

## SONOGRAPHIC SIGNATURES OF THYROGLOSSAL DUCT CYSTS: DIAGNOSTIC ACCURACY AND CLINICAL RELEVANCE – A SYSTEMATIC REVIEW

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DOI: <https://doi.org/10.5281/zenodo.15695368>

### Keywords

Thyroglossal duct cysts,  
diagnosis, ultrasonography,  
imaging modality

### Article History

Received on 10 May 2025

Accepted on 10 June 2025

Published on 18 June 2025

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### Abstract

**Background:** In the last ten years, ultrasound has become a useful instrument in medical diagnostic especially in the examination of thyroid and parotid gland abnormalities. Nevertheless, the use thereof in the assessment of general head and neck conditions has not been sufficiently explored in literature. Ultrasound is particularly helpful in detecting cystic lesions as a first-line imaging tool. Ultrasound has a great potential to be used more widely in the head and neck assessments due to its non-invasive character, availability, and diagnostic accuracy.

**Objective:** To evaluate the effectiveness of ultrasound in the diagnosis of thyroglossal duct cysts by assessing its ability to identify the nature of the lesion, the size and location of the lesion, and differentiate it from other neck masses.

**Methodology:** Published reports of investigating the effectiveness of ultrasonography as the first line imaging modality for the diagnosis of TGDC were identified by a systematic search of Google Scholar, PubMed, ResearchGate and the Sci Hub, supplemented with citation tracking. From 602 initially identified studies, only 21 studies met the inclusion criteria after screening and duplicate removal. These studies assessed the role of ultrasonography in early detection and diagnosis of TGDC using standard statistical measures, typically at a 95% confidence level.

**Results:** The literature podcasts the high diagnostic accuracy and clinical utility of ultrasound in the assessment of thyroglossal duct cysts (TGDCs). On sonography, TGDCs usually appear as well defined, anechoic or hypoechoic cystic masses, frequently in the midline or para midline of the neck, and commonly attached to the hyoid bone. The sophisticated ultrasonographic findings can show heterogeneous internal echogenicity, multiloculated compartments, ill-defined or irregular margins, and longitudinal extension to the base of the tongue-findings that help to distinguish between TGDCs and dermoid cysts, lymphatic malformation, or infected lymph nodes. In others, ultrasound may reveal intralesional debris or infection or intramuscular extension, particularly

in recurrent or complicated cases. The incidental detection rate of TGDCs is reported to be about 0.9 percent and stable lesions appear to change minimally over time, demonstrating the sensitivity of the modality, both in symptomatic and asymptomatic presentations. Moreover, ultrasound possesses a great level of reliability in preoperative evaluation, which would help determine the procedure of Sistrunk and reduce the possibility of recurrence. The ultrasound offers radiation-free, cost-effective, first-line diagnostic modality compared to other imaging techniques, particularly in children and young adult populations. Such a powerful sonographic nature highlights the use of ultrasound in not only the primary diagnosis but also long-term monitoring and treatment planning of TGDCs.

**Conclusion:** The use of ultrasound has become a very sensitive, non-invasive, and accurate mode of imaging in the diagnosis and treatment of thyroglossal duct cysts (TGDCs). Its sensitivity in the precise description of the lesion morphology, evaluation of anatomic relations, and specificity in differentiation of TGDCs with the other midline neck lesions qualifies it as an essential first-line modality, especially in children and young adults. The identification of sonographic appearance of multilocation, bone attachment of the hyoid and heterogeneous echogenicity have role in increasing the confidence of the diagnosis and directing the appropriate clinical management with regard to surgery. Considering its low cost, non-exposure to radiation, and diagnostic accuracy, ultrasonography must remain the preferred initial imaging modality in the short-term follow-up and long-term monitoring of TGDCs.

