for thyroidectomy when FNAC of the index nodule was benign included interval growth, obstructive symptoms, cosmetic reasons, adverse ultrasonographic nodule features, and/or patient preference.

All 702 patients underwent hemithyroidectomy or total thyroidectomy, and final histopathology (HPE) was then compared with initial FNAC results.

Results

A total of 702 patients, aged between 13 and 78 yrs, with median age of 39 yrs underwent FNAC of the thyroid followed by thyroidectomy between January 2008 and December 2010. Out of the total number of patients, 119 (17%) were men and the remaining 583 (83%) were women.

Out of the total number of cases studied on FNAC, 460 (66%) were diagnosed with benign thyroid disease while 115 patients (16%) were diagnosed to have malignancy (Table 1). 71 (10%) FNAC results were classified as indeterminate and 56 patients had a non-diagnostic FNAC (Table 1). Out of the 115 patients who were diagnosed with malignancy, 107 (93%) had PTC while 8 (7%) had medullary thyroid cancer (Table 1). Among the

indeterminate reports, 34 patients (48%) were reported to have FN, while 5 (7%) were diagnosed as HN and the remaining 32 (45%) were suspicious for PTC (Table 1).

Among the 460 patients with benign disease as diagnosed on FNAC, 433 (94%) patients had benign disease after HPE, while 27 (6%) patients turned out to have malignancy (Table 1). Out of the 115 patients diagnosed with malignancy on FNAC, 110 (96%) patients had malignancy on HPE while 5 (4%) patients had benign disease on HPE of the operative specimen (Table 1). All these 5 patients had been diagnosed with PTC on FNAC. All the patients diagnosed with MTC on FNAC had MTC on HPE of the operative specimen. Out o the 71 patients with indeterminate FNAC diagnosis, 32 (45%) had malignancy on HPE, while 39 (55%) patients had benign disease (Table 1).

Out of the total number, 196 patients had solitary thyroid nodules (Table 2). While 118 patients (60%) had benign diagnosis on FNAC, 41 patients (21%) were diagnosed with malignancy, 29 (15%) had indeterminate FNAC and 8 patients (4%) had non-diagnostic results (Table 2). On comparison with final HPE, FNAC had a sensitivity of 86.9%, specificity of 99.1%, false negative rate of 13.1%, false-positive rate of 0.9%, positive predictive value of 97.6% and negative predictive value of 94.9% for diagnosis of malignancy.

The remaining 502 patients had MNG or DG (Table 3). Out of these, 342 (68%) were diagnosed with benign disease on FNAC, while 74 patients (15%) were diagnosed with malignancy (Table 3). 42 patients (8%) had indeterminate results, while FNAC was non-diagnostic in 48 patients (9%). When compared with the final HPE, FNAC had a sensitivity of 76.9%, specificity of 98.8%, false negative rate of 23.1%, false-positive rate of 1.2%, positive predictive value of 94.6% and negative predictive value of 93.8% for diagnosis of malignancy.

Overall, FNAC had a sensitivity of 80.2%, specificity of 98.9%, false negative rate of 19.8%, false-positive rate of 1.1%, positive predictive value of 96.6% and negative predictive value of 94.1% for diagnosis of malignancy.

In all, 179 out of the total of 702 patients (25%) were found to have malignant thyroid disease on final HPE (Table 4). Out of these, 113 (63%) had PTC, 48 (27%) had follicular variant of PTC, 8 patients (4%) had MTC, 4 (2%) had follicular carcinoma, 2 (1%) had Hurthle cell carcinoma and 4 patients had other variants of PTC.

Discussion

In this study, FNAC was conducted with the help of a 24-guage needle. Non-aspiration cytology was not performed.

In the present study, the overall false negative rate for FNAC was 19.8%. Other reports in the literature suggest false negative rates ranging from 1% to 17%.[6,8-16] On analysis of FNAC results with respect to the anatomical diagnosis, FNAC had a false negative rate of 13.1% for solitary thyroid nodules and 23.1% for diffuse goitre or multinodular goitre.

