

Abstract

Purpose

The use of externalized jejunal monitoring flaps for jejunum transfers could be facilitative for the direct clinical assessment. Though this monitoring method would seemed to be highly reliable, we modified this method and used mesentery only as a monitor to make it easy to manage the monitor more.

Materials and Methods

Between 2013 and 2018, 43 patients underwent vascularized jejunum transfer for reconstruction of laryngopharyngectomy using the externalized mesentery monitor. There were 39 men and 4 women and patient ages ranged from 40 to 80 years, (average 66.6 years). The nursing staff monitored the externalized mesentery by using handheld Doppler ultrasonography every 2 hours for 7 days after surgery.

Results: 3 patients had rather weak signal of handheld Doppler ultrasonography on the externalized mesentery monitors during operation and could not be applied handled Doppler ultrasonography. Of the remaining 40 patients using the externalized mesentery monitor with handled Doppler ultrasonography, 39 had an uncomplicated postoperative period. In one patient, no signal of Doppler ultrasonography and lack of bleeding by pin prick from the monitor segment were noted in the immediate postoperative period and revision of the vascular

anastomosis was performed. Finally the graft was salvaged. There was no case of infection in the monitoring flap or hypertrophic scar at the part resected the flap.

Conclusions: Using the externalized mesentery monitoring flaps, clinical monitoring by examining the exteriorized monitoring flap is possible. And only mesentery monitors were managed easily than jejunum monitoring flaps.

INTRODUCTION

Vascularized jejunum transfer has become a widely used reconstruction method after total laryngopharyngectomy. The most serious problem is failure of the vascular anastomosis, resulting in graft necrosis. Although the vascular thrombosis is rare, most of these cases can be salvaged by timely revision. Therefore monitoring the viability of the graft is very important to detect vascular failure. Reliable monitoring is observing the graft tissue directly involves the tissue color, capillary refill, and bleeding after pin prick. Several authors have previously reported clinical observation of external jejunal monitoring for the simple, reliable and continuous monitoring of vascularized jejunum transfer¹⁻⁴. They reported the jejunal flap was divided into a major and a minor segment and the minor segment brought out through the neck incision was used as monitoring. Although, before 2013, we had applied the externalized jejunal monitoring for some cases, the monitoring flap had some disadvantages including infection and

troublesome of intestinal fluid. Therefore we modified this monitoring method. The intestinal tract was removed from the monitoring segment and only mesentery tissue was used for monitoring.

In this study, we report our experience of vascularized jejunum transfers with the externalized mesentery monitoring, and we evaluated the efficacy of this monitoring technique.

MATERIALS AND METHODS

Between 2013 and 2018, 43 patients underwent vascularized jejunum transfer for reconstruction of laryngopharyngectomy using the externalized mesentery monitor. Of 43 patients, 11 were applied deltopectoral flap for covering skin defect. There were 39 men and 4 women and patient ages ranged from 40 to 80 years, (average 66.6 years).

Surgical technique

A suitable length of jejunum with its mesentery supplied by a major branch of the superior mesenteric artery was first harvested, followed by an end-to-end anastomosis of the remaining bowel. The flap was always placed in an iso-peristaltic orientation in the neck. The jejunal graft was divided into two segments, keeping their common main mesenteric blood supply intact. In the minor segment, the intestinal tract was removed with the ligation of the blood vessels, while as much of the mesentery as possible was left (Fig. 1).

The transverse cervical artery and superior thyroid artery were the most common recipient

vessels for the arterial anastomoses, whereas for the recipient vein, we preferred the internal jugular vein. An end-to-side anastomosis was chosen according to vessel diameter.

The major segment was anastomosed so as to provide a conduit between the oropharynx and esophagus (Fig. 2A), whereas the part of remaining mesentery was brought out through the neck wound (Fig. 2B) or newly created incisional wound and sutured to the skin. A suitable length of the externalized mesentery was seemed to be about 2 cm. The externalized mesentery was covered by clear film dressing (Fig 2C). The externalized mesentery was used for monitoring flap viability by using handheld Doppler ultrasonography (Fig 2D).

The nursing staff monitored the externalized mesentery by clinical examination and using handheld Doppler ultrasonography every 2 hours after surgery. It was not necessary to usually change the film dressing because exudate from the monitoring was little (Fig 3A, B, C). The monitors were ligated and excised about 7days postoperatively after viability of the jejunal graft had been confirmed.

