

Case
Report

Superdrainage Using the Cephalic Vein Due to Unsuitable Internal Thoracic Vein for Microvascular Anastomosis in Esophageal Reconstruction Using Pedicled Jejunum

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The progress and popularization of microvascular surgical techniques may improve the outcomes of esophageal reconstruction using non-gastric tube (GT) grafts. A pedicled jejunum (PJ) with microvascular anastomoses is frequently selected as a reconstructed conduit for esophageal reconstruction when the GT is unavailable, and the internal thoracic (IT) vein is frequently selected as a recipient blood vessel for microvascular anastomosis. However, the IT vein may be inadequate for microvascular anastomosis because of its absence or underdevelopment. Since it is difficult to preoperatively predict such rare cases, it becomes necessary to urgently and rapidly prepare an alternative blood vessel. Herein, we present surgical procedures for superdrainage using the cephalic vein (CeV). Due the superficial nature of the CeV, it is both easy to identify and collect sufficient length. Thus, the CeV is very useful as an urgent substitute blood vessel when the IT vein is unavailable for microvascular anastomosis in esophageal reconstruction.

Keywords: cephalic vein, esophageal reconstruction, jejunum, grafts, esophageal cancer

Introduction

The gastric tube (GT) is typically the first choice as a reconstructed conduit after esophagectomy for esophageal

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Received: February 4, 2019; Accepted: April 16, 2019

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cancer. However, the GT is not available in patients with synchronous gastric cancer requiring gastrectomy or with a history of gastrectomy. The reconstruction method after esophagectomy using reconstructed organs other than GT has not been standardized.¹⁾ In many cases, pedicled jejunum (PJ) or colon is selected as a substitute for the GT. In Japan, colon graft interposition was frequently utilized in the past; however, PJ reconstruction has now been gradually increasing. The GT or the entire stomach was selected for esophageal reconstruction after esophagectomy in 81.1% of patients, and the frequency of PJ and colon graft usage was 5.0% and 3.8%, respectively, in 2007.²⁾ However, high postoperative morbidity and mortality rates are a serious problem in esophageal reconstruction that uses other organs than the GT. Especially, the brought-up PJ tends to be congestive because of the presence of the long-route drainage vein, which may disturb the microcirculation of the conduit and result in anastomotic leakage.³⁾ The progress and popularization of

microvascular surgical techniques may improve the outcomes of esophageal reconstruction using these alternative organs.⁴⁾ Internal thoracic (IT) vessels or cervical vessels are generally used as recipient vessels for microvascular anastomosis in esophageal reconstruction using PJ.⁵⁾ However, there are rare patients in whom the IT vein is inadequate for microvascular anastomosis because of its absence or underdevelopment, and it is necessary to urgently and rapidly prepare another graft. In this report, we present a surgical procedure of superdrainage using the cephalic vein (CeV) in lieu of an unsuitable IT vein for microvascular anastomosis.

Case Report

A 76-year-old man with synchronous duplicated cancer, thoracic esophageal cancer, clinical T2N0M0, Stage IB, and gastric cancer, clinical T1bN0M0, Stage IA (UICC-TMN, 8th edition), underwent radical esophagogastrectomy. In esophageal reconstruction using PJ, the IT vein was very thin, which seemed to be due to underdevelopment (**Figs. 1A** and **1B**). Eventually, we used the CeV from the right brachium as a graft, and superdrainage was performed on the microvascular anastomosis using the CeV and the jejunal vein (**Figs. 1C** and **1D**). Supercharge was performed on the microvascular anastomosis using the IT artery and jejunal artery, as planned.

First, the CeV was identified subcutaneously in the right upper arm and then was peeled off to the inside of the shoulder joint toward the proximal side's direction. Sufficient length can be secured through peeling on the distal side to the elbow. The distal side of the end of the CeV (the prepared graft) was then guided toward the fourth intercostal space via the subcutaneous route (**Fig. 2**) and underwent microvascular anastomosis with the jejunal vein (**Figs. 1C** and **1D**). Needless to say, care must be taken not to bend the graft around the shoulder joint. Microvascular anastomosis with donor vessels should be performed, as usual.

