

Leiomyoma of the esophagus: open versus thoracoscopic enucleation

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Background/aim: To describe a novel, easy, and secure thoracoscopic surgical approach for esophageal leiomyomas.

Materials and methods: We retrospectively analyzed 18 cases in which patients were treated at a single center between 1991 and 2011 for esophageal leiomyoma. We compared our results of patients who were treated by open surgery with those who were treated by the thoracoscopic approach, and we also compared our results with the results of resection of the leiomyoma of the esophagus in the literature.

Results: Eighteen patients were studied. Eight patients were treated with 3-port thoracoscopic surgery, 8 with open thoracotomy, 1 with surgical incision, and 1 with esophagectomy. The mean operating time was 167.5 min and 92.5 min in the thoracotomy and thoracoscopy groups, respectively (P = 0.0012). The average hospital stay was 9 days and 6 days for the thoracotomy and thoracoscopy groups, respectively (P = 0.016). Rupture of esophageal mucosa occurred preoperatively once in both groups and was repaired immediately, and postoperative esophageal leak was not seen in any patient.

Conclusion: Thoracoscopic enucleation of esophageal leiomyomas is a safe and feasible procedure with decreased hospital stay and operating time. The 3-port technique that we used is a safe and effective procedure, as well.

Key words: Esophagus, leiomyoma, minimally invasive surgery, thoracoscopy

1. Introduction

Esophageal leiomyoma is the most common benign esophageal tumor; it accounts for 70% to 80% of benign esophageal tumors (1,2). However, despite being the most common benign esophageal neoplasm, it is relatively rare when compared to esophageal carcinoma, which occurs 50 times more frequently than the former condition (3).

Morgagni first described leiomyoma in 1761, and Munro was the first to report esophageal leiomyoma in 1797 (3). However, the histological characteristics of leiomyoma were not described until 1863 by Virchow (4).

Surgical excision of the tumor is currently the only definitive treatment available for esophageal leiomyoma. It was first proposed by Sauerbruch in 1932 and involved an esophageal resection, but Ohsawa reported the enucleation of leiomyoma via thoracotomy 1 year later in 1933 (5). Until 1992, the enucleation of esophageal leiomyoma was traditionally performed via thoracotomy (6), but Everitt reported a thoracoscopic approach in 1992 (7), which has been used widely for leiomyoma treatment because it is considered safe and effective.

Even with the rise of thoracoscopic approaches, the port sites and the number of trocars used are still controversial issues. The thoracoscopic approach has been accomplished with 7 trocars (7), 6 trocars (8), 5 trocars (9), 4 trocars (10), and 3 trocars (11). Moreover, a thoracoscopy in the prone position (12) has also been reported. Despite the differences, all of these procedures have been defined as safe and feasible.

Herein, we report a summary of our 20 years of experience treating esophageal leiomyoma. The first 10 patients before 2004 were treated using an open technique. Subsequently, we treated 8 patients via thoracoscopy with 3 trocars. We explain the details of our procedures, and we retrospectively analyze both of our groups and compare our technique with the literature.

2. Materials and methods

The charts of the patients with leiomyoma treated via thoracic approach from 1991 to 2011 were evaluated retrospectively. Demographic features, symptoms, diagnosis methods, surgical approaches, operating times,

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tumor sizes, hospital stay, and complications were all noted.

The frequency and descriptive analyses of the cases were recorded. The qualitative data were analyzed using Fisher's exact test, and the quantitative data were analyzed using the Mann-Whitney U test.

2.1. Surgical technique for thoracotomy

The patients were intubated with a double-lumen endotracheal tube to allow single-lung ventilation. A standard right thoracotomy and enucleation was used for all lesions. We ligated the azygos vein in all of the mid-1/3 lesions. The longitudinal esophageal muscles were approximated with 3/0 polyglycolic acid sutures. Esophageal leakage was controlled with our "puff up" method. We insert a nasogastric tube at the beginning of the operation, we move it to the proximal side of the lesion after enucleation, and we obstruct the distal side of the lesion. We fill up the esophageal cavity with saline, and the surgeon or another health worker blows air through the nasogastric tube. We then follow the bubbles to indicate any leaks.

