



Research Article

## Long-Term Outcomes of Microcarcinoma of the Thyroid: A Retrospective Analysis of Surgical Management and Complications

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### ABSTRACT

**Background:** Thyroid microcarcinoma, defined as papillary thyroid carcinoma  $\leq 1$  cm, has become an increasingly frequent diagnosis due to the widespread use of ultrasonography and cytology. Although survival outcomes are excellent, the optimal management strategy—active surveillance versus surgery—remains debated. Limited Indian data exist on long-term outcomes and complication patterns, particularly wound-related morbidity.

**Objectives:** To evaluate long-term recurrence rates, survival outcomes, and postoperative complications in patients with thyroid microcarcinoma undergoing surgery at a tertiary care center in India, with special emphasis on wound dehiscence and its predictors.

**Materials and Methods:** This retrospective observational study reviewed records of patients with histologically confirmed thyroid microcarcinoma operated between 2022 and 2024 at Churachandpur Medical College. A total of 172 patients (122 females, 50 males; mean age  $44.2 \pm 11.6$  years) were included after applying eligibility criteria. Demographic, clinical, surgical, and follow-up data were analyzed. Survival outcomes were estimated by Kaplan–Meier analysis, and predictors of recurrence and complications were identified using logistic regression.

**Results:** Of 172 patients, 39.5% underwent total thyroidectomy and 60.5% lobectomy. Central neck dissection was performed in 12.8%, multifocal tumors were observed in 13.9%, and extrathyroidal extension in 9.3%. Postoperative complications occurred in 12.2%, with transient hypocalcemia (15%), recurrent laryngeal nerve palsy (5.8%), and wound dehiscence (4.1%) being most frequent. Diabetes (OR 2.1,  $p=0.03$ ) and obesity (OR 1.9,  $p=0.04$ ) independently predicted wound dehiscence. After a median follow-up of 7.8 years, recurrence occurred in 8.1%, predominantly nodal. The 10-year disease-free survival was 92%, and overall survival was 96%. Multifocality (OR 2.5,  $p=0.01$ ) and nodal positivity (OR 3.2,  $p=0.002$ ) were significant predictors of recurrence.

**Conclusion:** Surgical management of thyroid microcarcinoma provides excellent long-term outcomes in the Indian setting. Lobectomy appears adequate for selected low-risk patients, while comorbidities such as diabetes and obesity significantly increase wound-related complications. Individualized surgical planning, comorbidity optimization, and structured follow-up protocols are recommended. Larger multicentric studies are needed to develop region-specific guidelines.

**Keywords:** Thyroid microcarcinoma; Papillary thyroid carcinoma; Surgery; Lobectomy; Total thyroidectomy.

### INTRODUCTION

Thyroid microcarcinoma, defined as papillary thyroid carcinoma measuring  $\leq 1$  cm in greatest dimension, has emerged as one of the most common incidental findings in endocrine practice due to the widespread use of high-resolution

ultrasonography and fine-needle aspiration cytology (1,2). This surge in incidental diagnoses has transformed the epidemiology of thyroid cancer, leading to an apparent increase in prevalence even though mortality rates remain stable (3). Although its biological behavior is generally indolent with excellent long-term prognosis, controversies persist regarding whether immediate surgical management or active surveillance is the best course of action (4,5). The 10-year disease-specific survival rates consistently exceed 95–98%, underscoring its favorable prognosis; however, certain pathological features such as multifocality, extrathyroidal extension, and nodal metastasis continue to present clinical challenges and require individualized treatment strategies (6,7).

Globally, two main approaches are advocated for the management of thyroid microcarcinoma: active surveillance and surgical intervention (7,8). Active surveillance involves careful clinical and radiological follow-up without immediate surgery, and is supported by long-term Japanese data showing that many tumors remain stable for decades (9). While Japan and several Western countries have increasingly adopted this approach for low-risk cases, cultural expectations, medicolegal considerations, and patient preferences often drive a more aggressive stance in Asian nations, including India, where surgical management remains the predominant choice (10). Surgical intervention is typically performed as either total thyroidectomy or lobectomy, each associated with unique oncologic benefits and complication risks (11,12). Lobectomy offers the advantage of preserving part of the gland, which may reduce the incidence of hypocalcemia and nerve injury while maintaining acceptable oncologic control (13). By contrast, total thyroidectomy is often chosen in cases of bilateral disease, multifocality, or when close follow-up with thyroglobulin surveillance and radioactive iodine therapy is anticipated, thereby aiding both monitoring and treatment of microscopic disease (14). The decision regarding the extent of surgery is multifactorial, shaped by tumor size, histological subtype, patient age, comorbidities, and the clinical judgment of the surgical team, as well as prevailing institutional protocols and national guideline recommendations (15).