## INTRODUCTION

Ultrasonography is a non-invasive, cost-effective imaging modality that does not involve radiation or surgical procedures. It effectively differentiates between fluid-filled cysts and solid masses, aiding in the early identification of potentially malignant lesions. Ultrasonographic assessment of swollen lymph nodes give a clue for its cancerous or benign nature. Ultrasonography facilitates the accurate diagnosis of thyroglossal duct cysts (TGDCs), thereby enabling efficient management and treatment of associated neck pathologies. (1) The thyroid gland begins to form in the third week of pregnancy as a small growth from the bottom part of the early throat, near an area called the foramen cecum. As the baby develops, the thyroid moves down the center of the neck and reaches its final spot by the seventh week. During its descent, the thyroid remains connected to the tongue by a tubular structure known as the thyroglossal duct, which typically involutes by the eighth week of gestation. (2)

At the same time, a bone in the neck called the hyoid bone also develops in parallel in the same area. The thyroglossal duct often ends up closely connected to the hyoid bone – in anterior, posterior or middle of the hyoid bone. The lower part of the thyroglossal duct later becomes a small part of the adult thyroid gland called the pyramidal lobe.(3)Ultrasound imaging has become an essential tool and first line imaging modality in the early diagnosis and management of various head and neck pathologies over the past decade because of its non-invasive nature, accessibility, and ability to distinguish between cystic and solid lesions.(7) While ultrasound is frequently employed for assessing thyroid and parotid gland abnormalities, its application in the broader context of congenital neck lesion such as thyroglossal duct cysts (TGDCs) has been less extensively documented.(8) Thyroglossal duct cysts are the most common congenital neck masses in children and young adolescents, typically

presenting as midline or near-midline neck swellings. Their diagnosis is crucial due to the potential for recurrence or infection, especially when not managed appropriately. (9) Ultrasound plays a pivotal role in the initial evaluation by identifying the cystic nature of the lesion, its precise location in relation to surrounding structures, and distinguishing it from other differential diagnoses such as dermoid cysts, lymphatic malformations, and inflamed lymph nodes. (6) Studies revealed that thyroid cysts exhibited higher concentrations of thyroid hormones in cyst fluid than thyroglossal duct cysts and cysts related to nodular goiters. This biochemical distinction may aid in further refining ultrasound-based diagnoses when coupled with fluid analysis. (11)

Although existing literature provides limited reports on the comprehensive use of ultrasound for general head and neck lesions, emerging evidence—including the current review—supports its valuable role in identifying and differentiating congenital neck masses like TGDCs. (6) Hormone analysis of the cyst fluid revealed that single thyroid cysts had higher levels of thyroid hormones compared to nodular goiter-related cysts, and both were higher than levels found in thyroglossal duct cysts. (12) These differences in hormone content across cyst types may provide additional diagnostic clues and aid in formulating treatment plans. (6) The diagnosis and treatment of such Cases are few; so, summaries are very important. (13) The diagnosis and treatment of TGDC remain controversial, neither FNA nor frozen sections are absolute. (12) With the advancement of medical technology, other different methods and equipment are being invented and discovered. We expect the clinical diagnosis and treatment of this disease to improve alongside. (14) Ultrasonography is the standard practice and is proposed for different age groups to avoid duplicate information from unnecessary investigation or radiation exposure. The recurrence rate of TGDC is lower and no cases of ectopic thyroid tissue or postoperative hypothyroidism are reported. Ethanol Ablation is widely used as a non-surgical, minimally invasive treatment for various disease entities. EA widely treats cystic thyroid nodules. Despite, its wide range treatment options, established guidelines for the treatment of TGDC via EA is still lacking which

requires a comprehensive review of the practices in use today. TGDC is the second most common pathology for EA use next to cystic thyroid nodules, as it is the most common congenital neck mass frequently encountered in clinical practice. Ultrasonographic features of TGDCs were significantly marked by an ill-defined margin, rough or irregular contour, attachment to the hyoid bone, a location that is intramuscular, heterogeneous internal echogenicity, multi-loculations within lesion, and longitudinal extension into the tongue base. Incidental findings of thyroglossal duct cysts are found in almost 0.9% cases. These cysts do not grow with time but changes are found in the same lesion in terms of ultrasonographic features. Therefore, it is recommended to screen these lesions after interval of 2 to 3 years, even if asymptomatic. Additionally, it is recommended that FNA should be deferred unless any features pertaining to malignancy are noticed. TGDC are asymptomatic lesions that are commonly found in pediatrics. It generally becomes prominent after infections have invaded the body turning into a swollen, tender and throbbing mass. When left untreated, these round masses may rupture and develop into a draining sinus which often leads to upper respiratory infection. The TGDC has a bimodal age distribution most commonly peaked in the first and fifth decade of life, influencing the pre-scholar population frequently. Ultrasound performed after an initial physical examination is the essential diagnostic modality differentiating TGDC from other midline neck irregularities, particularly ectopic thyroidal tissue. Sistrunk's procedure is the most effectual way for the surgical treatment of TGDC. This procedure is delayed in the newborns unless the baby requires another surgery for which the newborn requires general anesthesia.