2.2. Surgical technique for thoracoscopy

The patients were intubated with a double-lumen endotracheal tube to allow single-lung ventilation. All operations were made in the right lateral decubitus position, and the patients were rotated 20° to the front. The first trocar (i.e. for the camera) was inserted at the ninth intercostal space on the anterior axillary line. The incision for the other 2 port locations was made with injector assistance. We use injector assistance because we

intend to reach the lesion by finger during the operation. We usually use the 5th and 7th intercostal space on the posterior axillary line. The placement of the surgeon, assistant, nurse, and patient are depicted in the Figure. After port placement, the right lung was retracted to expose the esophagus. The mediastinal pleura on the lesion were incised, and the longitudinal and transverse muscles of the esophagus were dissected by hook via electrocautery. After that, the surgeon palpated the lesion with his/her finger and/or a conventional mounted swab. Blunt dissection was then accomplished with this mounted swab, and a second mounted swab, or the surgeon's finger for accessible lesions, was used to rotate the esophagus and provide good exposure. A transection of the leiomyoma tumor was then inserted into a bag and extracted through a port site or through the utility thoracotomy, depending on its size. The esophageal muscles were then sutured with 3/0 polyglycolic acid sutures using interrupted sutures. Conventional instruments were used for these sutures. Esophageal leakage was controlled with our "puff up" method.

One case was treated via esophagectomy in 1998. In this case, the patient had a giant leiomyoma (20 cm in diameter), which was treated as esophageal cancer. This case was reported in a national journal (13).

3. Results

We retrospectively analyzed 18 cases in which patients were treated at a single center between 1991 and 2011. Of the 18 cases, 10 patients were treated by thoracotomy, 1 by

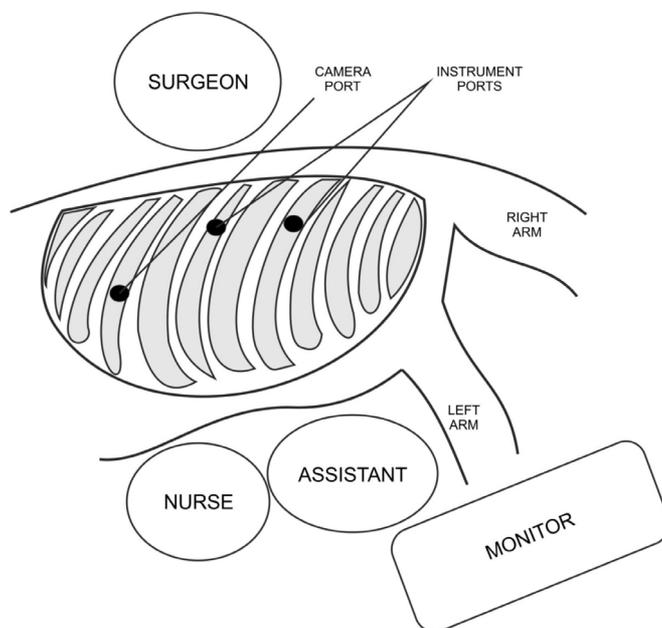


Figure. Port localizations.

esophagectomy, and 1 by cervical incision; the remaining 8 were treated using thoracoscopy.

Eighteen patients, 10 males and 8 females with a median age of 48.38 ± 9.03 years (age range: 31 to 64 years), were studied. All patients were symptomatic at diagnosis. The most common symptom was dysphagia, which was seen in 12 patients (66.7%), and 6 patients (33.3%) reported symptoms of heartburn. Hiatal hernia was present in only 2 patients (11.1%). The official diagnosis was made using esophagography in 3 patients (16.7%), computerized thorax tomography in 3 patients (16.7%), and endoscopy in 12 patients (66.7%). The leiomyomas were located in the upper 1/3 of the esophagus in 1 patient (5.6%), middle 1/3 of the esophagus in 4 patients (22.2%), and lower 1/3 of the esophagus in 13 patients (72.2%).