RESULTS

In 3 patients, there was rather weak signal of handheld Doppler ultrasonography on the externalized mesentery during operation. One was monitored by confirming bleeding from the externalized mesentery by pin prick. The remaining two patients, there was no bleeding at the externalized mesentery. Therefore, the two patients then underwent transcutaneous

Doppler ultrasound monitoring. Of the remaining 40 patients using the externalized mesentery monitor with Doppler ultrasonography, 39 had an uncomplicated postoperative period and could continue to be monitored the externalized mesentery by using handheld Doppler ultrasonography. The mesentery segments showed no infectious appearance. In one patient, no signal of Doppler ultrasonography and lack of bleeding by pin prick from the monitor segment were noted in the immediate postoperative period and revision of the vascular anastomosis was performed. Arterial thrombosis was presented, therefore thrombectomy and reanastomosis were performed. Finally the graft was salvaged.

There was no case of infection in the monitoring flap or hypertrophic scar at the part resected the flap (Fig 3D).

DISCUSSION

Vascularized jejunum transfers have been widely performed after total laryngopharyngectomy. Obstruction of the vascular anastomosis was the most undesirable complication. If detected early, revision of the vascular anastomosis can salvage the flap with no need for additional jejunum harvesting. However, buried free flaps success rate was significantly lower than externalized free flaps⁵. One of the reasons for the difference is that the patency of microvascular anastomosis is difficult to monitor of the buried flap.

Externalized free flap permits monitoring by clinical examination—considered the gold standard— and other non-invasive techniques such as external ultrasound Doppler and pulse oximetry.

To overcome the difficulty of monitoring for buried flap, several monitoring methods have been reported: such as ultrasound Doppler, implantable Doppler probes⁶, and direct visualization, including electronic fiber scope⁷, silastic window placed in the neck flap⁸, and externalizing some part of flap⁹

Although good accuracy has been reported with the implantable Doppler probe for free flap reconstruction¹⁰⁻¹³, its use in head and neck reconstruction may be limited because of the unfavorable geometry, difficult positioning, interference with other vessels, and easy displacement caused by neck movement or even coughing¹⁴. Moreover, false-positive rates have varied widely between studies¹⁵. False-positive cases lead to unnecessary surgical exploration⁶,¹⁶. Although recent reviews of implantable Doppler systems suggest they are effective, they caution that further study is required^{17, 18}.

Transcutaneous ultrasound Doppler has been used to assess free jejunum transfer because of simple and noninvasive. However, it is limited by the interference of other vessels in the neck. In this method, unrecognized flap loss could occur^{14, 16}.

The most reliable monitoring method is still clinical examination, which involves observing the tissue color and turgor, capillary refill, and bleeding after a pin prick. Direct visualization of a flap using a fiberoptic pharyngoscope is obviously invasive and is not accurate enough because the change of mucosal color caused by ischemia needs a long time after vascular obstruction¹⁹. Bradford et al.² and Deane et al.²⁰ described some late graft failures undetected by this method.

Direct visualization through a silastic window also has many shortcomings, including impairment of visualization because of accumulation of blood or serum between the window and the serosa and an inability to assess bleeding and peristalsis.

There are several articles reported the usefulness about the externalized monitoring method for buried free flaps¹⁻⁴. Katsaros et al.¹ described that after the revascularized jejunal flap was divided into a major and a minor segment, the former was used for the reconstruction and the latter was exteriorized as a monitor satellite. This method was simple and reliable, allows direct visualization of the free jejunal autograft and is without additional morbidity⁴. We had applied this method for some cases before 2013. However, the clinical assessment of using the externalized satellite jejunal monitoring flap seemed to have some disadvantages. After a few days, a fibrinous peritonitis covers the minor segment, which makes color evaluation or the presence of peristalsis difficult to interpret unless it is peeled off²¹. Moreover, intestinal juice

was troublesome and exposed jejunum was seemed unfavorable appearance for patients.

Therefore, we modified this monitoring method. Intestinal duct was removed from the monitoring segment and only mesentery tissue was used for monitoring. In our cases, there were few exudates from the monitoring and no infection which came to have difficult evaluation of graft viability. Moreover, there were not both false-positive and false-negative cases. In 3 patients, there was rather weak signal of handheld Doppler ultrasonography on the exteriorized mesentery during the operations. We speculated the reason was the sizes of monitoring segments were so small. We recommended the size of the monitoring was about 2cm and the visible pulsed artery and vein should be included in the mesentery segment using as a monitor.

