Review

Esophagoplasty using previously resected stomach proposed by A.A. Rusanov: History and the current state

Yuri N. Shiryajev, Nikolay Y. Kokhanenko

A Department of Faculty Surgery named after Professor A.A. Rusanov, Saint-Petersburg State Pediatric Medical Academy, Saint-Petersburg, Russian Federation
B Sixth Department of Surgery, Mariinsky Hospital, Saint-Petersburg, Russian Federation

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To perform esophageal reconstruction in patients after distal gastrectomy colonic or jejunal transplant is usually used. But the use of remnant stomach in esophagoplasty appears to be an interesting idea. This method preserves some advantages of esophagogastroplasty as such. It is possible to pull-up the remnant stomach to the needed level, using mobilization with the spleen and pancreatic tail and its transposition into the left pleural cavity. This type of esophageal replacement, currently widely adopted in China, was proposed and first performed in 1958 by Professor A.A. Rusanov from Russia (former USSR). Different aspects of this method including historical are discussed in the literature review.

In 2009 we celebrate 100-anniversary of the prominent Russian surgeon Professor Alexandr Andreyevich Rusanov who was the Head of the Faculty Surgery Department at the Leningrad Pediatric Medical Institute — the Saint-Petersburg State Pediatric Medical Academy in the present — since 1958 till 1983 (Fig. 1). Professor Rusanov gained general recognition in Russia as an authority in esophageal surgery. He proposed several original techniques in esophagoplasty (EP). One of them is the esophageal replacement with the gastric transplant, mobilized en-block with the spleen and pancreatic tail with its subsequent transposition into the left pleural cavity. This operation was firstly performed by A.A. Rusanov in 1954, and then successfully applied and developed in the clinic. Such technical solution permits to significantly improve the circulation in the fundus of the gastric transplant and, thus, to decrease the esophagogastic anastomosis (EGA) leakage rate. However, the above mentioned method of EP was abandoned and Rusanov’s papers on this subject were almost not cited, especially by foreign authors. Different techniques of esophagogastoplasty (EGP) — using both the whole stomach and the gastric tube tailored from the greater curvature – which allowed performing the reliable subtotal/total esophageal replacement, were studied and used worldwide extensively. However, the unique Rusanov’s idea has being developed in the esophageal surgery.

In 1958 he successfully performed EP, using his own technique, in a difficult surgical situation — following the distal 2/3 gastrectomy.

Esophageal reconstruction in gastrectomized patients remains a significant surgical problem. It is generally accepted in such cases to replace the esophagus with the colonic or jejunal transplant. But the original idea is to use the remnant stomach for EP. Such method preserves a number of advantages of the EGP as such (more physiological, less traumatic, only one or maximum two anastomoses needed) in comparison with the bowel EP.

It is possible to pull-up the remnant stomach to the needed level, saving the supplying vessels, using mobilization of the gastric stump with the spleen and pancreatic tail and its transposition into the left pleural cavity by A.A. Rusanov.

Here is the brief information regarding the first remnant stomach EP, performed by Professor Rusanov.

The 65-year-old male patient was operated on for peptic ulcer ten years ago (distal 2/3 gastrectomy by Finsterer). Current admission and operation are for lower third esophageal cancer. Resection of the distal esophagus through the left thoracic approach was performed. The remnant stomach, afferent and efferent jejunal loops, spleen and pancreatic tail were mobilized...
en-block and transposed above the diaphragm. EGA was created below the aortic arch. The postoperative period was complicated with purulent tracheobronchitis and marked respiratory failure. That is why tracheostomy was made on the 3rd day, followed by slow gradual improvement and discharge. Six months after the operation the patient was in good general condition.

Two years later A.A. Rusanov performed the second successful remnant stomach EP in similar situation (reconstruction scheme is shown on the Fig. 2). The patient presented with previous distal esophageal cancer. Surgical approach, extent of resection and type of reconstruction were the same, as in the first case. The postoperative course was uneventful and the patient’s condition was satisfactory 2.5 years after the surgery. Soon, in 1963, this kind of operation was performed by Yuri I. Malyshev from Chelyabinsk (Russia), for benign stricture of the distal esophagus.

But these publications were ignored both in the former USSR and abroad. The proposed technique was really abandoned for a long time and rediscovered by Chinese surgeons. Since 1982 EP using the remnant stomach was introduced by Lu et al. from the Shantou University Hospital. They somewhat improved the Rusanov’s technique performing transection of the afferent jejunal loop close to the remnant stomach and mobilization of the efferent loop in Roux fashion with division of 1–2 jejunal vessels (if required). It allowed to pull-up the remnant stomach into the left pleural cavity and in some cases even into the neck and to make the EGA on this level. The final stage of reconstruction is Roux-en-Y jejuno-jejunal anastomosis.

In 1986 seven such operations were reported by authors. In 1990 their first English article was published, which included review of 30 operations. Three anastomotic leaks were found, treated conservatively. Finally, in 2006 series of seventy-eight remnant stomach EP’s were presented – with zero mortality.

At the last two decades the gastric stump EP was widely adopted in China. Many Chinese teams published their papers on this subject, including large series of up to 15 cases. As there are very few cases of gastrectomized patients among those with esophageal cancer – 0.87–2.5% this number of operations appears to be rather high.

Some surgeons use this modification of EP as a method of choice in patients with resected stomach. Collective review of Chinese clinics was published in 2006 on the base of 85 EP performed but the largest series (78 cases) from Shantou was not included.

