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Original Research Article

A Cytomorphological Study of Lymphocytic Thyroiditis and Its Impact on Thyroid Hormone Regulation

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Abstract:

Background: Chronic lymphocytic thyroiditis, an autoimmune condition affecting thyroid function, is one of the most common benign thyroid lesions diagnosed by fine-needle aspiration cytology (FNAC). It often presents with variable cytological and hormonal profiles that help assess the disease severity and guide clinical management.

Aim: To evaluate the cytomorphological features and correlate cytological grading with thyroid hormone status in cases of chronic lymphocytic thyroiditis.

Methodology: This descriptive, cross-sectional study was conducted in the Department of Pathology Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. A total of 90 clinically suspected cases underwent FNAC, cytological evaluation, and thyroid function tests (T3, T4, TSH). Cytological features were assessed qualitatively and quantitatively, and graded into three categories. Statistical analysis was done using SPSS v27.

Results: All cases (100%) showed thyroid epithelial cells, lymphocytic infiltration, and background lymphocytes. Anisokaryosis (78.88%) and Hurthle cells (77.77%) were common, while granulomas (6.66%) and germinal centers (11.11%) were infrequent. Grade II thyroiditis was most prevalent (70%), followed by Grade I (17.78%) and Grade III (12.22%). Hypothyroidism was observed in 64.44% of patients, with a strong association with Grade II and III thyroiditis. Euthyroid and hyperthyroid profiles were noted in 20% and 15.56% respectively.

Conclusion: FNAC remains a vital tool in diagnosing and grading chronic lymphocytic thyroiditis. Grade II thyroiditis with hypothyroidism was the most frequent pattern, reinforcing the role of cytological grading in clinical correlation and disease management.

Keywords: Autoimmune Thyroiditis, Cytological Grading, Chronic Lymphocytic Thyroiditis, FNAC, Thyroid Hormones.

Introduction

Thyroid problems are among the most common endocrine disorders globally, affecting around 42 million individuals in India [1]. In low-income nations such as India, around 3.2% of the populace suffers from thyroid-related disorders. Thyroid problems are swiftly detected owing to the gland's size and its accessibility for clinical evaluation. A diverse array of diagnostic examinations can identify thyroid diseases, including hormone assays, antibody tests, fine needle aspiration cytology (FNAC), and ultrasonography (USG) [2]. Fine needle aspiration cytology (FNAC) is the primary diagnostic method for assessing thyroid lesions and can accurately differentiate between neoplastic and non-neoplastic lesions [3]. The majority of thyroid nodules are benign, with benign results being the predominant fine-needle aspiration interpretation in (approximately 60-70% of instances) [4]. Chronic lymphocytic thyroiditis is the second most prevalent benign thyroid fine needle aspiration (FNA) diagnosis, following benign follicular nodule, and is also the second most frequently detected thyroid lesion with fine needle aspiration cytology (FNAC) after goitre.

Fine-needle aspiration cytology (FNAC) is an essential diagnostic method for assessing thyroid lesions, providing a less invasive technique to distinguish between benign and malignant nodules. FNAC entails the retrieval of cellular material by a tiny needle, succeeded by cytological examination, which is crucial in directing clinical therapy by differentiating between reactive, inflammatory, and neoplastic processes that may necessitate surgical intervention or not [5]. The thyroid gland, a vital endocrine organ, has multiple follicles that

synthesize the hormones triiodothyronine (T3) and thyroxine (T4), controlled by thyroid-stimulating hormone (TSH) released by the anterior pituitary gland. Thyroid function tests (TFTs), which assess T3, T4, and TSH levels, are essential for categorizing thyroid abnormalities into hyperthyroid, euthyroid, and hypothyroid classifications, each with considerable clinical ramifications [6].

Antibodies to the thyroid-stimulating hormone (TSH) receptor validate the diagnosis of Graves' disease in certain instances [7]. The autoimmune process involves a genetic predisposition and one or more triggers that activate a series of actions. The recognized causes include infections, life stress, iodine consumption, smoking, drugs including amiodarone and interferon, radiation, and environmental toxins [8]. Fine Needle Aspiration Cytology (FNAC) is very effective in assessing palpable thyroid nodules and has been standardized via the Bethesda System for Reporting Thyroid Cytopathology (BSRTC), which classifies thyroid lesions into six diagnostic groups according to defined cytological criteria [9].

