

Enucleation of a leiomyoma of the mid-esophagus through a right thoracoscopy with the patient in prone position

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Abstract

Background Leiomyoma is the most common benign esophageal neoplasm. Different open and minimally invasive approaches have been described. We describe a right thoracoscopic enucleation with the patient in the prone position.

Method A 49-year-old woman consulted us about solid-diet dysphagia without other symptoms. Preoperative work-up showed the presence of 50 × 28-mm leiomyoma of the middle esophagus, without satellite lymph nodes. The patient underwent general anesthesia with a double-lumen endotracheal tube, and subsequently was placed in the prone position. A 30° scope was introduced in the right 7th intercostal space on the posterior axillary line. Perioperative gastroscopy permitted localization of the lesion, which appeared to be situated at the level of the azygos

vein. Two 5-mm trocars were inserted in the right 5th and 9th intercostal spaces on one line with the first one. The azygos vein was ligated. The muscular layer of the mid-esophagus was opened by coagulating hook. Due to a 2-mm trocarless Cadière's forceps (Microfrance, France), introduced into the right 7th intercostal space, the operative field was well exposed and the lesion was enucleated without mucosal perforation. The muscular layer was closed by interrupted silk 2/0 stitches. A drain was left in the chest cavity.

Results Total operative time was 85 min and blood loss was less than 20 ml. The gastrograftin swallow on postoperative day 2 showed good clearance of the esophagus and absence of leak, hence the patient was allowed a liquid diet. The patient was discharged on postoperative day 3. Benign pathology was confirmed.

Conclusion Thoracoscopy in the prone position permits the surgeon to reach the esophagus under excellent working conditions, despite an only partially deflated lung. Gravity displaces blood loss eventually, which allows good visualization, and the surgeon can operate in an ergonomic position. This approach allows for fewer trocars which favorably influences the patient's comfort and reduces the length of hospital stay.

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Benign tumors of the esophagus are rare and include leiomyoma, gastrointestinal stromal tumors, schwannomas, lipomas, and granular cell tumors. More than 80% of cases are leiomyoma, representing about 10% of all gastrointestinal leiomyomas [1], and reported with an incidence at

autopsy between 0.005 and 5.1% [2, 3]. Leiomyomas occur mostly between the third and fifth decades of life [4], and patients seek medical help for dysphagia or chest pain [5, 6]. Transformation of the leiomyoma to malignancy is rare [7].

Treatment is undertaken only if tumors are symptomatic or more than 5 cm [8, 9], while regular endoscopic follow-up is mandatory for asymptomatic lesions [10]. Surgery consists of enucleation of smaller tumors and esophageal resection of larger lesions, annular tumors, or tumor densely adherent to mucosa [6, 11]. Traditionally, esophageal leiomyoma is approached by thoracotomy and laparotomy [12], but with the advent of the minimally invasive surgeries these techniques are preferred [1, 6, 13, 14]. Laparoscopy is used when the tumor is located in the lower third of the esophagus, and thoracoscopy when the lesion is in the middle or upper third of the organ. We report on a patient with an esophageal leiomyoma of the middle third that was swiftly and safely enucleated through a right thoracoscopy with the patient in the prone position.

Methods

Patient

A 49-year-old woman consulted us about dysphagia with solids without other symptoms or medical history. A barium swallow evidenced a filling defect of the middle third of the esophagus. Gastroscopy showed the presence of an endoluminal and submucosal lesion at 25 cm. Endoscopic ultrasound confirmed a 50 × 28-mm oval lesion with smooth margins and without satellite lymph nodes. Biopsy showed the lesion to be a leiomyoma. CT scan confirmed the presence of a mass without enlarged lymph nodes. Treatment by enucleation through right thoracoscopy in the prone position was proposed to the patient.

Operative procedure

Under general anesthesia a double-lumen endotracheal tube was inserted with the patient supine, and then the patient was placed in the prone position. A 30° scope was introduced into the right 7th intercostal space on the posterior axillary line. Two 5-mm trocars were inserted into the right 5th and 9th intercostal spaces on one line with the first one (Fig. 1). Perioperative gastroscopy permitted to the precise localization of the lesion which appeared to be situated more on the right side and at the level of the azygos vein. The azygos vein was isolated and ligated with 2/0 silk. A myotomy was performed over the tumor, taking care to preserve the main vagal trunks. The muscle was split longitudinally with the hook cautery and the plane

between the tumor, muscularis propria, and underlying submucosa was developed. Due to a 2-mm trocarless *Cadière's* forceps (*Microfrance*, France), introduced into the right 7th intercostal space, the operative field was better exposed (Fig. 2). The lesion was separated from the muscular layer, carefully protecting the mucosa from injuries, and finally placed in a plastic bag and removed from the cavity. The muscular layer was loosely approximated by interrupted silk 2/0 stitches. The dissected area was checked by endoscopy. A 28-Ch thoracic drain was left in the right chest, and no nasogastric tube was left in the postoperative course.

