# A patient with large retroperitoneal liposarcoma - a challenge for an anesthesiologist

Milica Bojanić[1], Dragana Radovanović[1, 2], Sanja Zahorjanski[1], Svetlana Škorić-Jokić[1], Mlađan Protić[2, 3]

Arch Oncol 2022; 28(2):28-31

Published Online
January 28th, 2022
https://doi.org/10.2298/AOO210617001B

[1] Oncology Institute of Vojvodina, Clinic for Oncological Surgery, Department of Anesthesiology, Intensive Therapy and Care, Put doktora Goldmana 4, 21204, Sremska Kamenica, Serbia
[2] University of Novi Sad, Faculty of Medicine, Hajduk Veljkova 3, 21000, Novi Sad, Serbia
[3] Oncology Institute of Vojvodina, Clinic for Oncological Surgery, Department of Surgery, Put doktora Goldmana 4, 21204, Sremska Kamenica, Serbia

**Correspondence to:**
Milica Bojanic
milicabojann@gmail.com

Received **2021-06-17**
Received in revised form **2021-10-11**
Accepted **2021-11-22**

## SUMMARY

*Retroperitoneal liposarcoma is a rare type of tumor characterized by slow growth and nonspecific symptoms, and is usually diagnosed at an advanced stage. Patients with huge retroperitoneal liposarcoma have a high risk of developing perioperative complications, and require special preoperative preparation and a carefully planned anesthetic approach. We present the case of a 57-year-old man, who was diagnosed with a huge retroperitoneal liposarcoma, 70 cm in diameter, weighing 30.4 kg and planned for surgical resection of the tumor under general anesthesia. Perioperative treatment and anesthesia for this patient were a great challenge for the anesthesiologist. However, due to preoperative preparation, monitoring and fluid replacement, hemodynamic and respiratory stability of the patient was maintained perioperatively.*

**KEY WORDS:** *Retroperitoneal liposarcoma; Anesthetic management; Invasive hemodynamic monitoring; Entropy*

## INTRODUCTION

Liposarcoma is a malignant mesenchymal tumor of adipose tissue origin. Soft tissue sarcomas are rare tumors, accounting for less than 1% of all malignancies, while in adults liposarcoma is the most common among them (1). This type of tumor can be found anywhere in the body, but the most common localization is on the extremities and retroperitoneum (2). More common it occurs in men (1.43:1), most often in the population aged between 40 and 70 years (3, 4). The prognosis of the disease depends on the age of the patient, the localization and depth of tumor invasion, resectability, size, histological type and the presence of metastases (5).

A multidisciplinary approach is important in treatment, which includes the cooperation of surgeons, anesthesiologists, internist-oncologists and radiotherapists. The basic method and gold standard of treatment for liposarcoma, both primary and recurrent, is complete surgical resection of the tumor (6).

Patients with large retroperitoneal liposarcoma are at high risk of developing perioperative complications, primarily cardiovascular and respiratory, and a carefully planned anesthetic approach is necessary. The most significant complications that occur intraoperatively as a consequence of tumor compression are hypotensive syndrome and inadequate lung ventilation, while hemodynamic instability and collapse are expected after tumor removal, as well as the possibility of re-expansion pulmonary edema due to a sharp decrease in thoracic pressure (6).

## CASE REPORT

We present the case of a 57 - year - old patient who was admitted to the Clinic for oncological surgery of the Oncology Institute of Vojvodina for the surgical treatment of retroperitoneal tumor. The patient complained of swelling and enlargement of the abdomen that lasted for two months, as well as weight loss.

Comorbidities of the patient were hypertension and chronic obstructive pulmonary disease. In therapy, the patient regularly used drugs to treat hypertension (valsartan, furosemide), he was a smoker for 25 years, and allergic to ibuprofen. The body weight of the patient was 78 kg, and the height was 174 cm. The abdomen was extremely enlarged and tense, 136 cm in circumference (Figure 1a, b). Chest radiography showed elevation of the right diaphragm to half of the right hemithorax (Figure 2a).

Computed tomography (CT) of the abdomen showed giant multiseptic tumour of hypodense characteristics and fat density, measuring 30x37x46 cm, that completely filled the abdominal cavity (Figure 2b).

After preoperative preparation and stabilization of the patient, exploratory laparotomy and tumor resection under general anesthesia were planned.