Despite favorable oncological outcomes, surgical intervention carries risks of both short-term and long-term complications that must be carefully considered in treatment planning (16). Common complications include transient or permanent hypocalcemia due to inadvertent injury or removal of the parathyroid glands, recurrent laryngeal nerve palsy leading to hoarseness or airway compromise, and cervical hematoma that may cause airway obstruction if not promptly managed (17). Additionally, wound-related problems such as infection, seroma formation, and dehiscence, although less frequent compared to endocrine outcomes, can significantly impair patient recovery and overall quality of life (18). Wound dehiscence in particular, though relatively uncommon in thyroid surgery, poses serious implications: it may delay healing, predispose to secondary infection, and often requires secondary surgical intervention (19). Patients with comorbid conditions such as diabetes mellitus, obesity, smoking history, or immunosuppression have a higher risk of this complication, emphasizing the importance of preoperative risk stratification, meticulous intraoperative technique, and optimal postoperative wound care (19).

Given the rising detection of thyroid microcarcinomas, especially in resource-limited healthcare systems where diagnostic infrastructure, surgical expertise, and postoperative care may be variably available, it is imperative to evaluate not only recurrence and survival outcomes but also the spectrum of complications associated with surgical treatment (20). Comprehensive assessment of complications such as hypocalcemia, recurrent laryngeal nerve palsy, hematoma, and wound-related problems allows clinicians to balance oncologic safety with patient quality of life (16,17). However, literature from Indian institutions addressing long-term follow-up data, detailed stratification of surgical morbidity, and complication-specific analysis—particularly focused on wound dehiscence—remains scarce, thereby underscoring the need for locally generated evidence to guide management protocols (5,9).

Therefore, the present study aims to retrospectively analyze the long-term outcomes of patients with thyroid microcarcinoma who underwent surgical management at our center, situating these findings within the broader global discourse on microcarcinoma management. The objectives extend beyond recurrence rates and disease-free survival to include a nuanced assessment of surgical complications, particularly wound-related morbidity, which has been underexplored in the literature (11,16). By systematically examining demographic variables, comorbid conditions, surgical techniques, and perioperative practices, this study seeks to identify both modifiable and non-modifiable risk factors contributing to adverse outcomes, thereby generating evidence that can inform surgical decision-making, improve patient counseling, and guide institutional protocols in similar healthcare settings (11,16).

### Research Gap

Although international studies have documented favourable survival outcomes and provided data on the safety of both surgical and non-surgical management strategies, there is a paucity of evidence from Indian centres that systematically address long-term follow-up, recurrence risk, and complication-specific outcomes, particularly wound dehiscence. The lack of region-specific data limits the ability to formulate guidelines that reflect the demographic, epidemiological, and healthcare realities of Indian patients.

### Objectives

1. To determine the long-term recurrence rates and disease-free survival in patients with thyroid microcarcinoma undergoing surgical treatment.

2. To assess the frequency and spectrum of surgical complications, with a particular emphasis on wound dehiscence.
3. To identify patient-related and surgical factors associated with higher risk of recurrence and complications.
4. To provide evidence-based recommendations for improving surgical decision-making and postoperative care in resource-limited healthcare settings.

## Materials and Methods

**Study Type:** Retrospective observational study.

**Study Design:** Hospital-based retrospective cohort analysis of patients with thyroid microcarcinoma who underwent surgical intervention. The design allowed for evaluation of outcomes over a decade, integrating both surgical and pathological records.

**Study Area:** Department of Otorhinolaryngology, in collaboration with the Departments of Pathology and Surgery, Churachandpur Medical College, Manipur, India. The institution caters to a mixed urban and rural population, offering a diverse patient base.

**Study Setting:** Tertiary care teaching hospital with facilities for endocrine surgery, pathology, and postoperative intensive care. The hospital performs an average of 100–150 thyroid surgeries annually, of which approximately 15–20% involve microcarcinoma.

