HISTOPATHOLOGIC EXAMINATION OF THYROIDECTOMY SPECIMENS FROM 1149 NODULAR GOITER PATIENT

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ABSTRACT

Introduction: Thyroid nodules are common in clinical pathology practice and are the most common indication for thyroidectomies. In the present study we evaluated patients diagnosed with nodular goiter according to preoperative thyroid fine needle aspiration cytology and who also underwent thyroidectomy.

Materials and methods: The case reports, pathologic reports, and stained sections of 1149 patients who were admitted and underwent thyroidectomy specimens were retrospectively evaluated.

Results: The cytology and histology records were correlated for 260 cases. The 1149 cases included in this study consisted of 1020 female and 129 male cases with a mean age of 41.4 years (range, 13 to 82 years). The distribution of histological findings are as follows: 999 (72.3%) cases were found to be non-neoplastic and 150 cases (13.1%) were neoplastic. Postoperative histologic evaluation demonstrated 939 (81.7%) cases of nodular hyperplasia, 70 (6.1%) cases of papillary carcinoma, 55 (4.8%) cases of follicular adenoma, 39 (3.4%) cases of Hashimoto’s thyroiditis. The correlation of cytology and histopathology showed that 145 of 260 FNA results (55.7%) were concordant, whereas 8 patients (3%) had discordant results. Eighty-five cases were excluded for being non-diagnostic. Histological review revealed incidental papillary thyroid carcinoma in 62 (5.39 %) patients. Mean tumor size was 1.26 cm.

Conclusion: Nodular hyperplasia was the most common histopathological finding followed by papillary thyroid carcinoma. Improved imaging techniques combined with the correct use of fine-needle aspiration diagnoses may reduce the number of cases that are not treatable by thyroidectomy. It is likely that the early detection of some thyroid cancers is primarily incidental.

Key words: Cytology, Carcinoma, Incidental, Nodular hyperplasia, Thyroid, Thyroidectomy.

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Introduction

Thyroid nodules are very common in clinical pathology practice. The incidence of palpable thyroid nodule is estimated at approximately 4-8% in adults. Autopsy studies have shown that nodules are extremely common, having been found in 50% of all thyroids examined1. 13-67% of nodules are detected by ultrasound (US). The most common thyroid nodules are benign, and malignancies occur in approximately 5% of cases2. Thyroid nodules occur more often in women than in men, and tend to be associated with advanced age. The etiology of nodule is almost certainly multifactorial; iodine deficiency, radiation exposure, and dietary goitrogenic factors all play an important role the pathogenesis of thyroid nodules3. In developed countries, thyroid nodules account for approximately 1% of all malignancies and 122,000 cases of cancer annually4. An estimated 56,460 new cases of thyroid cancer occurred in the United States in 20125. Papillary carcinoma is the most prevalent malignant thyroid neoplasm in the United States, accounting for 65% to 80% of all cases6. Incidental thyroid cancer has been found in preoperative test thyroidectomy specimens from patients with benign thyroid diseases. The estimated frequency of incidental thyroid cancer ranges from 3% to 16%. These cancers are primarily variants of microcarcinomas7. Increasing incidental thyroid cancer incidence may be attributable to successful
surgical interventions and improved imaging methods such as radionuclide scanning and ultrasonography\(^\text{(8)}\). Thyroid US is by far the most sensitive first-line diagnostic tool for benign and malignant thyroid lesions. In the US, the specificity and sensitivity of elastography for thyroid cancer is 96% and 82%, respectively\(^\text{(8)}\). A fine-needle aspiration biopsy (FNAB) is a widely accepted tool in clinical practice. This technique has several distinct advantages, such as rapid discharge and rapid diagnosis, however it can be very difficult to make the correct diagnosis in certain indeterminate cases\(^\text{(8)}\). Iodine deficiency is endemic to our country\(^\text{(10, 11)}\). In similar regions, the overall rate of endemic goiter is 30%. In this study, we reviewed the histopathologic diagnoses of 1149 consecutive thyroidectomy specimens of the thyroid, focusing on the correlation between FNA and outcomes in a subset of 260 cases.

