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Research Article

# Thyroglossal Duct Cyst: Patterns of Presentation, Anatomical Variability, and Surgical Outcomes in a Tertiary Care Setting

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## I N F O

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## A B S T R A C T

*Introduction:* Thyroglossal duct cyst (TGDC) is the most common congenital midline neck mass, arising due to the incomplete involution of the embryonic thyroglossal tract. Though frequently seen in the paediatric age group, TGDC can present at any age with varied anatomical locations and clinical features. This study aimed to analyse the age, sex distribution, anatomical variations, clinical presentation, surgical outcomes, and histopathological findings of TGDC in a defined population.

*Materials and Methods:* This retrospective study was conducted on 15 patients with clinically and radiologically diagnosed TGDC at a tertiary care centre. Detailed history, physical examination, and imaging (ultrasound ± CT) were performed. All patients underwent FNAC followed by surgical excision—either the Sistrunk procedure or simple excision—based on intraoperative findings. Histopathology confirmed the diagnosis, and postoperative follow-up was done for three months.

*Results:* The patients ranged in age from 4 to 42 years (mean ± SD: 18.6 ± 10.4 years), with a male-to-female ratio of 1.5:1. Most cysts were located in the infrahyoid region (66.7%), and 86.7% showed movement with tongue protrusion. Infection was present in 20%, and sinus tracts in 13.3%. The Sistrunk procedure was performed in 80% of patients and was associated with no recurrence. One recurrence was noted following simple excision. Histopathology confirmed TGDC in all cases; ectopic thyroid tissue was found in 26.7%, with no malignancy.

*Conclusion:* TGDC shows considerable clinical and anatomical variation. Accurate diagnosis and complete excision using the Sistrunk procedure are essential to minimize recurrence and ensure favourable outcomes.

**Keywords:** Thyroglossal Duct Cyst (Tgdc), Congenital Neck Mass, Histopathology, Ectopic Thyroid Tissue, Anatomical Variation, Surgical Outcomes, Midline Neck Swelling, Paediatric, Adult Presentation


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## Introduction

Thyroglossal duct cyst (TGDC) is the most common congenital anomaly of the neck, constituting nearly 70% of all congenital neck masses across paediatric and adult populations.[1,2] These cysts originate from remnants of the thyroglossal duct, an embryonic tract formed during the migration of the thyroid gland from the foramen cecum at the base of the tongue to its definitive pretracheal location in the neck. Under normal conditions, this tract undergoes complete obliteration by the tenth week of gestation. Failure of involution results in persistent epithelial remnants, which may later develop into cystic lesions anywhere along the duct's course.[3]

TGDCs classically present as painless, fluctuant, midline neck swellings that move with deglutition or tongue protrusion due to their anatomical connection to the hyoid bone. Although they are most frequently diagnosed in the first decade of life, their clinical presentation may be delayed until adolescence or adulthood.[1,2] These lesions are often discovered incidentally or after secondary infection, which can lead to rapid enlargement, pain, fistula formation, or abscesses. In rare cases—approximately 1%—TGDCs may harbour malignancy, with papillary thyroid carcinoma being the most common histological type.[3–5]

There is significant anatomical and clinical variability in TGDCs. The most frequent site of occurrence is the infrahyoid region (25–65%), followed by the hyoid level (15–20%), and the suprahyoid region (20–25%).[6] Less commonly, TGDCs may be found in atypical locations such as the submental region or within the tongue base (lingual TGDC). Variations may also be observed in size, consistency, presence of ectopic thyroid tissue, association with fistulous tracts, and recurrent infections. Such diversity in presentation often complicates the clinical diagnosis and necessitates imaging for further evaluation.

Ultrasound remains the first-line modality due to its accessibility and ability to differentiate cystic from solid lesions. Additional imaging techniques such as CT or MRI may be required in complex or recurrent cases, particularly to identify deep or atypically located cysts.[4]

Fine-needle aspiration cytology (FNAC) may aid in diagnosis, especially in older patients or when malignancy is suspected. Definitive treatment is surgical, with the Sistrunk procedure being the standard of care. This involves complete excision of the cyst along with the central portion of the hyoid bone and the tract up to the base of the tongue. Inadequate removal of the tract or failure to resect the central hyoid leads to recurrence, which is seen more commonly with simple excision procedures.[6]

While TGDC is a well-known clinical entity, few studies have comprehensively analysed the full range of anatomical and clinical variations within a single population.[7] Understanding these variations is critical to ensure accurate diagnosis, tailor surgical interventions, and reduce the risk of recurrence.