Eight patients (44.4%) were treated with thoracotomy and enucleation, and 8 patients (44.4%) were treated via thoracoscopic enucleation. Furthermore, 1 patient (5.6%) was treated with a cervical incision and 1 patient (5.6%) was treated via esophagectomy.

The mean operating time was 167.5 ± 20.43 min (range: 145–200 min) and 92.5 ± 37.70 min (range: 60–180 min) in the thoracotomy and thoracoscopy groups, respectively ($P = 0.0012$ in the Mann–Whitney U test). The mean tumor size was 3.81 ± 2.05 cm (range: 1.6 to 3.8 cm) and 4.13 ± 1.68 cm (range: 2.8 to 7.2 cm) in the thoracotomy and thoracoscopy groups, respectively ($P = 0.343$ in the Mann–Whitney U test).

Three patients (16.6%) developed intraoperative complications. These complications included esophageal mucosa rupture for 1 in the thoracotomy group and 1 in thoracoscopy group and hemorrhage in the azygos vein for 1 in the thoracoscopy group. All these patients were discharged uneventfully without any other postoperative complications.

Three patients developed postoperative complications, i.e. pleural effusion and atelectasis, and all these patients

were in thoracotomy group. No esophageal leakage was seen.

Average hospital stay was 9 ± 1.85 days (range: 6–12 days) for the patients undergoing thoracotomy and 6.37 ± 2.38 days (range: 5–12 days) for the patients undergoing thoracoscopic enucleation ($P = 0.016$ in the Mann–Whitney U test).

Table 1 shows a comparison of groups for age, tumor location, tumor size, operation times, peroperative complications, and hospital stays.

Table 2 shows a comparison of Obuchi et al.'s (14) group to our group. Obuchi et al. presented 7 cases, treated with minimally invasive procedures (either with laparoscopy or thoracoscopy). No statistical significant differences were observed in tumor age, tumor size, tumor location, and hospital stay. Operation time in our group was shorter because Obuchi et al. added antireflux surgery for the patients treated via laparoscopy.

4. Discussion

Esophageal leiomyoma is an uncommon benign tumor of smooth muscle origin. Malignant degeneration is rare, but removal is often required to address symptoms associated with this condition.

The characteristics of the lesion can clearly be seen with esophagoscopy and conventional imaging techniques (i.e. barium swallow, CT scan, and endoscopic ultrasound) (15). Thoracoscopic resection offers distinct advantages for the treatment of such lesions, but may not be applicable to 10% of patients (1). It is less invasive than open surgery and avoids the scarring and discomfort of thoracotomy; moreover, problems such as atelectasis are less likely. Furthermore, considerably fewer analgesic agents should be required after surgery.

Since 1992, thoracoscopy has been used as a feasible and safe procedure for esophageal leiomyoma. Thawatchia et al. (16) reported a 3-thoracic port technique, which was

Table 1. Comparison of groups.

	Thoracoscopic approach	Thoracotomy	P
N	8 (44.4%)	10 (65.6%)	
Median age	47.6 ± 2.7	49.0 ± 3.2	0.2
Location			
Upper 1/3	0	1 (10%)	
Middle 1/3	1 (12.5%)	3 (30%)	0.39
Lower 1/3	7 (87.5%)	6 (60%)	
Mean tumor size	4.13 ± 1.68	3.81 ± 2.05	0.343
Mean operating time (min)	92.5 ± 37.7	167.5 ± 20.4	0.001
Perop. complications (n)	2	1	0.529
Hospital stay	6.37 ± 2.38	9 ± 1.85	0.016

Table 2. Comparison of Obuchi et al.'s group (14) and our group.