Material and methods

**Case selection and clinicopathologic features**

In this retrospective study we examined four micrometer thick formalin-fixed and paraffin-embedded sections from thyroidectomy specimens and thyroid FNA samples from patients with nodular goiter. A total of 1149 thyroid surgical specimens were obtained from State Hospital pathology laboratory between September 2006 and December 2014. Surgical specimens were stained with Hematoxylin and Eosin (H&E) and FNA specimens were stained with May-Grünwald-Giemsa (MGG), Papanicolaou (PAP) and H&E staining. All cases were categorized according to age, gender, non-neoplastic or neoplastic (benign, malignant) status, and patient age (≤ 20 years, 21 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years, and > 61 years). Histological evaluation was aimed to identify neoplastic thyroid lesions. A comparison of preoperative FNA diagnoses with the diagnoses according to the histopathology determination from the thyroidectomy specimens. Specimens were graded according to the classification system of the College of American Pathologists (CAP) and the Bethesda System for Reporting Thyroid Cytopathology (BSRTC). Histopathologic neoplastic thyroid lesion was categorized as an incidental microscopic finding in cases treated surgically for presumably benign thyroid disease\(^\text{(12-14)}\).

### Statistical analyses

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) software (version 21.0 for Windows, IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp.). A P value less than 0.05 was considered statistically significant.

### Results

**Patient analysis**

A total of 1149 thyroidectomy specimens examined between September 2006 and December 2014 were evaluated. The mean age of the patients was 41.41 ± 12.29 years (range 13 to 82 years). The distribution of cases by age group was: ≤ 20 years, 3.1%; 21 to 30 years, 16.6%; 31 to 40 years, 29.9%; 41 to 50 years, 28.7%; 51 to 60 years, 15%; and > 61 years, 6.7%. The overwhelming majority of patients were females and the female:male ratio was 7.9:1. There were 1020 female cases (88.8%) and 129 male (11.2%) cases in the present study. There was a significant correlation between thyroid disease and gender (p < 0.05).

<table>
<thead>
<tr>
<th>Surgical Diagnosis</th>
<th>Number (n)</th>
<th>Percentage (%)</th>
<th>Gender (F/M)</th>
<th>Age (Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granulomatous thyroiditis</td>
<td>4</td>
<td>0.3</td>
<td>3/1</td>
<td>41.76</td>
</tr>
<tr>
<td>Lymphocytic thyroiditis</td>
<td>6</td>
<td>0.5</td>
<td>5/1</td>
<td>37.83</td>
</tr>
<tr>
<td>Hürthle cell (oncocytic) tumors</td>
<td>39</td>
<td>3.4</td>
<td>33/6</td>
<td>35.95</td>
</tr>
<tr>
<td>Dysfuntional goiter</td>
<td>4</td>
<td>0.3</td>
<td>All female</td>
<td>32.75</td>
</tr>
<tr>
<td>Graves’ disease</td>
<td>5</td>
<td>0.4</td>
<td>2/3</td>
<td>33.4</td>
</tr>
<tr>
<td>Nodular hyperplasia</td>
<td>939</td>
<td>81.7</td>
<td>84/95</td>
<td>41.7</td>
</tr>
<tr>
<td>Follicular adenoma</td>
<td>59</td>
<td>4.8</td>
<td>47/12</td>
<td>38.8</td>
</tr>
<tr>
<td>Papillary carcinoma</td>
<td>70</td>
<td>6.1</td>
<td>59/11</td>
<td>45.89</td>
</tr>
<tr>
<td>WDFT-UMP</td>
<td>3</td>
<td>0.3</td>
<td>2/1</td>
<td>41</td>
</tr>
<tr>
<td>Follicular carcinoma</td>
<td>2</td>
<td>0.2</td>
<td>All female</td>
<td>34</td>
</tr>
<tr>
<td>FT-UMP</td>
<td>2</td>
<td>0.2</td>
<td>1/1</td>
<td>35</td>
</tr>
<tr>
<td>Hürthle cell (oncocytic) tumors</td>
<td>16</td>
<td>1.4</td>
<td>13/3</td>
<td>49.63</td>
</tr>
<tr>
<td>Medullary carcinoma</td>
<td>0.1</td>
<td>0.1</td>
<td>Female</td>
<td>41</td>
</tr>
<tr>
<td>SETTLE</td>
<td>0.1</td>
<td>0.1</td>
<td>Male</td>
<td>13</td>
</tr>
<tr>
<td>Thyroiditis</td>
<td>0.1</td>
<td>0.1</td>
<td>Female</td>
<td>49</td>
</tr>
<tr>
<td>Normal</td>
<td>0.1</td>
<td>0.1</td>
<td>Female</td>
<td>41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1149</strong></td>
<td><strong>100.0</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Mean Age, gender and histopathological diagnosis in 1149 patients with thyroid of non-neoplastic disorders and neoplastic lesions.