Technical details of the discussed EP method are carefully developed, especially by the Chinese surgeons. The standard operative approach is the left thoracotomy through the 6th or 7th intercostal space, or the left thoracoabdominal incision. If the tumor is resectable, the esophagus is mobilized and the diaphragm is opened. The remnant stomach, afferent and efferent loops of jejunum are to be mobilized with the spleen and the tail of the pancreas. The splenophrenic, spleno-colic and splenonephric ligaments, then adhesions around the remnant stomach will be divided, fixation in mesocolic window (in retrocolic position of the jejunum) – eliminated: pancreatic tail – detached from the retroperitoneal fat. Left gastric vessels are divided; esophagus is transected close to the cardia. The left gastroepiploic and short arteries will be the main source of blood inflow for the gastric stump. It is necessary to save at least 2–3 short arteries. The remnant stomach after such mobilization can be pulled up to 20–25 (sometimes more) cm. The efferent jejunal loop can be elongated by transection of 1–2 jejunal vessels, if needed. The afferent loop of jejunum close to gastrojejunal anastomosis is transected and the gastric end is closed. But this technical detail can be avoided. Some surgeons use it as a standard, but the majority – for necessity only – in excessive tension of the short afferent loop or gastrojejunal anastomosis. Thus, Guo et al.9 have transected the afferent loop in 4 cases of 30, Su et al.11 in 2 of 18, Chen et al.12 in 2 of 12.

In some areas of China the most popular method of distal gastrectomy is the one with long antecolic jejunal loop but without Braun’s anastomosis. Some authors add the latter to gastric stump EP scheme for prevention of afferent loop syndrome – then conversion into Roux-en-Y is not needed.

The other methods of transplant elongation should be mentioned here: division of the inferior mesenteric vein close to the junction with the splenic vein in pancreatic mobilization and semilunar seromyotomy of the anterior gastric wall 3–5 cm below the EGA.

Then the esophagus should be resected together with periesophageal fat and lymph nodes. Reconstructive stage of the procedure consists of EGA and jejuno-jejunal anastomosis. The most Chinese surgeons routinely use the stapler for EGA. In some cases it is possible to use this mobilization technique to place the EGA even on the neck.

There is a problem an accommodation of the spleen in the thoracic cavity. The free placing of the spleen is inconvenient, because this can lead to dehiscence of EGA due to its overtension. Torsion of the splenic hilus must be avoided in order to prevent necrosis of the spleen and gastric stump. Usually the spleen is “suspended” by fixing the rest of splenic ligaments to the thoracic wall.

Is it possible to use the similar type of EP after Billroth I gastrectomy? The limited mobility of duodenum may preclude it. It needed to mobilize not only gastrosplenopancreatic complex, but the duodenum – using incision of lateral peritoneum. Comparing with the Billroth II cases, reconstruction after Billroth I is more difficult. Some surgeons performed such operations occasionally.
and noted that in their papers, but all such series are very small.\textsuperscript{8,10,18}

It is suggested that EP using the remnant stomach with its transposition with the spleen and pancreatic tail into the left pleural cavity is quite justified and technically possible in majority of middle and lower thoracic esophageal cancers.\textsuperscript{9,11-13} Operation is technically simple, time-saving, only one incision is needed with rare exceptions (thoracotomy or thoracoabdominotomy) and two Anastomoses (EGA and jejuno-jejunal). Postoperative complications are rare (by Chen et al.\textsuperscript{9} 10.3\% among 78 operated cases); in majority of clinics there are no fatal outcomes at all.\textsuperscript{9,8,11,12,15,17}

Much less information is available on the follow-up results of the discussed type of EP. There are following rates of 5-year survival listed: 30.6\%,\textsuperscript{8} 36.3\%,\textsuperscript{9} which is almost the same as in esophageal cancer patients without the history of gastrectomy.\textsuperscript{8}

Although experience of Chinese surgeons in gastric remnant EP is substantial, most aspects of this method require further investigation. First, it is the technique of abdominal lymph node dissection, which is less developed for such operations. In lower esophageal cancer the rate of peri gastric lymph node metastases is high. Probably, due to this fact, it is sometimes necessary to retract the minor curve of gastric stump before its transposition above the diaphragm. The second important question is the mode of cancer recurrence after above mentioned type of EP, about which virtually nothing is known. Thus, definite opinion regarding oncological validity of remnant stomach EP remains obscure. Furthermore, no information is available on the hypothetical success rate of this method in non-Chinese patients due to absence of experimental and extremely small number of clinical observations.

Currently, remnant stomach EP is unique and very rarely employed method outside China. The study performed by Nakayama \textit{et al.}, based on questionnaires filled by Japanese surgeons,\textsuperscript{19} showed that the most popular type of esophageal replacement after resection for cancer in gastrectomized patients is colonic transplant. It was used in 130 of 180 cases (72.2\%). In contrast, remnant stomach was utilized for EP in 5 cases only (2.8\%). Lun \textit{et al.} proposed usage of remnant stomach as the contrast, remnant stomach was utilized for EP in 5 cases only. It was used in 130 of 180 cases (72.2\%). In middle and lower thoracic esophageal cancers, it is colonic transplant. It was used in 130 of 180 cases (72.2\%). However, described type of gastric approach is left thoracic or thoracoabdominal. This is a clear disadvantage of method. However, described type of gastric stump EP is a valid one for further investigations, both experimental and clinical.

In conclusion, esophageal reconstruction using the remnant stomach, transposed with the spleen and pancreatic tail above the diaphragm, is now well-established method of EP after gastrectomy in China. A lot of publications are currently present — papers listed below are only a small part of them.

But unfortunately, the name of A.A. Rusanov, who was the first in the world to propose and to perform this unique method of EP, is mentioned nowhere. One of the aims of our work is to reestablish the correct authorship.

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\textbf{References}


