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# Reconstruction of the Lower Abdominal Region Using Bilateral Pedicled Anterolateral Thigh Flaps Combined With Poly-Surgical Mesh

## A Case Report

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**Abstract:** The en-bloc resection of neoplasms on the abdominal wall often causes extensive defects that are difficult to manage. The anterolateral thigh (ALT) flap is a widely used flap in reconstructive surgery of defects. In this article, we present a case using bilateral pedicle anterolateral thigh flaps combined with a surgical polymesh to repair a large defect (22 cm × 18 cm) caused by dissection of a recurrent fibromatosis with good functional and aesthetic effects. There were no obvious morbidities or complications during a 6-month follow-up period.

We conclude that the bilateral pedicle anterolateral thigh flap is a good choice for reconstruction of large lower abdominal wall defects. It can afford sufficient soft tissue coverage without obvious donor site morbidity.

(*Medicine* 94(52):e2375)

**Abbreviations:** ALT = anterolateral thigh, TFL = tensor fascia late.

## INTRODUCTION

Extensive abdominal wall defects are often caused by tumors, infections, and trauma and present a major challenge for general surgeons, including plastic surgeons. Extensive local resection is inevitable, particularly when there is a malignant neoplasm of the abdominal wall. Reconstruction of the abdominal wall is necessary to achieve adequate soft tissue coverage and restoration of muscolofascial support for the abdominal contents; many types of methods and materials to do so have been reported in different papers. Techniques such as component separation, artificial polymesh, and local flaps are

normally used in surgery. Regardless of the method used, surgeons have to balance donor site morbidity with function of the reconstructed abdominal wall.

To achieve adequate soft tissue coverage, many local or distant flaps are used, such as external abdominal oblique muscle flaps, groin flaps, Tensor fascia late myocutaneous, latissimus dorsi flaps, and anterolateral thigh flaps. Among those flaps, the pedicle anterolateral thigh flap has been reported as the optimal choice for lower abdominal wall reconstruction.<sup>1-3</sup>

The anterolateral thigh flap (ALT) was first described by Song et al in 1984.<sup>4</sup> Because of the reliable blood supply, easy dissection, and low incidence of donor site morbidity, this flap has been widely used in reconstruction of defects throughout the body. Its use as a pedicle flap was first reported by Koshima et al in 1986.<sup>5</sup> As a local flap, the pedicle ALT flap has been used to cover defects of the groin, perineum, and the anus, and it can reach the contralateral inguinal area, even extending into the contralateral lower abdomen.<sup>2</sup>

Although many cases of lower abdominal wall reconstruction using a single pedicle ALT flap have been reported, there are few reports about abdominal reconstruction using bilateral pedicle ALT flaps. We report a case in which the bilateral pedicle ALT flap combined with a surgical polymesh reconstructed a full-thickness defect of the abdomen.

## MATERIAL AND METHODS

### Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

### Case Report

A 37-year-old male patient presented with a recurrent fibroma on his lower abdomen that had been present for 1 year. He had received an abdomen tumor resection and right colon ileal resection in September 2010. Pathological results after the operation confirmed fibromatosis, and some areas of the tumor in his abdomen muscle showed an infiltrative growth property. In May 2013, he underwent a second operation because of tumor recurrence in the abdominal wall. Before the second mass dissection and abdominal reconstruction operation, he also received cryosurgery twice with poor effects. During the follow-up period after the second operation, the tumor reappeared again in March 2014. It manifested as multiple painless masses, growing quickly and merged. The patient wanted to stop treatment until the lump in his abdomen grew into 1 extremely large mass.

Editor: Huaizhi Wang.

Received: November 8, 2015; revised: November 27, 2015; accepted: November 29, 2015.

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Funding: this study was supported by the grants from Science and Technology Foundation of Hunan province in China. (2013TP4087).

The authors have no conflicts of interest to disclose.