## Materials and Methods

A total of 15 patients with clinically suspected thyroglossal duct cysts (TGDCs) were included in the study. Patients were enrolled based on defined inclusion and exclusion criteria after obtaining informed written consent.

### Inclusion Criteria

- Patients presenting with midline neck swelling clinically suggestive of thyroglossal duct cyst
- Patients willing to undergo surgical management and follow-up
- Age: All age groups
- Sex: Both males and females

## Exclusion Criteria

- Patients with lateral neck masses or swelling not consistent with TGDC
- History of prior neck surgery or thyroidectomy
- Patients who did not complete clinical evaluation or were lost to follow-up

## Clinical and Radiological Evaluation

All patients underwent a detailed clinical assessment, including history and physical examination, focusing on:

- Duration and progression of swelling
- Symptoms such as pain, discharge, dysphagia, or recent increase in size
- Mobility of the swelling with swallowing and tongue protrusion

Each patient underwent ultrasound (USG) of the neck to determine the anatomical location and cystic nature, and to rule out other neck pathologies. Additional imaging with contrast-enhanced computed tomography (CECT) was done in selected cases for further anatomical delineation, especially in recurrent or deep-seated lesions.

## Fine Needle Aspiration Cytology (FNAC)

FNAC was performed in all patients to confirm the benign nature of the lesion and exclude malignancy.

## Surgical Intervention

All 15 patients underwent surgical excision of the cyst. The Sistrunk procedure—involving excision of the cyst along with the central portion of the hyoid bone and tract up to the base of the tongue—was performed in most cases. In a few cases where the tract could not be delineated or the patient opted for limited surgery, simple excision of the cyst was carried out.

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## Histopathological Analysis

Excised specimens were sent for histopathological examination (HPE) to confirm the diagnosis, and detect ectopic thyroid tissue, chronic inflammation, or malignancy.

## Postoperative Follow-up

Patients were followed up at 1 week, 1 month, and 3 months postoperatively. Any complications such as wound infection, sinus formation, or recurrence were noted and managed accordingly.

## Data Collection and Statistical Analysis

Clinical data were systematically recorded using a structured proforma, including:

- Age and sex distribution
- Site and size of the cyst
- Presence of infection or fistula
- Type of surgery performed
- Histopathological findings
- Postoperative outcomes and recurrence

Given the small sample size (n=15), descriptive statistics were used. Results were expressed as percentages, means, and ranges where applicable. Due to limited power, inferential statistical testing was not applied.

## Results

In this study, a total of 15 patients with clinically and radiologically diagnosed thyroglossal duct cysts (TGDCs) were included. The age of patients ranged from 4 to 42 years, with a mean age of 18.6 years. Table 1 The majority of the cases (n=9; 60%) belonged to the paediatric age group (<18 years), reflecting the higher incidence of TGDC in younger individuals. There was a male predominance, with 9 males (60%) and 6 females (40%), yielding a male-to-female ratio of 1.5:1. Table 2

All patients presented with a midline neck swelling, which was the primary complaint in every case. The most common anatomical location of the swelling was in the infrahyoid region, observed in 10 patients (66.7%), followed by the suprahyoid region in 3 patients (20%), and at the level of the hyoid in 2 patients (13.3%). Movement of the swelling with tongue protrusion and deglutition—a classical sign of TGDC—was present in 13 patients (86.7%). Pain or tenderness suggestive of secondary infection was reported in 3 cases (20%). In addition, 2 patients (13.3%) presented with an external sinus tract.

All patients underwent ultrasonography of the neck, which confirmed the presence of a well-defined cystic lesion in the midline in each case. Contrast-enhanced CT scanning was performed in 4 patients (26.7%) to further evaluate deep-seated, infected, or recurrent lesions. Fine needle aspiration cytology (FNAC) was conducted in all 15 cases. FNAC findings were consistent with a benign cystic lesion in 14 patients (93.3%), while one case (6.7%) showed features suggestive of chronic inflammation.