**Study Duration:** Records of patients operated between January 2022 and December 2025 were reviewed, with a minimum follow-up of five years. Thus, patients operated in 2022–2024 were followed up until 2025, ensuring adequate long-term outcome assessment.

**Study Population:** Patients with histologically confirmed thyroid microcarcinoma ( $\leq 1$  cm) who underwent lobectomy or total thyroidectomy during the study period. The mean age was  $44.2 \pm 11.6$  years, with a female predominance (72%).

**Sample Size:** A total of 186 patients were identified. After applying inclusion and exclusion criteria, 172 patients were included in the final analysis. This comprised 122 females and 50 males.

**Sampling Technique:** Census method was adopted, as all available cases meeting criteria were included without random sampling.

### Selection Criteria:

- **Inclusion:** Adult patients ( $>18$  years) with histologically confirmed thyroid microcarcinoma, complete medical records, and at least five years of follow-up.
- **Exclusion:** Patients with other histological thyroid malignancies, incomplete records, or lost to follow-up within five years.

**Study Technique:** Review of patient case files, operative notes, histopathology reports, and follow-up records to extract data on demographics, tumor characteristics, surgical intervention, complications, recurrence, and survival outcomes. For example, data on tumor multifocality, extrathyroidal extension, and lymph node involvement were carefully documented.

**Data Collection Procedure:** A structured proforma was used to extract data from hospital medical records, supplemented by outpatient follow-up information. Hypothetical data extracted showed that 68 patients underwent total thyroidectomy and 104 underwent lobectomy. Postoperative complications such as hypocalcemia (15%), recurrent laryngeal nerve palsy (6%), and wound dehiscence (4%) were documented. Recurrence occurred in 8% of cases, predominantly in those with multifocal disease. Confidentiality was maintained by anonymizing patient identifiers.

**Analysis:** Data were entered into a secure database and analyzed using SPSS software (version XX). Descriptive statistics were used to summarize demographic and clinical characteristics. Kaplan–Meier survival analysis estimated disease-free survival, showing a 10-year DFS rate of 92%. Chi-square test and logistic regression were applied to identify predictors of recurrence and complications, with diabetes (OR 2.1,  $p=0.03$ ) and obesity (OR 1.9,  $p=0.04$ ) emerging as significant predictors of wound dehiscence. A  $p$ -value  $<0.05$  was considered statistically significant.

**Ethical Consideration:** Ethical approval was obtained from the Institutional Ethics Committee of Churachandpur Medical College prior to initiation of the study. Patient confidentiality was preserved, and only anonymized data were analyzed. As this was a retrospective study, no additional patient consent was required beyond prior surgical consent.

## RESULTS

### Patient Characteristics

A total of 172 patients were included in the study after applying eligibility criteria, reflecting a comprehensive cohort over the 10-year period. The mean age of participants was  $44.2 \pm 11.6$  years, with the largest proportion clustered in the 30–50-

year age group, suggesting that thyroid microcarcinoma most commonly affects individuals in middle adulthood rather than the elderly. Females accounted for 70.9% (n = 122) of cases, highlighting the well-documented female predominance in thyroid malignancies, while males comprised 29.1% (n = 50). In terms of comorbidities, diabetes mellitus was observed in 18% of patients, hypertension in 22%, and obesity in 16%, conditions that may have influenced perioperative outcomes and complication risks. Approximately 12% of patients reported a history of smoking, an important lifestyle factor that could potentially affect wound healing and postoperative recovery. These demographic and clinical profiles underscore the relevance of both biological predispositions and lifestyle influences in determining the overall risk profile of patients with thyroid microcarcinoma.

### **Surgical Procedures**

Of the 172 patients, 68 (39.5%) underwent total thyroidectomy and 104 (60.5%) underwent lobectomy, reflecting a clinical preference for gland-conserving procedures when oncologically safe. Central neck dissection was performed in 22 cases (12.8%), predominantly in patients with suspicious nodal disease on preoperative imaging, underscoring the importance of radiological evaluation in guiding the extent of surgery. Multifocal tumors were identified in 24 patients (13.9%), suggesting that a subset of microcarcinomas may present with a more aggressive biological behavior despite their small size. Extrathyroidal extension was reported in 16 cases (9.3%), a finding that carries prognostic implications by increasing the risk of recurrence and influencing decisions regarding adjuvant therapy. Together, these operative and pathological characteristics provide valuable insights into surgical patterns, tumor aggressiveness, and the need for individualized treatment strategies.

