

Video-thoracoscopic approach, without suture, of late thoracic esophageal perforations

Abordagem vídeo-toracoscópica, sem sutura, das perfurações do esôfago torácico diagnosticadas tardiamente

OMAR MOTÉ ABOU-MOURAD, ACBC-RJ¹; FILIPE MOREIRA DE ANDRADE^{2,3,5}; LUIZ FELIPE JÚDICE, ECBC-RJ¹; ÂNGELO JÚDICE¹; ANTONIO BENTO COSTA BORGES CARVALHO FILHO¹; MARIA RIBEIRO SANTOS MORARD, TCBC-RJ⁴; ROSSANO KEPLER ALVIM FIORELLI, TCBC-RJ^{2,4}.

ABSTRACT

Objectives: to evaluate the use of video-thoracoscopy, in the treatment of late perforations of the thoracic esophagus, without suture or organ resection. **Methods:** retrospective analysis of patients with late diagnosis (> 12 hours) of thoracic esophageal perforation treated by video-thoracoscopy, without suture or organ resection, over a 15-year period. **Results:** sixteen patients were operated on, ten men and six women, aged between 48 and 66 years, with time between the diagnosis of the perforation and the surgery ranging from 16 to 26 hours. All patients underwent video-thoracoscopy, with pulmonary decortication, pleural loculations approach, opening of the mediastinal pleura near the perforation site and debridement of the devitalized tissues, followed by double drainage of the pleural cavity. No esophageal suture or resection was performed, and the patients evolved with complete closure of the lesions, without deaths. **Conclusion:** the video-thoracoscopic surgical approach was able to control pleural infection, pulmonary expansion and enable complete regeneration of the esophagus with late-diagnosed perforation.

Keywords: Empyema, Pleural. Thoracic Surgery, Video-Assisted. Esophageal Perforation. Mediastinitis. Thoracoscopy.

INTRODUCTION

Technological development, coupled with reduced costs and increased professional training, allowed access to diagnostic and surgical procedures of the upper digestive tract now widely available in hospitals, clinics and health care facilities. In particular, high digestive endoscopy (HDE) has been used in situations with varying degrees of complexity for diagnosis and treatment, and therefore, perforations of the esophagus have been diagnosed in greater numbers, although their treatment is still a challenge for surgeons^{1,2}.

The esophagus is an organ with a peculiar anatomical structure, as it does not have a serous coating and is related to several noble structures. This makes its access difficult, and the various surgical techniques used in the treatment of its lesions, grounds for discussion and controversy. In addition, it is not infrequent for esophageal perforations to

have late diagnosis due to the absence of specific signs and symptoms, which warrants a high degree of suspicion by the attending physician, since the delay in the identification of such lesions may lead to severe local and systemic inflammatory and infectious complications, with high morbidity and mortality².

It is not uncommon that perforations of the thoracic esophagus, whether by trauma or medical instrumentation, are only noticed when the patient already shows signs of pleural empyema or sepsis³. At this time, both the perforated esophagus and the surrounding tissues are swollen and friable, rendering the surgical manipulation of the organ difficult and dangerous⁴. In such cases, the surgeon's insistence on correcting the perforation through sutures, partial or total esophagectomy, and derivations of alimentary transit invariably causes an increase in surgical time, an intense systemic inflammatory response and a high risk of complications, death or severe sequelae being common^{3,5}.

1 - Federal Fluminense University, Department of Surgery, Division of Thoracic Surgery, Niterói, RJ, Brazil. 2 - Severino Sombra University, Department of Surgery, Vassouras, RJ, Brazil. 3 - Federal University of Viçosa, Department of Medicine, Viçosa, MG, Brazil. 4 - Federal University of the State of Rio de Janeiro, Department of Surgery, Rio de Janeiro, RJ, Brazil. 5 - Governor Ozanam Coelho Faculty, Department of Medicine, Ubá, MG, Brazil.

In view of this scenario of uncertainties, the objective of this study was to evaluate the impact of thoracoscopy in the treatment of late thoracic esophagus lesions, without suture or organ resection, a diagnostic technique and surgical approach adopted by us for more than 15 years.

METHODS

This is a retrospective analysis of patients with late diagnosis of thoracic esophageal perforation treated by thoracoscopy, without suture or organ resection, from a database prospectively collected from January 2000 to January 2015, which was approved by the Ethics in Research Committee.