Anemia, hypoproteinemia, hypomagnesemia, hyponatremia, hypocalcemia and hypochloremia were present in the laboratory findings, which were corrected preoperatively. The ejection fraction of the left ventricle was 62%. Spirometry recorded moderate mixed pulmonary ventilation disorder, while pulmonary gas exchange at rest indicated hypoxemia with hyperventilation and alkalosis (pH=7.5; $pCO_2$=4.52; $pO_2$=8.11; $HCO_3$= 27.2; $SpO_2$= 90.7%). Anti-obstructive therapy was introduced (vilanterol and umeclidinium bromide, with the use of fenoterol and ipratropium bromide as needed, in case of suffocation attacks). The therapy lasted for 42 days, and the repeated results of gas exchange analysis were as follows: pH= 7.49; $pCO_2$= 5.8; $pO_2$= 9.9; $SpO_2$= 97%.

After the patient was admitted to the preoperative preparation area, two intravenous 17G cannulas were placed and an infusion of 500 ml of Ringer's solution was added. No premedication was prescribed.

After adequate positioning of the patient on the operating table, standard monitoring (electrocardiography, non-invasive blood pressure measurement, pulse oximetry and capnography) was set up and a urinary catheter was placed. Entropy was used to monitor the depth of anesthesia. Surgical Plethysmographic Index (SPI) monitoring was used to assess the adequacy of analgesia.

Vital parameters of the patient before induction of anesthesia were: blood pressure 90/60 mmHg, heart rate 101 beats/min, oxygen saturation in room air of 93-94%. For invasive measurement of blood pressure left radial artery was cannulated using 20G cannula as well as local anesthesia.

Preoxygenation was done for 5 min before tracheal intubation was facilitated. The patient was induced intravenously with 2 mg midazolam, 50 $\mu$g fentanyl, 80 mg propofol and 50 mg rocuronium. Endotracheal intubation was performed, and a tube with inside diameter of 8.5 mm was

placed without complications. After intubation, the patient was placed on a volume-controlled ventilation mode, with a tidal volume of 460 to 530 ml and a positive pressure at the end of expiration of 5 cm $H_2O$.

Anesthesia was maintained with $O_2$, $N_2O$ and sevoflurane. After induction of anesthesia, a central venous catheter was placed in the left subclavian vein. Large-diameter (14G) cannulas were placed in the left and right external jugular vein.

After induction of anesthesia and skin incision, the blood pressure was maintained between 110/55 and 115/60 mmHg, while during the opening of the peritoneum and tumor mobilization, there was a gradual drop in blood pressure, with the lowest value of 60/40 mmHg. After excision of the tumor, the values of blood pressure ranged from 60/40 to 85/50 mmHg. After the end of the surgical part the value of blood pressure stabilized, and at the end of the operation it was 110/60 mmHg. The heart rate was maintained between 77 and 91 beats/min.

According to blood pressure values and estimated losses, the use of crystalloid and colloidal solutions was intensified, red blood cell transfusion and fresh frozen plasma were administered. A minimum mean arterial pressure of 60 mmHg was also maintained with phenylephrine (bolus doses of 100 $\mu$g and 200 $\mu$g, up to a total of 1300 $\mu$g).

Entropy values, Response Entropy (RE) and State Entropy (SE) fell very rapidly after propofol administration, and were maintained intraoperatively at levels from 45 to 59.

The total operation time was 215 min, the anesthesia time was 270 min and the blood loss was calculated to be approximately 2500 ml. The total diuresis was about 700 ml. The surgery was performed in the patient's back position, and the tumor mass was completely removed. The tumor weighed 30.4 kg, and was 70 x 40 x 25 cm in size (Figure 3a, b). The histopathological examination confirmed well diferentiated sclerosing liposarcoma (atypical lipomatous tumor), Grade I, pT4 N1.

Intraoperatively, the patient was transfused with five units of resuspended red blood cells transfusions and two units of fresh frozen plasma, with infusion of 5000 ml of crystalloid and 250 ml of colloidal solution. All fluids were heated before use to prevent hypothermia.