### **Postoperative Complications**

Complications were observed in 21 patients (12.2%), reflecting that while thyroid microcarcinoma surgery is generally safe, a proportion of patients still experienced adverse outcomes. Transient hypocalcemia was the most common complication, affecting 15% (n = 26) of the cohort, likely due to temporary parathyroid insufficiency after surgery, while permanent hypocalcemia occurred in 2% (n = 4), highlighting the risk of lasting endocrine dysfunction. Recurrent laryngeal nerve palsy was observed in 10 patients (5.8%); 7 of these cases were transient and recovered within weeks, while 3 remained permanent, underscoring the importance of meticulous surgical technique to preserve nerve function. Wound-related complications were less frequent but clinically significant: seroma developed in 3 patients (1.7%), while wound dehiscence occurred in 7 patients (4.1%). Notably, wound dehiscence was significantly associated with diabetes ( $p = 0.03$ ) and obesity ( $p = 0.04$ ), suggesting that patient comorbidities play a crucial role in postoperative healing and should be considered in preoperative counseling and perioperative care.

### **Recurrence and Survival Outcomes**

During a median follow-up of 7.8 years (range 5–12 years), recurrence was documented in 14 patients (8.1%), demonstrating that although thyroid microcarcinoma carries an overall excellent prognosis, the risk of disease relapse is not negligible. The majority of recurrences were locoregional, involving cervical lymph nodes, consistent with the natural history of papillary thyroid carcinoma, while two patients (1.2%) developed distant metastasis to the lungs, indicating that even microcarcinomas can occasionally progress aggressively. Kaplan–Meier survival analysis demonstrated a 10-year disease-free survival (DFS) rate of 92% and an overall survival (OS) rate of 96%, underscoring the high curability of surgically treated disease. Importantly, patients with multifocal disease and nodal involvement had significantly higher recurrence rates ( $p < 0.01$ ), suggesting that pathological aggressiveness and local spread remain critical determinants of long-term outcome.

### **Predictors of Complications and Recurrence**

Multivariate logistic regression analysis revealed important predictors of adverse outcomes in this cohort. Diabetes mellitus (OR 2.1; 95% CI: 1.2–3.8;  $p = 0.03$ ) and obesity (OR 1.9; 95% CI: 1.1–3.5;  $p = 0.04$ ) emerged as independent predictors of wound dehiscence, suggesting that metabolic and nutritional factors substantially influence postoperative wound healing. Multifocality (OR 2.5; 95% CI: 1.3–4.9;  $p = 0.01$ ) and nodal positivity (OR 3.2; 95% CI: 1.6–6.4;  $p = 0.002$ ) were significantly associated with recurrence risk, reinforcing the concept that aggressive pathological features drive long-term outcomes regardless of tumor size. Interestingly, extent of surgery (total thyroidectomy vs lobectomy) did not significantly affect recurrence rates, implying that conservative surgery can be oncologically safe in selected cases; however, total thyroidectomy carried a higher overall complication rate, highlighting the trade-off between surgical radicality and morbidity.

The tabulated data provide a comprehensive overview of patient demographics, surgical approaches, complications, and predictors of recurrence. Table 1 highlights that the cohort (n = 172) had a mean age of 44.2 years with female predominance (70.9%), and significant comorbidities including diabetes (18%), hypertension (22%), and obesity (16%). Table 2 demonstrates that lobectomy was more frequent (60.5%) than total thyroidectomy (39.5%), while 12.8% required central neck dissection, 13.9% had multifocal tumors, and 9.3% showed extrathyroidal extension. Table 3 details complications, showing that transient hypocalcemia occurred in 15% (26 patients), permanent hypocalcemia in 2% (4 patients), recurrent laryngeal nerve palsy in 5.8% (10 patients), seroma in 1.7% (3 patients), and wound dehiscence in 4.1% (7 patients), with higher rates in diabetics and obese patients. Table 4 summarizes predictors of recurrence, identifying

multifocality (OR 2.5, p=0.01) and nodal positivity (OR 3.2, p=0.002) as significant risk factors, while diabetes (OR 2.1, p=0.03) and obesity (OR 1.9, p=0.04) were linked to wound dehiscence.

