

Repair using the pectoralis major muscle flap for anastomotic leakage after esophageal reconstruction via the subcutaneous route

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Background. Anastomotic leakage with an intractable cutaneous fistula frequently develops after an esophagectomy and reconstruction via the subcutaneous route.

Methods. A pectoralis major muscle (PMM) flap was used for the treatment of 6 patients with esophageal cancer who developed anastomotic leakage with fistula after reconstruction via the subcutaneous route. A gastric tube and colon had been used for reconstruction in 2 and 4 patients, respectively. A trimming and repair of the leakage site was initially performed and the anastomotic site was then covered with a muscle flap.

Results. Recurrent anastomotic leakage did not develop in 5 patients. Among these patients, oral intake was initiated from 11–15 days after the repair operation in 4 patients. A patient having recurrent anastomotic leakage after a repair operation recovered well with conservative therapy.

Conclusion. The coverage with a PMM flap over the repair site is a simple method for preventing the development of recurrent leakage after a repair operation. Even when recurrent anastomotic leakage has occurred after this operation, healing is normally expected by means of conservative treatment. We, therefore, recommend this method for the repair of intractable anastomotic leakage after reconstruction via the subcutaneous route for esophageal cancer. (*Surgery* 2010;147:212-8.)

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ANASTOMOTIC LEAKAGE is one of the most troublesome postoperative complications after esophageal reconstruction. It not only results in a prolonged hospital stay, but it also occasionally results in life-threatening infectious complications, such as pyothorax and mediastinitis. The factors associated with the development of this complication include the route, as well as the organ, used for reconstruction. The incidence of leakage is more frequent in cervical anastomoses performed through the subcutaneous (antesternal) route or the retrosternal

route than the intrathoracic route.^{1,2} In Western countries, the subcutaneous route is rarely selected owing to its cosmetic disadvantages.³ In Japan, 12.8% of patients were reconstructed via the subcutaneous route.⁴ The subcutaneous route of reconstruction has been indicated, especially for high-risk operations, such as salvage surgery after definitive chemoradiotherapy,^{5,6} colon interposition,^{7,8} and for patients with either severe diabetes or liver dysfunction,^{9,10} because it is considered to be the available safest method, with few serious complications occurring even after leakage.¹¹ We have frequently selected this reconstruction route for high-risk patients and reported low mortality (hospital mortality, 2.4%; 30-days mortality, 0% in 371 cases over the past 13 years) after esophagectomy.¹⁰ However, the occurrence of leakage after reconstruction through the subcutaneous route readily develops into an intractable esophagocutaneous fistula. Once a fistula develops, it rarely heals with conservative treatment, and a repair operation is usually required. Even after direct repair of the anastomotic

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leakage, recurrent esophagocutaneous fistula frequently develops.

The pectoralis major muscle (PMM) flap is a well-established technique for head and neck reconstruction, being a well-vascularized tissue that is easily mobilized.¹²⁻¹⁵ It is also used for protection of threatened great vessels from wound breakdown owing to fistula and infection.¹⁴ Heit-miller et al¹⁶ applied the pectoralis myocutaneous flap in the management of cervical esophageal anastomotic leakage. We have performed a simple method utilizing the PMM flap to cover the anastomotic repair in 6 patients with anastomotic leakage after esophageal reconstruction through the subcutaneous route.

PATIENTS AND METHODS

Patients. From 2005 to 2007, 108 patients with esophageal cancer underwent an esophagectomy by a right transthoracic approach and reconstruction at the Department of Surgery and Science (Department of Surgery II), Kyushu University Hospital. We selected the subcutaneous (antesternal) route for reconstruction in 22 of these patients. Indications for the subcutaneous route included patients in whom an anastomotic leakage may occur with a high incidence, such as salvage surgery after definitive chemoradiotherapy, colon interposition, and patients with liver cirrhosis or severe diabetes. The right hemicolon was used for colon interposition for either patients who underwent a gastrectomy or patients with synchronous gastric cancer. Furthermore, we have usually performed colon interposition via the subcutaneous route with additional microvascular anastomosis to preserve the blood flow of the anastomotic site because the occurrence of colon necrosis is considered to be fatal when the mediastinal route is used. In reconstruction via the subcutaneous route, the anastomotic site is in the subcutaneous area around the clavicular level and is located more superficial than the sternocleidomastoid muscle and sternohyoid muscle. One or 2 closed-type drains were inserted into the subcutaneous area near the anastomotic site.

Anastomotic leakage was diagnosed by either esophagography, a dye test, or saliva discharge. Anastomotic leakage was recognized in 7 patients who underwent subcutaneous reconstruction. Leakage was spontaneously healed by 3 weeks after esophagectomy in 1 patient, who was treated by irrigation through a drainage tube. Based on our experience, the anastomotic leakage, which shows only minimal signs of healing at 1 month after reconstruction via the subcutaneous route

normally takes a long time to heal. Therefore, the primary indication for performing a repair operation was defined as the presence of a situation where sufficient healing of the esophagocutaneous fistula was not evident, ≥ 1 month after the operation. In 4 patients, the cervical wound just above anastomosis spontaneously opened, and an incision to skin was made for the treatment of a subcutaneous abscess in 2 patients. For these 6 patients, repair using the PMM flap was therefore indicated without trying to perform a simple closure because a simple closure alone frequently results in the recurrence of leakage.

Method of repair with PMM flap. The repair operation was performed under general anesthesia. The first step of this operation is a repair of the leakage. The eroded and inflamed skin around the cutaneous fistula is removed and the anastomotic site is exposed. After the subcutaneous tunnel is opened, the adhesions around the esophagus, as well as the organ used for reconstruction, are removed and mobilized to avoid increasing the tension on the anastomotic site. After debridement of the esophagus and the reconstructed organ around the site of the leakage, repair of the anastomosis is performed with interrupted suture in 2-layer fashion with 4-0 synthetic absorbable suture (PDS II; Ethicon Inc., Somerville, NJ) (Fig 1, A).

The second step is the creation of the PMM flap. Whether the left or the right PMM is used for the PMM flap depends on the location of the esophagocutaneous fistula. An oblique incision is made on the anterior chest wall. An additional cutaneous flap is then created when the defect of the skin around the fistula is too large to be covered with the surrounding skin (Fig 2, A). After dissection of the anterior site of the PMM, the posterior site is dissected, with attention to the pectoral branch of the thoracoacromial artery, which is exposed on the posterior wall of the PMM. While preserving the thoracoacromial artery and vein, the PMM flap is made, 4 cm wide, using an ultrasonically vibrating scalpel (Harmonic Scalpel, Ethicon Endo-Surgery, Cincinnati, OH; Fig 2, B). The muscle is denervated in this process. A subcutaneous tunnel is created over the clavicle, connecting the chest and neck wounds. The tunnel must be wide enough to allow passage of the flap in to the neck without vascular compromise. The muscle flap is mobilized to the cervical site and the anastomotic site is covered with the muscle flap (Fig 1, B and Fig 2, C). The flap is sutured to the cervical esophagus as well as to the reconstructed conduit to fix it to the anastomotic site; however,

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