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When laparoscopy for fertility preservation prior to gonadotoxic treatment of an anterior mediastinal mass is a dilemma: A case report

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ABSTRACT

INTRODUCTION: The management of anterior mediastinal masses is a challenge for anesthesiologists. Recommendations for their management in the context of diagnostic or curative surgery are well described. The added risk of laparoscopic surgery for fertility preservation has however never been discussed in the literature.

PRESENTATION OF CASE: We present the case of a 32-year-old female patient with a large malignant anterior mediastinal mass. She was referred for anesthesia evaluation before laparoscopic ovarian tissue harvesting as part of fertility preservation prior to gonadotoxic treatment. The patient presented dyspnea at rest. Chest computed tomography revealed a tracheal deviation and a partial obstruction of the left mainstem bronchus. Transthoracic echocardiography showed a pericardial effusion. Proceeding to high risk anesthesia for a non-curative surgery in a patient with a highly symptomatic mass was considered unacceptable and the procedure was postponed. The patient received a single cycle of neoadjuvant chemotherapy. Clinical and radiological improvement were shown after this single dose and laparoscopic surgery was performed under general anesthesia without complications.

CONCLUSION: In the context of an anterior mediastinal mass and fertility preservation a thorough benefit-risk analysis must be undertaken before non-curative laparoscopic surgery. In case of severe symptoms, surgery should be postponed until the patient's condition improves after the minimum necessary chemotherapy treatment. So far it is impossible to say whether the risk exceeds the expected benefit in this difficult situation. Further studies need to be conducted in this area.

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1. Introduction

Anterior mediastinal masses are uncommon in adults. They can encompass a variety of malignant tumors, but the most frequently encountered are lymphomas or thymomas. The risk associated with performing general anesthesia (GA) in these patients is widely recognized. The tumor can cause airway or great vessels compression, which may worsen under GA, resulting in life threatening cardiopulmonary instability or even death [1–3]. Therefore the anesthetic risk stratification and the development of preoperative strategies are key elements for successful perioperative management of these patients.

Currently, advances in cancer treatment improve the probability of cure. However, chemotherapy regimens can be gonadotoxic and induce a decrease or even a loss of fertility after repeated doses. Ovarian tissue cryopreservation has developed during the last decade and has been a proven method to preserve fertility in women of reproductive age [4]. The tissue harvesting requires a laparoscopic approach under GA.

The anesthetic management of anterior mediastinal masses in the context of diagnosis or curative surgery is widely described in the literature [5–7]. To our knowledge, there is no data whether the pneumoperitoneum and Trendelenburg position during a laparoscopic surgery enhance the mass effect of the mediastinal pathology. Risk stratification and perioperative management of these patients need to be carefully considered in the context of a non-curative laparoscopic surgery.

We describe the case of a patient with a large anterior mediastinal mass, referred to the pre-operative anesthesia consultation for a laparoscopic ovarian tissue harvesting as part of fertility preservation method prior to gonadotoxic treatment.

This work has been reported in line with the Surgical Case Report (SCARE) guidelines [8].

This work has been registered with a Research Registry Unique Identifying Number: 6181.

2. Presentation of case

A 32-year-old woman with no medical, surgical or familial history was admitted to the intensive care unit for stridor, stage IV dyspnea (NYHA classification) with orthopnea, chest pain and weight loss. A facial edema and cervical swelling aggravated dur-

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Fig. 1. Computed Tomography performed on day 0 revealing tracheal compression and deviation.

M: anterior mediastinal mass.

T: trachea (cross section above the carina).

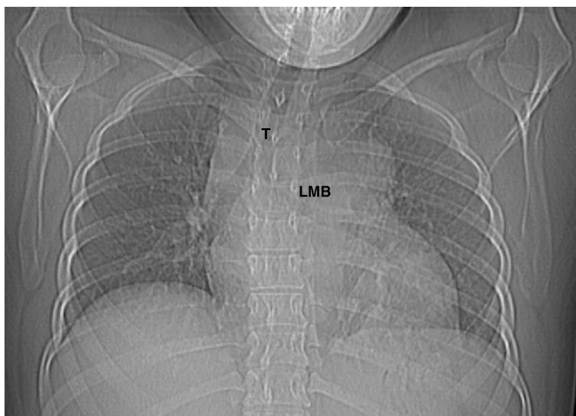


Fig. 2. Chest X-Ray performed on day 0 revealing tracheal compression and partial obstruction of the left main bronchus.

