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Misdiagnosis of asymptomatic intrathyroidal pyriform sinus fistula: a case report

Zengfang Hao[1], Yuqi Hou[1], Xiaoyu Li[2], Juan Wang[3], Ying Wang[3], Zhihong Gao[4], Lei Lou[1,*] and Yuehong Li[1,*]

Abstract

Pyriform sinus fistula is uncommon and easily misdiagnosed. Most reported cases occur in children and are associated with either acute suppurative thyroiditis or deep neck infection. Asymptomatic pyriform sinus fistula is difficult to diagnose because it can manifest as an incidental thyroid nodule with highly suspicious malignant features on ultrasonography. The patient was a 41-year-old man with asymptomatic thyroid nodules incidentally detected on ultrasonography. Surgery was performed under the suspicion of thyroid cancer. Pathology findings revealed multiple cystic walls lined by ciliated columnar cells with stratified squamous epithelial cysts in a background of inflammatory and lymphoid cells. Barium swallow examination performed 2 weeks later revealed a sinus tract measuring 1.8 cm that arose from the apex of the left pyriform sinus. The diagnosis and management of pyriform sinus anomalies are challenging. The majority of physicians, including some otolaryngologists, lack an understanding of the disease, which should be considered one of the important differential diagnoses of neck masses. Barium swallow examination, ultrasonography, computed tomography, and laryngoscopy are useful to diagnose this condition.

Keywords

Pyriform sinus fistula, cyst, thyroiditis, nodule, pathology, misdiagnosis

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[1]Department of Pathology, The Second Hospital of Hebei Medical University, Shijiazhuang City, Hebei Province, P. R. China
[2]Department of Thyroid and Breast Surgery, The Second Hospital of Hebei Medical University, Shijiazhuang, Hebei, P. R. China
[3]Department of Ultrasonography, The Second Hospital of Hebei Medical University, Shijiazhuang, Hebei, P. R. China
[4]Department of Radiology, The Second Hospital of Hebei Medical University, Shijiazhuang, Hebei, P. R. China

*These authors contributed equally to this work.

Corresponding author:
Lei Lou, Department of Pathology, The Second Hospital of Hebei Medical University, 215 West Heping Road, Shijiazhuang City, Hebei Province 050017, P. R. China.
Emails: 18032004321@163.com

Background

Pyriform sinus fistula (PSF) is a rare clinical entity that is found incidentally and is associated with either acute suppurative thyroiditis or a deep infection of the left side of the neck, especially in children.[1] Diagnosis of an asymptomatic intrathyroidal PSF is challenging because of its rarity and physicians' lack of experience. PSF accounts for less than 1% of all branchial anomalies,[2] and sonography is useful to detect these fistulas.[3–5] Herein, we report a case of asymptomatic intrathyroidal PSF mimicking thyroid cancer on ultrasonography.

Case presentation

A 41-year-old man with an unremarkable medical history was referred to our institution for an incidental left thyroid nodule. Physical examination revealed a hard mass measuring approximately $15 \times 10\,mm^2$ that was palpable in the left thyroid gland and moved up and down when the patient swallowed. The results of routine blood examination and thyroid function tests were within the normal ranges. Ultrasonography demonstrated a 12-mm nodule with unclear borders and an irregular shape located in the upper left thyroid. Moreover, multiple dot-like calcifications and blood flow signals were observed. Blood flow signals appeared as more intense and star- or dot-shaped centrally and peripherally; therefore, a malignant nodule was suspected (Figure 1a). Another 5.4- $\times$ 3.4-mm^2, oval-shaped, anechoic, cystic lesion with well-defined margins was noted at the inferior aspect of the thyroid that was superior to the suspicious malignant nodule (Figure 1b). The patient elected not to follow the recommendation to undergo fine needle aspiration (FNA). As a result, he underwent left hemithyroidectomy, and intraoperative biopsy was performed. The reporting of this study conforms to the CARE guidelines.[6]

Pathological results

The frozen specimen revealed multiple cysts with interstitial fibroses and vitreous degeneration. The cystic wall was lined by ciliated columnar cells with stratified squamous epithelial cysts in a background of inflammatory and lymphoid cells, and the cysts were initially considered branchial clefts or other complicated cysts (Figure 2a–b). The other nodule, inferior to the thyroid gland, was