The total doses of hypnotics, opioid analgesics and muscle relaxants administered intraoperatively were as follows: 90 mg propofol, 5 mg midazolam, 100 $\mu$g fentanyl, and 160 mg rocuronium. After the introduction of anesthesia, the concentration of inhaled anesthetics sevoflurane was 0.2 Vol %, that was increased to 0.6 Vol % before skin incision. This concentration was maintained during the hemodynamic stability of the patient, while in periods of hypotension it was reduced to 0.4 Vol% or completely excluded when the mean arterial pressure was 55 mmHg. The operative wound was infiltrated locally with 20 ml of 0.25% levobupivacaine.

At the end of anesthesia, the patient was prescribed with 4 mg dexason, 2.5 g metamizole and 10 mg metoclopramide to provide postoperative analgesia and prevent nausea and vomiting.

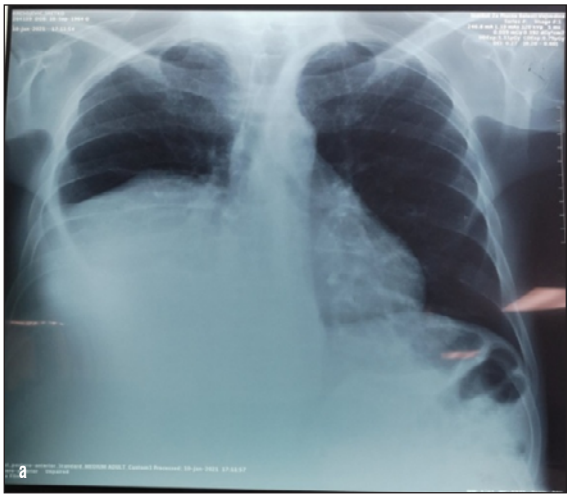
Due to the involvement of the right kidney, the right nephrectomy was also performed, along with tumor resection. After the surgery, the patient was transferred to the Intensive Care Unit (ICU), and after hemodynamic stabilization (when adequate gas exchange and heating was achived) he was extubated (one hour after admission to the ICU), without complications. The immediate postoperative course was orderly, and on the third postoperative day, the patient was transferred to the regular unit of the Department of Surgery.



**Figure 1.** Distended abdominal tumor

## DISCUSSION

Retroperitoneal liposarcoma is a rare tumor, with an incidence of about 2.5 per million inhabitants (7). The method of choice in the treatment of retroperitoneal liposarcoma is surgical resection of the tumor. Negative margin significantly prolongs survival, and, if necessary, excision of the surrounding affected abdominal and retroperitoneal organs should be performed (8).



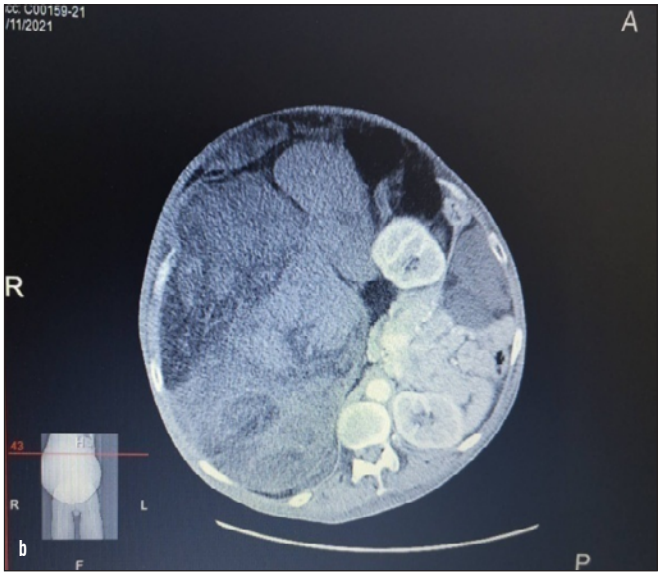




**Figure 2.** Preoperative chest X-ray showing right diaphragmatic elevation due to the tumor size (a) and preoperative computed tomography (CT) scan of the abdomen showing a giant solid mass (b)

Patients with large retroperitoneal liposarcoma are at high risk of developing perioperative complications and require a carefully planned anesthesia approach.

The most significant complications that can occur during anesthesia in these patients are ventilation disorder, desaturation, aspiration during intubation, massive blood loss, hypotension, cardiac arrhythmias, and re-expansion pulmonary edema (RPE) (9, 10).