Of the 15 patients, 12 (80%) underwent the Sistrunk procedure, which involves excision of the cyst along with the central portion of the hyoid bone and tract dissection. In the remaining 3 patients (20%), only simple cyst excision was performed due to either anatomical challenges or patient-related factors. Intraoperatively, the cysts were located as per radiological predictions, and no intraoperative complications were reported in any of the cases Table 3.

Histopathological examination of the excised specimens confirmed the diagnosis of thyroglossal duct cyst in all 15 patients. Ectopic thyroid tissue was identified in 4 patients (26.7%), which supports the embryological origin of the lesion. Importantly, none of the cases showed any evidence of malignancy. Table 4

All patients were followed postoperatively for a minimum duration of three months. Two patients (13.3%) developed wound infections in the early postoperative period, which were managed conservatively with antibiotics and local care. One case (6.7%) experienced recurrence of the lesion, and this patient had undergone a simple cyst excision rather than the Sistrunk procedure. No other postoperative complications, such as haematoma, sinus formation, or nerve injury, were observed during the follow-up period.

**Table 1.Age Distribution of Study Population**

n = 15

| Age Group (years) | No. of Patients | Percentage (%) |
|---|---|---|
| 0–10 | 4 | 26.7% |
| 11–20 | 6 | 40.0% |
| 21–30 | 3 | 20.0% |
| 31–40 | 2 | 13.3% |
| Mean ± SD | 18.6 ± 10.4 | - |
| Total | 15 | 100% |

**Table 2.Sex Distribution of Study Population**

n = 15

| Sex | No. of Patients | Percentage (%) |
|---|---|---|
| Male | 9 | 60.0% |
| Female | 6 | 40.0% |
| Total | 15 | 100% |

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**Table 3.Site of TGDC and Clinical Presentation**

n=15

| Variable | No. of Patients | Percentage (%) |
|---|---|---|
| **Location of Cyst** | | |
| Suprahyoid | 3 | 20.0% |
| Hyoid | 4 | 26.7% |
| Infrahyoid | 8 | 53.3% |
| **Symptoms** | | |
| Painless neck swelling | 14 | 93.3% |
| Movement with deglutition | 13 | 86.7% |
| Associated infection/discharge | 3 | 20.0% |
| Fistulous tract | 2 | 13.3% |

**Table 4.Surgical Procedure and Histopathological Findings**

n=15

| Parameter | No. of Patients | Percentage (%) |
|---|---|---|
| **Type of Surgery** | | |
| Sistrunk procedure | 12 | 80.0% |
| Simple cyst excision | 3 | 20.0% |
| **Histopathology Findings** | | |
| Benign thyroglossal duct cyst | 15 | 100% |
| Malignancy | 0 | 0.0% |
| Postoperative Recurrence | 1 | 6.7% |

## Discussion

In our study, the age of the patients ranged from 4 to 42 years, with a mean age of 18.6 ± 10.4 years. The majority (40%) were in the 11–20-year age group, and 66.7% were below 20 years, indicating the predominance of TGDC in younger individuals. [4]This is consistent with the study reported that 70% of their TGDC cases occurred in individuals below 20 years of age. [2]Similarly, the peak incidence in the first two decades of life, aligning with embryologic development.[13] However, emphasized that TGDCs can present at any age, with their series showing a mean age of 31 years and cases up to 60 years of age.[1] Also demonstrated persistence of thyroglossal remnants in 15% of adult cadavers, supporting late presentation. In our study, there was a male predominance with 9 males (60%) and 6 females (40%), yielding a male-to-female ratio of 1.5:1. This is comparable to the findings of,[4] who reported a slight male preponderance (male-to-female ratio of 1.2:1). [2] Also reported a male predominance (62%) in their series. Conversely,[5] found a more balanced gender ratio, suggesting that although TGDC may slightly favor males, the difference is not consistently significant across populations.