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ISSN: 0025-7974

DOI: 10.1097/MD.0000000000002375

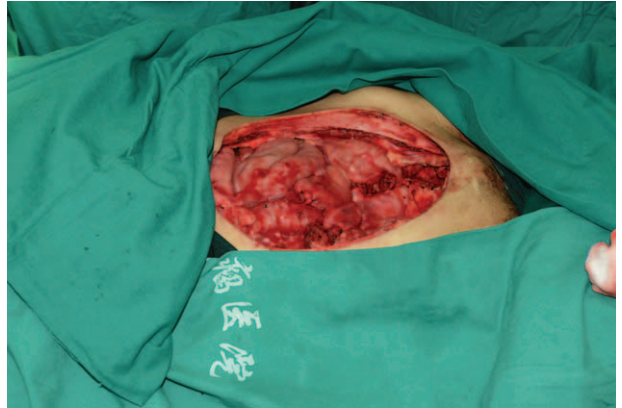


**FIGURE 1.** A large recurrent tumor involving the lower abdominal wall.

This patient has no family history of fibromatosis and is nonsmoking and without hypertension, diabetes, or other basic diseases. The lesion was located in the lower abdominal wall extending up from the umbilicus to the pubis, from the right to left anterior axillary lines. The abdominal wall muscles were uncontrollably involved; we touched a merged solid mass under the skin in large regions when doing physical examination (Fig. 1). The lesion measured 18 cm × 16 cm. Computed tomography demonstrated that the tumor had infiltrated from the muscle layer to the parietal peritoneum; part of the jejunal mucosa were tightly adhered to the tumor without clear boundaries (Fig. 2). Therefore, the patient received enteroscopy before surgery. Although the result showed no infiltration of the enteric cavity, bowel preparation had been implemented before operation.

**Surgical Details**

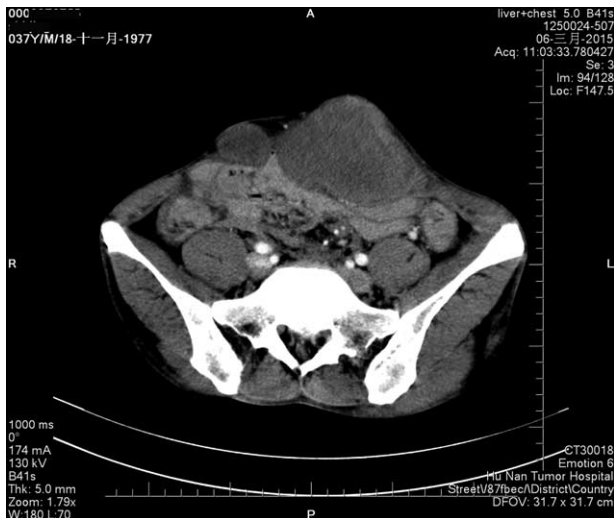
The resection of the tumor was performed by general surgeons. We extended the margins of the lesion by 1 cm to



**FIGURE 3.** Defect of the abdominal wall post-tumor en-bloc resection.

achieve negative pathological incisional margins. The full thickness of the abdominal wall was dissected during the operation. We found 2 sites of adhesions between the jejunal mucosa and the tumor. Part of the serous membrane of the jejunum was then removed and all of the incisions were repaired. Frozen-section examination confirmed a negative incisional margin. After that, a full-thickness defect that measured 22 cm × 18 cm remained in the lower region of the abdominal wall (Fig. 3). A surgical mesh (PROCEED® Ethicon) was tailored to the proper size and sutured tightly to the residual lateral fascial margins to enhance the strength of the abdominal wall (Fig. 4).

The pedicle ALT flaps were raised simultaneously by plastic surgeons in the conventional manner. We designed the same ALT musculocutaneous flap measuring 20 cm × 8 cm in both sides of the leg (Fig. 5). Parts of the femoral anterolateral muscles remained on the flap to fill the soft tissue defects of the abdomen. The motor nerves of the vastus lateralis were also separated and retained in the flap to avoid long-term muscle atrophy. The pedicles were dissected to the level of the origin of the lateral femoral circumflex artery. A tunnel beneath the rectus femoris through the inguinal region to the defect of abdomen was prepared, and the pedicle flaps were rotated 180° through the tunnel to reach the abdomen defect (Fig. 6). Two



**FIGURE 2.** CT scan showing the tumor infiltrate the full thickness of the abdominal wall with compression of the intestinal canal. CT=computed tomography.



**FIGURE 4.** Surgical poly mesh (PROCEED® Ethicon) was sutured to the residual lateral fascial margins to strengthen the abdominal wall.



**FIGURE 5.** The pedicle anterolateral thigh flap was dissected on the left leg.

pedicle ALT flaps were sutured together to fill the abdomen defect. One abdominal drain tube, and several subflap drain tubes were set. The resulting thigh defects were sutured directly without tension in both sides.

**Postsurgery**

The patient was kept at a bent-knee and bent-hip position in bed to reduce the tension of the pedicles, fasted until postoperative passage of gas, and provided sufficient parenteral nutrition. Antibiotics were applied for 5 days to prevent infection. Drain tubes were removed on the 7th day after the operation, wounds healed without complications, and he was discharged on the 13th day postoperation. The patient has been followed up with every 2 months until now, for half of a year, without any sign of recurrence or abdominal hernia (Fig. 7).