Large abdominal tumors can lead to elevation of the diaphragm, decreased lung compliance, and consequent disturbance of respiratory function and respiratory distress syndrome. In order to prevent hemodynamic and respiratory disorders, as well as RPE, preoperative reduction of tumor mass is recommended, when possible. Kotera and Nishiyama presented cases of patients with cystic tumors (6, 11), in whom it was possible to evacuate cystic fluid preoperatively and reduce the risk of hemodynamic and respiratory instability. In our case it was a solid tumor, without the possibility of drainage of the content.

In patients with large abdominal tumors, there is a risk of inadequate lung ventilation after the application of neuromuscular relaxant, which occurs due to relaxation of the diaphragm and additional pressure of the abdominal organs on the lungs. As a consequence of reduced compliance of the lungs and chest, there is an increased risk of airway pressure and possible damage and trauma to the lungs.

For this reason, it is recommended that spontaneous ventilation is maintained in these patients for as long as possible, and that inspiratory pressures do not exceed 20 mmHg, although muscle relaxants are used (12). Ohashi et al. presented a case of a patient with a large abdominal tumor that led to respiratory dysfunction. In this case intubation of the trachea was performed without prior use of a muscle relaxant, and the same was done after the preparation of the operative field (10).

Our strategy was to apply a muscle relaxant before tracheal intubation, and the given respiratory volume was successfully achieved - the inspiratory pressure with the application of positive end-expiratory pressure (PEEP) did not exceed 22 mmHg, there was no disturbance of lung ventilation and respiratory distress.



**Figure 3.** Liposarcoma in situ (a) and macroscopic view of the liposarcoma, 70 x 40 x 25 cm in size (b)



www.onk.ns.ac.rs/Archive • Volume 28 • Issue 2 • July 2022 • https://doi.org/10.2298/AOO210617001B

In patients with a large abdominal tumor, there is a risk of developing RPE, that can occur after tumor removal and sudden expansion of the long time-collapsed lung. There is no specific method that can prevent RPE, but gradual re-expansion of the collapsed lung by spontaneous breathing is recommended (13), without performing recruitment maneuvers (14).

In our case, there was no development of RPE after tumor removal.

Bleeding and haemorrhagic shock are serious complications that can develop in patients with large abdominal tumors. The intravenous route should be provided preoperatively with large-diameter cannulas, in case of massive bleeding (15). Our patient experienced significant blood loss, but thanks to the procedures we undertook preoperatively, such as blood product reservations, placement of two large-diameter intravenous cannulas, provision of heated infusion solutions and blood heater, we ensured the hemodynamic stability of the patient during surgery.

In modern anesthesiology practice, entropy or some other method that enables the depth of anesthesia assessment should be applied as extended monitoring. Entropy measurement is objective monitoring and consists of monitoring of two components, SE and RE. For anesthesia to be adequate both values must be between 40-60 and the entropy of the condition must be equal to the entropy of the response (16).

In order to prevent the existence of wakefulness during anesthesia (due to insufficient depth of anesthesia), as well as postoperative complications related to excessive use of hypnotics and opioid analgesics (hemodynamic instability, respiratory depression at the end of anesthesia, nausea and vomiting, delayed recovery, cognitive disorder) we maintained the entropy within the reference values. This monitoring ensured that we applied lower inspiratory concentrations of sevoflurane with a satisfactory depth of anesthesia and thus facilitated the maintenance of hemodynamic stability.

The main purpose of SPI-guided analgesia was to provide adequate perioperative analgesia with a lower risk of intraoperative hemodynamic complications, postoperative pain and side effects associated with the use of opioid analgesics, and reducing their intraoperative use (17). Thanks to SPI-guided analgesia, and due to maintaining SPI<50, we reduced intraoperative use of opioid analgesics, and prevented consequent side effects (from postoperative nausea and vomiting, to respiratory depression).

## CONCLUSION

The key for overcoming challenges during the removal of a huge retroperitoneal tumor is in assessment of the operative risk, implementation of measures to minimize the risk, and development of detailed plan for the introduction and management of anesthesia.

### Declaration of Interests

Authors declare no conflicts of interest.

### REFERENCES


1 Antinori A, Antonacci V, Magistrelli P. Giant retroperitoneal liposarcoma. Am J Surg 2002;184:56–7. doi: 10.1016/s0002-9610(02)00880-2.

