Conservative management of esophageal perforation after pneumatic dilatation for achalasia

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RÉSUMÉ
Objectifs — Evaluer les résultats et les indications du traitement conservateur des perforations oesophagiennes compliquant les dilatations pneumatiques pour achalasie.

Malades et méthodes — Treize perforations oesophagiennes compliquant 524 dilatations chez 412 malades (3%) ont été diagnosticées par un examen clinique ou radiologique, selon une indication chirurgicale proposée par le chirurgien ou un diagnostic suspectant une perforation. La prise en charge était fondée sur l’existence de signes de gravité clinique ou radiologique. Les résultats fonctionnels ont été évalués par le score d’Eckardt.

Résultats — Six malades ont été traités médicalement. Sept malades ont été opérés, dont trois après échec du traitement médical initial. La présence d’un pneumomédiastin initial a été constamment associée à des signes de gravité conduisant à une chirurgie immédiate (n = 2) ou différée (n = 2). La mortalité a été nulle. Trois complications mineures sont survenues après traitement chirurgical (abcès de paroi, phlébite, épanchement pleural). Un malade traité médicalement a développé une pneumopathie grave. Les résultats fonctionnels ont été évalués à 6 semaines par le score d’Eckardt.

Conclusion — Le traitement conservateur, médical ou chirurgical, des perforations oesophagiennes après dilatation pneumatique est fiable, à la condition d’un diagnostic précoce. L’existence d’un pneumomédiastin initial apparaît comme un facteur prédictif d’échec du traitement médical.

SUMMARY
Purpose — To assess the results and indications of conservative management of esophageal perforation following pneumatic dilatation for achalasia.

Patients and methods — Thirteen esophageal perforations complicating 524 dilatations in 412 patients (3%) were diagnosed by esophagogram. Medical treatment consisted of nasogastric suction, antibiotics and pleural drainage, if necessary. Conservative surgical treatment included left thoracotomy, perforation closure, controlateral myotomy and anterior fundoplication. Surgical decision was based upon clinical and radiological parameters. Functional outcome was assessed by the means of the Eckardt’s grading score.

Results — Six patients were successfully managed by medical treatment. Seven patients underwent conservative surgery, three of whom after failure of medical treatment. The presence of a pneumomediastinum at initial presentation led to immediate (n = 2) or delayed (n = 2) surgery in all instances. No patients died. In the surgical group, morbidity consisted of one wound infection, one pleural effusion and one venous thrombosis. One severe chest infection occurred in the medical group. Oral feeding was reintroduced after a median of 10 and 11 days in the surgical and medical groups, respectively. Functional results were satisfactory and similar in both groups.

Conclusion — Conservative medical or surgical management of esophageal perforation following pneumatic dilatation is safe, if the diagnosis is done early. Pneumomediastinum at initial presentation seems to predict failure of conservative medical treatment.

Pneumatic dilatation for achalasia provides excellent results in 70-85% of the patients, but repeated dilatations are required for 15-30% [1]. Perforation of the esophagus is a serious complication of pneumatic dilatation and occurs in 2-6% of the patients [1-4]. Surgical treatment provides excellent outcome in 70-90% of the patients. The most common complication is gastroesophageal reflux, occurring in 10% of the patients [1-4]. Several risk factors for esophageal perforation have been reported in the literature: longstanding dysphagia, minimal weight loss, high amplitude esophageal contractions (> 70 cm H2O), and lastly the most commonly reported risk factor high balloon inflation pressure [1, 4-6]. Perforation appears to occur more often after a first dilatation session [1, 4-6].

Several treatments have been proposed for such type of perforation. Conservative medical treatment, conservative surgical treatment by suture alone or associated with myotomy, and “aggressive” surgical treatment (controlled fistulization, bipolar exclusion, esophagostomy) [7]. There remains some debate as to the proper indications for these different therapeutic options.

The purpose of this work was to assess the feasibility of conservative medical or surgical treatment and to analyze outcome in a retrospective series of 13 esophageal perforations after pneumatic dilatation in order to better define indications.
Patients and methods

Patients

Among 412 patients who underwent pneumatic dilatation of the esophagus for achalasia at the Cochin Hospital between January 1983 and May 1999, 13 (eight women and five men; mean age 56 ± 16 years), developed an esophageal perforation related to the dilatation.