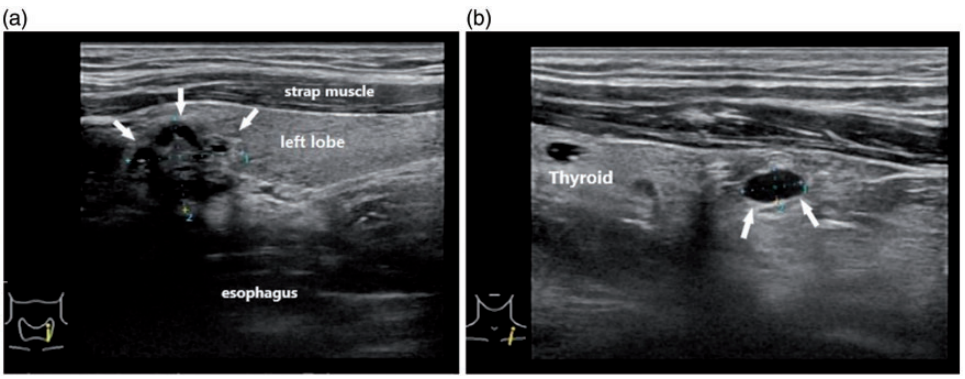

Figure 1. (a) Ultrasonography in the longitudinal plane showing a 12-mm nodule at the uppermost part of the left thyroid gland (arrows). (b) An oval nodule inferior to the thyroid gland measuring 5.4 $\times$ 3.4 mm^2 with well-defined boundaries and homogeneous echo (arrows).

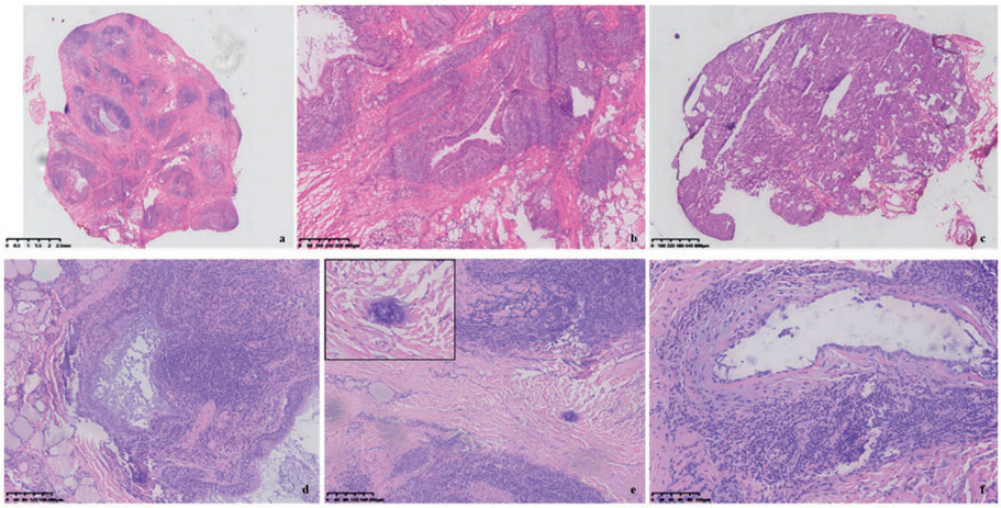

Figure 2. Pathological findings in the intraoperative frozen section examination. (a) Histopathological examination of the uppermost part of the left thyroid gland (hematoxylin and eosin staining) showing multiple cysts with interstitial fibrosis and vitreous degeneration (original magnification: ×10). (b) The inner linings consist of ciliated pseudostratified columnar epithelium in a background of inflammatory and lymphoid cells (original magnification: ×40). (c) A second nodule inferior to the thyroid gland was diagnosed as parathyroid adenoma (original magnification: ×35). (d) Calcification observed on the collagen fibers and hyaline degeneration in the thyroid structure (original magnification: ×100). (e) Abundant lymphoid tissue and follicles beneath the epithelium (original magnification: ×100). (f) The cystic contents comprised mucinous fluid and inflammatory cells. Residual thyroid tissue (left side) (original magnification: ×200). All images: hematoxylin and eosin staining.

diagnosed as a parathyroid adenoma (Figure 2c). Histopathologic examination of the surgical specimens revealed that they were lined with ciliated and stratified cuboidal epithelium with chronic inflammatory cell infiltration, and that fibrosis was present within the thyroid. Tiny, irregular calcifications were present in a hyalinized matrix; however, there was no evidence of malignancy. Unfortunately, despite oral antibiotics, the patient developed symptoms of neck pain, swelling, fever, and dyspnea that worsened progressively after the thyroidectomy. After treatment and resolution of the infection, barium contrast studies demonstrated contrast medium in the left pyriform fossa flowing downwards in the shape of a stripe with a slightly wider end. An internal fistula extended from the left pyriform sinus to the ipsilateral thyroid lobe (Figure 3a–b). The ultimate diagnosis was left PSF. The patient was discharged successfully, and regular follow-up was conducted in the outpatient department.