Results

Total operative time was 85 min and blood loss was estimated at less than 20 ml. The frozen section examination confirmed benign pathology. Pain medication was required only for the first postoperative day (paracetamol 4 g). The gastrografin swallow, realized on postoperative day 2, showed good clearance of the esophagus and absence of leak. The patient was started on a liquid diet and the chest tube was removed. The patient was discharged on postoperative day 3, having supported a soft diet. Final histopathology was positive for desmin and smooth muscle actin and negative for CD34 and CD117.

Discussion

Considering the first successful thoracoscopic enucleation of esophageal leiomyoma reported in 1992 [15], and the introduction of thoracoscopy in the prone position [16], we dared to propose this technique to our patient and hinted at the superiority of the minimally invasive surgery compared to open surgery for benign esophageal tumors [17]. Prone positioning is based on the principle that gravity will

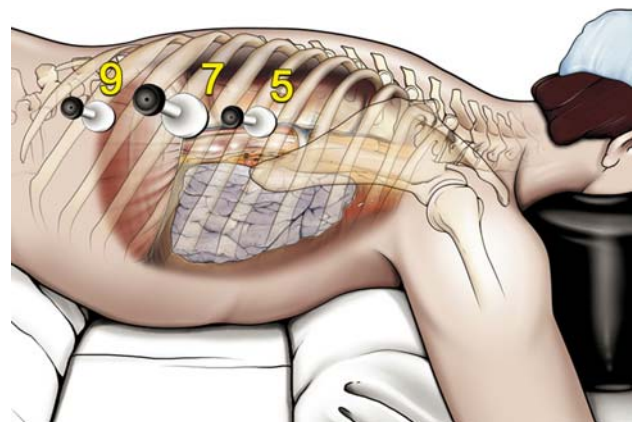


Fig. 1 Right thoracoscopy in prone position: placement of the trocars

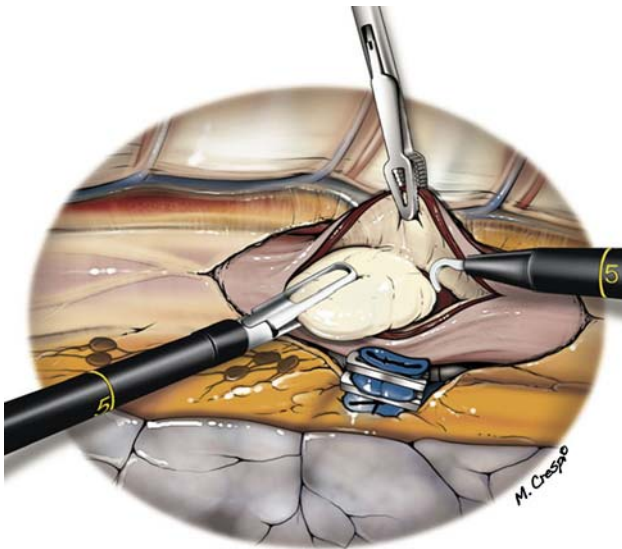


Fig. 2 Enucleation of the leiomyoma

enable the cardiopulmonary bloc to fall anteriorly, aiding in dissection of the esophagus off the spine, hence a fourth trocar to retract the lung [6, 18] is not necessary. As the surgeon is in front of the esophagus, the ergonomics of the procedure are satisfactory. Because of the induced pneumothorax, no single-lung ventilation is required because a partial ventral collapse of the lung is created, providing an adequate working area.

The functional residual capacity created by the patient being in the prone position is greater compared to that of the supine position because the prone position does not negatively affect respiratory mechanics and improves lung volumes and oxygenation [19]. Ventilation-perfusion matching is improved thanks to an increased homogeneity of the ventilation and consequent correlation of regional ventilation and perfusion [20]. This is different from the lateral position where the nondependent lung will collapse and the dependent lung will be compromised by pressure from the mediastinum and abdominal contents.