WDFT-UMP: Well-differentiated tumor of uncertain malignant potential, FT-UMP: Follicular tumor of uncertain malignant potential; SETTLE: Spindle epithelial tumor with thymus-like elements
There was no statistically significant difference in thyroid disease incidence according to age or age group (p=0.404, 0.319, respectively). Mean age, gender and histopathological diagnosis of the 1149 patients with thyroid lesions are summarized in Table 1.

**Histopathological evaluation**

The surgical procedures were subtotal or near total thyroidectomy in 667 (58.1%) patients, total thyroidectomy in 364 (31.7%) patients and lobectomy in 118 (10.3%) patients. Out of a total of 1149 thyroidectomy materials examined, 999 cases (86.9%) were non-neoplastic lesions and 150 cases (13.1%) were neoplastic. These cases of thyroiditis have been subdivided into three groups as granulomatous (de Quervain) thyroiditis, lymphocytic thyroiditis and Hashimoto thyroiditis. The total of 49 cases were diagnosed as thyroiditis, accounting for 4.2% of all thyroidectomy specimens. Female cases were more common than male cases, with a female-to-male ratio of 7.16 to 1.0. Hashimoto’s thyroiditis was the most common type of thyroiditis. There were 948 (82.4%) patient surgical specimens, including 939 (81.7%) nodular hyperplasia specimens (including nodular or multinodular goiter, adenomatous goiter, adenomatous hyperplasia, nodular colloid goiter), 5 (0.4%) cases of Graves’ disease (diffuse toxic goiter) and dyshormonogenetic goiter 4 (0.3%) (Figure 1A, 1B). Nodular hyperplasia was the most common type of hyperplasia or non-neoplastic thyroid disease. 64 (5.6%) cases are composed almost exclusively of these massive colloid with nodularity or nodular colloid goiter. The female to male ratio was 8.67:1.0.

**Neoplastic lesions**

Out of 150 cases (13.1% in all cases), neoplastic disease occurred in 55 (36.7%) patients with follicular adenoma, and 70 (46.7%) patients with papillary carcinomas. Papillary carcinoma was the most common malignant neoplasm in this study. The remaining cases included 3 (2%) well-differentiated tumors of uncertain malignant potential (WDT-UMP), 2 (1.3%) follicular carcinoma, 2 (1.3%) follicular tumor of uncertain malignant potential (FT-UMP), 16 (10.7%) Hürthle cell (oncocytic) tumors, 1 (0.7%) medullary carcinoma and 1 (0.7%) spindle epithelial tumor with thymus-like elements (SETTLE). The majority of patients were female (female to male ratio 4.84:1.0). There was no statistically significant difference in the number of surgical procedures or the histologic diagnosis of neoplastic disease (p=0.86). No patients with lymphoma, poorly differentiated or anaplastic carcinoma were seen in our study.