Discussion

The thyroid gland is an internal endocrine organ containing high amounts of iodine and with a thick fibrous capsule. These features make this gland very resistant to bacterial infections.[7] Although bacterial infection occurs rarely in the thyroid gland, in PSF, the fistula tract can act as a pathway for infection propagation to the thyroid gland. Most fistulas are located on the left side and are often present during childhood as an acute inflammatory swelling of the neck,[1] while neonatal PSF presents as a large cervical cystic mass

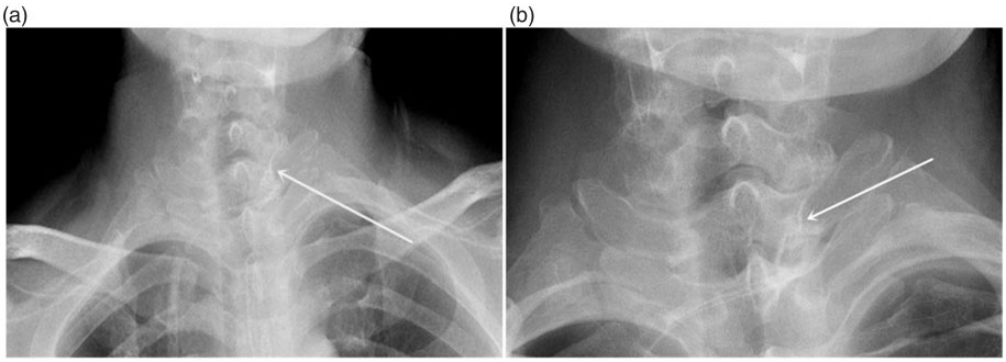

Figure 3. Barium swallow examination showing accumulation of barium on the left side (white arrow). (a) frontal view; (b) lateral view.

that causes respiratory distress.[8] Acute suppurative thyroiditis (AST) is normally associated with PSF, except in immunosuppressed patients.[7] Asymptomatic PSF is extremely uncommon and is easily misdiagnosed.[9] We reported a case of asymptomatic PSF that manifested as an incidental thyroid nodule and caused serious complications requiring left hemithyroidectomy.

The complex anatomic structures in the neck may result in fistulas of various sizes and shapes.[2] Because of complicated clinical manifestations and individual variations owing to inflammatory stimulation and tissue hyperplasia, PSF can be easily misdiagnosed.[9] There are reports of intrathyroidal branchial clefts or cleft-like cysts that manifested mainly as cystic lesions.[10] A similar case to this study presented with a thyroid nodule with suspicious malignant features on ultrasonography and underwent fine-needle aspiration (FNA) that caused serious infectious complications.[11] Although PSF has been reported in numerous articles,[1,8,11–13] its morphological profile has been poorly described. In this study, our case was misdiagnosed as thyroid neoplasm, and the patient developed a postoperative infection. Postoperative pathology showed that the cystic wall was lined by ciliated columnar cells with stratified squamous epithelial cysts in a background of inflammatory cells in normal thyroid tissue. Generally, clinically, the presence of either respiratory or squamous epithelium within the thyroid gland is unusual. Therefore, it is essential to consider the source of the epithelium and its probable origin. Furthermore, the possibility of a thyroglossal duct cyst or a branchial cleft cyst should be considered. An intrathyroidal branchial cleft cyst is extremely rare. The exact histogenesis of an intrathyroidal branchial cleft cyst is unclear, but probably results from failure of the third or fourth branchial pouches to atrophy and dissipate *in utero*, resulting in cysts or sinus tracts lying in close proximity to, or inside, the thyroid gland.[10,14] The distinguishing features between both forms include mass presentation and infection frequency. Thyroglossal duct cysts are more likely to be midline neck masses, whereas branchial cleft cysts are typically lateral neck masses. In terms of infection frequency, branchial cleft cysts are more likely to be infected.[14] Histology of the cellular components of the cyst wall and surrounding tissue is the most valuable method of differentiation. However, preexisting inflammation may cause metaplasia of the lining of a thyroglossal duct cyst, making histologic