The same surgical team operated the patients, always using the same approach. All had uni or bilateral pleural effusion and at least two systemic signs of inflammatory response: tachycardia and tachypnea. We excluded patients with perforation of the cervical esophagus, as well as those in whom the diagnosis was made immediately, allowing primary suture. We excluded two patients with punctiform perforation of the thoracic esophagus, diagnosed by digestive endoscopy, in whom computed tomography (CT) with oral and venous contrast did not identify collections in the mediastinum or pleural cavity, and were treated with enteral diet via nasogastric catheter and venous antibiotic therapy. We indicated surgery in patients presenting mediastinal collection or evident extravasation of contrast identified at CT (Figure 1).

In this way, we obtained a homogeneous sample, with patients who had a preoperative, late diagnosis of thoracic esophageal perforation. We

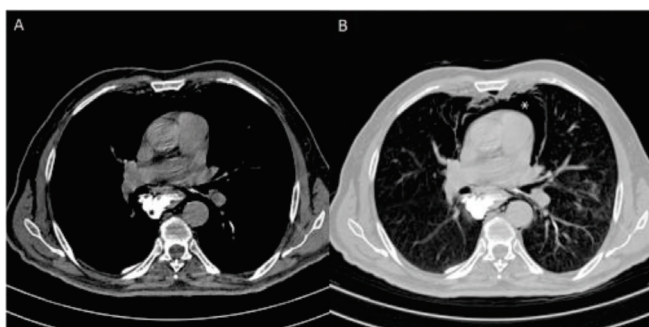


Figure 1. A) Contrast extravasation; B) Pneumomediastinum.

classified as late diagnosis the one made more than 12 hours after the event that caused the perforation.

Surgery consisted of thoracoscopy, with pulmonary decortication, approach to pleural loculations, opening of the mediastinal pleura near the perforation site and debridement of the devitalized tissues, followed by a double drainage of the pleural cavity, one drain anterior to the lung, and the other, posterior. We always placed the posterior drain near the perforated area. We performed esophageal suture in no patient, nor did we use esophageal shunt (esophagostomy) proximal or distal to the lesion. In addition, we did not performed partial or total esophagectomy in any of the cases.

All patients were admitted to an intensive care unit in the immediate postoperative period. Antibiotic therapy directed to Gram negative and anaerobic germs was initiated empirically and, when necessary, the scheme was altered based on cultures of blood or secretions of lung, pleura and mediastinus. All patients were submitted to daily postoperative radiological control in the first three days.

RESULTS

In the study period, we operated on 16 patients, ten of them were male and six were female. Patients were aged between 48 and 66 years (median: 58.5; mean: 57.3). The time elapsed between the esophageal perforation and thoracoscopy ranged from 16 to 26 hours. Figure 2 shows the etiology of the lesions.

Pleuritic chest pain was present in 11 of the 16 patients (68.7%) and fever in 9 (56.25%). All had the diagnosis of perforation confirmed by imaging methods or under direct vision, as shown in table 1.

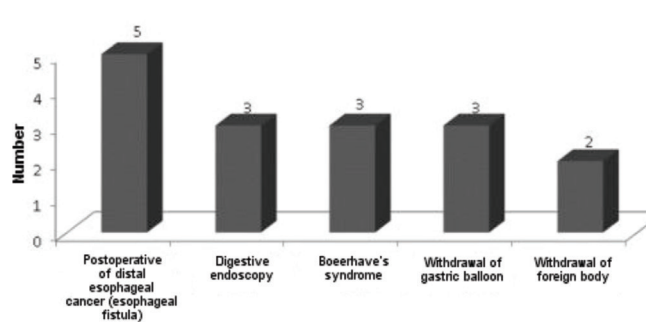


Figure 2. Etiology of esophageal perforations.

Table 1. Method used for the diagnosis of esophageal perforation and oral contrast used.

Method *	n (%)
Chest CT /contrast: Iodine	8
Chest CT /contrast: iodine and upper gastrointestinal endoscopy	6
Chest CT /contrast: Iodine and barium	1
Upper gastrointestinal endoscopy	1

* All CT scans were performed with intravenous contrast.

Among the 15 patients submitted to iodinated contrast-enhanced CT, in only one case no extravasation of contrast was detected for the mediastinum. In this single case, we then used the barite contrast, with adequate identification of extravasation.

All patients underwent thoracoscopy under general anesthesia. We used selective orotracheal intubation in 12 of the 16 patients (75%), and intubation with a common orotracheal tube, in four cases. We used three ports with 10 mm trocars and conventional video-surgery material. We submitted no patient to intercostal retraction.

