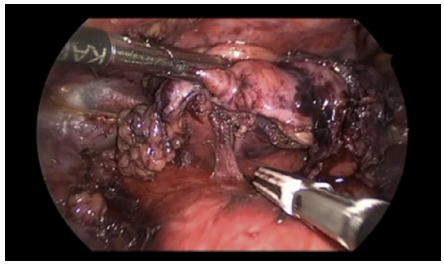
Thoracoscopic Resection of a Nonseminomatous Primary Mediastinal Germ Cell Tumor

Raul Caso, MD, MSCI, and M. Blair Marshall, MD

PMNGCT is an independent predictor of poor prognosis despite advances in multidisciplinary management. Multidrug chemotherapy followed by aggressive surgical resection remains the mainstay of treatment. Although associated with significant morbidity, an open surgical approach is traditionally used. We describe the first reported case, to our knowledge, of a patient who underwent resection of a PMNGCT via a minimally invasive approach following induction chemotherapy.

Semin Thoracic Surg 31:870–872 © 2019 Elsevier Inc. All rights reserved.

Keywords: Germ cell tumor, PMNGCT, Thoracoscopic surgery



Intraoperative image of VATS residual PMNGCT resection.

Central Message

Surgery for residual PMNGCT is traditionally performed via an open approach. This is the first reported case, to our knowledge, of a minimally invasive resection following induction chemotherapy.

BACKGROUND

Primary mediastinal nonseminomatous germ cell tumors (PMNGCT) represent a distinct subset of germ cell tumors that are an independent predictor of poor prognosis compared with those of gonadal origin.[1] Multidrug chemotherapy followed by surgical resection is the mainstay of treatment. Surgical resection of residual disease allows assessment of response, removal of chemotherapy-resistant disease, and directs additional chemotherapy.[2] Traditionally, an open approach is used for surgical resection and can be associated with significant morbidity.[3] Here, we describe the case of a patient with a PMNGCT who underwent resection via a minimally invasive approach following induction chemotherapy.

CASE SUMMARY

A 29-year-old male with no significant medical history initially presented to an emergency room with chest pain and was found to have a mediastinal mass measuring 5.8 × 4 cm (Fig. 1A). Further evaluation revealed elevated serum tumor markers (AFP 2029, βHCG <1, LDH 183) and biopsy via Chamberlain procedure was consistent with PMNGCT. Testicular ultrasound was negative for malignancy and there was no evidence of metastasis. The patient completed 4 cycles of induction chemotherapy (etoposide, ifosfamide, cisplatin) and subsequently had undetectable tumor markers. Postinduction CT scan demonstrated a residual mass with a maximal diameter of 4 cm and residual hypermetabolic activity on PET scan. The patient was subsequently referred to our institution for surgical resection.

Taking into consideration the patient's excellent performance status, response to induction chemotherapy and residual mass size (Fig. 1B), we opted for a minimally invasive thoracoscopic approach (Video 1). The patient underwent intubation with a double-lumen tube. He was placed in a modified supine position as we have previously described,[4] allowing access to bilateral chests, sternum, and neck. A right VATS approach was used given lack of involvement of the aortopulmonary window, better visualization of the innominate-caval junction, and an unobstructed view. We placed three 5 mm ports along the border of the right pectoralis margin (Fig. 2). Carbon dioxide (CO_2) insufflation was utilized to compress the lung and improve our exposure. The mass was identified in the superior mediastinum and associated with some fibrosis and scarring. Sharp dissection was used to separate the mass off the pericardium and aorta. Along the right lateral margin, the mass was dissected off the innominate-caval junction. Once mobilized in its entirety, it was placed in a disposable bag. There was no violation of the mass during the dissection. The middle port was then enlarged to accommodate delivery of the mass. The specimen was closely examined on the back table. The tumor was bisected. Frozen sections of the margins were not performed as they were not involved. A chest tube was inserted in the right chest and intercostal blocks were

Division of Thoracic Surgery, MedStar Georgetown University Hospital, Washington, District of Columbia

Conflicts of Interest: The authors have no conflicts of interest to report.