T: trachea (cross section above the carina).

LMB: left main bronchus.

ing the ten previous days, were suggestive of a superior vena cava syndrome.

Thoracic computed tomography (CT) and chest X-Ray revealed a large anterior mediastinal mass extending up to the supraclavicular level (Figs. 1 and 2) with 70% compression and right tracheal deviation. Superior vena cava and left brachiocephalic veins were collapsed. After high-dose corticosteroid therapy (methylprednisolone 160 mg per day) and improvement of symptomatology the patient was discharged from intensive care unit. Dyspnea at rest and chest pain persisted, however there were no more signs suggesting superior vena cava syndrome. The echocardiography revealed a mild circumferential pericardial effusion without hemodynamic compromise and the functional respiratory tests showed a moderate restrictive deficit and impaired diffusion capacity.

Needle biopsy was performed and the diagnosis of a Large B-Cell lymphoma stage II A was made.

In this context, the patient was addressed to the pre-operative anesthesia evaluation in order to proceed to a laparoscopic ovarian tissue sampling. This procedure is common and usually performed

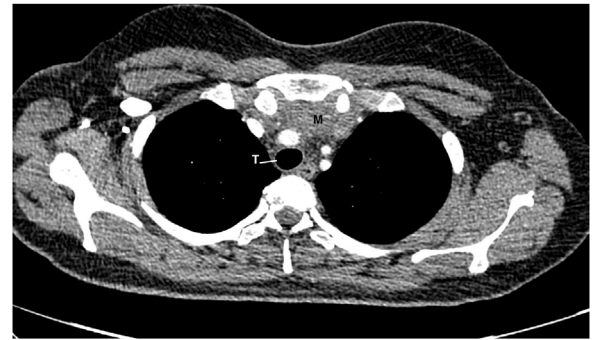


Fig. 3. CT performed on day 30 after neoadjuvant chemotherapy. Tracheal compression and deviation have disappeared.

M: anterior mediastinal mass.

T: trachea (cross section above the carina).



Fig. 4. Chest X-Ray performed on day 30, after neoadjuvant chemotherapy. Tracheal compression and deviation have disappeared.

T: trachea (cross section above the carina).

LMB: left main bronchus.

prior to gonadotoxic treatment to preserve fertility in patients in reproductive age.

Respiratory and vascular structure compression, the pericardial effusion and the dyspnea at rest were considered major risk factors by the anesthesia team. After multidisciplinary discussion the surgery was postponed. The patient received a single dose of neoadjuvant chemotherapy in order to reduce the size and the mass effect of the tumor.

Two weeks after the chemotherapy, the patient was asymptomatic. A new thoracic CT showed a 40% decrease of the mass size. The respiratory track was fully visible and there was no deviation or compression. The superior vena cava and the left brachiocephalic veins were clear. (Figs. 3 and 4). These clinical and radiological improvements allowed the surgery to be scheduled.

Surgery was performed in our tertiary care center by a senior surgeon with more than ten years of specific experience in laparoscopic surgery for ovarian tissue cryopreservation. Patient underwent GA with administration of neuromuscular blocking agents, orotracheal intubation and positive pressure ventilation. She was placed in lithotomy position prior to pneumoperitoneum induction followed by Trendelenburg position. The insufflation pressure used to induce pneumoperitoneum did not exceed 13 mmHg and lasted 19 min. The total duration of the surgery was 26 min.

Table 1
Anesthetic risk stratification in patients with an anterior mediastinal mass [13].

	Anesthetic risk stratification
Low	- Asymptomatic patients - Mild symptoms but without postural implications - No radiological evidence of airway compression
Intermediate	- Mild or moderate postural symptoms - Radiological evidence of airway compression less than 50%
High	- Severe postural symptoms - Stridor - Cyanosis - Radiological evidence of airway compression more than 50%, tracheal compression with bronchial compression - Pericardial effusion - Superior vena cava syndrome

The procedure was well tolerated by the patient. Hemodynamics measurements such as non-invasive blood pressure, heart rate and electrocardiography were continuously registered and remained stable. At the end of the surgery, the patient was awakened, extubated and kept under surveillance in the recovery room. She did not experience any postoperative complications. The patient received her second dose of chemotherapy the next day and returned home on the fifth day.