differentiation from a branchial cleft cyst difficult.[15] Regardless of their origin, histologic analysis of thyroglossal duct cysts revealed that these generally have well-circumscribed cystic walls lined by straight squamous or pseudostratified columnar epithelium, with abundant lymphoid tissue and follicles beneath the epithelium. The cystic contents may be clear, watery to mucinous fluid, or consist of desquamated, granular cellular debris. In addition, the luminal epithelium is completely replaced by granulation tissue and inflammatory cells.[16]

Definitive diagnosis should be made according to comprehensive information, namely local symptoms, signs, and recurrent inflammation, which are the most common symptoms, with auxiliary inspection.[9] The thyroid gland is very resistant to bacterial infection and is not in contact with the external environment, and acute inflammation is unlikely to occur unless there is an underlying abnormality. Therefore, development of suppurative thyroiditis is the most important diagnostic clue to suggest an underlying anomaly, such as a PSF.[17] Identifying the sinus tract is important for correct diagnostic management.[1,9,12,13] Ultrasonography is a useful diagnostic modality for determining the presence of an underlying PSF in patients with suppurative thyroiditis or a thyroid nodule.

An abscess tract involving the thyroid gland strongly suggests an underlying fistulous tract crossing the gland. If a hypoechoic tubular lesion across the thyroid gland is detected on ultrasonography, suspension laryngoscopy can be performed to confirm and treat the fistula.[18] In imaging examinations, air within the cyst is useful to diagnose a PSF.[19] Air foci depicted on ultrasonography appear to be an important clue for the diagnosis of various intrathyroidal structures that communicate with laryngopharyngoesophageal structures. However, internal echogenic spots from air bubbles can be confused with microcalcifications, and these may be important ultrasonographic features leading to a misdiagnosis of intrathyroidal PSF as thyroid cancer.[11]

Computed tomography and magnetic resonance imaging have also been used in the diagnosis of PSF.[12,13,20,21] Fistulous tracts are best identified in barium swallow examinations; however, fistulas are not always revealed by this method, and timing is important. The reason why it may be difficult to visualize a fistulous tract in barium swallow examinations during an inflammatory episode is that the fistulous tract narrows in response to edema, which prevents the passage of barium. Therefore, it is important to perform the barium swallow examination after inflammation has subsided, and repeated examinations are recommended to diagnose PSF.[22]

An accurate diagnosis is made according to histopathologic confirmation. In our case, a barium swallow examination was performed after suppurative inflammation was identified following thyroid surgery. The majority of physicians, including some otolaryngologists, lack experience with and understanding of this disease. PSF should be considered one of the important differential diagnoses of a neck mass. When the patient is in the acute infection stage of PSF, antibiotics should be given to control the infection. If there is abscess formation, timely abscess incision and drainage is important. After acute infection, complete removal of the fistula is the best choice for a PSF.[1] Moreover, suspension laryngoscopy can be performed to make a definitive diagnosis, and high ligation of the fistula through the external neck approach can achieve good therapeutic effects.[9]

Conclusion

Despite its rarity, the pathological features of PSF are similar to those of other

congenital cystic lesions in the neck, such as thyroglossal duct cysts and branchial cleft cysts, which may provide diagnostic clues. A cystic nodule in the thyroid should alert the pathologist to the possibility of a congenital developmental cyst. Therefore, strong clinical suspicions, barium swallow studies, and histopathologic evaluations are key to a PSF diagnosis.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of The Second Hospital of Hebei Medical University, Shijiazhuang, China (approval number: 2021-R439). The patient provided written informed consent for the publication of his data and associated images.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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Authors' contributions

LL was responsible for study concept and design. YH, YL and ZG acquired the data for the study. LL and ZH were responsible for data analysis and interpretation. LL prepared the manuscript, and YL reviewed the manuscript. JW and YW participated in data analysis and constructive discussion. LL is the study's corresponding author. All authors read and approved the final version of the manuscript.

Availability of data and materials

Data sharing is not applicable to this article because no datasets were generated or analyzed in this study.