Address reprint requests to Raul Caso, MD, MSCI, Department of Surgery, MedStar Georgetown University Hospital, Washington, DC 20007. E-mail: Raul.Caso@gunet.georgetown.edu

1043-0679/$–see front matter
https://doi.org/10.1053/j.semtcvs.2019.04.004

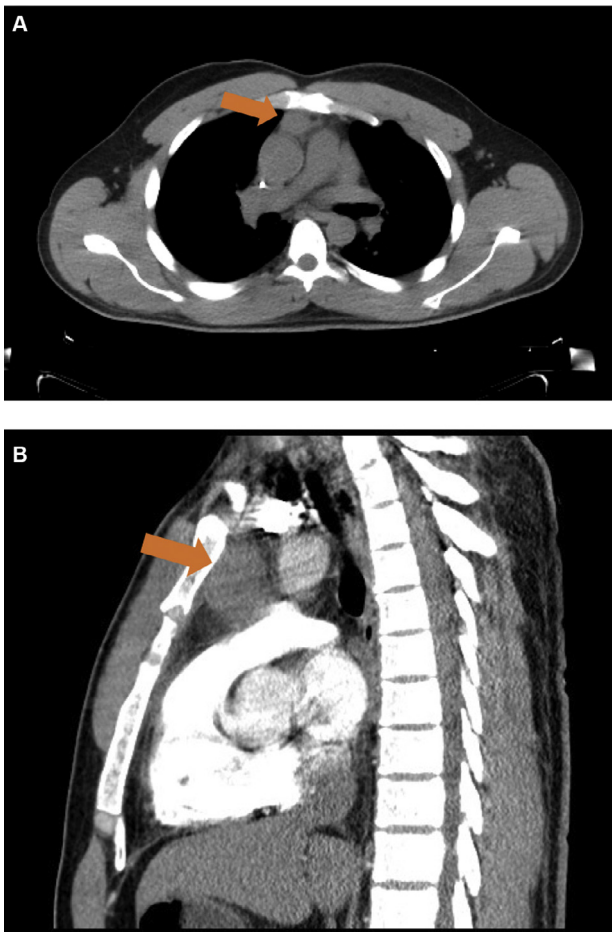


Figure 1. CT of the chest obtained prior to induction chemotherapy (sagittal; A) and upon chemotherapy completion (B; arrow indicates mass).

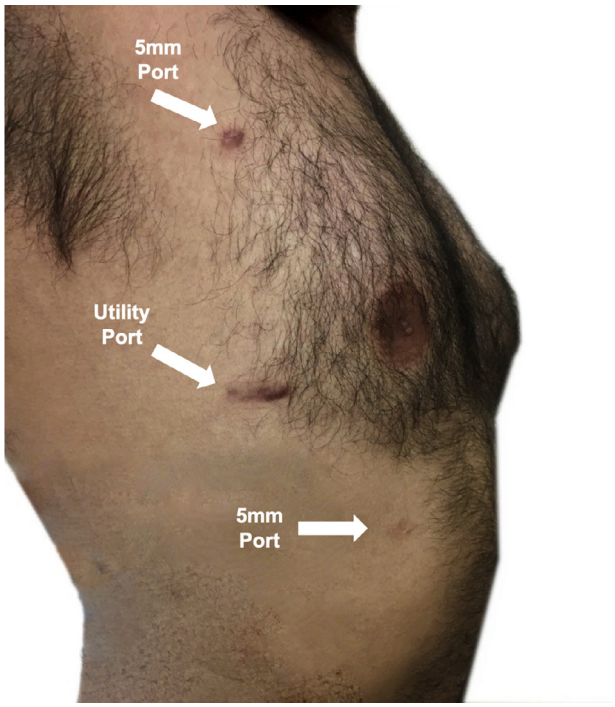


Figure 2. Thoracoscopic port placement. Three 5 mm ports were placed along the border of the right pectoralis margin. The middle port was enlarged to accommodate delivery of the mass.

placed. The CO_2 insufflation was stopped and the right lung was allowed to re-expand. The right chest tube was then removed and the incisions were closed. The patient was extubated and transferred to the recovery unit in stable condition.