**Fine-needle aspiration cytology of cases**

Pre-operative cytological evaluation was performed in 260 (22.6%) cases. BSRTC defines 6 categories: the FNA results included 85 cases (32.7%) that were non-diagnostic or unsatisfactory sections, 142 (54.6%) benign tissues, 12 (4.6%) Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance (AUS/FLUS) specimens, 10 (3.8%) Follicular Neoplasm or Suspicious for a Follicular Neoplasm (FN/SFN) specimens, 10 (3.8%) specimens suspicious for malignancy, and 1 (0.4%) malignant specimen (Table 2). Repeat FNA biopsies in 41 patients resulted in an initial diagnosis of non-diagnostic cytology in 23 cases (8.8%). The cytological diagnoses were as follows: 23 (8.8%) unsatisfactory, 15 (5.8%) benign, 3 (1.2%) AUS/FLUS. No repeat aspirates were available for cases suspicious for follicular neoplasm, suspicious for malignancy and malignant.

A comparison of pre-operative FNA diagnoses after thyroidectomy are summarized in Table 3. The overall malignancy rate on histology after thyroidectomy was 17 of 260 (6.5%).

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**Figure 1A:** Nodular hyperplasia (nodular or multinodular goiter) (A) Gross appearance gland is diffusely enlarged.

**Figure 1B:** Nodular hyperplasia (nodular or multinodular goiter) (B) Grossly, the gland is nodular cut surface and cystic degeneration.
Overall, there was a sensitivity rate of 61.53% and specificity rate of 97.8%. The cumulative positive predictive value and negative predictive value for these categories were 72% and 96%, respectively. Among the 85 non-diagnostic or unsatisfactory FNA results, Hashimoto thyroiditis was found in 4 cases, nodular hyperplasia in 70 cases, follicular adenoma in 6 cases, papillary carcinoma in 2 cases, WDT-UMP in 1 case, and Hürthle cell (oncocytic) tumors in 2 cases. When FNA was indeterminate, nodular hyperplasia, follicular adenoma, papillary carcinoma and Hürthle cell (oncocytic) tumors were present in 14, 5, 8 and 4 cases, respectively.

**No pre-operative FNA cytology of cases**

Among the cases where no pre-operative FNA was available (889 thyroidectomy specimens), 729 (82%) patients exhibited nodular hyperplasia, 54 (6%) patients exhibited papillary carcinoma, 41 (4.6%) patients exhibited follicular adenoma, 30 (3.4%) patients exhibited Hashimoto thyroiditis, 9 (1%) patients exhibited Hürthle cell tumors. Nodular hyperplasia was coexistent in 117 (10.2%) cases of lymphocytic thyroiditis, 37 cases (3.7%) with papillary carcinoma, 25 cases (2.2) with follicular adenoma, 19 cases (1.7%) with Hashimoto thyroiditis, 9 cases (0.8%) with Hürthle cell tumors and both Hashimoto's thyroiditis and papillary carcinoma were present in 6 (0.5%) patients. Thyroid carcinoma was not associated with Graves' disease.

**Neoplastic cases**

We identified 70 patients who developed papillary thyroid cancer after thyroidectomy. 34 (48.6%) patients had morphologic follicular variant of papillary thyroid carcinoma (FVPTC), 21 patients (30%) had classic (usual, conventional) carcinomas, 13 (18.6%) had papillary thyroid microcarcinoma (PTMC) (occult, size 1 cm or less in diameter), and 2 patients (2.9%) had oncocytic (oxyphilic) carcinomas (Table 4). Of these cases 59 (84.3%) were female and 11 (15.7%) were male, with a female to male ratio of 5.3:1. Mean tumor size was 1.32 ± 1.07 cm (range 0.05-5.5 cm). There was no significant difference in the variants of papillary carcinoma according to age, gender, tumor size, or surgical procedure (p=0.781, 0.320, 0.661, 0.791, respectively). Among the 1149 cases, histopathology examination revealed incidental papillary thyroid carcinoma in 62 (5.39 %) patients.

