

# Robotic Esophagectomy for Esophageal Gastrointestinal Stromal Tumor

Matheus Sarmento Militz, MD, Alessandro Bersch Osvaldt, PhD,  
Diego da Fonseca Mossmann, MsC, Guilherme Goncalves Pretto, MsC,  
Mariana Sarmento Militz, MD, Oly Campos Corleta, PhD, Leandro Totti Cavazzola, PhD

Service of General Surgery, Universidade Federal do Rio Grande do Sul, Hospital de Clínicas de Porto Alegre, Rio Grande do Sul, Brazil. Rua Ramiro Barcelos, 2350 - Santa Cecilia, Porto Alegre - RS, 90035-007 (Drs Militz, Corleta, Cavazzola and Messrs Mossman and Pretto).

Service of Digestive Surgery, Universidade Federal do Rio Grande do Sul, Hospital de Clínicas de Porto Alegre, Rio Grande do Sul, Brazil. Rua Ramiro Barcelos, 2350 - Santa Cecilia, Porto Alegre - RS, 90035-007 (Dr Osvaldt).  
Universidade do Sul de Santa Catarina, Palhoça, Santa Catarina, Brazil. Avenida Pedra Branca, 25 - Pedra Branca, Palhoça - SC, 88137-270 (Dr Militz).

## ABSTRACT

Gastrointestinal stromal tumors (GST) account for less than 1% of the total tumors of the gastrointestinal tract. Data suggests that 50–60% of these tumors are located within the stomach and 10–20% in the small bowel. The esophagus involvement is extremely rare, accounting for less than 5% of all GST. This explains the scarcity of clinicopathological data and lack of clear recommendations regarding surgical management of this disease. Surgery as the first line therapy has been associated with better outcomes such as disease control, increased survival, and complete cure.

We present a case of a 63-year-old woman who was referred to the General Surgery Department of the Hospital de Clínicas de Porto Alegre due to dysphagia for solid food with 5 years of evolution. Upper gastrointestinal endoscopy revealed an ulcerated and stenosing lesion of the middle third of the esophagus extending from 25 cm to 33 cm from the upper dental arch. Lesion biopsies confirmed the diagnosis of esophageal GST. She was submitted to neoadjuvance with tyrosine kinase inhibitor and a robotic esophagectomy in prone position was performed.

**Key Words:** Esophagus; Gastrointestinal stromal tumors; Esophagectomy; Robotic esophagectomy.

**Citation** Militz M, Osvaldt A, Mossmann D, Pretto G, Militz M, Corleta O, Cavazzola L. Robotic esophagectomy for esophageal gastrointestinal stromal tumor. CR<sup>SLS</sup> e2020.00054. DOI: 10.4293/JSLS.2020.00054.

**Copyright** © 2020 by SLS, Society of Laparoscopic & Robotic Surgeons. This is an open-access article distributed under the terms of the Creative Commons Attribution-Noncommercial-ShareAlike 3.0 Unported license, which permits unrestricted noncommercial use, distribution, and reproduction in any medium, provided the original author and source are credited.

Disclosure: none.

Funding/Financial support: none.

Conflicts of interest: The authors declare no conflict of interest.

Informed consent: Dr. Militz declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

Address correspondence to: Matheus Sarmento Militz, MD, Service of General Surgery, Hospital de Clínicas de Porto Alegre, Porto Alegre, Rio Grande do Sul Brazil. Telephone: +555133598000, E-mail: matheus.militz@gmail.com

## INTRODUCTION

Gastrointestinal stromal tumors (GSTs) account for less than 1% of the total tumors of the gastrointestinal tract. Data suggests that 50% of these tumors are located within the stomach and 10% in the small bowel. GSTs arising in the

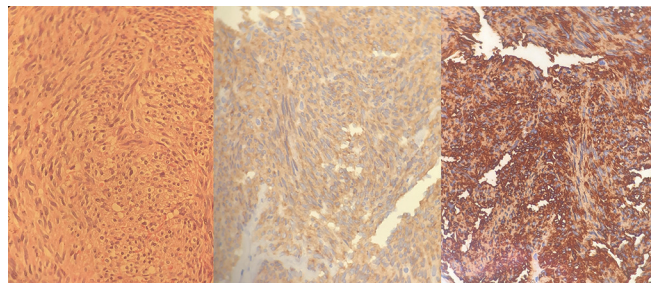
esophagus are extremely rare, accounting for less than 5% of all GSTs. This explains the scarcity of clinicopathological data and lack of clear recommendations regarding surgical management of esophageal GSTs. Surgery as the first line therapy has been associated with better outcomes such as disease control, increased survival, and complete cure.<sup>1</sup>

Surgery can be performed conventionally or using minimally invasively approaches, such as videolaparoscopy, and more recently, robotic surgery. The latter is still poorly studied, and the technique is not standardized due to the rarity of esophageal GSTs. Chemotherapy with tyrosine kinase inhibitors is indicated in advanced cases.<sup>2</sup> In this report, we describe the first esophagectomy for esophageal GST completely performed by a robot during both abdominal and thoracic phases. The patient was 63 years old and presented with a large esophageal lesion that was previously submitted to neoadjuvance with tyrosine kinase inhibitor.