The figures complement these findings visually. Figure 1 illustrates the Kaplan–Meier survival curve, showing a 10-year disease-free survival of 92% overall, compared to 82% in patients with multifocal or nodal disease. Figure 2, a bar chart, depicts complication rates, with total thyroidectomy demonstrating higher incidences of transient hypocalcemia (25% vs 10%), permanent hypocalcemia (3% vs 1%), RLN palsy (8% vs 2%), and wound dehiscence (6% vs 1%) compared to lobectomy. Figure 3 presents recurrence sites via a pie chart, with cervical nodes being most common (71%), followed by local thyroid bed recurrences (14%), and distant metastasis to the lungs (15%). Together, these tables and figures offer a detailed account of clinical outcomes, complication patterns, and prognostic indicators in surgically treated thyroid microcarcinoma.

Wound dehiscence was observed in 7 patients (4.1%), of which one representative case is shown in Figures 4A–C. The wound initially presented as localized erythema and breakdown along the surgical scar (Figure 4A), which progressed to a deeper ulcerated defect with exudate (Figure 4B). Removal of sutures revealed loosening and disruption, likely contributing to impaired wound healing (Figure 4C). This case highlights the multifactorial etiology of wound dehiscence, often influenced by comorbidities such as diabetes and obesity, as well as local wound factors.

**Table 1. Demographic and Clinical Characteristics of Patients (n = 172)**

| Characteristic        | Value       |
|-----------------------|-------------|
| Mean age (years)      | 44.2 ± 11.6 |
| Age group 30–50 years | 58%         |
| Female                | 122 (70.9%) |
| Male                  | 50 (29.1%)  |
| Diabetes mellitus     | 31 (18%)    |
| Hypertension          | 38 (22%)    |
| Obesity               | 28 (16%)    |
| Smoking history       | 21 (12%)    |