Use of perioperative gastroscopy helps to localize the exact position of the lesion, and if the patient is placed in prone position, the endoscope can be kept in the esophagus, permitting at the beginning of surgery the localization of the lesion during thoracoscopy and the direct inspection of the esophageal mucosal integrity at the end of the procedure. In our case the lesion appeared to be localized at the level of the azygos vein which necessitated its ligation both for working space and bleeding concerns.

Controversy exists regarding reapproximating the muscle fibers after enucleation. We did suture the esophageal muscle layers in order to prevent the development of pseudodiverticulum [21], and because we believe that the propulsive activity of the esophageal body is decreased

when this maneuver is not performed [22]. However, some authors have not reported complications after extramucosal defects have been left open [23, 24].

Another interesting technique appears to be endoluminal intracavitary enucleation assisted by thoracoscopy in which a balloon-mounted intraluminal endoscope is used. The balloon is used for the expulsion of the tumor from the esophageal wall, permitting a facilitated thoracoscopic enucleation [25, 26].

The time needed to place the patient in the prone position for thoracoscopy is not different than the time needed to place the patient in the lateral position, nor is the total operative time for the thoracoscopic enucleation. We recorded an operative time similar to the median time of 70 min reported when the lateral position is used [27].

The postoperative course is also not dependent on the patient's position during thoracoscopy because after minimally invasive surgery a liquid diet is usually permitted from postoperative day 2, as confirmed by our case [27]. Moreover, thanks to thoracoscopy, surgical trauma is reduced and postoperative pain is minimal. Bonavina et al. [1] reported that patients who underwent thoracoscopy in the lateral position did not require pain medication after postoperative day 1, as was in our case.

Hospital stay after minimally invasive surgery appears reduced compared with that of open surgery because the patients can have a liquid diet sooner [27]. Kent et al. [6] achieved a median length of stay of 5.5 days in their open group compared with 2.75 days in the minimally invasive group, and Bonavina et al. [1] found a significant difference ($p < 0.05$) in the mean hospital stay between thoracoscopy and thoracotomy, 6.8 ± 0.6 days versus 10.2 ± 3.1 days, respectively.

Finally, because the scars are small, patients are generally pleased with the cosmetic outcomes of the surgical treatment [28, 29].

In conclusion, thoracoscopy in the prone position allows the surgeon to reach the esophagus under excellent working conditions, despite an only partially deflated lung. Gravity displaces blood loss eventually, which allows good visualization, and the surgeon can operate in an ergonomic position. This approach requires fewer trocars which favorably influences the patient's comfort and reduces hospital stay.

References

1. Bonavina L, Segalin A, Rosati R, Pavanello M, Peracchia A (1995) Surgical therapy of esophageal leiomyoma. *J Am Coll Surg* 181:257–262
2. Postlethwait R, Musser A (1974) Changes in the esophagus in 1000 autopsy specimens. *J Thorac Cardiovasc Surg* 68:953–956