## CASE DESCRIPTION

A 63-years-old woman was referred to the General Surgery Department of the Hospital de Clínicas de Porto Alegre due to dysphagia for solid food with 5 years of evolution. The patient had a history of 2 hematemesis episodes and weight loss of 8 kg in the last 6 months. At the time, she denied fever, nausea, vomiting, or changes in bowel habit. The physical examination was normal as well the laboratory exams. Upper gastrointestinal endoscopy revealed an ulcerated and stenosing lesion of the middle third of the esophagus extending from 25 cm to 33 cm from the upper dental arch. Lesion biopsies confirmed the diagnosis of esophageal GST (**Figure 1**). The mitotic index was 3 mitoses per 50 high-power fields and Ki-67 index of less than 2%. Computed tomography (CT) scan showed a large tumor with a maximum diameter of 100 mm. The tumor was in close contact with the posterior wall of the right main bronchus, left atrium, and right anterolateral wall of the thoracic aorta, but without showing invasion of these structures.

After diagnosis, she was referred to the oncology service and neoadjuvant chemotherapy with Imatinib was indicated for 9 months. After 6 months of treatment, a new CT scan of the thorax demonstrated regression of the lesion to 50 mm. After neoadjuvancy, she underwent robotic Ivor Lewis esophagectomy associated with jejunostomy. The abdominal and thoracic phases were performed by a robot. The patient's postoperative course was uncomplicated. Diet was introduced via jejunostomy from postoperative day (PD) 2, liquid oral diet in the PD 5, and pasty in the PD 6, the time of hospital discharge. On PD 14, the patient returned for follow-up without complications, on an exclusive oral diet without dysphagia. The patient remains in follow-up after 10 months of surgery with no



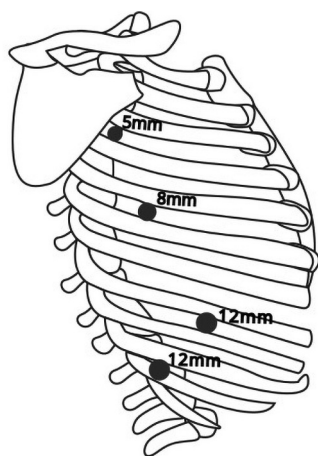
**Figure 1.** Fusocellular neoplasm with CD 34 and CD 117 markers positive respectively.

signs of recurrence or complications, and did not receive adjuvant therapy.

## DESCRIPTION OF THE OPERATIVE TECHNIQUE

The patient received general anesthesia combined with an epidural block. For the abdominal phase, the patient was placed in the supine position, with 12 mm umbilical trocar, 8 mm in right hypochondrium, 12 mm accessory trocar between umbilical scar, and the 8 mm robotic trocar in the left hypochondrium. The Nathanson liver retractor was positioned under direct viewing and robot docking by head position. Gastric dissection and release were performed with ligation of the short gastric blood vessels and the left gastric artery followed by pyloromyotomy and Stamm jejunostomy. We created the gastric tube with 45 mm cutting endoscopic linear stapler. The opening of the diaphragmatic hiatus and was followed by release of the distal esophagus. Gastric and esophageal mobilization were tested without difficulties. Finally, we completed closing of portals and undocking.

In the thoracic phase, we used the left lateral docking, trocars were positioned in the right pleural cavity, the patient was placed in the prone position, and monopulmonary ventilation was used. The trocars' positions (**Figure 2**) were as follows: 12 mm in the 8th right intercostal space (RIS) about 5 cm posterior to the right midclavicular line, 8 mm in the 5th RIS 2.5 cm above the optics, 12 mm in the 10th RIS, and 5 mm accessory portal in the 3<sup>rd</sup> RIS just after the right scapula. We isolated the thoracic esophagus and identified the thoracic duct, followed by total release of the thoracic esophagus from the diaphragmatic hiatus to about 3 cm above the azygos vein. We identified lesions with an upper limit near the



