

Intraoperative Right Colic Graft Ischemia, Followed by Delayed Oesophagoplasty Including an Ileo-Transverse Anastomosis and the Cervical Revascularisation of the Ileum: Case Report

Constantin Ciuce^{1*}, Mariana Matei¹, Ioan Cetina¹, Cristina Ivan¹, Cedric Kwizera¹, Natalia Hagau¹, Catalin Ciuce²

¹Regina Maria Hospital, Cluj-Napoca, Romania

²Surgical Clinic I, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

*Corresponding author:

Professor Constantin Ciuce

Regina Maria Hospital, Cluj-Napoca
Romania

E-mail: constantinciuce@gmail.com

Rezumat

Ischemia grefonului colic drept intraoperator urmată de esofagoplastie tardivă cu includerea în grefon a anastomozei ileotransverse și revascularizare cervicală a ileonului: prezentare de caz

Complicațiile ischemice apărute în timpul izolării sau după plasarea grefonului de substituție esofagiană pot conduce la necroza acestuia și la obligația identificării unui alt procedeu reconstructiv. Cel mai frecvent sunt raportate necroze de grefon în zilele următoare gestului reconstructiv. Prezentăm cazul unui pacient în vârstă de 27 de ani cu disfagie completă prin stenoza postcaustică la care a fost abandonată reconstrucția esofagiană după ischemia ireversibilă a grefonului colic drept în cursul izolării vasculare, urmat de hemicolectomie dreaptă și anastomoza ileotransversă. La 4 ani de la ingestia de substanță caustică și la doi ani după necroza ischemică a grefonului colic drept, am efectuat reconstrucția esofagului utilizând un grefon ileocolic pediculat pe vasele colice stângi și revascularizat cervical. Particularitatea grefonului constă în faptul că este compus din colon stâng, transvers și ileon, incluzând anastomoza ileotransversă efectuată cu 2 ani anterior reconstrucției de esofag.

Cuvinte cheie: esofagocoloplastie, ischemie ireversibilă a grefonului colic drept intraoperator, revascularizare cervicală

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Abstract

The ischemic complications during the isolation of the substituting oesophageal graft placement and after its placement may lead to graft necrosis and to the need to find a different reconstructive procedure. The most frequent reports of graft necroses occur in the days following the reconstruction. We are presenting the case of a 27-y.o. with full dysphagia as a result of caustic stenosis, in whose case the oesophageal reconstruction was abandoned following the irreversible ischemia of the right colic graft during the vascular isolation, followed by right-side hemicolectomy and ileo-transverse anastomosis. 4 years post the ingestion of a caustic substance and 2 years post the right colic graft ischemic necrosis, we performed an oesophageal reconstruction using a pediculated, cervically revascularized, ileo-colic graft on the left colic vessels. The graft's particularity is that is formed from left and transverse colon and ileum portions, including the ileo-transverse anastomosis performed 2 years prior to the oesophageal reconstruction.

Key words: oesophagoplasty, irreversible right colic graft ischemia, intraoperative, cervical revascularisation

Introduction

Most post-corrosive substance ingestion oesophageal stenoses need oesophageal reconstruction for treating dysphagia. Oesophagoplasty involves selecting a digestive tube as an oesophageal substitute and the placement access way for the graft used.

The selected option depends on the experience of the surgical team, the integrity of the organs that might be used for reconstruction, the length of the oesophageal defect and of the graft placement track. The substitute options include the stomach, if not impacted by corrosion lesions, the jejunum or the colon. The graft placement access way can be subcutaneous, retrosternal, or posterior mediastinal. The posterior mediastinal placement involves the extirpation of the stenosed oesophagus. The more experienced the surgical team is, the less chances there are for complications resulting from the difficulty of the surgery, the therapy choices and the patient's anatomy. Regardless of the cumulative experience, there is a percent of oesophagoplasty complications occurring even in specialised care establishments. One of the most feared is the graft necrosis which, not recognised early enough, may lead to patient death. In colon graft oesophagoplasties the prevalence of necrosis is

higher when using the right colon, due to the higher vascularisation variability in comparison with the left colon. Irreversible intraoperative colic graft ischemia is rarely reported. If recognised during surgery, it will lead to selecting an alternate method of oesophageal reconstruction. In the case we are presenting, the surgical team decided to abandon the reconstruction, extirpating the ischemic right colic graft, and using the ileo-transverse anastomosis for repairing the remaining digestive tube.