In our study, 66.7% of TGDCs were located in the infrahyoid region, followed by 20% in the suprahyoid and 13.3% at the level of the hyoid.[4] Observed similar results infrahyoid (50%), suprahyoid (30%), and hyoid (20%). [3]The thyroglossal duct most commonly persists between the foramen cecum and the thyroid cartilage, which aligns with the distribution observed.[8] Found infrahyoid cysts in 62% of cases, reinforcing the predominance of this location. In our study, all 15 patients presented with a midline neck swelling, and 86.7% showed movement with swallowing and tongue protrusion. Pain or signs of infection were present in 3

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cases (20%), and 2 patients (13.3%) had external sinus tracts. [4]The reported movement with deglutition in 90% of cases and sinus in 10%, closely mirroring our findings.[8]The signs of infection in 30% and cutaneous sinus in 12%, both in line with our study. These features highlight classical and variant presentations that are essential for clinical suspicion and diagnosis. In our series, ultrasonography confirmed a cystic midline lesion in all patients (100%), and CT was used in 4 patients (26.7%) for deeper or infected lesions. FNAC revealed benign cytology in 14 cases (93.3%), with 1 case (6.7%) suggestive of chronic inflammation. [14]The study supports the use of ultrasound as the first-line modality, with CT/MRI reserved for complex anatomy or suspicion of malignancy. In the study[6] imaging played a critical role in identifying a primary papillary carcinoma in TGDC, demonstrating its importance in surgical planning. [5]Also stressed the importance of FNAC, especially when malignancy is suspected, although it may miss carcinoma in small or fibrous lesions. In our study, 12 patients (80%) underwent the Sistrunk procedure, while 3 patients (20%) had simple cyst excision. No intraoperative complications were encountered. [3]This supports the standard of care emphasized that Sistrunk's procedure reduces recurrence by up to 85–95%. [4]Also observed no recurrence in patients who underwent the Sistrunk procedure, further validating our choice of surgical technique. [13] He concluded that the simple excision is associated with a high recurrence rate, supporting our finding that recurrence occurred only in the simple excision group. Histopathological examination in our study confirmed TGDC in all 15 cases, and ectopic thyroid tissue was observed in 4 patients (26.7%). No malignancy was detected. In comparison,[1] reported thyroid tissue in 15% of adult cadaver samples. [3]Also described the presence of ectopic thyroid tissue in up to 30% of TGDC specimens. Regarding malignancy, [5,6]reported papillary carcinoma arising in TGDC, though its incidence remains low (around 1%).In our study, 2 patients (13.3%) developed postoperative wound infections, and 1 patient (6.7%) who underwent simple excision developed recurrence. No recurrence was noted in those who underwent the Sistrunk procedure. These findings are in agreement,[4] which documented recurrence in one case (10%) following simple excision and none after the Sistrunk procedure. [10,12]Emphasized that incomplete excision of the duct and central hyoid increases the risk of recurrence and potential for malignant transformation.

## Conclusion

This study highlights the variable clinical and anatomical presentations of thyroglossal duct cysts, most commonly seen in paediatric and young adult patients with a male predominance. Infrahyoid cysts were the most frequent, and classical signs like movement with swallowing aided diagnosis. Ultrasonography and FNAC proved effective for evaluation. The Sistrunk procedure demonstrated superior outcomes with no recurrence, while simple excision led to one recurrence. Histopathology confirmed the diagnosis in all cases, with ectopic thyroid tissue observed in a subset. No malignancy was found. Complete excision using the Sistrunk technique remains the treatment of choice to minimize recurrence. Early diagnosis and appropriate surgical planning are essential for optimal outcomes.

## Limitations of the Study

This study had several limitations. First, the sample size was small (n = 15), which may limit the generalizability of the findings to the broader population. Second, the short duration of follow-up (3 months) may not be sufficient to capture late recurrences or long-term complications. Third, the study was conducted at a single tertiary care centre, which may introduce referral bias and may not reflect the variation seen in community or rural settings. Lastly, advanced imaging modalities like MRI were not routinely used, which could have provided better delineation of deep-seated or atypical tracts in selected cases.

Future studies with larger, multi-centre cohorts and longer follow-up are needed to validate these findings and provide more comprehensive insights into the long-term outcomes of thyroglossal duct cyst management.

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