## **MATERIALS AND METHODS:**

### **STUDY DESIGN:**

This study is a systematic review of multiple articles that enlightens the essential role of ultrasonography in the early detection, diagnosis and monitoring of TGDC over time. This study is reported in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines as shown in figure 1. No meta-analysis was carried out.

### SEARCH STRATEGY:

Published reports on investigating the role of ultrasonography in the early diagnosis and monitoring of thyroglossal duct cysts were identified by a systematic search of Google Scholar, PubMed, ResearchGate, Science direct and the Sci Hub, supplemented with citation tracking. The search was made using combinations of the following keywords: “Thyroglossal duct cyst”, “TGDC imaging”, “Treatment of TGDC” and “diagnosis of TGDC”. In addition, BOOLEAN operators such as “AND” and “OR” were used for efficient search strategy.

### INCLUSION AND EXCLUSION CRITERIA:

Publications published till April 2025 were included in our study. From 602 initially identified studies, 21 studies met the inclusion criteria after screening and duplicate removal. The studies included original articles and reviews that consisted of at least one of the following terms: “ultrasonography”, “Thyroglossal duct cyst”, “diagnosis of TGDC”. The inclusion criteria included full text articles exclusively presented in English language.

The exclusion criteria consisted of conference abstracts, publications in languages other than English or without English translation and studies that did not mark a clear difference between TGDC and other neck masses and comorbidities.

### RESULTS:

The search strategy generated 602 publications. 581 studies were excluded as they did not meet the selection criteria. These studies were related to other imaging modalities, neck pathologies other than TGDC. A total of 21 studies were included and subjected to the quality assessment of imaging technologies in the detection of TGDC and data extraction. The references to these studies are numbered and added to this paper in the references. 11 studies were published in a language other than English and therefore, were excluded from the study. The literature podcasts the high diagnostic accuracy and clinical utility of ultrasound in the assessment of thyroglossal duct cysts (TGDCs). On sonography, TGDCs usually appear as well defined, anechoic or hypoechoic cystic masses, frequently in the midline or para midline of the neck, and commonly attache

to the hyoid bone. The sophisticated ultrasonographic findings can show heterogeneous internal echogenicity, multiloculated compartments, ill-defined or irregular margins, and longitudinal extension to the base of the tongue-findings that help to distinguish between TGDCs and dermoid cysts, lymphatic malformation, or infected lymph nodes. In others, ultrasound may reveal intralesional debris or infection or intramuscular extension, particularly in recurrent or complicated cases. The incidental detection rate of TGDCs is reported to be about 0.9 percent and stable lesions appear to change minimally over time, demonstrating the sensitivity of the modality, both in symptomatic and asymptomatic presentations. Moreover, ultrasound possesses a great level of reliability in preoperative evaluation, which would help determine the procedure of Sistrunk and reduce the possibility of recurrence. The ultrasound offers radiation-free, cost-effective, first-line diagnostic modality compared to other imaging techniques, particularly in children and young adult populations. Such a powerful sonographic nature highlights the use of ultrasound in not only the primary diagnosis but also long-term monitoring and treatment planning of TGDCs.