An incidental PTC was found in 88.5 % (62 of 70) of patients with PTC. The majority of these patients were female (83.9%; 52). The mean age was 45.7 years (range of 20 - 76 years) and tumors

<table>
<thead>
<tr>
<th>Pre-operative Cytology status</th>
<th>Number (n)</th>
<th>%</th>
<th>Malignant case (malignancy risk, %)</th>
<th>Risk of malignancy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNA biopsies absent</td>
<td>889</td>
<td>77.4</td>
<td>57 (6.41%)</td>
<td>-</td>
</tr>
<tr>
<td>Non-diagnostic</td>
<td>85</td>
<td>7.4</td>
<td>2 (2.3%)</td>
<td>0.3</td>
</tr>
<tr>
<td>Benign</td>
<td>142</td>
<td>12.4</td>
<td>5 (3.5%)</td>
<td>0.3</td>
</tr>
<tr>
<td>AUS/FLUS</td>
<td>12</td>
<td>1.0</td>
<td>2 (16.7%)</td>
<td>5 - 15</td>
</tr>
<tr>
<td>FN/SFN</td>
<td>10</td>
<td>0.9</td>
<td>0 (0%)</td>
<td>15 - 30</td>
</tr>
<tr>
<td>SM</td>
<td>10</td>
<td>0.9</td>
<td>7 (70%)</td>
<td>60 - 75</td>
</tr>
<tr>
<td>Malignant</td>
<td>1</td>
<td>0.1</td>
<td>1 (100%)</td>
<td>97 - 99</td>
</tr>
<tr>
<td>Total</td>
<td>1149</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2**: Distribution of cases in the Bethesda categories in our study.

**AUS/FLUS**: Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance; **FN/SFN**: Follicular Neoplasm or Suspicious for a Follicular Neoplasm; **SM**: Suspicious for malignancy; **FNA**: Fine-needle aspiration

<table>
<thead>
<tr>
<th>Surgical Diagnosis</th>
<th>FNAAbs</th>
<th>Non-diagnostic</th>
<th>Benign</th>
<th>AUS/FLUS</th>
<th>FN/SFN</th>
<th>SM</th>
<th>Malignant</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nodular hyperplasia</td>
<td>719</td>
<td>70</td>
<td>126</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>909</td>
</tr>
<tr>
<td>Others (non-epithelial tumors)</td>
<td>19</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Hashimoto thyroiditis</td>
<td>30</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>39</td>
</tr>
<tr>
<td>Follicular adenoma</td>
<td>41</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>55</td>
</tr>
<tr>
<td>Papillary carcinoma</td>
<td>54</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>1</td>
<td>70</td>
</tr>
<tr>
<td>Follicular carcinoma</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Medullary carcinoma</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hürthle cell tumors</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>TT-UMP</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>SETTLE</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>889</td>
<td>85</td>
<td>142</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>1149</td>
</tr>
</tbody>
</table>
| abs: absent, TT-UMP: Thyroid tumors of uncertain malignant potential

**Table 3**: Correlation of Aspiration Cytology and Histopathology in the Thyroid Nodule.
in this subgroup ranged in size from 0.05 cm to 4 cm (mean size, 1.26 cm). The associated surgical procedures were subtotal or near total thyroidectomy in 33 (53.2%), total thyroidectomy in 22 (35.5%) and lobectomy in 7 (11.3%) cases. Coexistence included nodular hyperplasia (31 cases, 50%), Hashimoto thyroiditis (6 cases, 8.6%) (Figure 2), follicular adenoma and nodular hyperplasia (3 cases, 4.8%), Hürthle cell (oncocytic) tumors and nodular hyperplasia (2 cases, 3.2%), and follicular adenoma (1 case, 1.6%).