Methods

These 412 patients underwent 584 esophageal dilatation sessions performed under general anesthesia. The 40-mm diameter Witvel balloon was used for the first 58 sessions. For the remaining patients, the Rigiflex balloon (35 mm or 40 mm for repeat dilatations) was used at a pressure of 300 mmHg.

Diagnosis of esophageal perforation after dilatation was suspected in patients complaining of abdominal, thoracic or retrosternal pain. Leakage of the water-soluble contrast agent (gastrograffin) on the esophagogram confirmed the diagnosis. A plain x-ray of the chest and abdomen was obtained before the gastrograffin study.

Signs of sepsis (fever > 38.5 °C, WBC > 15,000/mm³), respiratory failure (tachypnea with PaO₂ < 70 mmHg), or abdominal defense signaled clinical gravity. Radiologically, signs of severity included intrabdominal leakage of the contrast agent, interpleural leakage, or major leakage signaling a major breach in the esophagus. Computed tomography (CT) of the thorax and abdomen with opacification was obtained in the presence of clinical or radiological signs of severity. Surgical treatment was performed for patients who presented early or late clinical and radiographic signs of gravity. An esophagogastroduodenal contrast study and thoracoabdominal CT were performed in all patients before reinstitution oral nutrition between day 7 and day 10. Images were checked for absence of esophageal leakage, mediastinal collection, or pleural effusion.

Treatment modalities

Medical treatment associated esophagogastric suction, parenteral antibiotics, total parenteral nutrition, and drainage of any pleural effusion.

Conservative surgical treatment was performed via left posterolateral thoracotomy through the 7th intercostal space. The lower mediastinal esophagus was exposed and isolated on either side of the perforation after radial phrenotomy, followed by closure of the esophageal breach in two planes using a single-thread resorbable suture reinforced with a pericardial, pleural, or omental patch, and esophagocardioomyotomy at 180° from the perforation (the myotomy was extended upward at least to the upper edge of the suture), and an anterior fundoplication covering the intra-abdominal portion of the myotomy. Thoracic drains were installed before closure.

Functional outcome was assessed with the Eckardt score (table I) [8] at one, three, and six months, then annually. An esophagogram was obtained at one month to verify the absence of leakage and esophageal stricture.

Statistical analysis

Due to the small sample size, the chi-square test was used with Yates correction to compare qualitative variables. The significance threshold was set at 5%.

Results

Among the 13 esophageal perforations, ten occurred at the first dilatation procedures and three at the second session. Median duration of dysphagia was 24 months (range, 1-360)

without significant weight loss (range of weight loss 0-12 kg). Median pressure of the lower esophageal sphincter was 38.3 cm water (range, 12-70), with a median amplitude of the P1 waves measured at 53.7 cm water (range, 10-100). The esophageal calibration was normal (< 4 cm) in ten patients, with moderate axial dilatation (4-7 cm) in two and marked dilatation (> 7 cm) in one.

Clinical and radiological diagnosis

The main clinical and laboratory findings are presented in table II for the patients treated medically, those who underwent surgery after failure of medical treatment, and those who underwent primary surgery. Clinical signs suggesting the diagnosis of perforation were thoracic, retrosternal, or epigastric pain which developed one hour (median) after dilatation (range, 1-8 hours). Radiographic confirmation was obtained within a median of four hours (range, 1-24) by demonstrating a fistula to the mediastinum on esophagogram: mediastinal leakage in all patients. The esophageal breach was located along the left posterior border of the esophagus in ten patients, the left anterior border in two, and the right anterior border in one.

Medical treatment

Nine patients were treated medically. Mean duration of suction was ten days (range, 7-28). Median duration of parenteral antibiotics was nine days (range, 7-14). Four patients required thoracic drainage (two left drains and one bilateral thoracic drainage) within 24 to 48 hours in order to evacuate the pleural effusion which was sterile in all cases. Mean duration of drainage was less than 72 hours. Three patients treated medically underwent secondary surgery on day 2 (2 patients) and day 8 (1 patient) after perforation due to respiratory failure associated with signs of sepsis. Two of these three patients developed a pneumomediastinum and subcutaneous cervical emphysema which was not present at the initial examination. The clinical course was rapidly favorable in the six patients who underwent exclusively medical treatment, within 48 hours for five of them. Oral nutrition was possible in these patients within 11 days (median). The esophagogram and thoracoabdominal CT were performed between day 7 and day 10 for eleven patients and confirmed the lack of contrast leakage, mediastinal collection, or pleural effusion. We did not find that fever alone (2 patients, 1/7 operated versus 1/6 treated medically), initial hyperleukocytosis alone (6 patients, 2/7 operated versus 4/6 treated medically), or initial pleural effusion (3 patients, 1/7 operated versus 2/6 treated medically) influenced the level of initial gravity or unfavorable outcome after medical treatment.

