

## BRIEF REPORT

WILEY

# Mediastinal granular cell tumor diagnosed with endoscopic ultrasound-guided fine needle aspiration via a modified technique based on wet suction: A case report and literature review

Yingjie Guo<sup>1</sup>  | Xueli Ding<sup>1</sup>  | Hua Liu<sup>1</sup>  | Feng Hou<sup>2</sup>  | Yueping Jiang<sup>1</sup>  | Zibin Tian<sup>1</sup> 

<sup>1</sup>Department of Gastroenterology, The Affiliated Hospital of Qingdao University, Qingdao, China

<sup>2</sup>Department of Pathology, The Affiliated Hospital of Qingdao University, Qingdao, China

## Correspondence

Xueli Ding, Department of Gastroenterology, The Affiliated Hospital of Qingdao University, Qingdao, China.  
Email: dxl369@126.com

## Abstract

Granular cell tumor (GCT) represents a less frequently seen tumor originating from Schwann cells. Although GCT develops in various locations in the human body, GCT of the mediastinum is extremely uncommon. A case of mediastinal GCT diagnosed by aspiration using a fine needle assisted by endoscopic ultrasound (EUS-FNA) via a modified technique based on wet suction was reported. An asymptomatic 28-year-old man was referred for assessment of a mass in the mediastinum that was found incidentally via chest computed tomography (CT) at health screening. EUS demonstrated a hypoechoic lesion with a distinct boundary, which was derived from the upper posterior mediastinum and partly located close to the posterior wall of the esophagus. Therefore, EUS-FNA with a modified wet suction technique was performed to harvest adequate specimens for the diagnosis of GCT. Minimally invasive tumor removal was performed, and histological examination of the specimen harvested surgically verified GCT, consistent with histological findings of the specimen obtained by EUS-FNA. The case highlights that a good accuracy of histological diagnosis and specimen quality are achieved for the modified wet-suction technique in EUS-FNA, and a preoperative diagnosis of mediastinal GCT can be made with certainty.

## KEYWORDS

endoscopic ultrasound-guided fine needle aspiration, mediastinal granular cell tumor, modified wet suction technique

## 1 | INTRODUCTION

Granular cell tumor (GCT) represents a less frequently encountered tumor that originates from Schwann cells, and most are often found in female adults.<sup>1</sup> Although GCT develops at various locations throughout the human body, GCT of the mediastinum is extremely uncommon. With the widespread use of high-resolution chest cross-sectional imaging, more asymptomatic mediastinal lesions are being

detected. It is not easy to make a diagnosis of GCT of the mediastinum based on radiological findings because GCT of the mediastinum is not associated with distinctive radiologic features, and this is compounded by the fact that the incidence of the condition is very low.

Aspiration using a fine needle assisted by endoscopic ultrasound (EUS-FNA) is now a vital method for instigating a cytopathological and histopathological diagnosis of lesions of the mediastinum. During sampling of solid lesions, two suction techniques can be used to