A portable chest radiograph was obtained postoperatively with no significant findings. The patient did well in the recovery unit and was discharged home on the same day. Final pathology was consistent with necrosis and negative margins. He was seen in the office one week after surgery and was recovering well without complications. The patient has been routinely followed with serial imaging and serum tumor markers, and remains without evidence of recurrence two years after resection.

DISCUSSION

Patients with PMNGCT have an overall survival of 40–50% after induction chemotherapy and surgery.[2] Chemotherapy can lead to tumor necrosis and fibrosis of surrounding mediastinal tissues, resulting in a technically demanding resection. Traditionally, an open approach is utilized, however there is increasing evidence of the safety and feasibility of thoracoscopic surgery for mediastinal dissection.[4,5] This is the first reported case, to our knowledge, of a patient who underwent thoracoscopic resection of a PMNGCT following induction chemotherapy.

It is worth noting the patient was worked-up at another institution prior to our involvement in his case. Traditionally, we do not pursue a surgical biopsy in the context of elevated serum tumor markers as this is already diagnostic. Surgical biopsy not only adds costs but has its own risk of morbidity, delays induction chemotherapy, and can make postinduction resection more challenging because of scarring.

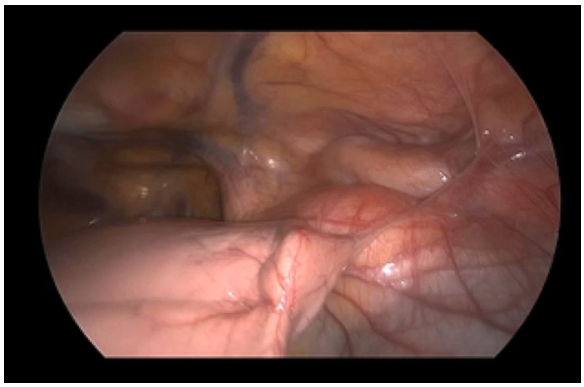
At his first consultation visit, the patient requested a minimally invasive approach. We counseled him this might not be feasible but given his wishes we would make an attempt assuring that the operation would not be compromised. The patient had no significant comorbidities (as most patients with this condition) and excellent performance status following induction therapy. Importantly, the tumor responded well to multidrug therapy exemplified by its reduction in size and lack of involvement of adjacent structures on preoperative imaging. Therefore, we believed we could successfully resect it using a minimally invasive approach. Intraoperatively, we confirmed the mass was not densely adherent to the phrenic nerves, pulmonary parenchyma, or pericardium requiring en bloc resection and resulting in higher complexity thus increasing the likelihood of conversion to an open approach. Ultimately, careful and systematic dissection of the mass was achieved with the enhanced view afforded with a thoracoscopic approach and CO_2 insufflation which enables collapse of the lung and diaphragm. This approach allowed complete resection of the

residual mass with a tumor-free margin and with minimal morbidity to the patient. In conclusion, in the absence of pulmonary metastasis or significant adherence to adjacent structures, a minimally invasive approach can be considered in select PMNGCT patients following adequate response to induction chemotherapy.

This case report was exempt from IRB approval.

SUPPLEMENTARY MATERIALS

The following is the supplementary data to this article:



Video 1. Minimally invasive resection of residual PMNGCT. Three 5 mm ports were placed along the border of the right pectoralis margin and CO_2 insufflation was utilized to improve exposure. The mass was carefully dissected off surrounding structures. Once the mass was mobilized in its entirety, the middle port was enlarged to accommodate its delivery.

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