Surgical treatment

Seven patients underwent surgery, four at diagnosis of the perforation and three after failure of medical treatment. Four
patients underwent surgery within eight hours due to radiographic signs of gravity (intra-abdominal leakage in two, large perforation with major leakage in two). Only one of the four patients who underwent first line surgery presented clinical signs of gravity initially: respiratory failure. For the three patients who underwent secondary surgery after failure of medical treatment, surgery was performed at 36 hours, 48 hours, and 8 days due to respiratory failure and sepsis. Five patients had an intrathoracic diagnosis has an important influence. There have been a few reports of favorable outcome after exclusive medical treatment using suction, antibiotics, and parenteral nutrition in patients without severe clinical signs diagnosed early [1, 11, 14, 15]. More recently, surgical teams have proposed early conservative surgical treatment with direct suture and contralateral esophagogastric anastomosis, and in certain cases, an anti-reflux procedure performed via left thoracotomy [12, 13, 16].

The results in our 13 patients illustrate that both conservative medical and surgical treatment can be successful for perforation of the esophagus after pneumatic dilatation for achalasia. Early diagnosis was achieved in all our patients on emergency esophagogram performed immediately after dilatation in symptomatic patients. This early diagnosis enabled medical treatment in two-thirds of our patients [9/13] who did not have severe clinical or radiographic signs. Medical treatment was successful without surgery in half of the patients (6/13). Opting for primary medical treatment did not hinder later surgical treatment and did not modify the postoperative period in such patients. In our experience, a 48-hour surveillance period appears sufficient to assess the therapeutic efficacy of medical treatment. This delay does not compromise secondary conservative surgery if the initial medical treatment is unsuccessful. The presence of a pneumomediastium from the outset, a situation observed in four of our patients, indicates surgical treatment, either with an emergency procedure when there is important contrast leakage (two patients in our series) or later due to the development of secondary respiratory failure and subcutaneous cervical emphysema (two

### Table III. – Functional results in patients undergoing medical treatment, delayed surgery or primary surgery.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Eckardt score</th>
<th>Median delay to oral nutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical alone (n = 6)</td>
<td>1 (0-4)</td>
<td>11 days (7-30)</td>
</tr>
<tr>
<td>Primary surgery (n = 4)</td>
<td>0 (0-2)</td>
<td>10 days (7-15)</td>
</tr>
<tr>
<td>Delayed surgery (n = 3)</td>
<td>1.5 (0-5)</td>
<td>10 days (7-21)</td>
</tr>
</tbody>
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Two patients developed gastroesophageal reflux (one after medical and one after surgical treatment). Two patients experienced episodic food blockage (one after medical and one after surgical treatment). There were no cases of late stricture of the lower esophagus. Functional outcome was considered excellent or satisfactory (Eckardt score < 3) in 11 of the 13 patients (84.6%). The Eckardt score was 4 in one patient treated medically and 5 in one operated patient.

### Discussion

There are several causes of iatrogenic perforation of the esophagus which usually occurs during diagnostic endoscopic procedures on diseased organs (caustic injury, tumor) or during interventional endoscopy (dilatation for tumor or peptic stricture, insertion of an endoprosthesis, pneumatic dilatation for achalasia) [9-11]. The largest series of surgical treatment reported in the literature concern these types of perforations which are generally diagnosed late and require aggressive surgery with closure of the esophagus and drainage of the mediastinum [12, 13], or perform esophagectomy [9-11]. Mortality (12-42%) and morbidity (30-52%) have been high in these series, in relation with major surgery performed on non-sterile tissue in patients with severe esophageal disease [9-13].

Treatment of perforations after pneumatic dilatation for achalasia is a different situation, mainly due to better patient status and the fact that the esophagus is “healthy”. Early diagnosis has an important influence. There have been a few reports of favorable outcome after exclusive medical treatment using suction, antibiotics, and parenteral nutrition in patients without severe clinical signs diagnosed early [1, 11, 14, 15]. More recently, surgical teams have proposed early conservative surgical treatment with direct suture and contralateral esophagogastric anastomosis, and in certain cases, an anti-reflux procedure performed via left thoracotomy [12, 13, 16].