2 Barbetakis N., Samanidis G., Samanidou E., et al. Primary mediastinal liposarcoma: A case report. J. Med Case Rep. 2007;1:161. doi: 10.1186/1752-1947-1-161.

3 J N Primrose, Soft tissue tumours. 3rd ed. F. M. Enzinger and S. W. Weiss. 1995. St Louis, Missouri: Mosby-Year-Book. British Journal of Surgery, Volume 82, Issue 10, October 1995, Page 1437. doi:10.1002/bjs.1800821050.

4 Dalal KM, Kattan MW, Antonescu CR, Brennan MF, Singer S. Subtype specific prognostic nomogram for patients with primary liposarcoma of the retroperitoneum, extremity, or trunk. Ann Surg. 2006;244(3):381–91.doi: 10.1097/01.sla.0000234795.98607.00.

5 Brennan MF, Antonescu CA, Maki RG. Management of soft tissue sarcoma. New York (NY): Springer; 2013. doi: 10.1007/978-1-4614-5004-7.

6 Kotera A, Kouzuma S, Miyazaki N, Taki K, Esaki K. Anesthetic management of a patient with an ultra huge ovarian tumor. Masui. 2009 Jul;58(7):907-9. PMID: 19618834.

7 Zhang W.D, Liu D.R, Que R.S, et al. Management of retroperitoneal liposarcoma: A case report and review of the literature. Oncol Lett. 2015; 10 (1): 405–9. doi: 10.3892/ol.2015.3193.

8 Bradley JC, Caplan R. Giant retroperitoneal sarcoma: a case report and review of the management of retroperitoneal sarcomas. Am Surg. 2002 Jan;68(1):52-6. PMID: 12467318.

9 Feng D, Xu F, Wang M, Gu X, Ma Z. Anesthetic management of a patient with giant retroperitoneal liposarcoma: case report with literature review. Int J Clin Exp Med. 2015 Oct 15;8(10):19530-4. PMID: 26770605; PMCID: PMC4694505.

10 Ohashi N, Imai H, Tobita T, Ishii H, Baba H. Anesthetic management in a patient with giant growing teratoma syndrome: a case report. J Med Case Rep. 2014 Jan 27;8:32. doi: 10.1186/1752-1947-8-32. PMID: 24467840; PMCID: PMC3917373.

11 Nishiyama T, Hanaoka K. Same day drainage and removal of a giant ovarian cyst. Can J Anaesth. 1997 Oct;44(10):1087-90. doi: 10.1007/BF03019231. PMID: 9350369.

12 Shinohara H, Ishii H, Kakuyama M, Fukuda K. Morbidly obese patient with a huge ovarian tumor who was intubated while awake using airway scope in lateral decubitus position. Masui. The Japanese Journal of Anesthesiology. 2010 May;59(5):625-628.

13 Kondo T, Kusunoki S, Yasuuji M, Kawamoto M, Yuge O. Prevention of reexpansion pulmonary edema during resection of mediastinal tumor with atelectasis. Masui to sosei. 2006;42:39–41.

14 Mihara T, Kurahashi K. Re-expansion pulmonary edema (RPE) during surgery for intraabdominal giant tumor. Masui. 2008 Feb;57(2):191-6. PMID: 18277569.

15 Morrison P, Morgan G. Removal of a giant ovarian cyst. Anaesthetic and intensive care management. Anaesthesia. 1987 Sep;42(9):965-74. doi: 10.1111/j.1365-2044.1987.tb05368.x. PMID: 3674358.

16 Singh S, Bansal S, Kumar G, Gupta I, Thakur JR. Entropy as an Indicator to Measure Depth of Anaesthesia for Laryngeal Mask Airway (LMA) Insertion during Sevoflurane and Propofol Anaesthesia. J Clin Diagn Res. 2017 Jul;11(7):UC01-UC03. doi: 10.7860/JCDR/2017/27316.10177. Epub 2017 Jul 1. PMID: 28893011; PMCID: PMC5583804.

17 Won YJ, Lim BG, Kim YS, Lee M, Kim H. Usefulness of surgical pleth index-guided analgesia during general anesthesia: a systematic review and meta-analysis of randomized controlled trials. J Int Med Res. 2018 Nov;46(11):4386-4398. doi: 10.1177/0300060518796749. Epub 2018 Sep 9. PMID: 30198405; PMCID: PMC6259411