ORCID iD

Lei Lou https://orcid.org/0000-0003-0737-3646

References

1. Sheng Q, Lv Z, Xiao X, et al. Diagnosis and management of pyriform sinus fistula: experience in 48 cases. *J Pediatr Surg* 2014; 49: 455–459.
2. Nicollas R, Guelfucci B, Roman S, et al. Congenital cysts and fistulas of the neck. *Int J Pediatr Otorhinolaryngol* 2000; 55: 117–124.
3. Kim HK, Lee JI, Jang HW, et al. Characteristics of Killian-Jamieson diverticula mimicking a thyroid nodule. *Head Neck* 2012; 34: 599–603.
4. Kim YJ, Kim EK, Kim J, et al. Paratracheal air cysts: sonographic findings in two cases. *Korean J Radiol* 2003; 4: 136–139.
5. Choi SH, Kim EK, Kim SJ, et al. Thyroid ultrasonography: pitfalls and techniques. *Korean J Radiol* 2014; 15: 267–276.
6. Gagnier JJ, Kienle G, Altman DG, et al. The CARE guidelines: consensus-based clinical case reporting guideline development. *Headache* 2013; 53: 1541–1547.
7. Miyauchi A, Matsuzuka F, Kuma K, et al. Piriform sinus fistula: an underlying abnormality common in patients with acute suppurative thyroiditis. *World J Surg* 1990; 14: 400–405.
8. Amano H, Uchida H, Sato K, et al. Differences in the characteristics and management of pyriform sinus fistula between neonates and young children. *Pediatr Surg Int* 2012; 28: 15–20.
9. Ma J, Ming C, Lou F, et al. [Misdiagnosic analysis and treatment of pyriform sinus fistula in children.] Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi *(Chinese J of Otorhinolaryngol Head Neck Surg)* 2018; 53: 381–384. doi: 10.3760/cma.j.issn.1673-0860.2018.05.010. [Article in Chinese.]
10. Haba R, Miki H, Kobayashi S, et al. Intrathyroidal branchial cleft-like cyst in chronic thyroiditis. *Pathol Int* 2000; 50: 897–900.
11. Kim SC, Kim JH, Won JK, et al. Asymptomatic intrathyroidal pyriform sinus fistula mimicking thyroid cancer: a case report and literature review. *Medicine (Baltimore)* 2018; 97: e0488.
12. Gan YU and Lam SL. Imaging findings in acute neck infection due to pyriform sinus

fistula. *Ann Acad Med Singap* 2004; 33: 636–640.
13. Seki N and Himi T. Retrospective review of 13 cases of pyriform sinus fistula. *Am J Otolaryngol* 2007; 28: 55–58.
14. Liberman M, Kay S, Emil S, et al. Ten years of experience with third and fourth branchial remnants. *J Pediatr Surg* 2002; 37: 685–690.
15. Johnston R, Wei JL and Maddalozzo J. Intrathyroid thyroglossal duct cyst as a differential diagnosis of thyroid nodule. *Int J Pediatr Otorhinolaryngol* 2003; 67: 1027–1030.
16. Shino M, Yasuoka Y, Nakajima K, et al. A case of pyriform sinus fistula infection with double tracts. *Case Rep Otolaryngol* 2014; 2014: 126840.
17. Park BW and Park CS. Pyriform sinus fistula. *Yonsei Med J* 1993; 34: 386–390.
18. Ahn D, Lee GJ and Sohn JH. Ultrasonographic characteristics of pyriform sinus fistulas involving the thyroid gland. *J Ultrasound Med* 2018; 37: 2631–2636.
19. Hosokawa T, Tanami Y, Sato Y, et al. Comparison of sonographic findings between neonates with pyriform sinus fistulas and lymphangiomas. *Am J Otolaryngol* 2021; 42: 102783.
20. Hosokawa T, Yamada Y, Sato Y, et al. Five neonatal cases of pyriform sinus fistula with cervical cystic lesion: a comparison between sonography and other modalities. *J Med Ultrason (2001)* 2015: 42: 579–585.
21. Wang HK, Tiu CM, Chou YH, et al. Imaging studies of pyriform sinus fistula. *Pediatr Radiol* 2003; 33: 328–333.
22. Hosokawa T, Yamada Y, Takahashi H, et al. Optimal timing of the first barium swallow examination for diagnosis of pyriform sinus fistula. *AJR Am J Roentgenol* 2018; 211: 1122–1127.