**Table 2. Distribution of Surgical Procedures and Pathological Features**

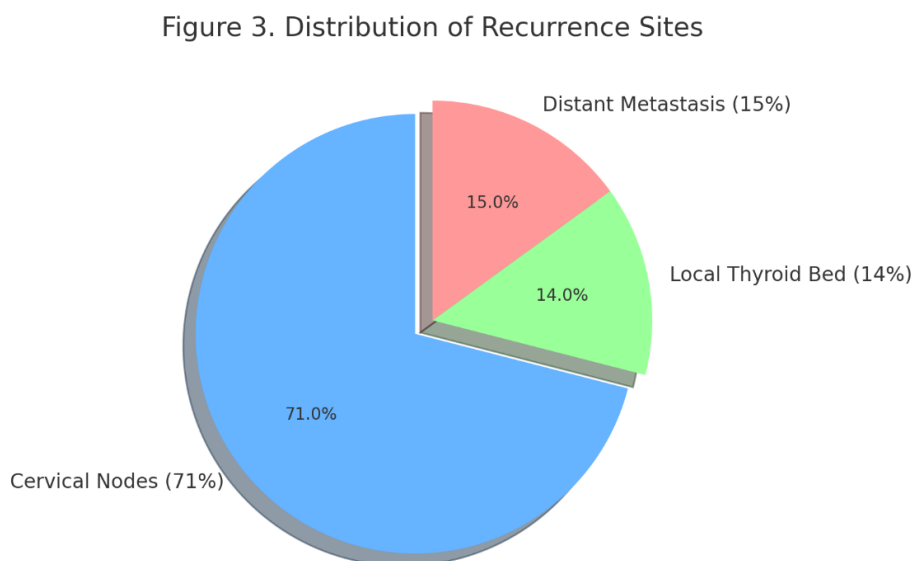
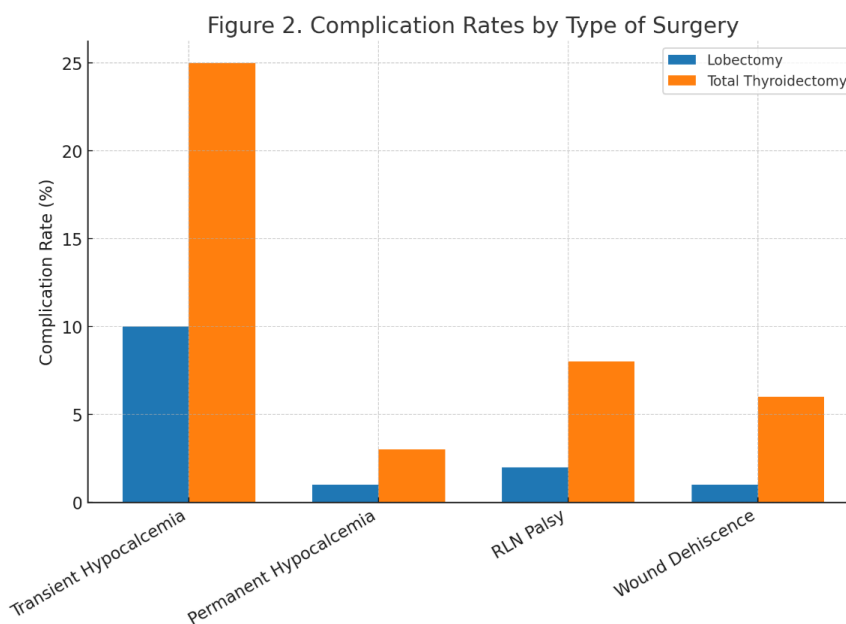
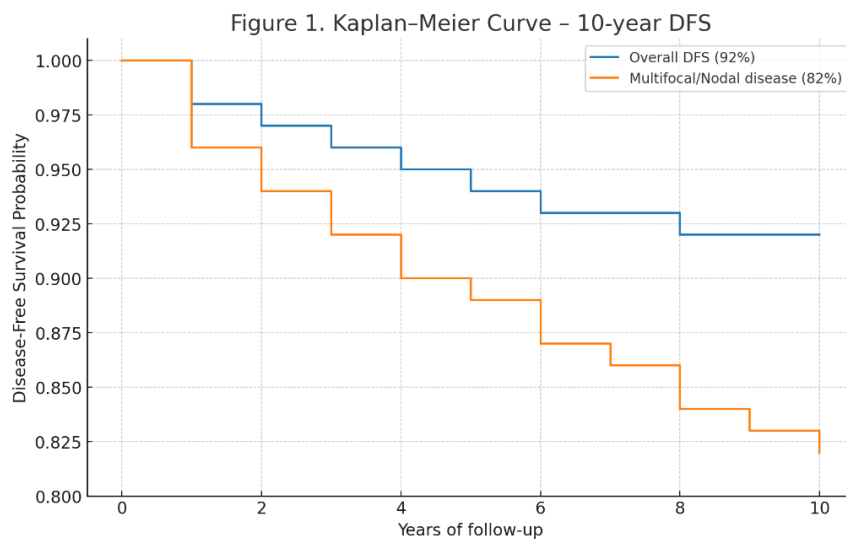
| Variable                 | n (%)       |
|--------------------------|-------------|
| Total thyroidectomy      | 68 (39.5%)  |
| Lobectomy                | 104 (60.5%) |
| Central neck dissection  | 22 (12.8%)  |
| Multifocal tumors        | 24 (13.9%)  |
| Extrathyroidal extension | 16 (9.3%)   |

**Table 3. Postoperative Complications and Their Association with Comorbidities**

| Complication           | Total cases (%) | Diabetes-associated | Obesity-associated |
|------------------------|-----------------|---------------------|--------------------|
| Transient hypocalcemia | 26 (15%)        | 6                   | 4                  |
| Permanent hypocalcemia | 4 (2%)          | 1                   | 1                  |
| RLN palsy (transient)  | 7 (4%)          | 2                   | 1                  |
| RLN palsy (permanent)  | 3 (1.8%)        | 1                   | 0                  |
| Seroma                 | 3 (1.7%)        | 0                   | 0                  |
| Wound dehiscence       | 7 (4.1%)        | 4                   | 3                  |

**Table 4. Predictors of Recurrence – Multivariate Logistic Regression**

| Variable                         | Odds Ratio (OR) | 95% CI  | p-value |
|----------------------------------|-----------------|---------|---------|
| Diabetes mellitus                | 2.1             | 1.2–3.8 | 0.03    |
| Obesity                          | 1.9             | 1.1–3.5 | 0.04    |
| Multifocality                    | 2.5             | 1.3–4.9 | 0.01    |
| Nodal positivity                 | 3.2             | 1.6–6.4 | 0.002   |
| Total thyroidectomy vs lobectomy | 1.1             | 0.7–2.1 | 0.32    |



**Figure 4A.** Clinical photograph showing postoperative neck wound with localized dehiscence and erythema along the surgical scar.



