



# The cervicosternolaparotomy approach for the treatment of graft dysfunction after retrosternal esophageal reconstruction for caustic injuries

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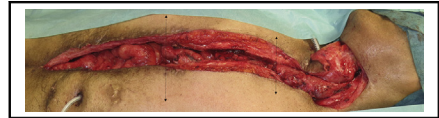
## ABSTRACT

**Objective:** The study purpose was to report the indications, technical aspects, and outcomes of cervicosternolaparotomy during revision surgery after esophageal reconstruction for caustic injuries.

**Methods:** Patients who underwent cervicosternolaparotomy during revision surgery for graft dysfunction between 1999 and 2015 were included. Cervicosternolaparotomy was performed to mobilize and pull up the primary conduit during surgery for strictures (rescue cervicosternolaparotomy) or to allow retrosternal access for management of other graft-related complications (exposure cervicosternolaparotomy). Statistical tests were performed to identify factors associated with primary conduit preservation during rescue cervicosternolaparotomy.

**Results:** Fifty-five patients were included (28 men; median age, 43 years). Median delay between primary reconstruction and cervicosternolaparotomy was 15 months. Exposure cervicosternolaparotomy was performed in 12 patients (22%) for redundancy ( $n = 8$ ), spontaneous perforation ( $n = 2$ ), and caustic re-ingestion ( $n = 2$ ). Rescue cervicosternolaparotomy was performed in 43 patients (78%) to treat supra-anastomotic ( $n = 11$ ), anastomotic ( $n = 23$ ), and diffuse ( $n = 9$ ) stenosis. During rescue cervicosternolaparotomy, the primary conduit was preserved in 32 patients; median length gain obtained by transplant release was 8 cm. Failure to preserve the primary conduit was associated with previous surgical repair attempts ( $P = .003$ ) and lack of initial concomitant pharyngeal reconstruction ( $P = .039$ ). Two patients died (4%), and 35 patients (64%) experienced operative complications. Operative outcomes were similar after rescue and exposure cervicosternolaparotomy. With a median follow-up of 4.4 years, the functional success rate was 85%.

**Conclusions:** Cervicosternolaparotomy during revision surgery for graft dysfunction is reliable, is associated with low morbidity and mortality, and has good results. (*J Thorac Cardiovasc Surg* 2016;152:1378-85)



CSLap: Interrupted lines mark thorax limits.

### Central Message

Cervicosternolaparotomy during revision surgery for graft dysfunction after caustic injury is associated with acceptable morbidity and has good results.

### Perspective

Revision surgery after esophageal reconstruction for caustic injuries is hindered by the retrosternal graft position, limiting treatment by the cervical or abdominal approach. Cervicosternolaparotomy offers an appropriate graft access enabling specific management of graft dysfunction and is associated with low mortality (4%) and high functional success (85%) rates.

See Editorial Commentary page 1386.

The retrosternal route is the gold standard for transplant ascension during esophageal reconstruction for caustic injuries.<sup>1-5</sup> In expert centers, mortality and morbidity of esophageal reconstruction are low and most patients regain the ability to

eat and drink without the need for supplementary tube feeds.<sup>1,2,4-7</sup> However, late complications consisting mostly of strictures and redundancy occur in up to half of the patients during follow-up and may lead to loss of function.<sup>5,8-12</sup> Revision surgery for graft dysfunction has been reported in 15% to 38% of patients and can be a difficult challenge.<sup>12,13</sup> The esophageal substitute traverses 3

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**Abbreviation and Acronym**

CSLap = cervicosternolaparotomy approach

compartments (abdomen, thorax, and neck), and its longer part is located behind the sternum. Revision surgery can be performed occasionally by a limited cervical or abdominal approach, but in most cases, access to the graft is hindered by the sternum.

Bridging of cervical gaps by free jejunal grafts<sup>14</sup> or by fasciocutaneous and myocutaneous flaps<sup>15-17</sup> has been reported for the treatment of long cervical strictures. Nevertheless, such procedures have failed to gain wide acceptance in current practice because of technical difficulties requiring experience in microsurgical techniques, high risks of graft necrosis, substantial mortality, and disappointing functional outcomes. In 1994, Wu and colleagues<sup>18</sup> described successful mobilization of the colonic transplant by cervicotomy and sternotomy during revision surgery for graft strictures. In 2001, our group reported the successful use of the cervicosternolaparotomy approach (CSLap) to treat extended cervical stenoses after esophageal reconstruction for caustic injury.<sup>19</sup> Transplant release by CSLap provided a median 6-cm length gain and allowed primary repair of the cervical anastomosis in 5 of 8 patients; 3 patients failed transplant preservation and underwent secondary esophagocoloplasty during the same operation.<sup>19</sup> Indications for CSLap have been progressively expanded to treat other graft-related complications (redundancy, perforation), and the number of CSLap procedures performed in our center has increased steadily.