Discussion

The advantages of using an IT vessel as a recipient vessel are consistent location, large caliber, and ease of exposure. Therefore, the IT vessel is representative as a recipient blood vessel when adding supercharge or superdrainage to esophageal reconstruction using PJ. In this report, we presented a patient with an unsuitable IT vein for microvascular anastomosis, and the surgical procedure

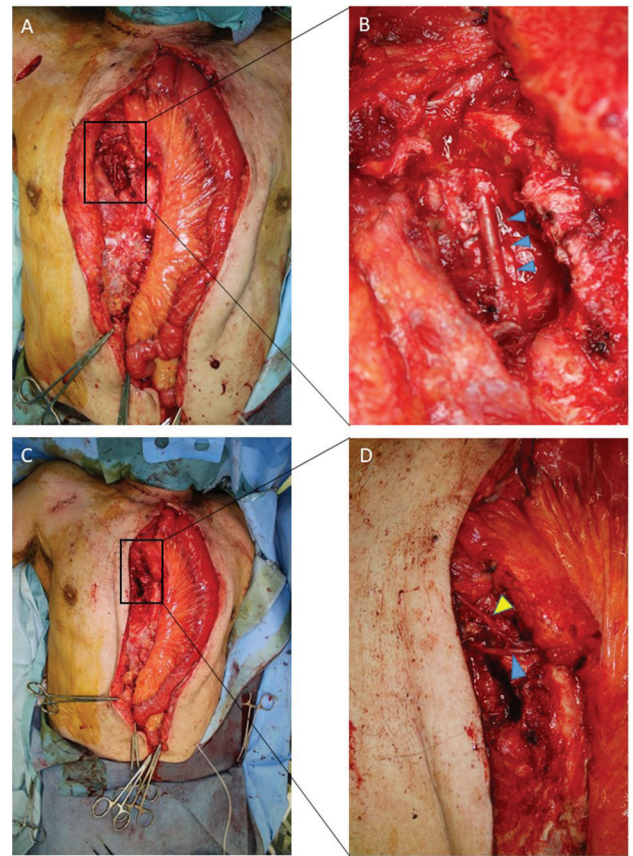


Fig. 1 We attempted to identify the IT vessels in preparation for microvascular anastomoses after esophago-jejunostomy (**A**). Close image of the third and fourth intercostal spaces (**B**). The IT artery (indicated by the blue arrows) can be confirmed with a sufficient diameter, but the IT vein that should be in the vicinity was extremely fine. In the fourth intercostal space, superdrainage was performed using the CeV and supercharge was performed using the IT artery against the second jejunal vessel (**C**). Close image of the microvascular anastomoses; the yellow and blue arrows indicate the venous and arterial anastomoses, respectively (**D**). CeV: cephalic vein; IT: internal thoracic

of superdrainage was completed using the CeV. Few publications have used the CeV as a substitute for an undeveloped IT vein in esophageal reconstruction. Miyamoto et al. reported three cases using the CeV as a superdrainage recipient vessel, after determining that the left IT vein was ineligible for microvascular anastomosis due to intraoperative findings in esophageal reconstruction; the pectoralis major muscle was used as external coverage of the reconstructed conduit.⁶⁾ On the other hand, previous studies have shown that the internal mammary vessels are unusable in about 2% of breast reconstructions.⁷⁾ Of course, the subjects examined in