Four months after surgery, the patient has already gone through five out of the six planned chemotherapy cycles. She is closely followed by the oncologic team and she has not experienced any major treatment complications.

3. Discussion

Anesthetic management of diagnostic and curative surgical procedures in patients with an anterior mediastinal mass presents life threatening challenges. Total occlusion of the airway and cardiovascular collapse are well known complications during GA [9]. Even in patients with few or no symptoms, GA can result in severe cardiopulmonary instability [10]. Risk stratification of these patients is thus essential to determine the best perioperative strategy [11,12].

Our patient was referred for a preoperative anesthetic evaluation for fertility preservation method. Ovarian tissue cryopreservation requires collection of healthy ovarian tissue via laparoscopy before the beginning of treatments that may harm the ovary. To our knowledge, there are no data in the literature suggesting that lower abdominal laparoscopic surgery can be safely performed in patients with a large anterior mediastinal mass prior to gonadotoxic treatment.

Advantages of laparoscopic surgical techniques are well known. However, the increase of intra-abdominal pressure due to pneumoperitoneum, Trendelenburg position, and mechanical ventilation during laparoscopy can negatively impact cardiopulmonary function [13]. Laparoscopic surgery by itself may thus be a major risk factor for cardio-respiratory decompensation in the presence of an anterior mediastinal mass. Therefore, complications related to laparoscopic techniques should be considered when establishing anesthesia risk stratification. Patients with an anterior mediastinal mass are conventionally distributed into three risk categories: “low” “intermediate” and “high” based on clinical and radiological findings (Table 1) [14,7]. Low risk patients can undergo safe anesthesia and surgery. For the other categories, a multidisciplinary discussion (anesthesiologist, oncologist and surgeon) is necessary to assess the anesthetic risk.

In the present case, left bronchial compression, pericardial effusion and respiratory symptoms classified the patient in a high

risk category. After multidisciplinary discussion, it was suggested a neoadjuvant chemotherapy treatment until the low-risk criteria were met.

The purpose of collecting ovarian tissue is to cryopreserve ovarian fragments before oncological treatment. The advantage of this technique is that it does not require ovarian stimulation and it does not depend on the menstrual cycle. Therefore, it does not postpone the oncological treatment. Moreover, it is the only option available to spare eggs for prepubertal girls. Restoration of ovarian activity can be expected following transplantation of cryopreserved tissue, offering chances of pregnancy [15].

The organization of fertility preservation may seem secondary to the urgency of starting an oncological treatment [16]. However, it has been shown that discussing this subject with the patient before the start of treatment is associated with less regrets and a better quality of life after remission [17,18]. Any anesthesiologist could be confronted with a patient for whom GA and laparoscopy represent a high risk but whose desire to preserve fertility is an issue to be taken into consideration.

The degree of ovarian damage and the risk of infertility are related to the age of the woman at the time of treatment and depend on the cumulative dose and the type of chemotherapeutic agent [18]. In the case of our patient, after multidisciplinary discussion, it was decided to give one single dose of neoadjuvant chemotherapy to achieve low anesthetic risk criteria. The impact of this treatment on fertility is lower than cumulative doses of a complete treatment [19]. However, it allowed anesthesia and surgery to be performed in optimal safety conditions.

4. Conclusion

This is the first description of a case of a patient with a symptomatic anterior mediastinal mass at high risk of anesthesia, undergoing laparoscopic ovarian tissue harvesting to preserve fertility.

While waiting for standardized recommendations, we advise to make a thorough benefit-risk analysis and put in balance the risk of GA and laparoscopy and the fertility preservation.

If the anesthetic risk is considered high or intermediate, neoadjuvant treatment should be considered until the lowest risk category is reached.

This case highlights the lack of data on the possible effects of pneumoperitoneum during a laparoscopy in patients with an anterior mediastinal mass. Without knowing whether the risk of laparoscopic surgery and anesthesia exceed the expected benefit of cryopreservation, it seems crucial to carry out additional studies in this area.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

This work is exempt from ethical approval.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy

of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author's contribution

Johanna Tabet: Writing - Original Draft.
Cristina Bianca Robu: Writing - Review & Editing.
Mona Momeni: Review.
Natalia Patricia Magasich-Airola: Writing - Review & Editing.

Registration of research studies

researchregistry6365 available at: <https://www.researchregistry.com/browse-the-registry#home/registrationdetails/5fd9dd24194c04001c6d4f4c/>.

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