This could be due to misrepresentative sample or misinterpretation of the sample. False negatives in the case of STNs could be due to misinterpretation, while those in patients with MNG or DG could be misrepresentative samples.

The false positive rate of FNAC was 1.1% in the present study. This incidence is consistent with other reports that cite false positive FNA results ranging from 0% to 9%.[9-13]

This could be ascribed to changes in the thyroid as a result of TSH stimulation. Hypothyroidism is characterised by hyperthyrotropinemia. Cellular hyperplasia is common in a functioning gland under TSH stimulation, resulting in highly cellular smears with scanty colloid, resembling malignancy.

Conclusion

Overall, FNAC had a sensitivity of 80.2%, specificity of 98.9%, false negative rate of 19.8%, false-positive rate of 1.1%, positive predictive value of 96.6% and negative predictive value of 94.1% for diagnosis of malignancy. FNAC was more accurate in patients with solitary thyroid nodules than in those with multinodular or diffuse goitre. While false negativity could be due to misrepresentative sample or misinterpretation of the sample, false positivity could be ascribed to hyperplasia of thyrocytes in the functioning thyroid as a result of TSH stimulation. . On the basis of these findings, we suggest that it is advisable to avoid FNAC in hypothyroid state.

References

1. Mazzaferri EL. Management of a solitary thyroid nodule. N Engl J Med 1993;328:553–9
2. Davies L,Welch HG. Increasing incidence of thyroid cancer in the United States, 1973–2002. JAMA 2006;295:2164–7
3. Frates M, Benson C, Charboneau J, et al. Management of thyroid nodules detected at US: Society of Radiologists in Ultrasound consensus conference statement. Radiology 2005;237:794–800
4. Gharib H, Goellner JR. Fine-needle aspiration biopsy of the thyroid: an appraisal. Ann Intern Med 1993;118:282–9
5. Cooper DS, Doherty GM,Haugen BR, et al. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009;19:1167–1214
6. Lowhagen T, Willems JS, Lundell G, et al. Aspiration biopsy cytology in diagnosis of thyroid cancer. World J Surg 1981;5:61–73
7. Gharib H. Fine-needle aspiration biopsy of thyroid nodules; advantages, limitations, and effects.Mayo Clinic Proc 1994;69:44–9
8. Baloch ZW, Sack MJ, Yu GH, et al. Fine-needle aspiration biopsy of thyroid: An institutional experience. Thyroid 1998;8:565–9

9. Lew JI, Snyder RA, Sanchez YM, Solorzano CC. Fine needle aspiration of the thyroid: correlation with final histopathology in a surgical series of 797 patients. J Am Coll Surg 2011;213:188-94
10. Meko JB, Norton JA. Large cystic/solid thyroid nodules: A potential false-negative fine needle aspiration. Surgery 1995;118:996–1004
11. Amrikachi M, Ramzy I, Rubenfield S, WheelerTM. Accuracy of fine needle aspiration of thyroid: A review of 6226 cases and correlation with surgical or clinical outcome. Arch Pathol Lab Med 2001;125:484–8
12. Blansfield JA, Sack MJ, Kukora JS. Recent experience with preoperative fine-needle aspiration biopsy of thyroid nodules in a community hospital. Arch Surg 2002;137:818–821
13. Yassa L, Cibas ES, Benson CB, et al. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. Cancer Cytopathol 2007;111:508-16
14. Scalbas GM, Staerkel GA, Shapiro SE, et al. Fine-needle aspiration of the thyroid and correlation with histopathology in a contemporary series of 240 patients. Am J Surg 2003;186:702–10
15. McCoy KL, Jabbour N, Ogilvie JB, et al. The incidence of cancer and rate of false-negative cytology in thyroid nodules greater than or equal to 4 cm in size. Surgery 2007;142:837–44
16. Yang J, Schnadig V, Logrono R, Wasserman PG. Fine-needle aspiration of thyroid nodules: A study of 4703 patients with histologic and clinical correlations. Cancer Cytopathol 2007; 111:305–15