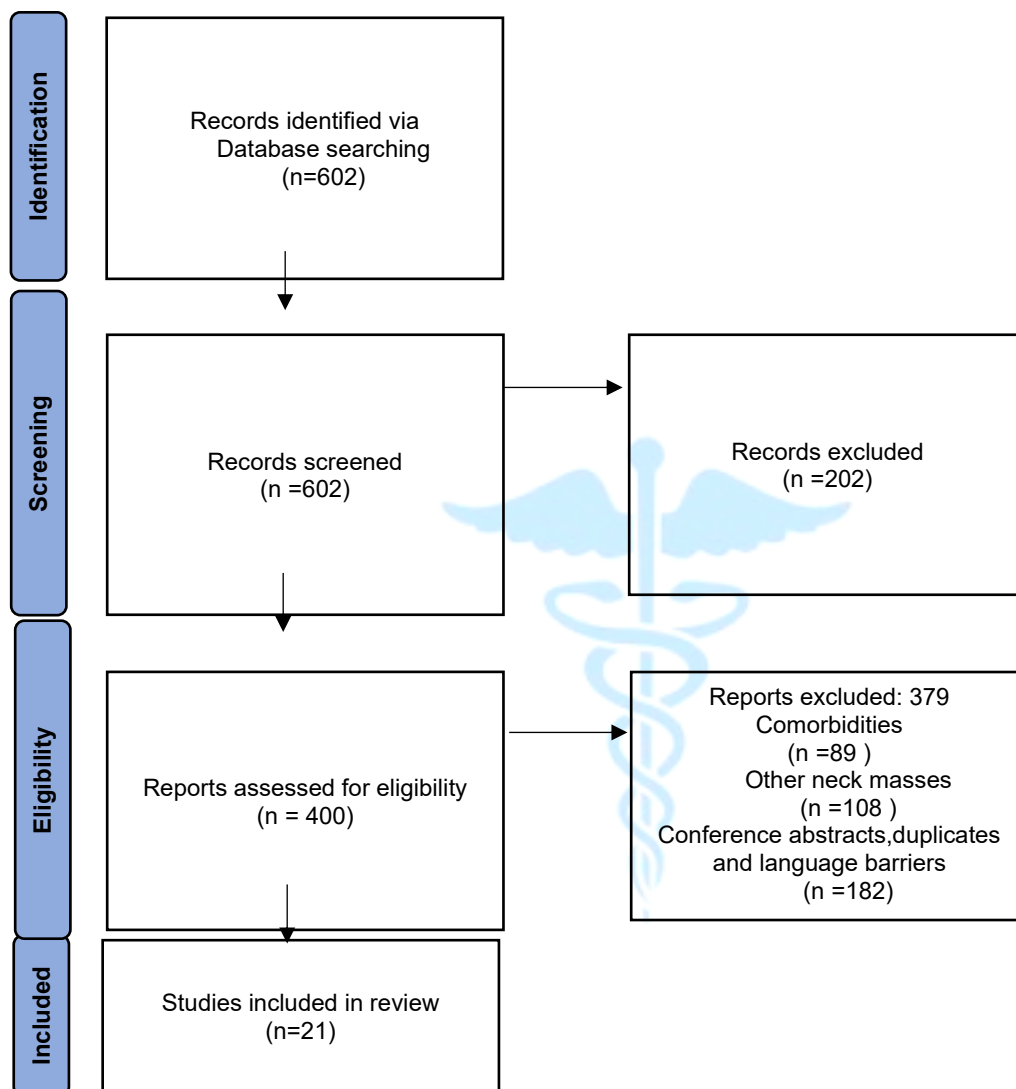
### DISCUSSION:

The outcome of this review strengthens the fact that ultrasonography is an essential initial investigation modality in diagnosis and follow-up of thyroglossal duct cysts (TGDCs). The fact that midline or Paramidline cystic masses, attachment to the hyoid bone, multiloculated, or heterogeneous internal appearances are recurrent features when observed by means of sonography proves the high diagnostic power of ultrasound to diagnose TGDCs and distinguish them from other neck masses. Its capacity to identify the occurrence of complications like infection, or debris or intramuscular spread adds more value to it, particularly in repetitive or untypical one. The low incidental detection rate as well as the small lesion progression during asymptomatic cases proves that ultrasound must be used when it comes to initial assessment and conservative follow-up procedures. Notably, the fact that the modality is non-invasive, does not involve any radiant energy and is less expensive, makes it peculiarly applicable in relation to the pediatric and

adolescent groups. In general, the outcomes defend the further application and increase of ultrasound in

the complete assessment and longitudinal treatment of TGDCs.