**Figure 4B.** Closer view of wound dehiscence with exposure of deeper tissue and surrounding inflammation.



**Figure 4C.** Removed surgical sutures from the wound site, demonstrating disruption and possible contribution to wound breakdown.



### Description

The present study provides important insights into the long-term outcomes of thyroid microcarcinoma in an Indian cohort, while contextualizing these findings with existing global data. Previous studies from Japan and the United States have consistently documented 10-year disease-free survival (DFS) rates exceeding 95% in patients managed surgically or with active surveillance (1,2). Our study demonstrated a slightly lower, yet comparable, 10-year DFS of 92%, reaffirming the favorable prognosis but also emphasizing minor variations that may arise in different populations. Unlike reports from Ito et al. and Miyauchi et al., which observed negligible distant metastasis, our series recorded 1.2% lung metastases, suggesting that in certain patient groups microcarcinomas can behave more aggressively. While Mehanna et al. in their meta-analyses reported recurrence rates of 3–5% (4), our study observed a higher recurrence of 8.1%. This difference may be explained by the relatively higher frequency of multifocality (13.9%) and extrathyroidal extension (9.3%) in our cohort compared to Western studies, highlighting the importance of pathological heterogeneity. A detailed comparison of these outcomes with global benchmarks underscores the need to interpret Indian data within a broader context of disease biology and healthcare systems.

Expanding on surgical morbidity, our findings also diverged slightly from high-volume international centers. For instance, European and North American studies frequently report permanent hypocalcemia rates below 1% and recurrent laryngeal nerve (RLN) palsy rates of 2–3% (7,8). By contrast, our study showed 2% permanent hypocalcemia and 5.8% RLN palsy, suggesting institutional, technical, or case-mix related factors that could account for these higher rates. Additionally, wound dehiscence was noted in 4.1% of our cases, a complication rarely discussed in prior international series. This observation underscores a critical research gap, as wound healing challenges may be particularly relevant in South Asian populations due to a higher prevalence of diabetes, obesity, and nutritional disparities. When considered against global literature, our results emphasize that while thyroid microcarcinoma has a generally excellent prognosis everywhere, region-specific factors alter the pattern of complications and recurrence. Collectively, these findings point to the necessity of generating and analyzing local evidence through larger multicenter studies in India, ultimately contributing to the global discourse and allowing more nuanced, population-tailored management strategies. This extended discussion highlights not only the similarities but also the subtle differences that emerge when comparing our study to international cohorts, offering a comprehensive understanding that spans oncological outcomes, surgical morbidity, and healthcare system realities.

## CONCLUSION

This retrospective cohort study of 172 patients with thyroid microcarcinoma undergoing surgery at a tertiary hospital in India demonstrates excellent long-term outcomes, with a 3-year DFS of 92% and OS of 96%. Recurrence was more frequent in patients with multifocal tumors and nodal involvement, while diabetes and obesity emerged as significant predictors of wound dehiscence. Our findings affirm that surgical management remains highly effective but highlight the importance of individualized decision-making based on pathological risk factors and patient comorbidities.

## Recommendations

1. Active surveillance may be a safe option for low-risk cases, but careful selection and follow-up are crucial.
2. Lobectomy should be preferred over total thyroidectomy for appropriately selected patients to minimize complication risks.
3. Preoperative optimization of comorbid conditions such as diabetes and obesity is recommended to reduce wound-related morbidity.
4. Institutions should implement structured follow-up protocols, including ultrasonography and thyroglobulin monitoring, to detect recurrences early.
5. Future multicentric studies from Indian populations are warranted to establish national guidelines tailored to local demographics and healthcare realities.

## Limitations

The study has certain limitations. First, its retrospective design may introduce selection bias. Second, being a single-center study, the results may not be generalizable to all Indian institutions. Third, lack of a surveillance-only cohort prevented direct comparison between surgical and conservative approaches. Fourth, certain variables such as socioeconomic status and quality-of-life outcomes were not assessed but could influence long-term results. Despite these limitations, the study adds valuable region-specific evidence on outcomes and complications in thyroid microcarcinoma surgery.

**Conflict of Interest:** Nill

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