**Table 4:** Patients demographics and clinical characteristics in the papillary thyroid carcinoma.

<table>
<thead>
<tr>
<th>Morphologic variants of papillary carcinoma</th>
<th>Number (%)</th>
<th>Gender (F/M)</th>
<th>Mean Age (year)</th>
<th>Mean tumor size (cm)</th>
<th>Pre-operative FNA (Absent/Present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follicular variant</td>
<td>34 (48.6)</td>
<td>28/16</td>
<td>48.44</td>
<td>0.62</td>
<td>26/8</td>
</tr>
<tr>
<td>Classic (usual)</td>
<td>21 (30%)</td>
<td>17/4</td>
<td>43.57</td>
<td>1.98</td>
<td>16/5</td>
</tr>
<tr>
<td>Micronodular carcinoma</td>
<td>13 (18.6)</td>
<td>12/1</td>
<td>42</td>
<td>2.13</td>
<td>10/3</td>
</tr>
<tr>
<td>Oncocytic</td>
<td>2 (29%)</td>
<td>2/0</td>
<td>52</td>
<td>1.35</td>
<td>2/0</td>
</tr>
<tr>
<td>Total</td>
<td>70 (100%)</td>
<td>59/11</td>
<td>45.8</td>
<td>1.32</td>
<td>54/16</td>
</tr>
</tbody>
</table>

**Figure 2:** Gross appearance of coexistence of papillary thyroid cancer and Hashimoto thyroiditis.

**Discussion**

Benign, non-neoplastic, and malignant diseases occur in a subset of patients and are more common in regions where iodine deficiency is common. The prevalence of goiter is far higher in premenopausal women and thyroid nodules are found with increased frequency in older patients\(^{(15)}\). Thyroid diseases are characterized by a predilection for women. Previous studies have reported female to male ratios of 3.4:1, 3.7:1, and 4.5:1, respectively\(^{(16-18)}\). The present study identified an even higher proportion of women with a female:male ratio of 8.67:1.0. The mean age at thyroidectomy has been reported in prior studies as 53 years\(^{(16)}\); 51 years, range 4-87 years\(^{(16)}\); 39.7 years, range 14-95 years\(^{(17)}\). Another study reported that all cases were 20-59 years old\(^{(18)}\). Liu et al reported average age of 46 years (16 to 82 years) for total thyroidectomy for benign thyroid disease\(^{(20)}\). The mean age at thyroidectomy was 41 years in the present study, similar to previous reports in the literature. Our patients were predominantly adults with a peak frequency in nodular hyperplasia between 20 and 50 years of age. Luo et al. reported 1791 consecutive thyroidectomy specimens including 838 patients with multinodular goiter; malignancy was found in 30% (537/1791) and 31% (260/838), respectively\(^{(21)}\). Darwish et al. reported 110 thyroidectomy specimens including nodular goiter (45.5%), malignancy (24%), follicular adenoma (15.5%), and Hashimoto thyroiditis (7%)\(^{(22)}\). Misiakos et al. observed nodular goiter (54.9%), cancer (18.2%), adenoma (8.3%) and Hashimoto thyroiditis (3.8%)\(^{(23)}\).