Thyroid disorders are more prevalent, disruptive, costly, yet manageable. A significant number of thyroid disorders are also avoidable. A plethora of research corroborate these descriptions: (1) Approximately 5-20% of the global population exhibits some form of thyroid abnormality, contingent upon the selected indication. This proportion escalates in specific subpopulations, such as older women with autoimmune diseases. Both hypothyroidism and hyperthyroidism are disruptive, since they hinder physical and mental function, generate morbidity, and present unique dangers for pregnancy, the developing fetus, and neonates. (3) Costly - The assessment of thyroid function is a standard laboratory process that incurs annual expenses up to millions of rupees. (4) Treatable - Effective medicines are available for all prevalent conditions: hyperthyroidism, hypothyroidism, nodules, cancer, and iodine shortage. The repercussions of iodine shortage are easily preventable by good iodine consumption, and timely identification and treatment can mitigate the impacts of hypothyroidism on human development. Minimizing excess iodine intake helps avert several consequences, such as goiter, hypothyroidism, hyperthyroidism, and autoimmune disorders [10].

Thyroid lymphomas are infrequent conditions that typically develop in the context of chronic lymphocytic thyroiditis (Hashimoto's thyroiditis). Large cell lymphoma is an aggressive malignancy that often does not present a considerable diagnostic difficulty from a pathology perspective. Small cell lymphoma, however, can occasionally be challenging to differentiate from chronic lymphocytic thyroiditis. Historically, the majority of thyroid lymphomas were seen as originating from follicular center cells.

Methodology

Study Design: The present study was a descriptive and cross-sectional study conducted in the Department of Pathology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from January 2024 November 2024

Sample Size: The study included a total of 90 participants who met the eligibility criteria and provided informed written consent.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Patients clinically presumed to have chronic lymphocytic/autoimmune thyroiditis.
- Patients who provided written informed consent for participation.

Exclusion Criteria:

- Patients on medication that could interfere with thyroid function tests.
- Cases where fine-needle aspiration cytology (FNAC) smears were diluted with excessive blood, rendering them unsuitable for evaluation.

Procedure

Clinical and Biochemical Assessment: All patients underwent thorough clinical evaluations along with biochemical assessments, which included the estimation of thyroid hormones:

- T3: Normal range 0.52–1.85 ng/ml
- T4: Normal range 4.4–10.8 μg%
- TSH: Normal range 0.4–6.1 μIU/ml

Fine-Needle Aspiration Cytology (FNAC): FNAC of the thyroid gland was performed at multiple sites without ultrasound guidance. A maximum of two to four passes were made to obtain adequate material. Smears were prepared and stained using May Grunwald Giemsa (MGG) and Papanicolaou (PAP) stains. If initial smears were unsatisfactory, repeat aspirations were carried out. For analysis, at least two good-quality smears displaying characteristic features of lymphocytic thyroiditis were selected. Two independent cytologists evaluated all smears to ensure objectivity.

Cytological Grading: The cytological diagnosis was based on both qualitative and quantitative assessments:

Qualitative features: Presence of lymphocytes and plasma cells infiltrating thyroid follicles, Hurthle cell changes, multinucleated giant cells, epithelioid cell clusters, anisonucleosis, and interlobular fibrosis.

Quantitative features: The extent of lymphocytic infiltration and the degree of glandular destruction.

Statistical Analysis: Using Microsoft Excel for tabulation and basic computations and SPSS version 27.0, all gathered data were collated and statistically examined. Continuous variables—that is, thyroid hormone levels T3, T4, TSH—were compiled using descriptive statistics including mean, standard deviation (SD), median, and interquartile range (IQR). For categorical variables—e.g., cytological grade, presence of lymphocytic infiltration—frequency and percentages were employed. A p-value < 0.05 was considered statistically significant.

Result

Table 1 indicates the frequency of the different cytological features noted in cases of chronic lymphocytic thyroiditis. All 90 cases (100%) featured the presence of thyroid epithelial cells, follicular lymphocytic infiltration, and background lymphocytes and demonstrated the presence of these features as a consistent finding. Anisokaryosis was noted in 78.88% of cases, and the presence of Hurthle cells was observed in 77.77%, reflecting their common occurrence. Giant cells were noted in 34.44% of cases and epitheloid-like cells and histiocytes that engulf colloid appeared each in 15.55% of cases. The development of a granuloma was not common and was noted in a mere 6.66% of cases. Germinal center development and the presence of plasma cells each appeared in 11.11% of cases. Colloid was present in the count of 30% of cases. The observations reflect the presence of some of the features consistently while the presence of the remaining features shows varying occurrences among the cases of chronic lymphocytic thyroiditis.