During the last 30 years, the Saint-Louis Hospital in Paris has progressively become the referral center for the treatment of caustic injuries of the upper gastrointestinal tract and esophageal reconstruction–related complications in patients residing in Paris and the suburbs (serving a population of 13 million).<sup>20</sup> We report our experience with 55 patients who underwent CSLap during revision surgery for graft dysfunction after esophageal reconstruction for caustic injuries.

**PATIENTS AND METHODS****Patients**

Between January 1999 and May 2015, patients aged more than 16 years who underwent CSLap during revision surgery for graft dysfunction after esophageal reconstruction for caustic injuries were the subjects of the study. The study was approved by the Saint-Louis Hospital Ethics Committee.

**Indications for Cervicosternolaparotomy Approach**

With increasing experience, 2 distinct clinical situations likely to require CSLap were identified. The first indication included management of extensive graft strictures after failure of cervical mobilization to provide enough length gain to bridge the gap. In these patients, mobilization and pull-up of the transplant by CSLap was performed with the aim of



**FIGURE 1.** Rescue cervicosternolaparotomy for the treatment of long anastomotic stenosis (*arrows*) provided a 6-cm length gain, which enabled preservation of the primary conduit and redo of the pharyngocolonic anastomosis.

preserving the primary conduit (rescue CSLap) (Figure 1). As previously reported, strictures after esophageal reconstruction were divided in supra-anastomotic (located above the cervical anastomosis at pharyngeal level), anastomotic (located at the level of the cervical anastomosis), and diffuse (multiple, long segmental graft strictures).<sup>5</sup> Endoscopic dilation was used as first-line treatment, and revision surgery was offered for strictures that were not eligible (>5 cm, >3 strictures) or had failed dilation (>5 attempts).<sup>5</sup>

The second indication for CSLap included situations in which exposure was necessary to obtain direct access to the retrosternal space; graft lengthening was not the issue in these circumstances. Exposure CSLap was performed for symptomatic (dysphagia, recurrent aspiration pneumonia) thoracoabdominal redundancy and graft perforation.

**Preoperative Evaluation**

A 3- to 6-month delay was considered mandatory between esophageal reconstruction and CSLap. Patient evaluation included dynamic barium swallow, upper gastrointestinal endoscopy and cervicothoracoabdominal computed tomography. If rescue CSLap was considered, otolaryngology evaluation with endoscopic assessment of vocal cord function was performed. Analysis of initial operative reports was performed by the team members during a dedicated preoperative surgical staff. Celiomesenteric arteriography was not undertaken. Elective CSLap was offered only to psychologically stable patients after careful psychiatric evaluation.

**Technical Considerations**

The patient was put on the operative table in a supine position with arms secured at his side, and a large operative field was prepared from the jaw to the pubis. The operation was always started by a comprehensive neck exploration through the previous cervical incision or by a median laparotomy to confirm that repair was not suitable by a limited approach. In case of stricture management, the cervical segment of the graft was dissected free; if length issues precluded the construction of a tension-free anastomosis, rescue CSLap was undertaken. Graft dissection through an abdominal approach initially was attempted during management of thoracic redundancy because the maneuver may allow intra-abdominal lowering of the redundant segment; exposure CSLap was undertaken in case of failure. The upper part of the graft was dissected free from the thoracic inlet, and the dissection was pursued between the anterior side of the graft and the posterior aspect of the sternum. Sharp dissection followed by blunt finger dissection of the substernal space was conducted caudally as far as possible. The abdomen was opened through the previous midline laparotomy, and complete dissection of the abdominal part of the transplant was undertaken before proceeding to sternotomy; during rescue, CSLap dissection of the graft vascular pedicle was always carried to its origin to increase length gain. Dissection of the lower end of the substernal space was started upward to join the neck dissection plane before starting bone transection; if this was not technically feasible, the anterior side of the transplant was released step by step from the posterior aspect of the sternum as the osteotomy progressed. At this point, no attempts were

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