Chukudebelu et al. reported 742 benign and 261 malignant thyroidectomy specimens, which included papillary thyroid carcinoma (75.1%), follicular carcinomas (13.4%), Hürthle cell carcinoma (1.5%), medullary thyroid carcinomas (3%)\(^{(24)}\). In our study the overwhelming majority of cases were non-neoplastic, with a non-neoplastic diseases: neoplastic disease ratio was 6.66:1. Our histopathology findings are consistent with previous reports on thyroidectomy specimens. Follicular adenoma is the most common neoplasm in the human thyroid gland. Two autopsy series reported an incidence of 3-4.3%. Occasional cases are discovered incidentally in surgical specimens\(^{(25)}\). Follicular carcinomas are the second most common type of malignancy\(^{(25)}\) and accounts for about 10% of all cases of thyroid malignancy in iodine deficiency areas\(^{(26)}\). Follicular adenomas were the most common type of benign neoplastic lesion. Our study is consistent with previous studies of thyroidectomy specimens. Medullary carcinoma of the thyroid is an unusual neuroendocrine neoplasm and accounts for approximately 5-7% of all thyroid cancers\(^{(26)}\). Only one case of medullary carcinoma was found in our study, and accounting for 1.4% of all thyroid cancers. Our results differ from other literature in that respect. A potential diagnostic dilemma occurs on cases of Hürthle cell neoplasm (HCN) and Hürthle cell (HC) change biopsy.

There are reliable data in the literature regarding the incidence of Hürthle cell neoplasms. HCN and HC occurs in 3-5% of all thyroid neoplasm and 2-3% of all thyroid malignancy.
Recently, Rossi et al reported on 150 consecutive Hürthle cell neoplasms and found 141 (94%) adenomas and 9 cases of (6%) malignant neoplasm\(^{(27)}\). Hürthle cell neoplasms occur as a morphological spectrum of tumors with variable biological behavior. It is advisable to regard them all as malignant or potentially malignant tumors\(^{(14)}\). In our study we found no cases of malignancy, among all patients with the Hürthle cell adenoma. In the last twenty years, ancillary diagnostic techniques such as FNA cytology are highly accurate in the diagnosis of thyroid nodules\(^{(8)}\). Baloch et al. characterized FNAs from 616 patients, including 455 cases (69%) negative for malignancy; 30 (4%) indeterminate cases; 105 (16%) neoplasm/malignant cases, and 72 (11%) non-diagnostic specimens. Sensitivity and specificity were reported as 92% and 84%, respectively\(^{(28)}\).

\[\text{Table 5: Data of the published cases of correlation of cytology and histology in the thyroid. In our study diagnoses of 5 patients with false-negative and 3 patients with false-positive.}\]

Altavilla et al. Reported on FNAs performed in 1796 patients, including 16.11% unsatisfactory cases (392), 66.91% benign cases, 4.89% cases suspicious for malignancy and 1.31% malignancy. Sensitivity and specificity were 71.43% and 100%, respectively\(^{(29)}\). Ylagan et al reported cytohistologic correlation in 255 patients, including 196 cases (77%) that were consistent and 45 cases (18%) that were discordant (30). Sidawy et al. reported on the correlation between cytology and histology and found 25 cases (27%) of inconsistency. In the present study, the false-positive and false-negative rates were 6% and 19%, respectively\(^{(31)}\) (Table 5).

The sensitivity of the present study was low relative to others in the literature, contributing to the difference in overall incidence. There were 3 (1.15%) false positive and 5 (1.9%) false negative results. Of the 66 cancers that were not recognized pre-operatively, 59 (89.4%) were more than 1 cm in diameter. Multinodular goiter is associated with potential malignancy and occurs in approximately 7.2% of all cases of referred thyroidectomy. Bombil et al. reported incidental malignancy in 5.7 % of multinodular goiter cases.

The present case series includes a pathologic review of all cases recorded as papillary carcinoma. The follicular variant of papillary thyroid carcinoma (FVPTC) occurs in 75% of all cases\(^{(32)}\). Previously, Pezzolla et al reported 256 cases (56%) of benign disease (predominantly multinodular goiter) and 202 (44%) cases of malignant growth in a series of 455 thyroidectomies, of which follicular variant of papillary thyroid carcinoma (FVPTC) accounted for 6.3% (29 cases), papillary carcinomas accounted for 2.19% (10 cases), and follicular carcinoma accounted for 0.2% (1 case). Papillary thyroid microcarcinoma (PTMC) is the most common form of incidental carcinoma (57.5%)\(^{(33)}\). In another report involving 300 sequential autopsies, malignant neoplasms were found in 2.33% of cases and included occult carcinoma in 1 % of cases\(^{(34)}\). Pagni et al. conducted a cytohistological correlation analysis of 287 PTC thyroid specimens, reporting incidental PTC in 45.2 % of cases\(^{(35)}\).