Case Report

27-y.o. patient with full dysphagia following the progressive oesophageal stenosis resulting from a suicide attempt by ingesting caustic soda. A PES was placed in 2003, replaced shortly after with a jejunostomy.

Two years later, we attempted a colic graft oesophagoplasty. The right colon was chosen as an oesophageal substitute. While isolating the right ileo-colic graft, we noticed the irreversible graft ischemia, for reasons still unknown to us. We abandoned the reconstruction, excised the ischemic colon portion and repaired the digestive tube using an end-to-end anastomosis between the ileum and the transverse colon.

For the following two years, the patient resumes feeding via the jejunostomy.

The patient is admitted in our service in 2007, for oesophageal reconstruction. The patient is in full dysphagia upon admission. The preliminary assessment reveals a hypotrophic patient with a jejune feeding tube - *Fig. 1*. Following the adhesiolysis, we determined that the remaining colon length is insufficient for using it as a oesophageal substitute. We identified an antimesenteric diverticula at next to the ileo-colic anastomosis.

We isolated the terminal ileum artery and its accompanying vein, from its stem in the upper mesenteric artery and vein, and keeping both the ileo-colic anastomosis and cranial marginal arches (*Fig. 2*). We resected the diverticula next to the anastomosis (*Fig. 3*).

The medial colic vessels were cut next to their stems in the upper mesenteric vessels.

We cut the cranial ileum from the isolated vessels for a length of 15 cm. After cutting the ileum vessels, we noticed low flowrate bleeding from both the ileal artery and vein (*Fig. 4*).

We couldn't identify, upon abdomen exploration, any antral stenosis. We unravelled the cervical hypopharynx and oesophagus affected by post-caustic stenosis. We extirpated the trans-hiatal oesophagus (*Fig. 5*). We sectioned the lateral wall of the hypopharynx (*Fig. 6*).

As a oesophageal reconstruction graft, we used a conduit from a left colon portion, vascularised on the left colic vascular pediculus, a transverse colon portion and a 15 cm ileum portion attached to the colon using ileocolic anastomosis (*Fig. 4*).

The graft was placed in the posterior mediastina, with the ileum portion and the isolated ileum vessels towards the exterior, in the cervical area. The carotid artery and the jugular vein were prepared as receptors for ileum revascularisation (*Fig. 7*).

After the ileum-pharynx anastomosis, the ileal vessels were sutured end-to-side to the carotid artery (*Fig. 8*) and the inner jugular vein (*Fig. 9*). Restarting the arterial and venous blood flow ended the cervical segment of surgery, while obtaining a good vascularisation of the ileum and digestive anastomosis (*Fig. 10*).



Figure 1. Multiple scars after the attempted right colic graft collection and after reversing the gastrostomy. Feeding jejunostomy



Figure 2. Isolating the last ileal artery and the accompanying vein. Ileo-transverse anastomosis diverticula. The clamp end indicates the left colic vessels

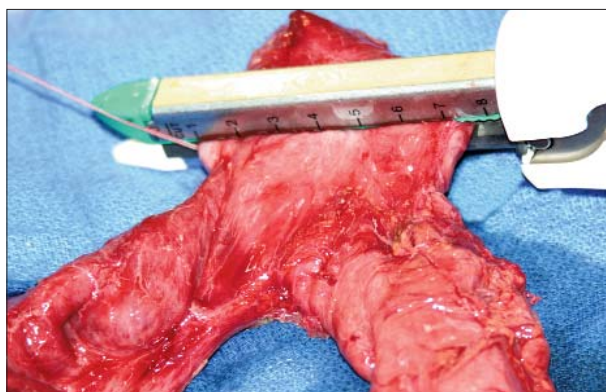


Figure 3. Resection of the diverticula next to the anastomosis



Figure 4. Sectioning the medial colic vessels. The graft includes the ileum-transverse colon anastomosis



