CASE SERIES

Three Abdominal Defects, Three Pedicled Flaps

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Abstract: The reconstruction of complex defects in the abdominal wall after wound infection or trauma can be challenging. In this article, a superficial inferior epigastric artery flap, a tensor fascia lata flap, and an anterolateral thigh flap used for 3 different abdominal wall reconstructions are described. The authors conclude that different specific abdominal wall defects can be successfully reconstructed using different pedicled flaps in simple and effective single-stage reconstructions.

Key words: abdominal wall defect, anterolateral thigh flap, superficial inferior epigastric artery flap, tensor fascia lata flap

Complex acquired abdominal wall defects may result from trauma, tumor resection, or infection. The management of these defects presents a significant challenge, and different options have been proposed for the reconstruction of defects of varying sizes. The authors report 3 cases. In the first, a moderate abdominal wall defect without peritoneal involvement that was successfully reconstructed with a pedicled superficial inferior epigastric artery (SIEA) flap. In the second case, involving a large defect in the abdominal wall and peritoneum, the wound was covered with a pedicled tensor fascia lata (TFL) flap. In the third case, involving a lower-abdominal wall defect with a ruptured bladder, the bladder defect was covered with a portion of muscle and the wound was reconstructed with an anterolateral thigh (ALT) flap. This study suggests that different abdominal wall defects can be reconstructed with different types of pedicled flaps, depending on the size, position, and missing tissue of the defect.

Case reports

Case 1. A 70-year-old woman had previously undergone a colectomy with a colostomy for advanced colon cancer in the Division of Colon and Rectal Surgery, Tri-Service General Hospital, Taipei, Taiwan, Republic of China. She underwent several rounds of debridement because of wound infection, leaving an abdominal wall defect of 5 × 8 cm², but the peritoneum was intact. An intraoperative Doppler examination showed the origin of the SIEA arising from the common femoral artery just below the inguinal ligament (Figure 1A). The SIEA flap dissection was commenced from below, and once
the pedicle was identified, the dissection proceeded forward and upward. After the skin incision, the dissection was extended to the external oblique fascia. The SIEA flap was elevated and positioned to cover the abdominal wall through a tunnel that had been constructed (Figure 1B). The donor site was closed primarily. Two weeks later, the wound had healed without infection or dehiscence (Figure 1C).

**Case 2.** A 75-year-old man had previously undergone an exploratory laparotomy for a perforated peptic ulcer. The wound was diagnosed with infection 8 days later, and after a series of debridements, the abdominal wall defect measured 13 cm² × 17 cm², with peritoneal involvement (Figure 2A). The flap design was marked along the TFL muscle and the iliotibial tract during active leg raising, with the knee extended while the patient was lying in a supine position. A vascular pedicle was observed at a site approximately 7 cm more caudal than the middle line of the anterior superior iliac spine and the greater trochanter. Therefore, the size of the flap was expected to be 13 cm² × 17 cm². The dissection of the flap began with a circumferential incision down to the deep fascia, followed by the division of the iliotibial tract distally and the elevation of the fascia lata from the underlying muscles, progressing proximally. The vascular pedicle was identified on the deep surface of the tensor muscle and traced medially as it passed deeply through the rectus femoris. The dissection stopped at the lateral circumflex femoral artery proper. The flap was raised and rotated into position on its pedicle (Figure 2B). When the wound was sutured, the fascia–fascia suturing was performed with absorbable suture (3-0 Vicryl, Johnson & Johnson, New Brunswick, NJ), and skin–skin suturing was performed with 4-0 nylon, using a tension-free technique. After 3 weeks, the wound had healed without infection or dehiscence (Figure 2C).