In another series involving 187 thyroidectomies specimens, incidental thyroid carcinoma (ITC) was found in 38 patients (20.3%). Mean ITC size was 4.21 ± 1.98 cm, and the most common carcinomas were papillary carcinoma and follicular variant\(^{(36)}\). The present study reported similar incidence of carcinoma subtypes. Papillary carcinoma was the most common malignancy, with the most common type being follicular variant (34 cases; 48.6%). Mean diameter of the PTC was 1.32 cm. In the United States, papillary thyroid microcarcinoma (PTMC) occurs more frequently in patients older than 45 years\(^{(37)}\).
Papillary thyroid microcarcinoma (PTMC) is the most common in autopsy studies, with a prevalence of about 2% to 35.6%, although multinodular goiter occurs in 8.5% of autopsy cases. Detection of mPTCs increased by 441% between 1983 and 2006 according to the SEER database of the National Cancer Institute. In the present study, only 13 cases (18%) were diagnosed as papillary thyroid microcarcinoma (PTMC), which are considered an incidental finding at surgery. The median tumor size was 2.13 mm (range, 0.05-10 mm). There were 12 females and 1 male patient, with a female to male ratio of 12. Age was < 51 years in 10 patients, and 51-60 years in 3 patients.

Hofman et al. observed 1,078 consecutive thyroid specimens including 31 (2.9%) thyroid tumors of uncertain malignant potential (TT-UMP). This included 16 WDT-UMP and 15 FT-UMP cases. Histologically, WDT-UMP and FT-UMP both have a follicular architecture of encapsulated thyroid tumors, contributing to diagnostic difficulties. The definition of WDT-UMP describes incomplete nuclear changes of papillary carcinoma, absence of capsular penetration. FT-UMP is characterized by questionable capsular penetration without blood vessel invasion or nuclear changes. We found only 5 cases of TT-UMP (0.5%), 3 WDT-UMP and 2 FT-UMP) out of 1149 consecutive thyroidectomy specimens. An estimate of WDT-UMP incidence in the thyroid specimens of 1.1% cases has been previously published. Hashimoto thyroiditis is the most common cause of hypothyroidism and inflammatory thyroid lesions in the United States. Hashimoto thyroiditis is associated with papillary thyroid cancer, with a coexistence of 8.6%. Hashimoto thyroiditis occurs in 23.5% of cases of papillary thyroid cancer (HT-PTC).

Several studies have reported coexistent Hashimoto’s thyroiditis and thyroid carcinoma or papillary carcinoma in 38% and 0.4% of thyroid patients, respectively. More recent studies have reported the incidence of PTC with HT as 29.4%, with greater prevalence in men than in women. We observed coexistence of Hashimoto’s thyroiditis and papillary carcinoma in 6 cases (0.5%). Amongst 70 specimens with PTC, the prevalence of HT was 8.5%.

In conclusions, nodular hyperplasia was most common histopathological result followed by papillary thyroid carcinoma in our histological evaluation of thyroidectomy samples. In this study, thyroid neoplastic lesions accounted for 13.1% of all cases presenting with thyroid goiter who underwent thyroidectomies. The results of our study of 70 patients with PTC demonstrated that 88.5% of cases were incidentally detected during surgery for other thyroid disorders. Improved imaging techniques and the use of correct FNA diagnoses may facilitate early diagnosis. Although a number of studies have demonstrated that thyroid FNA cytology is a highly sensitive tool for early detection of thyroid cancer, regular clinical follow-up is essential for patients with nodular goiter.

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