Figure 5. Transhiatally extirpated oesophagus

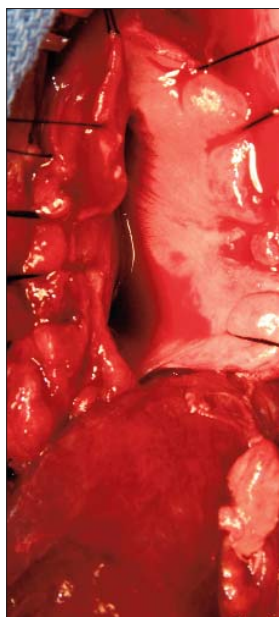


Figure 6. Lateral hypopharynx wall prepared for anastomosis

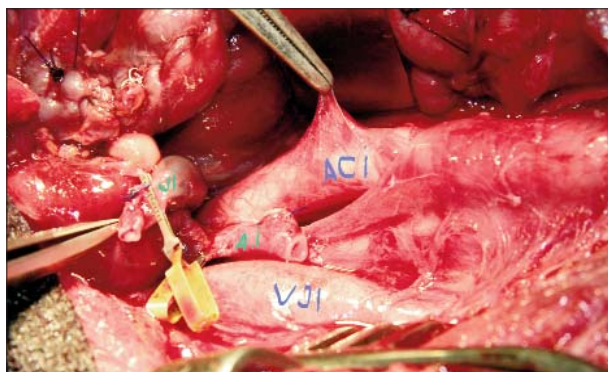


Figure 7.

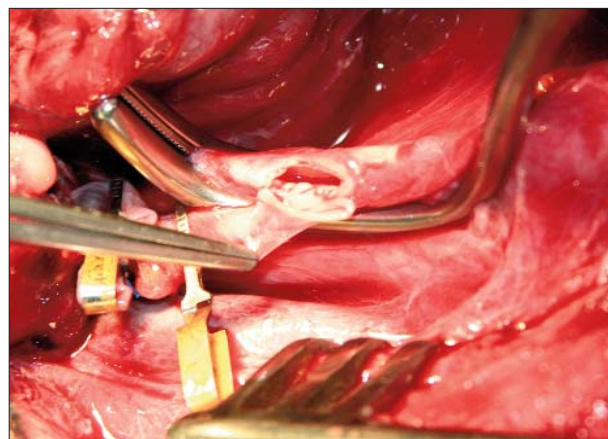


Figure 8. Suture of the ileal artery to the inner left carotid artery

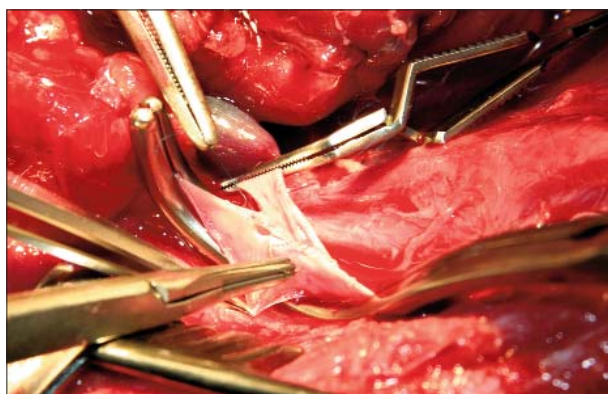


Figure 9. Ileal vein-inner jugular vein anastomosis. The dilated ileal vein is visible after restarting the arterial blood flow.