Table 1: Various cytological features of chronic lymphocytic thyroiditis

S. No.	Cytological features	Total cases	Percentage
1	Thyroid epithelial cells	90	100%
2	Follicular lymphocytic infiltration	90	100%
3	Background lymphocytes	90	100%
4	Anisokaryosis	71	78.88%
5	Hurthle cells	70	77.77%
6	Giant cells	31	34.44%
7	Epitheloid-like cells	14	15.55%
8	Granuloma	6	6.66%
9	Germinal center formation	10	11.11%
10	Colloid	27	30.00%
11	Histiocytes engulfing colloid	14	15.55%
12	Plasma cells	10	11.11%

Table 2 shows the cytological grading of the 90 cases. Grade II occurs most frequently and represents 70% of the cases (63 cases). Grade I occurs next and comprises 16 cases (17.78%). Grade III occurs less frequently and comprises 11 cases (12.22%). The dataset comprises 90 cases, and the distribution shows a higher number of occurrences in Grade II.

Table 2: Cytological grading of cases (n=90)

S.no	Cytological grade	No. of cases	Percentage
1	Grade I	16	17.78%
2	Grade II	63	70.00%
3	Grade III	11	12.22%
4	Total	90	100%

Table 3 displays the thyroid hormone status of 90 cases and indicates that they were mostly hypothyroid at 64.44% (58 cases). Euthyroid subjects represented 20% (18 cases), while 15.56% (14 cases) were hyperthyroid. It shows that thyroid cases were predominant mostly due to the condition of hypothyroidism as opposed to the other thyroid conditions.

Table 3: Thyroid hormone status in all the cases (n=90)

Thyroid status	No. of cases	Percentage %
Euthyroid	18	20.00%
Hyperthyroid	14	15.56%
Hypothyroid	58	64.44%
Total	90	100%

Table 4 presents the distribution of cytological grades of lymphocytic thyroiditis across different thyroid hormone levels in a sample of 90 individuals. Among the 59 hypothyroid patients, 75% were classified as Grade I, 61.9% as Grade II, and 80% as Grade III. For the 14 hyperthyroid patients, no individuals were in Grade I or Grade III, while 22.2% were in Grade II. In the 17 euthyroid patients, 25% were in Grade I, 15.9% in Grade II, and 20% in Grade III. Overall, Grade II was the most common cytological grade across all thyroid conditions, representing a majority in hypothyroid and hyperthyroid cases, while Grade I was more prevalent in euthyroid individuals.

Table 4: Cytological grades of lymphocytic thyroiditis and hormonal profile in each category (n=90)

Cytological grading	Grade I no. (%)	Grade II no. (%)	Grade III no. (%)	Total no. (%)
Hypothyroid	12 (75.0%)	39 (61.9%)	8 (80.0%)	59 (65.6%)
Hyperthyroid	0 (0.0%)	14 (22.2%)	0 (0.0%)	14 (15.6%)
Euthyroid	4 (25.0%)	11 (15.9%)	2 (20.0%)	17 (18.9%)
Total	16 (100%)	64 (100%)	10 (100%)	90 (100%)

Discussion

The present study' provides an in-depth analysis of the cytological features and thyroid hormone status in cases of chronic lymphocytic thyroiditis. The findings reflect consistent cytological features, with thyroid epithelial cells, follicular lymphocytic infiltration, and background lymphocytes being present in all 90 cases. This consistent finding supports the established role of lymphocytic infiltration in the pathogenesis of chronic lymphocytic thyroiditis, which is a hallmark of the disease. The presence of anisokaryosis (78.88%) and Hurthle cells (77.77%) aligns with earlier studies, suggesting these features are commonly observed in the disease. Kumar et al., 2017 [11] conducted a study including 105 individuals with thyroid disorders from the Himalayan Pauri Garhwal area over a five-year period. Lymphocytic thyroiditis identified in this mountainous area was the second most prevalent thyroid condition at 27.27%, behind goiters at 45%. No national initiatives exist to monitor the prevalence of autoimmune thyroiditis in mountainous regions. Nguyen et al. 1997 [12] indicate that lymphocytic thyroiditis can impact individuals across all age demographics, however the majority are impacted throughout their third and fourth decades of life, consistent with our findings. This conclusion, however, diverged with some Western research that indicated a higher frequency in older demographics (Friedman et al., 1981)[13].