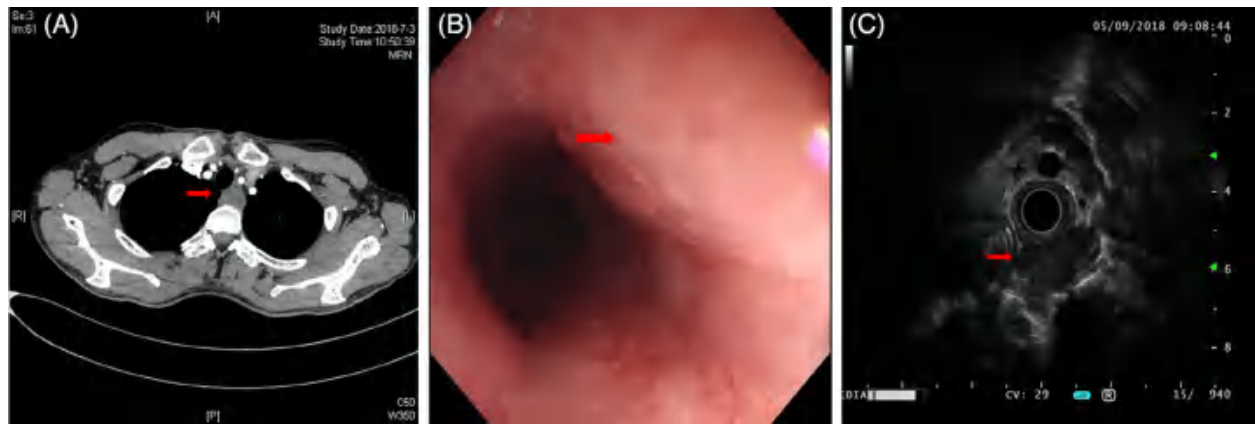


FIGURE 1 A, Contrast-enhanced chest computed tomography showed a round-shaped mass in the peritracheal posterior mediastinum. B, Gastroscopy revealed a protruded lesion in the esophageal midsection. C, EUS views of a mediastinal mass derived from upper posterior mediastinum, which is partly located close to the posterior wall of esophagus with hypoechogenicity

promote the acquisition of tissues: a technique based on dry suction and one based on wet suction.<sup>2,3</sup> More recently, a novel modified technique based on wet suction has been established, which involves using the wet technique to achieve preparation of the needle but with the application of suction that is based on a dry technique, thus merging the advantages of both.<sup>4</sup> Here, we present a rare case of asymptomatic mediastinal GCT which was diagnosed as EUS-FNA using the modified wet suction technique.

## 2 | CASE REPORT

An asymptomatic man who was 28 years old was admitted to the hospital for assessment of a mass in the mediastinum that had been found incidentally via imaging during health examination. Physical and laboratory examination showed no abnormalities. The chest CT showed a lesion that was round-shaped with a size of 1.4 cm × 2.6 cm in the peritracheal posterior mediastinum. Gastroscopy revealed a protruded lesion in the esophageal midsection. EUS revealed a lesion that was hypoechoic with a distinct boundary, derived from the upper posterior mediastinum, partly located close to the posterior wall of esophagus, and 2.5 cm × 2.1 cm in size (Figure 1).

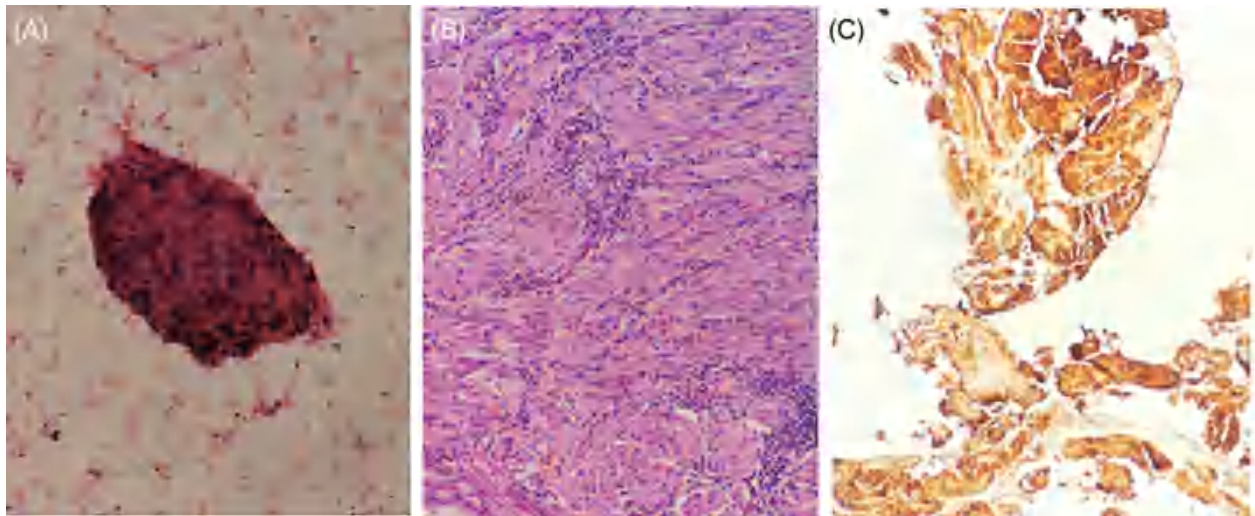
By using the modified wet suction technique, aspiration using a fine needle assisted by endoscopic ultrasound of the mediastinal lesion was performed with the linear Olympus echoendoscope (GF-UCT 260, EU-ME2, Olympus, from Tokyo, Japan). Every single FNA was conducted with the use of needles that were 22-gauge needles (ECHO-HD-22-C, Cook Ireland Limited). In the modified wet suction technique, before lesion puncture, removal of the stylet is accomplished and preflushing of the needle is carried out using saline (1–2 mL) in a 10 mL syringe so that fluid can replace the air column. Subsequent to the needle achieving lesion puncture, the syringe for suction is substituted with a 10 mL syringe that is prevacuumed and filled with air, which generates non-stop 5 or 10 mL suction involving negative pressure as backward and forward movement of the needle