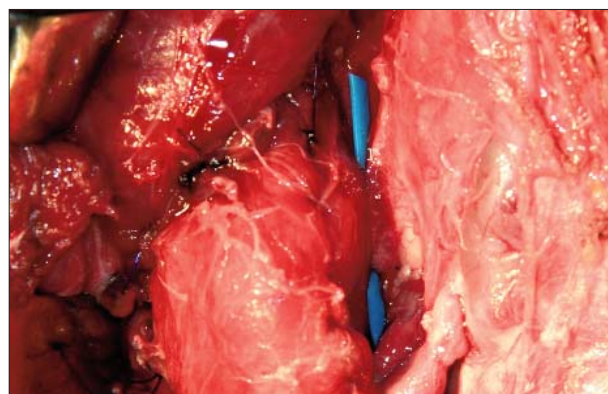


Figure 10. Pharynx-ileum anastomosis. Ileal vessels anastomosis to the outer carotid artery and to the inner left jugular vein.

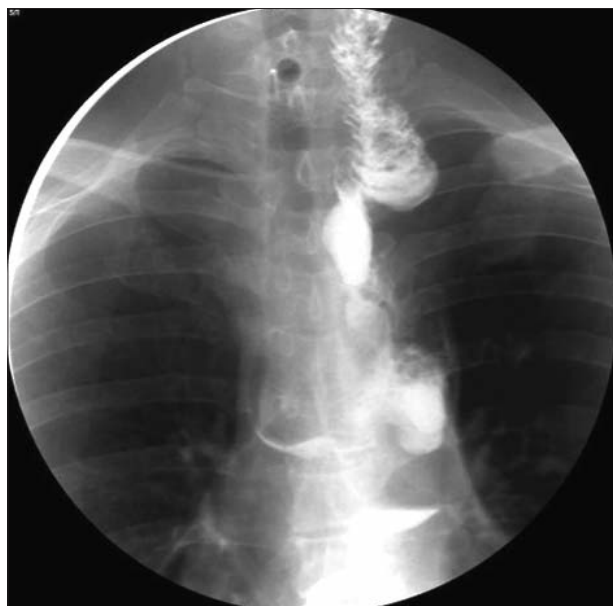


Figure 11. Barium radiology, one year post surgery. The two graft components (ileum and colon) are visible

The abdominal segment consisted of the anastomoses between the colic graft and the posterior stomach and ileo-colic sides. The jejunostomy was reversed.

The patient presented a favourable evolution. Oral feeding was resumed progressively, starting from the 9th day postoperatively. The barium radiology assessment indicated good passing of barium through the new oesophagus (*Fig. 11*). One year postoperatively, the patient feeds themselves without any difficulty and gained 5 kg.

Discussion

The case we present raises, in my opinion, several punctual questions regarding the intraoperatively identified colic graft ischemia.

1. How to deal with a intraoperatively identified colic graft ischemia with a major ongoing necrosis risk?
2. Are there means to avoid the colic graft devascularisation risk?
3. Is the right colon more susceptible to ischemia in comparison with the left colon?
4. What oesophageal reconstruction options do we have for replacing the ischemic graft?

5. Is it necessary to extirpate the oesophagus with post-caustic stenoses?
6. Are the cervical vascular anastomoses useful in supplementing the arterial inflow or the venous outflow in the graft used for oesophageal reconstruction?

The approach of an intraoperative colic graft ischemia depends on its root cause, on how experienced the surgical team is and, sometimes, on the existence of a multi-disciplinary support team for solving the complications. If the team is part of surgical department with a low volume of oesophageal surgeries, the solution is to abandon the oesophageal reconstruction, to remove the ischemic graft, to restore the ileo-colic continuity and to refer the patient to a specialised surgical centre. This approach lowers life-threatening risks for the patient. Trained teams may, if the ischemia was the result of vascular anatomical variations impossible to identify intraoperatively, preserve the abdominal pediculus and supplement the graft blood flow using anastomoses with cervical or inner mammary vessels, depending on the patient's anatomy (1, 2,3). If the ischemia is irreversible, such teams may remove the graft and, in the same surgery, use the remaining right or left colic segment.

