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Full Thickness Abdominal Wall Reconstruction Following Excision of a Large Abdominal Serous Borderline Tumor Using a Pedicled Anterolateral Thigh Flap Combined with Composite Mesh: A Case Report

Rowena Sudario-Lumague MD, FPCS, FPAPRAS and Lourna Leah Velasco-Victorio MD, FPCS, FPAPRAS

Complex abdominal wall reconstruction after surgery is crucial to preserve form and function. This paper describes the management of a 42-year-old female with a large abdominal wall mass (28cm x 20cm). Wide excision was done with a resulting full thickness abdominal wall defect (24cm x 20cm). Abdominal wall reconstruction was then performed using composite mesh and a pedicled anterolateral thigh flap with a single perforator. Postoperatively, no flap compromise was observed, and hospital course was unremarkable. Final pathology report revealed serous borderline tumor of the peritoneum which is a rare type of tumor. Proper patient selection and planning combined with perforator flap dissection techniques are important, and the use of a pedicled anterolateral thigh flap with composite mesh is reliable for abdominal wall reconstruction.

Key words: sarcoma, abdominal reconstruction, anterolateral thigh flap

Abdominal wall masses ranging from benign to malignant etiology require prompt diagnosis since management varies widely. After adequate imaging and histopathologic diagnosis, it is the role of the surgeon to decide whether an aggressive surgical approach is necessary. In patients who present with large abdominal wall masses, excision with appropriate margins may result in extensive full-thickness defects involving the skin, muscle, and fascial layers, thereby exposing the intra-abdominal contents.

Several reconstructive options are available depending on the size, location and depth of the defect. Free tissue transfers are ideal to use in large full thickness abdominal wall defects because they can provide adequate coverage. However, this approach may require prolonged operative times because of the multiple steps involved and may be limited by the availability of recipient vessels in the abdomen.[1]

Another option is the use of local muscle or fasciocutaneous flaps, although its applicability may be limited due by the arc of rotation or size of their vascular territories. Pedicled muscle and fasciocutaneous flaps used for abdominal wall reconstruction include the rectus abdominis muscle flap, as well as flaps harvested from the thigh, such as the tensor fasciae lata (TFL) and anterolateral thigh (ALT) flaps.

This case report describes the use of a pedicled ALT flap and composite mesh for a large abdominal wall defect following abdominal wall mass excision in a tertiary hospital in the Philippines. Several authors have already described the use of a large pedicled ALT flap for lower abdominal reconstruction.[2,3,4,5,6] But the skin dimension of the ALT flap used in this case is among the largest reported based on a single septocutaneous perforator reported.

The Case

A female patient in her forties presented to our outpatient unit with a 10-year history of a gradually enlarging right lower quadrant abdominal mass (Figure 1). Two years prior to admission, the mass started to grow rapidly and ulcerate.

The patient had no known co-morbidities, no family history of malignancy and no smoking history.

On physical examination, there was a 28 cm x 20 cm slightly movable mass on the right lower abdominal wall with areas of ulceration on the inferomedial aspect of the mass. There was no palpable inguinal lymphadenopathy. A wedge biopsy of the mass revealed atypical glands with clear cell features. The clinical impression during this

Department of Surgery, Division of Plastic Surgery, University of the Philippines Manila

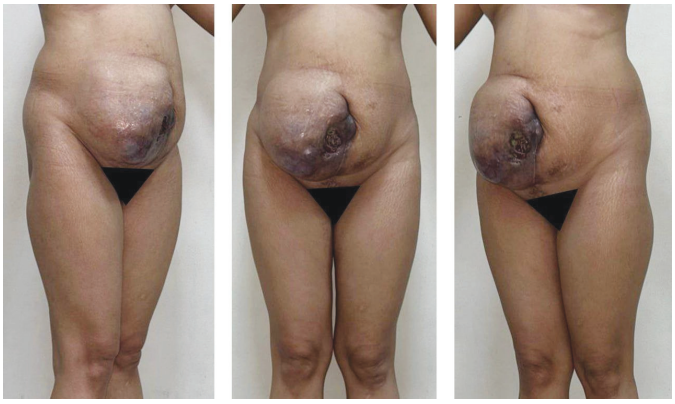


Figure 1. Female patient presenting with a right lower quadrant abdominal mass measuring 23 cm x 28 cm.

time was a right lower abdominal wall mass, to consider abdominal wall neoplasm.

A whole-abdominal CT scan revealed a 13.1 cm × 16.7 cm × 12.2 cm complex, mixed solid predominantly cystic mass in the anterior abdominal wall involving the rectus abdominis and right oblique muscles. The mass also has an intraperitoneal extension and intimately related to the ascending colon, ileum, right adnexa and uterine fundus. (Figure 2). A multidisciplinary team comprising general surgery, plastic surgery, and gynecology was involved in the patient's care and prepared her for surgery. Preoperative planning for reconstruction with a pedicled ALT flap from the ipsilateral thigh was performed. The availability of perforators was assessed using a handheld Doppler, which demonstrated good signals.