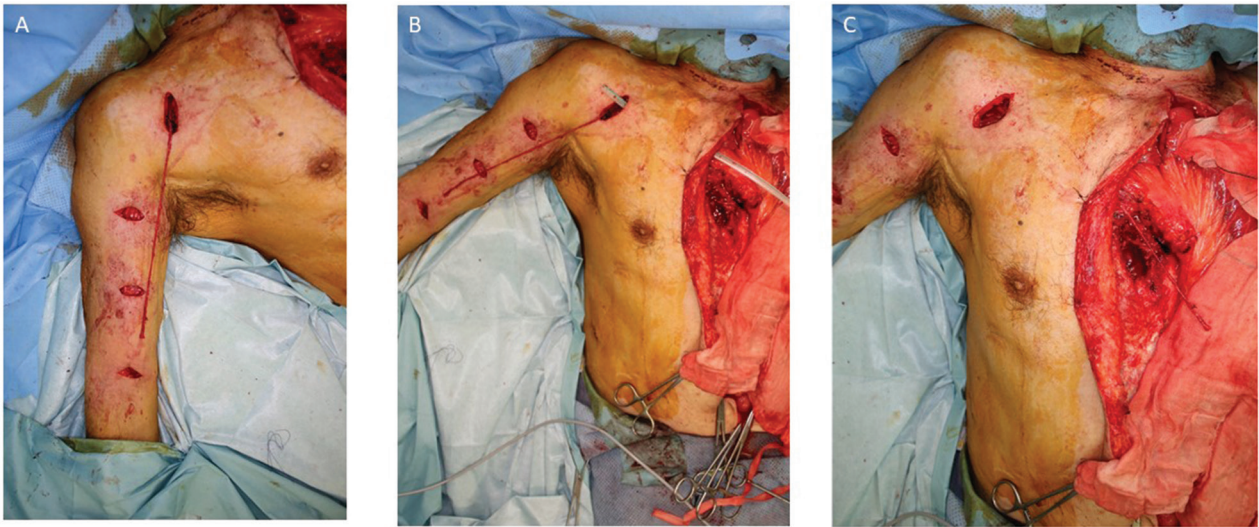


Fig. 2 Preparation of the right CeV as a recipient vessel for microvascular anastomosis. The right CeV that ran subcutaneously at the right elbow was dissected, peeled from the subcutaneous to the shoulder, and was collected as a graft (A). Then, it was guided subcutaneously to the fourth intercostal space for use as a recipient blood vessel (B and C). CeV: cephalic vein

these studies contained a large number of patients who were receiving radiation, and irradiation is known to cause poor recipient vascularization, especially in the venous system. Therefore, the unsuitable use of IT vessels for microvascular anastomosis in esophageal reconstruction appears to be less frequent than that in breast reconstruction. As we could not find any references regarding the frequency of absence or abnormality of IT vessels at esophageal reconstruction, it is unclear how many IT vessels are inappropriate for microvascular anastomosis in esophageal reconstruction. Moreover, we have no such experience beyond this patient. However, if there are rare cases of patients with IT vein absence or underdevelopment, it goes without saying that it is important to predict whether IT vessels are inappropriate prior to surgery. In our patient, preoperative computed tomography showed that the IT vein was somewhat thinner than healthy cases. (Fig. 3) Thus, preoperative contrast computed tomography is useful for evaluating the IT vein; especially, identifying cases of an absent IT vein is completely possible. Furthermore, it may be possible to predict an undeveloped IT vein to some extent by the observation of a poor contrast effect and a narrow vein diameter; however, it is difficult to predict such cases completely. If it is difficult to fully predict an undeveloped case of IT vessels before surgery, the determination that the IT vessels are inappropriate for microvascular anastomosis will be determined intraoperatively, by evaluating the blood vessel diameter macroscopically, at which point an alternative

blood vessel will inevitably be rapidly prepared. Therefore, it is necessary to fully understand the vein that can be used as an alternative blood vessel for the IT vein in advance. The CeV is a blood vessel with poor affinity for gastroenterologists, but due to superficial blood vessels, it is easy to both identify and collect sufficient length. The thoracoacromial vein is another candidate for a substitute blood vessel that has sufficient diameter near the thoracoacromial trunk; however, it is known to become gradually thinner as it branches.⁸⁾ On the other hand, since the CeV only has a few side branches, both long length and diameter are secured, and it is often used in ineligible IT vein cases in breast reconstruction.

In esophageal reconstruction using PJ, microvascular anastomosis is usually performed after esophagojejunostomy.⁹⁾ By performing the intestinal anastomosis first, microvascular anastomosis can be performed at a site where the positional relationship between the jejunal blood vessel and recipient blood vessel is good. Moreover, in order to prevent applied excessive external force to the microvascular anastomoses, other operations after the anastomosis should be completed as much as possible. This order of surgical procedures also supports that the CeV is important as an alternative blood vessel for an IT vein that is inappropriate for vascular anastomosis. In other words, it is often inevitable that the IT vein will be ineligible for the first procedure in circumstances where a blood vessel anastomosis must be performed at the third or fourth intercostal space. Naturally, it is troublesome to