To avoid the intraoperative colic graft devascularisation, besides observing the vascular trunks, the vascular pediculi to be sectioned for colic graft isolation may be clamped with a soft clamp. The post-clamping vascularisation and the designed graft colours must be monitored. This test is purely informative. It might induce a false assessment of the vascular pediculi sections' secondary viability as, while there might be a blood flow through the graft vessels, such blood flow is insufficient for the future cranial extremity and may result in cervical anastomosis necrosis and dehiscence. The test can be followed by a Doppler assessment of the blood flow to increase the certainty level of the intraoperative assessment. The same arguments are used against the use of mesenteric arteriography in assessing the colon vasculari-

sation. The arteriography highlights the vascular distribution but cannot assess the blood flow quality in the vessels irrigating the graft (4,5).

The risk of ischemia at the moment of graft collection is higher for an ileo-colic graft compared to a left colon graft. The explanation is in the variable vascularisation of the vessels irrigating the right colon and the ileo-colic area. (6-10) For the grafts that seem viable upon collection and turn ischemic postoperatively, the root cause seems to be the venous outflow issues difficulties in the upper chest aperture area. The ischemia seems more frequent in case of the retrosternal placement of the colic graft (11). Venous congestion is followed by arterial obliteration and a full or partial necrosis of the colic graft (11-13).

After a failed colic graft collection, the oesophageal reconstruction can use a counter-lateral colic segment, or a stomach segment (14) without lesions, or the jejunum. The choice is directly linked to the defect to be repaired length and depends on the free flow in the vascular pedicle of the selected digestive tube segment. For the jejunum, the graft viability is ensured via the revascularisation of vascular arches from the inner mammary and/or cervical vessels. If the intraoperative assessment indicates, especially for long grafts, a suspicion of deficient vascularisation towards the cervical extremity, it is useful to collect available vessels for cervical anastomoses along with the utilised graft.

There is a possibility of malignant processes starting on post-chemical burn oesophagi. The reported timeline for malignancy is 25-45 years. For this reason, it is preferable to simultaneously extirpate the oesophagus in young and, especially, paediatric patients (15). Transhiatal oesophagectomy can, usually, be performed without any difficulties and allows for passing the colic graft through the oesophagus bed. The oesophagus-mediastinal structures adhesions may lead to tracheal membrane lesions, paresis/paralysis of the left recurrent nerve or a ductus thoracicus lesion. The trajectory through the posterior mediastinum reduces the necessary graft length

and allows for deglutition closer to normal. I opt for a transhiatal oesophagectomy simultaneous with the oesophageal reconstruction.

Supplementing the blood flow reduces the risk of complications such as the anastomosis cervical fistulae and avoids the risk of post-ischemic anastomosis or graft stenoses. They should not be used constantly, but adapted to the vascular situation of the graft, especially in the case of long grafts used for simultaneous pharyngeal and oesophageal reconstruction.

The particularity of the case we presented was the option selected for the secondary oesophageal reconstruction. The graft consisted of a portion of descendent colon, the remaining portion of the transverse colon and ileum, incorporating the ileo-transverse anastomosis. Although during the two years with an ileo-transverse anastomosis there was a parietal trans-anastomosis revascularisation, most probably via the submucous vascular network (16), the ileum blood flow was unsatisfactory. The cervical vessels-supported revascularisation substantially improved the ileal vessel inflow, leading to a simple postoperative evolution, accompanied by a good deglutition recovery.

Although the literature data suggests using the collateral vessels of the outer carotid artery as receptors, I prefer the common carotid artery and the inner jugular vein. The intraoperative retrograde flow control in the carotid artery confirms the presence of the Willis polygon and makes clamping the carotid artery for vascular anastomosis safe.

Conflict of Interests

The authors declare that they have no conflict of interest.

Ethical Statement

All procedures performed were in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments.

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