A novel reconstruction strategy in esophagectomy for megaesophagus

Na Wu, MD, Yutian Lai, MD, Qi Xia, MD, Wei-Peng Hu, MD, Pei-Song Yuan, MD, and Yang Hu, MD, Chengdu, China

From the Department of Thoracic Surgery, West China Hospital, Sichuan University, Chengdu, China.

Received for publication June 4, 2023; revisions received Sept 1, 2023; accepted for publication Sept 6, 2023.

Address for reprints: Yang Hu, MD, Department of Thoracic Surgery, West China Hospital, Sichuan University.

No. 37 Guoxue Lane, Wuhou District, Chengdu City, Sichuan Province, People’s Republic of China (E-mail: huyangthoracic@126.com).

JTCVS Techniques 2023; -:1-5

Copyright © 2023 The Author(s). Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

https://doi.org/10.1016/j.xjtc.2023.09.014

Megaesophagus symbolizes the end stage of achalasia. Esophagectomy has been established as an initial treatment modality in patients with end-stage achalasia but challenges remain due to the significantly dilated esophagus and long-
term postoperative gastro-esophageal reflux after surgery.\textsuperscript{1} A novel reconstruction strategy named cross-bedded antireflux (CAR) anastomosis combined with esophagoplasty was applied in esophagectomies for megaesophagus. The term \textit{cross-bedded} refers to the gastric mucosa and the whole layer of esophagus were sutured together with continuous sutures to form the inner layer of anastomosis. It was inserted to gastric lumen ultimately.

\textbf{METHODS AND RESULTS}

The institutional Review board number and date of approval was 612, May 19, 2022. Informed consent of all patients for publication of study data was obtained. Figure 1 and Video 1 summarize the procedures of esophagoplasty and formation of CAR anastomosis. This technique has been performed on 4 patients with megaesophagus who underwent thoracoscopic and laparoscopic 3-incision esophagectomy. At 6 months following surgery, no reflux was found. The results are presented in Table E1.

\textbf{DISCUSSION}

Among all achalasia patients, 5\% to 25\% would progress to end-stage disease despite various conservative interventions.\textsuperscript{2} Recurrent symptoms, including dysphagia, regurgitation, and respiratory complications are disabling or even life-threatening. Management of end-stage achalasia remains controversial. Esophagus preserving treatments such as redo myotomy, pneumatic dilation, and cardioplasty are associated with perforation, recurrent dysphagia, and reflux.\textsuperscript{3} Esophagoplasty has been effective to reestablish digestive tract patency and decrease the incidence of pulmonary aspiration and cancerization.\textsuperscript{4,5} Nevertheless, postoperative recurrent dysphagia or nocturnal regurgitations have been frequently reported, which necessitates the refinement of reconstruction. In this strategy, esophagoplasty reduced the size of megaesophagus and straightened the shape facilitating the anastomosis whose safety could be supported by the tubulization of stomach.\textsuperscript{E1} Previous studies have shown leakage and reflux can be well controlled by intussusception.\textsuperscript{E2,E3} Possible mechanisms might be the adhesion between intussuscepted esophagus and stomach limited the potential intraluminal leakage anastomosis and the intussuscepted esophagus and gastric wall would functioned as a unidirectional valve to prevent reflux. Although endoscopy often rules out the existence of stricture, postoperative dysphagia could be caused by the anatomy that the double layers of the stomach might compress the esophagus, as Figure E1 shows. This issue could be managed by removing the seromuscular layer of intussuscepted gastric wall to reduce the thickness of gastric wall covering the esophagus (2-1.5 layers) and avoid the bulge of gastric wall when intussusception was performed.

\textbf{CONCLUSIONS}

Esophagoplasty and CAR anastomosis may elevate the status of esophagectomy in the treatment strategy of achalasia (Figure 2). Further validation of the good outcomes in more patients with megaesophagus and even malignancy is needed.

\textbf{Conflict of Interest Statement}

The authors reported no conflicts of interest.

The \textit{Journal} policy requires editors and reviewers to disclose conflicts of interest and to declined handling
manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

References


Surgical Technique

**E References**


FIGURE E1. Mechanism of how cross-bedded antireflux (CAR) anastomosis reduces postoperative dysphagia. The top row illustrates the thickness of different tissues when they are folded. A, No bulge exists when a single-layer tissue is folded. B, No bulge exists when a double-layer tissue, with whose outer layer larger than inner layer is folded. C, Bulge appears when a double-layer tissue, with whose inner layer larger than outer layer, is folded. The inner layer piles up, together with the outer layer covering the inner layer, inducing a bulge at the site where the tissue bends. The bottom row illustrates the compression to esophagus induced by common intussuscepted anastomosis versus CAR anastomosis. D, The inner layer of stomach is larger than its outer layer. Bulge appears at the site where the gastric wall bends inside when intussusception is made in common intussusception anastomosis, which might lead to the intussuscepted gastric wall overly compress the esophagus below and cause postoperative dysphagia. E, With removing the seromuscular layer of the intussuscepted gastric wall, CAR anastomosis eliminates the bulge and reduces the thickness of gastric wall covering the esophagus.

TABLE E1. Intraoperative and postoperative 6-month evaluation data of patients with megaesophagus undergoing esophagectomy combining esophagoplasty and cross-bedded antireflux anastomosis

<table>
<thead>
<tr>
<th>Case no.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter of esophagus (cm)</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Time for anastomosis (min)</td>
<td>23</td>
<td>25</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Anastomotic leakage</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
</tr>
<tr>
<td>Dysphagia scoreΔ*</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Reflux scoreΔ*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DeMeester score</td>
<td>8.0</td>
<td>2.4</td>
<td>0.3</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Δ, Change. *The reflux score and dysphagia score were evaluated by visual analog scale ranging from 1 to 10.