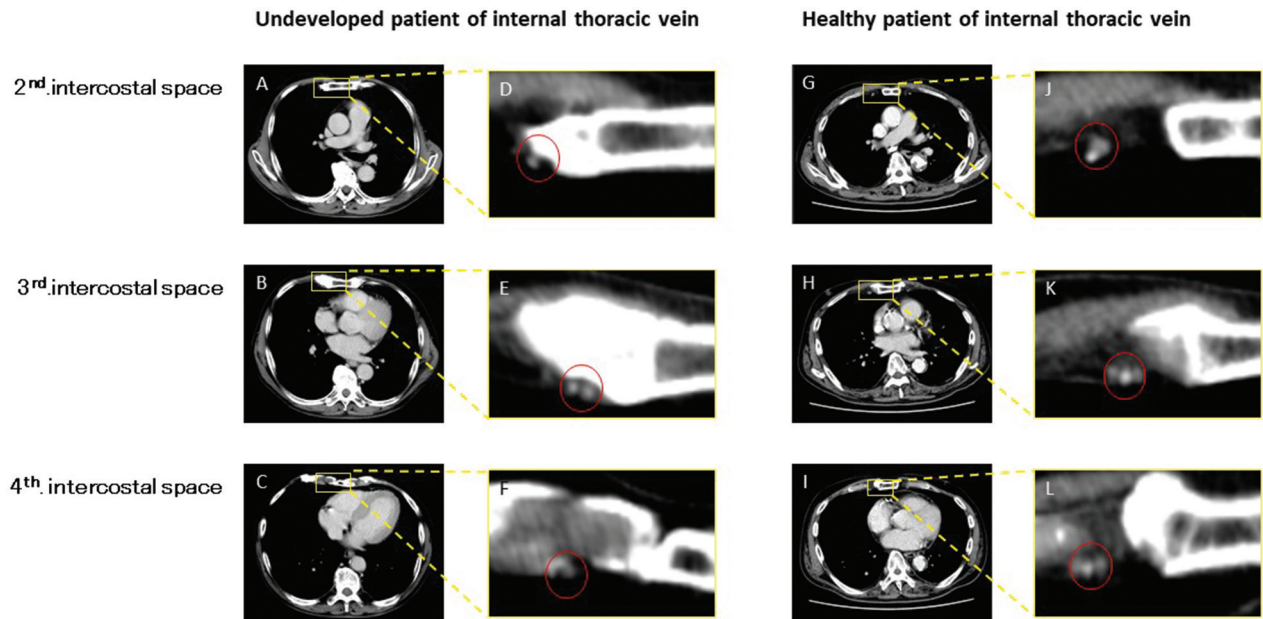


Fig. 3 Comparison of the visualization of the IT vein in preoperative computed tomography. Comparison of the visualization of the IT vein in the second, third, and fourth intercostal spaces between the undeveloped patient (A–F) and the healthy patient (G–L). Compared to the IT vein in the healthy patient, in the undeveloped patient, the IT vein was somewhat weakly depressed (D and F). However, even in cases with an undeveloped IT vein, visualization of the IT vein, which is located in the vicinity of the IT artery, can be easily confirmed with preoperative computed tomography (E). IT: internal thoracic

select blood vessels of the neck, such as the external or internal jugular vein, that travel a long distance as an alternative blood vessel. Therefore, the CeV is a promising alternative for a recipient blood vessel in cases for which a vascular anastomosis is required at a position away from the neck after a preceding intestinal anastomosis. Naturally, when the jejunal blood vessel to be used as a donor blood vessel is closer to the cervix, blood vessels of the neck, such as the external and internal jugular veins, seem to be preferred as substitutes for recipient blood vessels.

As a limitation for the selection of the CeV as a substitute blood vessel, there are cases in which the CeV length is insufficient due to the anastomotic site. In such cases, vein graft interposition may be useful, as shown in Uchiyama et al.¹⁰⁾

Conclusion

The CeV is very useful as an urgent substitute blood vessel when the IT vein is not available for microvascular anastomosis in esophageal reconstruction. Especially, in cases for which a vascular anastomosis is required at a position away from the neck after a preceding intestinal anastomosis.

Disclosure Statement

The authors disclose no conflict of interest or funding for present paper.

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