FIGURE 1: PRISMA Flow Map





## REFERENCES:

- Patel S, Bhatt AA (2019) Thyroglossal duct pathology and mimics. *Insights Imaging* 10(1):12. <https://doi.org/10.1186/s1324>
- Zander DA, Smoker WR (2014) Imaging of ectopic thyroid tissue and thyroglossal duct cysts. *Radiographics* 34(1):37-50. <https://doi.org/10.1148/rg.341135055>
- Wadsworth DT, Siegel MJ (1994) Thyroglossal duct cysts: variability of sonographic findings. *AJR Am J Roentgenol* 163(6):1475-1477
- Dedivitis RA, Camargo DL, Peixoto GL, Weissman L, Guimarães AV (2002) Thyroglossal duct: a review of 55 cases. *J Am Coll Surg* 194(3):274-277
- Brousseau VJ, Solares CA, Xu M, Krakovitz P, Koltai PJ (2003)
- Lee DH, Jung SH, Yoon TM, Lee JK, Joo YE, Lim SC (2012) Computed tomographic evaluation of thyroglossal duct cysts in children under 11 years of age. *Chonnam Med J* 48(3):179-182. <https://doi.org/10.4068/cmj.2012.48.3.179>
- Ahuja AT, King AD, King W, Metreweli C (1999) Thyroglossal duct cysts: sonographic appearances in adults. *AJNR Am J Neuroradiol* 20(4):579-582
8. Kutuya N, Kurosaki Y. Sonographic assessment of thyroglossal duct cysts in children. *J Ultrasound Med.* 2008 Aug;27(8):1211-9. doi:10.7863/jum.2008.27.8.1211.
- Ahuja AT, King AD, Metreweli C. Sonographic evaluation of thyroglossal duct cysts in children. *Clin Radiol.* 2000 Oct;55(10):770-4. doi:10.1053/crad.2000.0514.
- Tokarz E, Gupta P, McGrath J, Szymanowski AR, Behar J, Behar P. Proposed ultrasound algorithm to differentiate thyroglossal duct and dermoid cysts. *Int J Pediatr Otorhinolaryngol.* 2021 Mar; 142:110624. doi: 10.1016/j.ijporl.2021.110624.
- Lim-Dunham JE, Feinstein KA, Yousefzadeh DK, Ben-Ami T. Sonographic demonstration of a normal thyroid gland excludes ectopic thyroid in patients with thyroglossal duct cyst. *AJR Am J Roentgenol.* 1995 Jun;164(6):1489-91. doi:10.2214/ajr.164.6.7754899.
- Mahmoud W, El Ansari W, Abdelaal A, Petkar M, Al Hassan MS. Two separate tumors Concomitant papillary carcinoma in thyroglossal duct cyst and right thyroid lobe: case report and review of the literature.
- Huang LD, Gao SQ, Dai RJ, et al. Intra-thyroid thyroglossal duct Cyst: a case report and review of literature. *Int J Clin Exp Pathol.* 2015;8(6):7229-7233. PMID: 26261619.
- Pérez-Martínez A, Bento-Bravo L, Martínez-Bermejo MA, CondeCortés J, de Miguel-Medina C. An intra-thyroid thyroglossal duct.
- Mettias B, Cole S, Valsamakis T. Preoperative investigations in thyroglossal duct cyst surgery: a 9-year experience and proposed practice guide. *Ann R Coll Surg Engl.* 2023 Jul 1;105(6):554-60.
- Ahn D. Ultrasound-Guided Ethanol Ablation for Thyroglossal Duct Cyst: A Review of Technical Issues and Potential as a New Standard Treatment. Vol. 12, *Journal of Clinical Medicine*. Multidisciplinary Digital Publishing Institute (MDPI); 2023.
- Gilony D, Shaked O, Tsur N, Raveh E, Hod R. Predictors of residual disease following pediatric thyroglossal duct cyst excision. *American Journal of Otolaryngology - Head and Neck Medicine and Surgery.* 2023 May 1;44(3).
- Malka Yosef L, Lahav Y, Hazout C, Zloczower E, Halperin D, Cohen O. Impact of age on surgical outcomes and failure rates in patients with thyroglossal duct cysts. *Am J Otolaryngol [Internet].* 2021 May 1 [cited 2025 Jun 13];42(3):102902. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S019607092100003X>
- Choi HI, Choi YH, Cheon JE, Kim WS, Kim IO. Ultrasonographic features differentiating thyroglossal duct cysts from dermoid cysts. *Ultrasonography.* 2018 Jan 1;37(1):71-7.
- Ahuja AT, King AD, King W, Metreweli C. Thyroglossal Duct Cysts: Sonographic Appearances in Adults [Internet]. 2025. Available from: <http://www.ajnr.org/content/20/4/579>

Trovalusci E, Pizzolon C, Tesser S, Doratiotto S, Gobbi D, Midrio P. Incidental finding of thyroglossal duct cyst in a neonate during endotracheal intubation: a case report. BMC Pediatr. 2024 Dec 1;24(1)