	Group	n	Mean ± std. deviation	P
Age	Ziyade et al.	8	47.6 ± 2.7	0.09
	Obuchi et al.	7	46 ± 6.0	
Sex	Ziyade et al.	8	4 Female 4 Male	0.59
	Obuchi et al.	7	4 Female 3 Male	
Location	Ziyade et al.	8	1/3 Upper, 0 pts 1/3 Mid, 1 pts 1/3 Lower, 7 pts	0.25
	Obuchi et al.	7	1/3 Upper, 2 pts 1/3 Mid, 1 pts 1/3 Lower, 4 pts	
Tm size	Ziyade et al.	8	4.13 ± 1.68	0.36
	Obuchi et al.	7	3.9 ± 1.2	
Operation time (min)	Ziyade et al.	8	92.5 ± 37.7	Not applicable
	Obuchi et al.	7	190	
Hospital stay (days)	Ziyade et al.	8	6.37 ± 2.38	0.36
	Obuchi et al.	7	8.5 ± 3.7	

deemed a safe procedure. We have used a 3-port technique since 2004, and our complications and operative times are similar to that reported in the literature for 4 or more trocars. We do not use special surgical instruments, and conversion to open surgery and increased hospital stay are not significantly different from that of thoracotomy in other reports in the literature ($P = 0.068$).

Several different techniques have been described to assist extramucosal enucleation using intraluminal tools. For example, esophageal bougies have been used (17), and a balloon dilator has been employed (18) and was found to be useful for facilitating the separation of the tumor by promoting progressive expulsion of the lesion from the esophageal wall. Izumi et al. (8,19) described the use of a balloon-mounted esophagoscope for a new technique called the balloon push-out method; instead of pulling the tumor, which was found to be "hard to grasp because of its delicate nature", it was pushed out of the esophageal wall (19). In the cases described, we did not use any intraoperative manipulations in the esophageal lumen.

We determined the trocar locations using the assistance of an injector. Moreover, we can use thoracoscopic finger palpation (i.e. we remove the trocar and reach into the thorax cavity with a finger), which gives the surgeon an extra measure of comfort. As established by previous experience, the worst aspect of laparoscopic and thoracoscopic surgery is the deficiency of sensation.

We can partially return some sense of feeling with finger palpation. Deciding on the assistance of an injector allows us to use conventional instruments without trocars.

We use an unusual method to control esophageal leakage. More specifically, we insert a nasogastric tube at the beginning of the operation, we move it to the proximal side of the lesion after enucleation, and we obstruct the distal side of the lesion. We fill up the esophageal cavity with saline, and the surgeon or another health worker blows air through the nasogastric tube. We then follow the bubbles to indicate any leaks. Some authors advocate intraoperative endoscopy to localize the lesion and control the leakage (10,20). However, we have never needed intraoperative endoscopy, and we hesitate to manipulate the scope through the mucosa after the enucleation. Blue dye is used by some authors (21), but we think our method is easier.

In tumors larger than 8 cm, enucleation would result in large muscular defects. Another issue is suspicion of malignancy. The tumor was 20 cm in size in our esophagectomy patient, and a malignancy had been suspected.

The first reports on the thoracoscopic approach were published in 1992 by Everitt et al. (6) and Bardini et al. (22), who presented 1 and 3 cases, respectively. The first published literature comparing open and minimally invasive surgery was presented by Von Rahden (9). Our series is the first larger series to compare both minimally

invasive approaches with open surgery from Turkey. It is clear that enucleation of submucosal esophageal tumors can be performed easily and safely by open and minimally invasive surgery (21). In our series, the operating time (mean: 92.5 min) was similar whether minimally invasive or open approaches were used. The results are comparable with series in the literature reporting operating times of 120 min (23). It was shown that the major advantage of the minimally invasive approach appears to be the avoidance of thoracotomy, which may be associated with considerable pleural and pulmonary complications such as atelectasis, pneumonia, and pleural effusion. The postoperative

hospital stay was also significantly shorter after minimally invasive surgery compared with open surgery in both the previously published literature and in this study. Furthermore, long-term discomfort and pain associated with the surgical access site were markedly reduced with the minimally invasive approaches (9).

In conclusion, thoracoscopic enucleation of esophageal leiomyomas is a safe and feasible procedure. The 3-port technique that we use is a safe procedure, as well. Trocar placement assisted by an injector is an easy and applicable technique and provides extra operative manipulation advantages and finger palpation assistance.

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