takes place approximately 20 times inside the lesion. An adequate sample was obtained. The core, which was visible at a macroscopic level, was conveyed to eppendorf tubes with formalin at 10% so that histological examination could be enacted. The residual tissue was used in smears for cytological evaluation.

Histopathological evaluation revealed loosely cohesive oval-shaped or polygonal cells with cytoplasm containing copious amounts of eosinophilic to amphiphilic granules. Immunohistochemistry staining was performed and yielded the results as follows: S100+, SMA–, Desmin–, CD117–, DOG1–, and Ckpan– (Figure 2). The results related to morphology as well as the patterns of staining obtained via immunohistochemistry pointed to a GCT diagnosis. The tumor lesion was completely excised en bloc via video-assisted thoracoscopic surgery, and it was a hard, uncapsulated, red-white mass of 3 × 2 × 1.5 cm in size. The surgical specimen showed similar findings of EUS-FNA specimens in which the Ki-67 labeling index was 2%. The patient was discharged three days after the operation. During the follow-up of 18 months, signs indicative of tumor recurrence were not observed.

## 3 | DISCUSSION

GCT represents a rare tumor first reported as a non-malignant neoplasm by Abrikossoff. It features profuse eosinophilic to amphiphilic granules within the cytoplasm. The tumor shows S100 positivity. It has been reported that GCT can develop regardless of age, race, or gender, but it is most common in females, between the ages of 40 and 60.<sup>5</sup> The majority of GCTs are benign neoplasms, and around 2% of GCT cases are malignant.<sup>6</sup> A proportion of GCTs which are diagnosed initially as nonmalignant or possess characteristics that are nontypical may progress to malignancy, and local relapse or metastasis with or without involvement of lymph nodes may be found. Generally speaking, the local relapse of GCTs at a variety of organs is decidedly rare, and the relapse rate is reported to be 2%–9%.<sup>7</sup> In patients without



**FIGURE 2** EUS guided FNA of the lesion showed loosely cohesive oval-shaped or polygonal cells with cytoplasm containing copious amounts of eosinophilic to amphiphilic granules, which are positive for S100. A, Cytologic examination ( $\times 200$ ). B, Histological examination ( $\times 200$ ). C, Immunohistochemical staining for S100 ( $\times 200$ )

radical resection, GCT may become locally aggressive and recur. Indeed, Lack et al. described that 20.8% percent of patients in whom there was incomplete tumor resection went on to exhibit local recurrence.<sup>8</sup> Because of these factors, GCT that has been diagnosed through pathologic examination should be subjected to a process of thorough resection, and regular subsequent observation of the patient should be enacted.