Eight patients (50%) required a contralateral pleural approach, three (37.5%) of them being thoracoscopy due to multiloculated pleural effusion. In the other five, we installed a water-filled pleural drain, with complete resolution of the pleural effusion.

The site of the fistula guided us as to the hemithorax to approach surgically, and the technique was the same for higher or lower lesions in the thorax. The only lesion location of capable of generating access doubts is the cervico-thoracic transition, particularly those 3 cm above the clavicle level. These lesions are amenable to cervical approach and the drains can be inserted through the neck to reach the mediastinum.

In all operated patients, we used oral cavity aspiration in the first 72 hours, to reduce saliva contamination. In patients who were awake and oriented in the immediate postoperative period, instead of aspiration we orientated not to swallow the saliva.

Table 2 shows the time for healing of the esophageal lesion, which we characterized as the interval between surgery and the removal of the last pleural drain, and beginning of the oral diet.

All patients presented complete healing of the esophagus with the sutureless approach. In patients who underwent jejunostomy, we started the diet, on average, about 12 hours after surgery. We reintroduced oral feeding only after ingestion of the methylene blue dye (2 ml diluted in 100 ml of water) to rule out the possibility of pleural drainage-guided fistula. We performed this test with the patient with adequate level of consciousness and no clinical evidence of esophageal secretion through the drain. Even so, prior to the removal of the posterior thoracic drain, positioned near the lesion, we performed a chest CT with esophagography, using an iodinated contrast associated with a thickener. The length of hospital stay ranged from 16 to 68 days, with a mean of 46.31 and median of 49. There were no deaths in this series.

DISCUSSION

The patient with late diagnosis of thoracic esophagus perforation may present, in addition

Table 2. Time between surgery and the definitive closure of the esophageal fistula.

Patient	Days
1	50
2	43
3	60
4	45
5	49
6	46
7	51
8	35
9	42
10	57
11	25
12	28
13	14
14	27
15	55
16	8

to the systemic infectious condition, ventilatory complications due to pulmonary incarceration resulting from infectious pleural effusion^{6,7}. The treatment method proposed here has the objective of effective rehabilitation of the pleural cavity, with the elimination of pleural loculations, which allows adequate lung re-expansion, associated with anterior and posterior pleural drainage^{7,8}, the posterior one located near the site of the esophageal lesion. We also propose the exclusion of the oral route, which allows the regeneration of the esophagus without the need for suture or organ resection, hampered by the intense local inflammatory process. The longer surgical time required for more complex operations, such as esophagorrhaphy or esophageal resection, would greatly increase treatment-related morbidity.

Although not used in all our patients, we currently recommend feeding jejunostomy, which is a simple, fast, low-morbidity procedure that allows early initiation of enteral feeding. Parenteral diet is reserved for patients with paralytic ileus that makes the enteral diet of early onset unfeasible. We have used decompressive gastrostomy at the beginning of the experience with this type of patient with the objective of reducing a possible gastroesophageal reflux, with irritation of the injured area, but we no longer use it, without any negative effect on treatment.

The literature reports several treatment options for late-diagnosis esophageal lesions^{1-5,9}. The suture with pediculated flap protection over the perforated area is time-consuming and most teams indicate thoracotomy, given the difficulty in carrying out the dissection and suturing with a video-surgery approach. Nevertheless, we consider that the index of postoperative fistulas is high with this type of approach. By our evaluation, when the diagnosis of the esophageal lesion is late, the suture of the organ invariably opens, leading the patient to the situation in which he/she was before the surgery, which is the open esophagus requiring a drainage approach. Thus, we advocate that primary suture in the setting of esophageal perforation with delayed diagnosis is contraindicated, with little controversy on this issue in the literature^{1,9,10}.

One option considered minimally invasive is the use of esophageal orthoses of different models⁹. The main drawbacks of this approach are the high cost, the possibility of displacement of the orthosis and the eventual impossibility of complete occlusion of esophageal secretions between the orthosis and the wall of the organ, leading to contamination of the mediastinum^{9,11}. Regardless of the displacement and/or progressive mediastinal contamination by the secretion, if there is collection in the mediastinum, pleural effusion, systemic signs of infection, pleural and mediastinal drainage should be performed. This drainage can be performed through thoracoscopy, using the technique presented in this work. The presence of the orthosis in cases of late diagnosis only makes the treatment more expensive and with greater morbidity, since the patient will have to be submitted to the insertion of the orthosis and its future removal, not excluding the need for a pleuro-mediastinal approach by thoracoscopy. These orthoses should be reserved for specific cases, such as in some situations of early diagnosis of perforation in patients with very high surgical risk. We also consider their use in patients with late diagnosis who remain with esophageal-pleural fistula for a long period, even after thoracoscopy with extensive drainage of the pleural and mediastinal cavity, use of antibiotics and adequate nutritional management.