Oral nutrition was reinstated after a median ten days (range, 7-21) for the operated patients and eleven days (range, 7-30) for the medically treated patients (Table III). Functional outcome at mean follow-up of 36 months (range, 24-144) was not different between operated patients and those treated medically (Table III).
patients in our series). The presence of an initial pneumomediastinum should be considered to be an indirect sign of a significant rupture in the esophagus. The size of the breach can be underestimated on the initial esophagogram: the size measured at surgery in our patients (mean 4 cm) was always greater than that estimated from the initial x-ray.

In the present series, surgical treatment of the perforation and the underlying condition was possible during the same operation in all patients. There were no cases of fistulization, morbidity was low, and satisfactory or excellent results were achieved in 84.6% of the patients. Our results are comparable with those of Vantrappen and Hellemans [1] who reported their experience with perforations after pneumatic dilatation treated by suture, myotomy, and an anti-reflux valve. After a mean follow-up of 36 months, we observed satisfactory or excellent function in 11 of our 13 patients. This is in line with data from the literature [12, 13]. It noteworthy that patients treated medically had functional results comparable with those in operated patients, for gastroesophageal reflux, persistent dysphagia, or absence of late stricture. This indicates that it may not be necessary to perform myotomy in addition to suture in treating cardiospasm. All teams do not advocate myotomy in addition to suture for conservative surgical treatment of esophageal perforation after pneumatic dilatation [7, 16]. We feel however, esophagocardiomoty is necessary to maintain a good quality two-plane suture without excessive tension in order to avoid fistulization or late stricture. The efficacy of anterior fundoplication as an anti-reflux procedure is controversial. It is nevertheless recommended by most teams to cover the myotomy and avoid fibrous retraction due to contact with the anterior aspect of the left lobe of the liver. More recently, a prospective controlled study was conducted to compare anterior fundoplication and complete fundoplication (associated with myorrhaphia in both treatment arms) for laparoscopic treatment of gastroesophageal reflux [17]. This study included 107 patients and showed that control of reflux was comparable with a significantly lower rate of postoperative dysphagia after anterior fundoplication. The follow-up was however too short to determine the risk of late recurrent reflux. The study by Watson et al was the first prospective controlled study of functional outcome after anterior fundoplication which appears to provide satisfactory short-term results for all patients [17].

In our patients, secondary conservative surgery after failure of medical treatment did not worsen morbidity. Surgery at a deferred stage after late diagnosis must be distinguished from those operated on late because of failed medical treatment since therapeutic management is different [13]. If the diagnosis is established late, the surgical procedure was more frequently aggressive with bipolar exclusion of the esophagus, wide mediastinal drainage, or even esophagectomy [18], due to the associated mediastinitis. We did not have any such clinical situations among the patients who were treated initially with suction and antibiotics, even after failure of this treatment. Conservative medical treatment was performed in 70% of our patients and was successful in 46%. This rate is similar to that reported by Vantrappen and Hellemans [1] who treated medically 10 of 13 patients with perforation of the esophagus after pneumatic dilatation. Four of their patients required thoracic drainage. Similarly, four of our patients required thoracic drainage thus illustrating that an initial sterile pleural effusion does not contraindicate conservative medical treatment.

Medical treatment was given to only 23.3% of the 86 patients with esophageal perforations caused by various conditions in a recent series [11]. For several authors [10, 11, 14, 19], indications for conservative medical treatment include the absence of severe sepsis or associated bleeding, and no communication between the esophagus and the abdominal or pleural cavity on the esophagogram. In our experience, medical treatment always fails in case of pneumomediastinum or respiratory failure and sepsis.

In conclusion, conservative medical or surgical treatment of esophageal perforation after pneumatic dilatation is a reliable therapeutic approach providing satisfactory functional outcome if the diagnosis is established early. The analysis of our results lead us to propose medical treatment in the following clinical and radiological situations: early diagnosis, absence of initial respiratory failure or sepsis, no evidence of pneumomediastinum on the chest x-ray, no intra-abdominal or intrapleural contrast leakage. Conservative surgery with one operation associating...
Suture, esophagocardiomyotomy, and an anti-reflux procedure is indicated for patients not meeting these criteria and after failure of medical treatment during the first 48 hours (figure 1).

REFERENCES