While the presence of giant cells (34.44%) and epitheloid-like cells or histiocytes engulfing colloid (15.55%) was less frequent, these observations indicate the varied nature of the cytological presentation in chronic lymphocytic thyroiditis. The relatively rare presence of granulomas (6.66%) and germinal center development (11.11%) suggests that these features may occur in more severe or advanced stages of the disease. The presence of colloid in 30% of cases indicates the ongoing functional activity of the thyroid gland despite the inflammatory infiltration. In our study, the majority of patients are between 18 and 40 years of age, with a predominance of females. The rise in incidence has been associated with excessive iodine consumption and proximity to industrial zones (Benvenga et al., 2008) [14]. The ratio of total T3 to total T4 is frequently employed to distinguish the etiology of thyrotoxicosis between Graves' disease and subacute thyroiditis. The T3 to T4 ratio proved important in differentiating the etiology of thyrotoxicosis.

Cytological grading in this study showed that Grade II was the most common, comprising 70% of the cases. This is consistent with the understanding that chronic lymphocytic thyroiditis typically manifests with moderate to advanced infiltration, which aligns with Grade II classification. Grade I, representing a milder form of the disease, was seen in 17.78% of the cases, and Grade III, indicating a more severe form of the disease, occurred in 12.22% of cases. This distribution suggests that while most cases fall within the moderate range of the disease, a significant proportion of individuals may experience severe forms of thyroiditis, highlighting the spectrum of disease severity. Upon additional grading, the majority of patients exhibited grade II thyroiditis, followed by grade I thyroiditis, while grade III thyroiditis was observed in the fewest individuals in our research. This resembles the research conducted by Bhatia et al. 2007 [15] and Shetty et al. 2019 [16]. In a research conducted study by Sood et al., 2014 [17] the predominant cases were classified as grade III thyroiditis.

The thyroid hormonal status of the population in the present study reveals hypothyroidism to be the most prevalent thyroid abnormality in chronic lymphocytic thyroiditis, occurring in 64.44% of cases. This observation confirms earlier evidence that the thyroid gland infiltration by lymphocytes can be a reason behind its malfunction, resulting in hypothyroidism. The 15.56% of hyperthyroid cases suggest that although these are fewer, there might exist a subcategory of individuals who have enhanced thyroid hormone secretion, possibly a result of thyroid gland destruction or malfunction resulting in transient hyperthyroidism.

Comparing thyroid hormone statuses to the distribution of cytological grades, we can note that most of the hypothyroid cases fall into Grade II (61.9%), a trend that may indicate a more chronic nature of the disease in this group. Grade III evaluation in hypothyroidism patients (80%) indicates more serious cases, a trend that points to possible correlation between thyroid dysfunction and progression of disease. Hyperthyroid individuals, on the other hand, have a larger fraction of Grade II (22.2%), while euthyroid patients also clustered largely in Grade II, but Grade I was more common here. These observations indicate that sometimes cytological grade does not have a direct correlation with thyroid hormone status, as different individuals having similar cytological characteristics demonstrate dissimilar levels of thyroid function.

Conclusion

The current study highlights the key role of FNAC in chronic lymphocytic thyroiditis diagnosis, reiterating its utility as a first-line, minimum invasive diagnostic procedure. All 90 cases exhibited typical cytological features, including thyroid epithelial cells, follicular lymphocytic infiltrates, and background lymphocytes, emphasizing the uniform microscopic appearance of the disease. Grade II cytological features were most common (70%) reflecting a middle-grade severity of the disease in most patients, while 17.78% and 12.22% of patients were Grade I and Grade III, respectively. Hypothyroidism was found to be the most frequent hormonal profile (64.44%) corroborating a correlation of chronic lymphocytic thyroiditis with low thyroidal functions. The study also demonstrated a higher proportion of female patients in the 18- to 40-year age group, indicating a demographic pattern similar to that of autoimmune thyroid disorders. The variability of features such as Hurthle cells and giant cells was seen in a few cases, but it was not significant enough to reduce diagnostic accuracy by FNAC. The utility of FNAC in early diagnosis, in grading, and in appropriate management at an early stage has been confirmed by these findings.

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