**DISCUSSION**

The abdominal wall is composed of several layers, including the skin, subcutaneous fat, muscles, fascia, and parietal peritoneum. The en-bloc resection of a neoplasm on the abdominal wall often causes full-thickness defects. To treat these defects, we have to solve at least 2 problems: sufficient coverage and adequate strength. According to the depth and the



**FIGURE 6.** The pedicle ALT flap was rotated onto the defect area of the abdominal wall on the right side. ALT = anterolateral thigh.



**FIGURE 7.** Postoperative view at the 6th month follow-up.

scale of the defects, different methods have been applied. Tang et al have categorized abdominal wall defects into 3 types.<sup>6</sup> Defects involving only the loss of skin and subcutaneous tissue after resection with no infiltration of the tumor into the myofascial layer are defined as type I; most of these defects can be sutured primarily. Type II defects involve myofascial layers with intact skin coverage; these defects generally need surgical mesh or autologous flap repairing. Type III defects are defined as myofascial defects without skin coverage after tumor resection; these defects often need an autologous flap combined with synthetic mesh to be repaired.

Various options of autologous flaps can be used in the reconstruction of type II and type III defects. For example, the tensor fascia lata (TFL) flap has an excellent arc of rotation and is often used to cover the lower defect of the abdomen. Although this flap has less donor site morbidity, some authors have reported the unreliability of the blood supply in distance of the flap if raised without delay.<sup>7-9</sup> As the TFL flap has a strong fascial layer that can strengthen the abdominal wall, it is most suitable for situations when prosthetic mesh cannot be used, such as with contaminated wounds or infectious defects. The main disadvantage of this flap is the poor distant blood supply; it cannot be extended too much. Dorai et al solved this problem by performing a second microvascular anastomosis at the distal end of the flap.<sup>10</sup>

The latissimus dorsi flap can also provide sufficient soft tissue coverage for extensive defects of the abdomen. However, most of the time it is used as a free flap, demanding good blood vessel conditions in the recipient and skilled microvascular techniques.<sup>11</sup> We did not choose it in our case because we found that the patient's inferior epigastric artery may have been invaded by the tumor. Furthermore, it requires treatment of the large resulting defect on the back by full-thickness skin grafting as well as frequent changing of the operative position during operation to prevent increases in the risk of infection.

The anterior thigh fasciocutaneous flap was considered to be the best choice for the abdominal wall reconstruction.<sup>12</sup> The vascular pedicle of the ALT flap is only 1 cm below the inguinal ligament, which is superior to the TFL flap. It provides more freedom, has good rotation, and as a pedicle flap, it can reach the upper region of the abdomen. Most of the time, the ALT flap is used as a single pedicle flap; with a reliable blood supply, it can be extended to be the large one.<sup>13</sup> However, the donor site morbidity needs to be taken into consideration, as a large flap means a large resulting defect that would have to be treated with



a full-thickness skin graft using an additional donor site. Furthermore, the rotation tunnel under the inguinal region would also have to be expanded to fit the large flap. We solved this problem by designing 2 pedicle ALT flaps. Although it would increase the operating time, the resulting defects could be sutured primarily in both sides so that after the operation, only 2 symmetrical linear scars would remain. We thought this would achieve a better aesthetic result than 1 large ALT flap. The use of bilateral anterolateral thigh flaps has been reported in the past, but not for abdominal wall reconstruction.<sup>12</sup>

Most surgeons suggest separating and conserving the motor nerve of the vastus lateralis muscle, but we kept it in the pedicle and rotated it to the abdomen with part of the vastus lateralis muscle. We did this because the muscle can fill the volume deficiency and strengthen the abdominal wall, and keeping the motor nerve in the flap can prevent long-term denervation muscle atrophy.

Donor site morbidity of the ALT flaps includes transient limb weakness, but most patients regain normal mobility and level of activity within 6 months and other quadriceps muscles compensate for the function if the vastus lateralis muscle has been removed during the operation.<sup>14</sup> Our patient left the hospital without obvious limb weakness.

### CONCLUSION

The pedicle ALT flap is a good choice for lower abdominal wall reconstruction; the bilateral anterolateral thigh flap can afford sufficient soft tissue coverage without obvious donor site morbidity. Combined with a surgical polymesh, it offers enough strength and achieves normal function, and furthermore, provides a good aesthetic effect.

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