**Figure 2.** Chest trocars positions.

azygos vein and completed azygos vein ligation. We isolated the thoracic esophagus using cardiac tape. The gastric tube was elevated to the thoracic region, maintaining a reference point to avoid rotation on its axis. The stomach was sectioned with 45 mm sharp linear endoscopic stapler, anchoring the stomach in the proximal esophagus with seromuscular suture. The esophagus was sectioned with ultrasonic scalpel. Robot Undocking was completed. A 50 mm incision opening was placed at the 10th RIS, enlarging the previous trocar site. The specimen was removed with plastic protection and macroscopic evaluation was completed without evidence of margin involvement. Following closure of the incision, docking was completed with end-to-side anastomosis in 2 planes between the esophagus and the gastric tube, respectively. Test with methylene blue showed no overflow. Robot undocking was then used, closing the portals and inserting a chest drain on the right.

## DISCUSSION

Standard treatment of esophageal GSTs includes surgery and, in individual cases, the use of Imatinib as adjuvant or neoadjuvant chemotherapy. This approach enables lesion regression and consequently less aggressive resections. Due to the rarity of esophageal involvement, there is no clear recommendation on the best surgical procedure indicated. Some groups recommend that small tumors between 2 mm and 50 mm and without signs of involvement of adjacent structure to be removed through enucleation. On the other hand, tumors larger than 80-mm, esophagectomy should become the choice.<sup>3</sup>

In recent decades, minimally invasive surgery has grown rapidly with some studies showing benefits over open surgery.<sup>4</sup> More recently, robotic esophagectomy has also been performed mainly for malignant esophageal tumors.<sup>5</sup> Interestingly, in our literature review, we found only 2 cases of robotic esophagectomy for esophageal GST.<sup>6,7</sup> None of the cases were performed entirely by a robot or in prone position. The robotic platform facilitates mediastinal dissection and suture of the gastric tube. Large medical centers have been using it routinely with good results in cases of malignancy. Prone positioning allows not only gravity to exert anterior traction on the esophagus naturally, but also positions the mediastinum and lung anteriorly without the need for traction with additional forceps on them.<sup>8,9</sup>

## CONCLUSION

We presented an extremely rare case of esophageal GST and a surgical technique little described for this presentation. Robotic esophagectomy in prone position proved to be feasible and safe for this type of tumor. Due to the surgeons' previous experience, the position employed in this procedure facilitates mediastinal dissection and, especially, intrathoracic suture.

## References:

1. Hihara J, Mukaida H, Hirabayashi N. Gastrointestinal stromal tumor of the esophagus: current issues of diagnosis, surgery and drug therapy. *Transl Gastroenterol Hepatol*. 2018;3:6.
2. Eisenberg BL, Harris J, Blanke CD, et al. Phase II trial of neoadjuvant/adjuvant imatinib mesylate (IM) for advanced primary and metastatic/recurrent operable gastrointestinal stromal tumor (GIST): early results of RTOG 0132/ACRIN 6665. *J Surg Oncol*. 2009;99:42–47.
3. Shin S, Choi YS, Shim YM, Kim HK, Kim K, Kim J. Enucleation of esophageal submucosal tumors: a single institution's experience. *Ann Thorac Surg*. 2014;97(2):454–459.
4. Yerokun BA, Sun Z, Yang CJ, et al. Minimally invasive versus open esophagectomy for esophageal cancer: a population-based analysis. *Ann Thorac Surg*. 2016;102(2):416–423.
5. Jin D, Yao L, Yu J, et al. Robotic-assisted minimally invasive esophagectomy versus the conventional minimally invasive one: a meta-analysis and systematic review. *The international journal of medical robotics + computer assisted surgery*. *MRCAS*. 2019;15(3):e1988.

6. Wee JO, Bravo-Iniguez CE, Jaklitsch MT. Early experience of robot-assisted esophagectomy with circular end-to-end stapled anastomosis. *Ann Thorac Surg.* 2016;102(1):253–259.
7. Hodari A, Park KU, Lace B, Tsiouris A, Hammoud Z. Robot-Assisted Minimally Invasive Ivor Lewis Esophagectomy With Real-Time Perfusion Assessment. *Ann Thorac Surg.* 2015;100(3):947–952.
8. Puntambekar SP, Rayate N, Joshi S, Agarwal G. Robotic transthoracic esophagectomy in the prone position: experience with 32 patients with esophageal cancer. *J Thorac Cardiovasc Surg.* 2011;142(5):1283–1284.
9. Jarra OA, Purkayastha S, Athanasiou T, Darzi A, Hanna GB, Zacharakis E. Thoracoscopic esophagectomy in the prone position. *Surg Endosc.* 2012;26(8):2095–2103.