GCT is known to manifest in any location in the human body. The head as well as the neck region are the sites most often affected, account for 45%-65% of cases. 30% of cases are affected at the skin or subcutaneous tissues, 15% at the breasts, 10% at the pulmonary system, and 4%-6% at the gastrointestinal system.<sup>9</sup> However, GCT is extremely rare in the mediastinum. After reading English reports, we found there have only been 18 cases with GCT in the mediastinum. There are no specific features on CT, EUS, and magnetic resonance imaging for confident differentiation of a GCT from other mediastinal tumors, such as thymoma, lymphoma, and neurogenic tumors. Clinically, as mentioned before, mediastinal GCTs may be asymptomatic or cause nonspecific symptoms including cough, chest pain, wheezing, and hoarseness. In our case, the patient was asymptomatic and the mediastinal lesion was found incidentally on a chest CT scan during health examination. An accurate preoperative diagnosis is crucial to avoid unnecessary workup or surgery, especially for small and asymptomatic mediastinal lesions.

EUS-FNA has become the first-line sampling procedure to obtain specimens and make a definitive diagnosis for lesions adjacent to the gastrointestinal tract. Current standard suction techniques for EUS-FNA sampling in clinical practice rely on suction which produces negative pressure to the proximal needle component after removal of the stylet using a prevacuumed syringe (the dry technique). However, dry suction increases the chance of blood contamination and, therefore, may affect the specimen quality. In order to meet the challenges of these issues, a technique based on wet suction was established, which

depends on the deployment of saline to preflush the needle, whereupon the air column is substituted with fluid, and a syringe that has been prefilled with saline solution can then be used to aspirate the proximal section. The wet-suction technique in EUS-FNA contributes to higher specimen quality and histological diagnostic accuracy when compared with the dry-suction technique.<sup>10</sup> In the current study, we describe a modified wet-suction technique to fulfill our overarching ambition of maximizing aspirate quality, which is dependent on utilizing saline solution to preload the needle, but making use of persistent negative pressure from a syringe that is prevacuumed to eliminate the requirement for manual suction that maybe unreliable and irregular. Therefore, the novel technique owns both benefits of the wet technique for preparation of a needle and the dry technique for preparation of a syringe for suction.

Several cases related to GCT of the mediastinum can be found in the literature, and in most the definitive diagnosis of GCT was achieved only following resection by surgical means as well as supplementary investigations (such as immunohistochemical methods and electron microscope examinations) that were carried out on sections of tissues, but only a few have been diagnosed by EUS-FNA.<sup>11,12</sup> It is reported that GCT—from any body parts—can be confidently diagnoses on cytology smears, and the cellblock may be used for ancillary studies.<sup>13</sup> However, the poor quality and inadequate cellularity in samples procured via EUS-FNA represents a frequent reason for limited diagnostic capacity, which contributes to procedures being redone or hold-ups to diagnosis.<sup>14</sup> We performed the EUS-FNA on the patient with the modified wet-suction technique, and a definite cytological diagnosis was made. The technique may increase the cellularity and adequacy of specimens without adding blood contamination. Although FNA needles are routinely used to achieve a cytological diagnosis, our study showed that using wet suction for FNA could also obtain sufficient histological specimens too and make a definitive histological diagnosis for mediastinal GCT. Minimally

invasive tumor removal was subsequently performed, and histological analysis of the surgically harvested specimen verified GCT, which is the same as the histological findings of the specimen procured by EUS-FNA.

We have herein reported a case of mediastinal GCT where an accurate preoperative diagnosis was made using EUS-FNA with the modified wet-suction technique. In summary, even though GCT represents an uncommon tumor, its inclusion in the consideration of differential diagnoses with regards to lesions in the mediastinum is crucial. The modified wet suction is a new suction technique that uses a fluid column inside the needle to generate persistent negative pressure with the use of a prevacuum syringe. EUS-FNA with a modified technique for wet-suction allows for adequate and simple sampling and may be beneficial in the diagnosis of mediastinal lesions.

#### CONFLICT OF INTEREST

The authors declare no conflicts of interest.

#### AUTHOR CONTRIBUTIONS

Yingjie Guo: Prepared manuscript. Xueli Ding and Feng Hou: Contributed in manuscript preparation and diagnosis. Hua Liu and Yingjie Guo: Collected clinical information. Yueping Jiang: Collected data. Zibin Tian and Xueli Ding: Done manuscript correction.

#### DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

#### ORCID

Yingjie Guo  <https://orcid.org/0000-0003-2909-9887>

Xueli Ding  <https://orcid.org/0000-0003-4021-2246>

Hua Liu  <https://orcid.org/0000-0002-0621-5358>

Feng Hou  <https://orcid.org/0000-0002-1205-0131>

Yueping Jiang  <https://orcid.org/0000-0002-9603-3581>

Zibin Tian  <https://orcid.org/0000-0001-7047-2327>

#### REFERENCES

- Julien TP, Hresko MT. Granular cell tumor presenting as a pediatric spinal deformity. *Harv Orthop J*. 2013;15:25-30.
- Villa NA, Berzosa M, Wallace MB, Rajman I. Endoscopic ultrasound-guided fine needle aspiration: the wet suction technique. *Endosc Ultrasound*. 2016;5:17-20.
- Wang Y, Chen Q, Wang J, et al. Comparison of modified wet suction technique and dry suction technique in endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) for solid lesions: study protocol for a randomized controlled trial. *Trials*. 2018;19:45.
- Attam R, Arain MA, Bloechi SJ, et al. "Wet suction technique (WEST)": a novel way to enhance the quality of EUS-FNA aspirate. Results of a prospective, single-blind, randomized, controlled trial using a 22-gauge needle for EUS-FNA of solid lesions. *Gastrointest Endosc*. 2015;81:1401-1407.
- Cui Y, Tong SS, Zhang YH, Li HT. Granular cell tumor: a report of three cases and review of literature. *Cancer Biomark*. 2018;23:173-178.
- Nakao M, Hishida T, Ishii G, Yoshida J, Nishimura M, Nagai K. Malignant granular cell tumor of the posterior mediastinum with dissemination. *Asian Cardiovasc Thorac Ann*. 2012;20:71-73.
- Fanburg-Smith JC, Meis-Kindblom JM, Fante R, Kindblom LG. Malignant granular cell tumor of soft tissue: diagnostic criteria and clinicopathologic correlation. *Am J Surg Pathol*. 1998;22:779-794.
- Lack EE, Worsham GF, Callihan MD, et al. Granular cell tumor: a clinicopathologic study of 110 patients. *J Surg Oncol*. 1980;13:301-316.
- Becelli R, Perugini M, Gasparini G, Cassoni A, Fabiani F. Abrikossoff's tumor. *J Craniofac Surg*. 2001;12:78-81.
- Wang Y, Wang RH, Ding Z, et al. Wet-versus dry-suction techniques for endoscopic ultrasound-guided fine-needle aspiration of solid lesions: a multicenter randomized controlled trial. *Endoscopy*. 2020;52:995-1003.
- Smith AR, Gilbert CF, Strausbauch P, Silverman JF. Fine needle aspiration cytology of a mediastinal granular cell tumor with histologic confirmation and ancillary studies. *Acta Cytol*. 1998;42:1011-1016.
- Bean SM, Eloubeidi MA, Eltoum IA, Cerfolio RJ, Jhala DN. Preoperative diagnosis of a mediastinal granular cell tumor by EUS-FNA: a case report and review of the literature. *CytoJournal*. 2005;2:8.
- Oprea-Ilie GM, Siddiqui MT. Breast cytology. In: Jing X, Siddiqui MT, Li QK, eds. *Atlas of Non-Gynecologic Cytology*. Part of Springer Nature 2018: Springer International Publishing AG; 2018.
- Van Riet PA, Larghi A, Attili F, et al. A multicenter randomized trial comparing a 25-gauge EUS fine-needle aspiration device with a 20-gauge EUS fine-needle biopsy device. *Gastrointest Endosc*. 2019;89:329-339.

How to cite this article: Guo Y, Ding X, Liu H, Hou F, Jiang Y, Tian Z. Mediastinal granular cell tumor diagnosed with endoscopic ultrasound-guided fine needle aspiration via a modified technique based on wet suction: A case report and literature review. *Diagnostic Cytopathology*. 2021;1–4. <https://doi.org/10.1002/dc.24704>