The esophagectomy for traumatic lesions of the esophagus was a classic approach in the past^{12,13}. The complete resection of the organ was based on the ability to better deal with the systemic repercussions of a large surgery, instead of dealing with complications involving an organ of peculiar anatomy and surgical approach, and of complex management. This approach was extremely morbid, with a very high mortality rate and with the need to be performed by teams with extensive experience with esophagectomy¹². In the few services where esophagectomy is a routine procedure, the team performing this procedure is generally not the same as that dealing with patients requiring trauma or urgency approach. Thus, we believe that, in the scenario of esophageal trauma, esophagectomy is an absolute exception procedure^{1,13-15}.

The complementary exams routinely used to evaluate esophageal lesions are HDE and CT with oral and venous contrast. There is controversy in the literature on the advantages and disadvantages of using oral contrast, and in relation to the most suitable contrast in these situations, whether a iodine or barium-based one. The iodinated contrast is poorly viscous, presenting a faster transit time through the esophagus, which theoretically could allow small lesions not to be diagnosed by this method. However, if there were extravasation to the mediastinum or pleural cavities, the iodinated contrast would not cause an important inflammatory reaction in adjacent structures and, because it is water-soluble, could be easily removed mechanically with local perioperative irrigation. The barium contrast is thicker, showing slower transit through the organ and even showing the pattern of mucous folds of the esophagus, which would allow a more accurate diagnosis of possible perforation points. The theoretical disadvantage of this contrast is the potential to lead to an important local inflammatory reaction in case of extravasation. Our experience in this work and in other patients with cervical or abdominal esophageal lesions, and in patients with early diagnosis of esophageal lesion (all excluded from this study) allows us to affirm that the local inflammatory reaction by barium is not important, and that the classic "barium chemical mediastinitis", if it really exists, is not a clinically relevant problem. However, contrast with barium presents the inconvenience of leading to an impregnation in the perforation path, generating a "tattoo" capable of causing diagnostic confusion in control tomograms performed later to evaluate the persistence or not of the initial perforation. It is not possible to evaluate with certainty if the path "marked"

by the contrast is a persistence of the perforation or simply the "tattoo" left by the barium of the initial examination. Thus, the recommendation of the authors is the use of iodinated contrast associated with a thickener, which makes the contrast more viscous. This approach associates the characteristics of iodinated contrast, which does not permeate tissues, with the main advantage of barium, which has slower transit and allows the identification of small perforations.

For patients with acute perforation, diagnosed between six and eight hours after injury, we believe that the best option is an early approach by conventional thoracotomy or thoracoscopy, with esophageal suture and protection of the sutured area with a pediculated flap of pericardial fat, intercostal muscles or parietal pleura. It is important to note that if pediculated intercostal muscles are used, one should take care not to carry the periosteum of the rib together with the pediculated muscular flap, due to the risk of ossification of the sutured site.

For patients with punctate perforation, with small pneumomediastinum, without mediastinal collection, without pneumothorax or pleural effusion, suspension of the oral diet, aspiration of the oral cavity and use of antibiotics are adequate measures.

We believe that the merit of the treatment we propose lies in the removal of the purulent collection of the pleural cavity with opening of the mediastinal pleura, good pulmonary re-expansion, effective pleural drainage and daily and careful observation of these patients, identifying and promptly acting in case of complications. The absence of manipulation of perforated esophagus contributed to its complete healing without stenosis or functional alterations in all cases, in addition to no mortality in the analyzed group.