3. Kramer M, Gibbs S, Ellis F (1986) Giant leiomyoma of the esophagus. *J Surg Oncol* 33:166–169
4. Lee LS, Singhal S, Brinster CJ, Marshall B, Kochman ML, Kaiser LR, Kucharczuk JC (2004) Current management of esophageal leiomyoma. *J Am Coll Surg* 198:136–147
5. Palanivelu C, Rangarajan M, Senthilkumar R, Annapoorni S, Jategaonkar PA (2007) Thoracoscopic management of benign tumors of the mid-esophagus: a retrospective study. *Int J Surg* 5:328–331
6. Kent M, d'Amato T, Nordman C, Schuchert M, Landreneau R, Alvelo-Rivera M, Luketich JD (2007) Minimally invasive resection of benign esophageal tumors. *J Thorac Cardiovasc Surg* 134:176–181
7. Pompeo E, Francioni F, Pappalardo G, Trentino P, Crucitti G, Ricci C (1997) Giant leiomyoma of the esophagus and cardiadiagnostic and therapeutic considerations: case report and literature review. *Scand Cardiovasc J* 31:361–364
8. Nemir P, Wallace HW, Fallahaajad M (1976) Diagnosis and surgical management of benign disease of the esophagus. *Curr Probl Surg* 13:1–74
9. Elli E, Espot NJ, Berger R, Jacobsen G, Knoblock L, Horgan S (2004) Robotic-assisted thoracoscopic resection of esophageal leiomyoma. *Surg Endosc* 18:713–716
10. Punpale A, Rangole A, Bhamblani N, Karimundackal G, Desai N, de Souza A, Pramesh CS, Jambhekar N, Mistry RC (2007) Leiomyoma of the esophagus. *Ann Thorac Cardiovasc Surg* 13:78–81
11. Metin E, Bilgi B, Gulen D, Sabri E, Nihat Y (2004) Thoracoscopic enucleation of a giant submucosal tumor of the esophagus. *Surg Laparosc Endosc Percutan Tech* 14:87–90
12. Mutrie CJ, Donahue DM, Wain JC, Wright CD, Gaissert HA, Grillo HC, Mathisen DJ, Allan JS (2005) Esophageal leiomyoma: a 40-year experience. *Ann Thorac Surg* 79:1122–1125
13. Bardini R, Asolati M (1997) Thoracoscopic resection of benign tumors of the esophagus. *Int Surg* 82:5–6
14. Palanivelu C, Rangarajan M, Madankumar MV, John SJ, Senthilkumar R (2008) Minimally invasive therapy for benign tumors of the distal third of the esophagus—a single institute's experience. *J Laparoendosc Adv Surg Tech A* 18:20–26
15. Everitt NJ, Glinatsis M, McMahon MJ (1992) Thoracoscopic enucleation of leiomyoma of the esophagus. *Br J Surg* 79:643
16. Cuschieri A, Shimi S, Banting S (1992) Endoscopic oesophagectomy through a thoracoscopic approach. *J R Coll Surg Edinb* 37:7–11
17. von Rahden BHA, Stein HJ, Feussner H, Siewert JR (2004) Enucleation of submucosal tumors of the esophagus: minimally invasive versus open approach. *Surg Endosc* 18:924–930
18. Vallbohmer D, Holscher AH, Brabender J, Bollschweiler E, Gutschow C (2007) Thoracoscopic enucleation of esophageal leiomyomas: a feasible and safe procedure. *Endoscopy* 39:1097–1099
19. Pelosi P, Croci M, Calappi E, Cerisara M, Mulazzi D, Vicardi P, Gattinoni L (1995) The prone positioning during general anesthesia minimally affects respiratory mechanics while improving functional residual capacity and increasing oxygen tension. *Anesth Analg* 80:955–960
20. Mure M, Domino KB, Lindahl SG, Hlastala MP, Altemeier WA, Glenny RW (2000) Regional ventilation-perfusion distribution is more uniform in the prone position. *J Appl Physiol* 88:1076–1083
21. Zaninotto G, Portale G, Costantini M, Rizzetto C, Salvador R, Rampado S, Pennelli G, Ancona E (2006) Minimally invasive enucleation of esophageal leiomyoma. *Surg Endosc* 20:1904–1908
22. Nguyen NT, Alcocer JJ, Luketich JD (2000) Thoracoscopic enucleation of an esophageal leiomyoma. *J Clin Gastroenterol* 31:89–90
23. Van-Eijkelenburg P, Bove T, Peters O, Delvaux G, Willems G (1996) Thoracoscopic removal of a leiomyoma of the oesophagus: a case report. *Acta Chir Belg* 96:223–225
24. Hennessy TPJ, Cuschieri A (1992) Tumors of the esophagus. In: Hennessy TPJ, Cuschieri A (eds) *Surgery of the esophagus*. Butterworth-Heinemann, London, pp 275–327
25. Izumi Y, Inoue H, Endo M (1996) Combined endoluminal-intracavitary thoracoscopic enucleation of leiomyoma of the esophagus. A new method. *Surg Endosc* 10:457–458
26. Mafune K, Tanaka Y (1997) Thoracoscopic enucleation of an esophageal leiomyoma with balloon dilator assistance. *Surg Today* 27:189–192
27. Jiang G, Zhao H, Yang F, Li J, Li Y, Liu Y, Liu J, Wang J (2009) Thoracoscopic enucleation of esophageal leiomyoma: a retrospective study on 40 cases. *Dis Esophagus* 22:279–283
28. Roviato GC, Maciocco M, Varoli F, Rebuffat C, Vergani C, Scardueli A (1998) Videothoracoscopic treatment of esophageal leiomyoma. *Thorax* 53:190–192
29. Bardini R, Segalin A, Ruol A, Ravanello M, Pernacchia A (1992) Videothoracoscopic enucleation of esophageal leiomyoma. *Ann Thorac Surg* 54:576–577