**Case 3.** A 20-year-old man sustained traumatic orthopedic injuries to his pelvis and bladder rupture in a scooter accident. The pelvic fracture was initially stabilized by an orthopedic team and the patient underwent a suprapubic cystostomy, together with multiple subsequent debridements of the open lower-abdominal...
wound (Figure 3A). Following its complete debridement, the defect was approximately $13 \text{ cm}^2 \times 13 \text{ cm}^2$ at its greatest dimensions. A flap of these dimensions was then outlined over the right ALT region, centered over a line drawn connecting the anterior superior iliac spine to the superior lateral patella (Figure 3B). The dissection was performed through the subcutaneous tissue down to the fascia lata, where it then proceeded laterally until the musculocutaneous perforators were visible. The perforators were then dissected through the muscle in a retrograde manner to the descending branch of the lateral circumflex artery, up to its insertion at the profunda vessels, defining the point of rotation. To fill the dead space above the ruptured bladder, a portion of the vastus lateralis was included. The lateral portion of the skin flap was dissected in a similar manner. To allow the proper placement of the flap into the lower abdominal defect, the dissection was continued along the medial side of the rectus femoris muscle. This was performed in a manner that prevented any kinking of the pedicle to the ALT flap. The dead space above the bladder and around the suprapubic cystostomy tube was filled with...
a portion of the muscle, and the flap was then set into the lower-abdominal defect without tension (Figure 3C). Three weeks later, the wound had healed without infection or dehiscence.

Discussion
An algorithm for abdominal wall reconstruction following the severe loss of domain has been reported.3 Such complex closures can be fraught with problems and difficulties, such as wound infection, hernia recurrence, and bowel adhesions, and further complicated by obstruction or enterocutaneous fistulas.4–6

Wood7 first described the SIEA flap, which spares both muscle and fascia, in 1863, as an axial pattern flap that he used to reconstruct a forearm defect. In 1975, Taylor and Daniel8 studied the anatomy of the SIEA in 100 cadaveric dissections. The SIEA was absent (or at least could not be identified) in 35 cadavers. In 1984, Hester et al9 reported their experience with 14 pedicled and 16 free SIEA flaps. By raising the SIEA pedicled flaps, those authors were able to dissect from a distal point toward the base, without always bothering to identify the actual pedicle.

The pedicled SIEA flap is usually used for breast and limb reconstruction. In the first case in the current study, the abdominal wall defect was only 5 cm² × 8 cm² and the peritoneum was not involved. The authors chose an SIEA flap to reconstruct the cutaneous defect in the abdominal wall because the pedicle was confirmed by Doppler imaging. The flap was easy to raise and the donor site could be closed primarily. The fresh flap was used to close the wound without tension, instead of closing the abdominal wall directly, because of the scarring around the wound.

The pedicled TFL flap was first described by Nahai et al10 in 1934 as a pedicled rotation flap. It is well suited to abdominal repair because it provides both a semirigid fascial layer and adequate skin cover. In the second case in the current study, the abdominal wall defect was large (13 cm² × 17 cm²) and the peritoneum was also involved. The authors chose a pedicled TFL flap to allow fascia–fascia and skin–skin suturing.

The ALT flap has been widely used for soft tissue reconstruction since its first description by Song et al11 in 1984. Supplied by either septocutaneous or musculocutaneous perforators from the descending or transverse branch of the lateral circumflex artery, the ALT free flap has achieved widespread popularity for the reconstruction of various regions throughout the body. The pedicled ALT flap is described less often because of its limitations outside locoregional areas. Tzeng et al12 described using a pedicled ALT flap for trochanteric pressure ulcer reconstruction, but there have been few reports describing the use of the pedi-
icled ALT flap in the lower abdomen.\textsuperscript{13,14} In the third case in the current study, the lower-abdominal defect was large (13 cm$^2 \times 13$ cm$^2$) and the patient also had a ruptured bladder with a cystostomy. The authors selected a pedicled ALT myocutaneous flap, and used the muscle portion to fill the dead space above the ruptured bladder and fixed it around the cystostomy tube, and used the cutaneous portion to cover the lower-abdominal wound.

**Conclusion**

The reconstruction of abdominal wall defects is complicated. No single flap is appropriate for every abdominal wall reconstruction. Before choosing a reconstructive method, the size, position, and missing tissue of the defect should be evaluated carefully. In the current study, the authors treated 3 different abdominal wall defects. In the first case, the defect was small and only cutaneous, so wound coverage could be achieved with a pedicled SIEA flap. In the second case, the defect was larger and there was also a peritoneal defect, so the wound required a pedicled TFL flap to achieve fascia–fascia and skin–skin coverage. In the third case, the defect was larger still and also involved a ruptured bladder, so the reconstruction was completed with a pedicled ALT myocutaneous flap. With the correct preoperative evaluation, these 3 pedicled flaps can be used to correct different abdominal wall defects.

**References**

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