R E S U M O

Objetivos: avaliar a utilização da vídeo-toroscopia, no tratamento das perfurações tardias do esôfago torácico, sem sutura ou ressecção do órgão. **Métodos:** análise retrospectiva de pacientes com diagnóstico tardio (>12 horas) de perfuração do esôfago torácico tratados por vídeo-toroscopia, sem sutura ou ressecção do órgão, num período de 15 anos. **Resultados:** foram operados 16 pacientes, sendo dez homens e seis mulheres, com idades entre 48 e 66 anos e com tempo entre o diagnóstico da perfuração e a cirurgia variando entre 16 e 26 horas. Todos os pacientes foram submetidos a vídeo-toroscopia, com decorticação pulmonar, abordagem das loculações pleurais, abertura da pleura mediastinal junto ao local da perfuração e desbridamento dos tecidos desvitalizados, seguido por dupla drenagem da cavidade pleural. Não foi realizada sutura ou ressecção esofágica, e os pacientes evoluíram com fechamento completo das lesões, sem óbitos. **Conclusão:** a abordagem cirúrgica vídeo-toroscópica mostrou-se capaz de controlar a infecção pleural, a expansão pulmonar e possibilitar a completa regeneração do esôfago com perfuração diagnosticada tardiamente.

Descritores: Perfuração Esofágica. Empiema Pleural. Toroscopia. Cirurgia Torácica Vídeoassistida. Mediastinite.

REFERENCES

1. Minnich DJ, Yu P, Bryant AS, Jarrar D, Cerfolio RJ. Management of thoracic esophageal perforations. *Eur J Cardiothorac Surg*. 2011; 40(4):931-38.
2. Jones WG 2nd, Ginsberg RJ. Esophageal perforation: a continuing challenge. *Ann Thorac Surg* 1992;53(3):534-43.
3. Vogel SB, Rout WR, Martin TD, Abbitt PL. Esophageal perforation in adults: aggressive, conservative treatment lowers morbidity and mortality. *Ann Surg*. 2005;241(6):1016-21.
4. Peng L, Quan X, Zongzheng J, Ya G, Xiansheng Z, Yitao D, et al. Videothoracoscopic drainage for esophageal perforation with mediastinitis in children. *J Pediatr Surg*. 2006;41(3):514-17.
5. Addas R, Berjaud J, Renaud C, Berthoumieu P, Dahan M, Brouchet L. Esophageal perforation management: a single-center experience. *Open J Thorac Surg*. 2012;2(4):111-7.
6. Griffin SM, Lamb PJ, Shenfine J, Richardson KL, Karat D, Hayes N. Spontaneous rupture of the oesophagus. *Br J Surg*. 2008;95(9):1115-20.
7. Wozniak CJ, Paull DE, Moezzi JE, Scott RP, Anstadt MP, York VV, et al. Choice of first intervention is related to outcomes in the management of empyema. *Ann Thorac Surg*. 2009;87(5):1525-30 ; discussion 1530-1.
8. Solaini L, Prusciano F, Bagioni P. Video-assisted thoracic surgery in the treatment of pleural empyema. *Surg Endosc*. 2007;21(2):280-4.
9. Freeman RK, Ascoti AJ, Dake M, Mahidhara RS. An analysis of esophageal stent placement for persistent leak after the operative repair of intrathoracic esophageal perforations. *Ann Thorac Surg*. 2014; 97(5):1715-9; discussion 1719-20.
10. Brinster CJ, Singhal S, Lee L, Marshall MB, Kaiser LR, Kucharczuk JC. Evolving options in the management of esophageal perforation. *Ann Thorac Surg*. 2004;77(4):1475-83.
11. Karagul S, Yagci MA, Ara C, Tardu A, Ertugrul I, Kirmizi S, et al. Small bowel perforation due to a migrated esophageal stent: report of a rare case and review of the literature. *Int J Surg Case Rep*. 2015;11:113-6.
12. Seo YD, Lin J, Chang AC, Orringer MB, Lynch WR, Reddy RM. Emergent esophagectomy for esophageal perforations: a safe option. *Ann Thorac Surg*. 2015;100(3):905-9.
13. Kiel T, Ferzli G, McGinn J. The use of thoracoscopy in the treatment of iatrogenic esophageal perforations. *Chest*. 1993;103(6):1905-6.
14. Lawrence DR, Ohri SK, Moxon RE, Townsend ER, Fountains SW. Primary esophageal repair for Boerhaave's syndrome. *Ann Thorac Surg*. 1999;67(3):818-20.
15. Jougon J, McBride T, Delcambre F, Minniti A, Vely JF. Primary esophageal repair for Boerhaave's syndrome whatever the free interval between perforation and treatment. *Eur J Cardiothorac Surg*. 2004;25(4):475-9.

Received in: 26/10/2016

Accepted for publication: 30/03/2017

Conflict of interest: none.

Source of funding: none.

Mailing address:

Omar Moté Abou-Mourad

E-mail: omarmourad@terra.com.br