Accordingly, it is believed that this externalized mesentery monitoring is the good technique because it is simple and reliable and inexpensive.

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FIGURE LEGEND

Figure 1 A diagram of the free jejunum graft demonstrating the reconstructive segment on the left and the monitored segment on the right. Both segments are supplied by the same segmental jejunal artery.

Figure2A Photograph of the jejunum being into reconstructive and monitoring segments (*above, left*).

Figure2B Immediate postoperative image showing the exteriorized mesentery for monitoring (*above, right*).

Figure2C The externalized mesentery was covered by clear film dressing. (*below, left*)

Figure2D Monitoring flap viability by using handheld Doppler ultrasonography (*below, right*).

Figure3A Immediate postoperative image showing the exteriorized mesentery for monitoring (*above, left*).

Figure3B Appearance of externalized monitoring next day after operation (*above, right*).

Figure3C Appearance of externalized monitoring 4 days after operation (*below, left*).

Figure3D Appearance of the neck scar 2 months after resection of the monitoring (*below, right*).

Figure 1

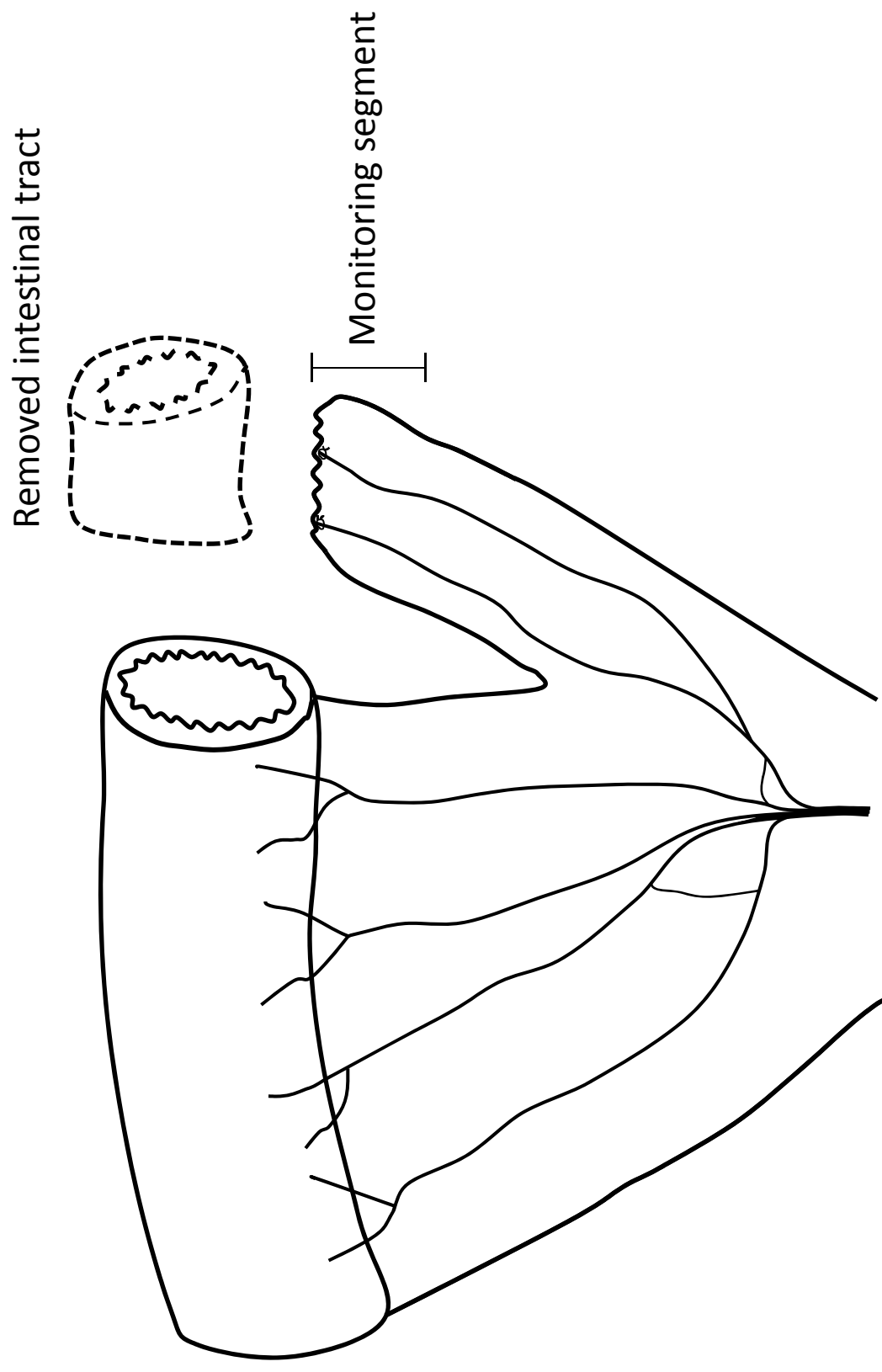


Figure 2

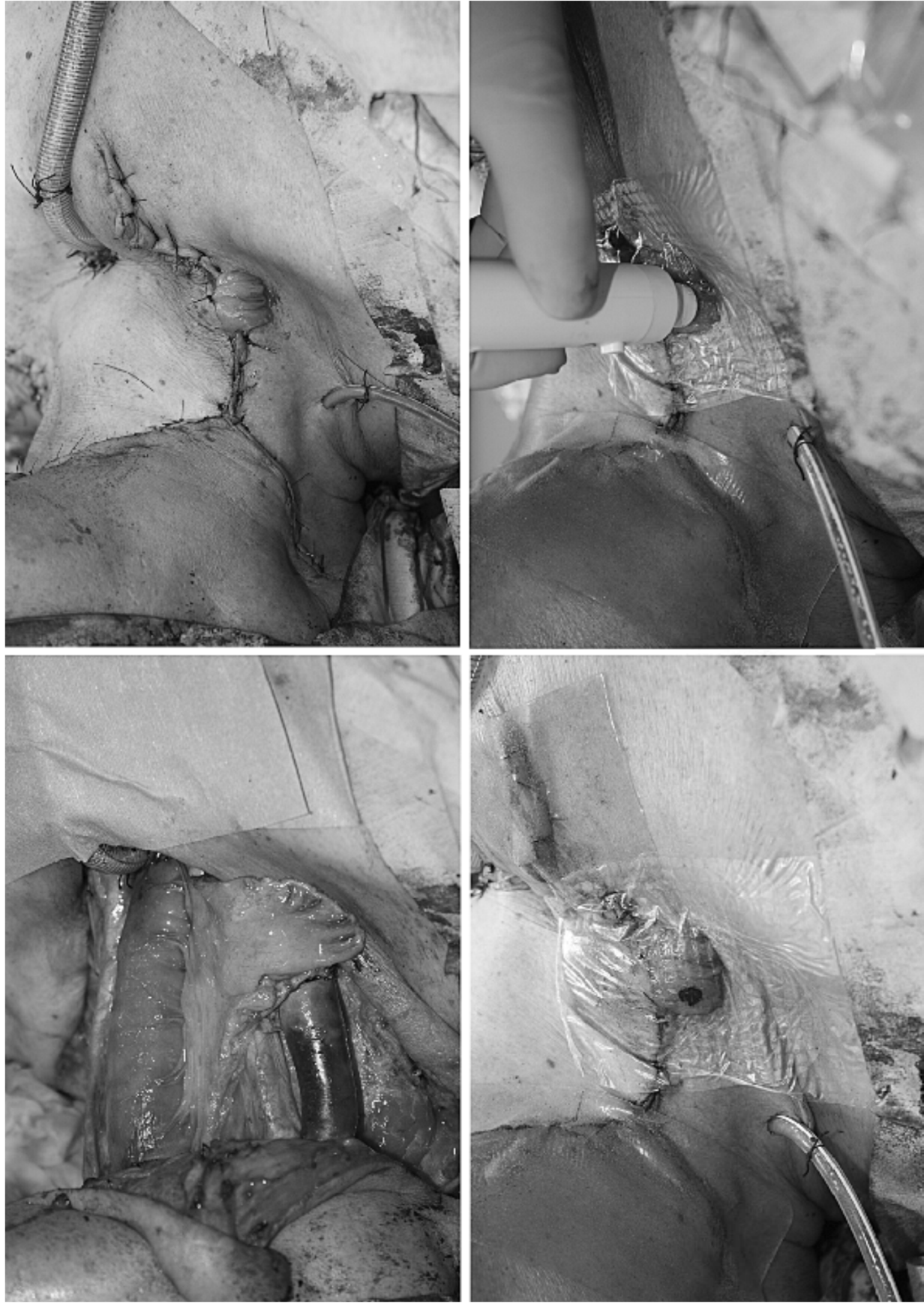


Figure 3