Treatment

On the day of surgery, the patient was placed under general anesthesia in the supine position. The general surgery team performed a wide excision of the abdominal wall mass with 2 cm margins. The mass was noted to be adherent to the anterior uterus. The gynecology team then excised the portion of the mass adherent to the uterine serosa and repaired the resulting defect.

The plastic surgery team subsequently received the patient with a 24 cm × 20 cm full-thickness defect of the lower abdominal wall and exposed bowel (Figure 3). A 24 cm × 20 cm ALT flap was designed on the ipsilateral right thigh. Three perforators were identified using a handheld Doppler (Figure 4). During flap elevation, all three perforators were identified; the middle perforator was of adequate caliber and was preserved to supply the flap (Figure 5). The perforator was traced to its origin from the descending branch of the lateral circumflex femoral artery.

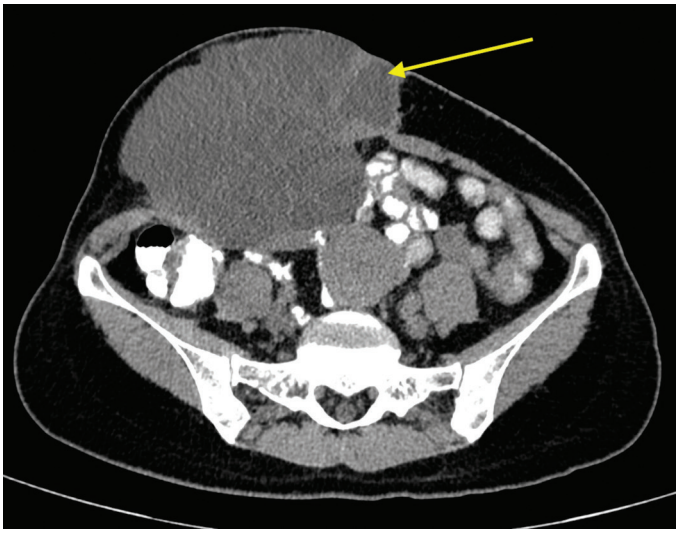


Figure 2. Axial contrast enhanced CT scan of the abdomen showing soft tissue mass in the anterior abdomen with solid yellow arrow.

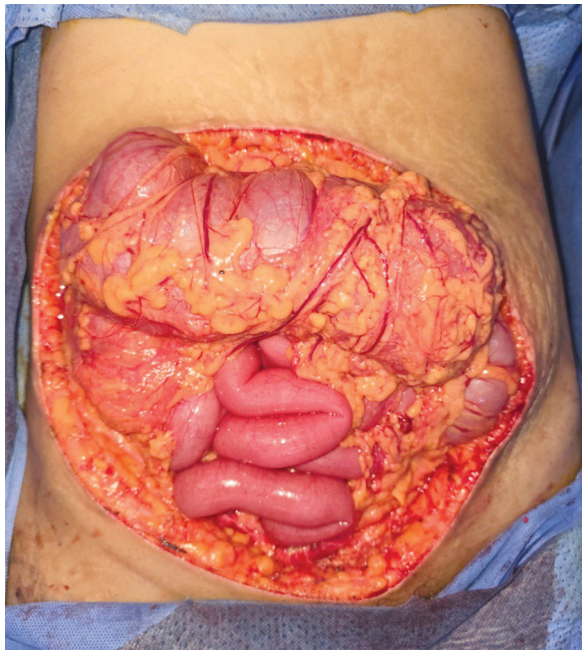


Figure 3. Full thickness abdominal defect measuring 24 cm x 20 cm after wide excision with exposed bowels

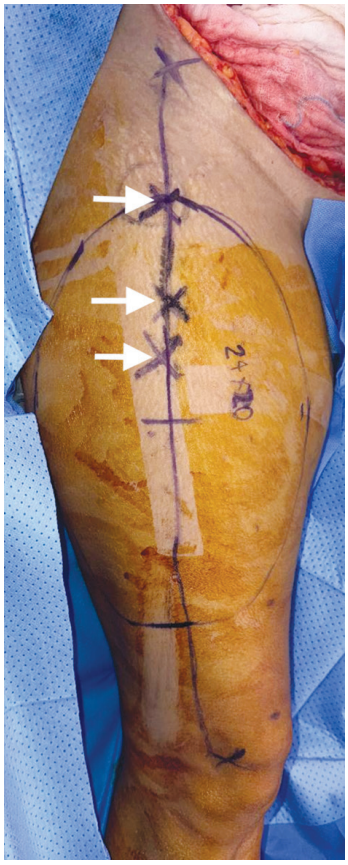


Figure 4. Design of a right ALT flap based on the lateral circumflex femoral artery, the location of three perforators (white arrows) were identified by handheld Doppler.

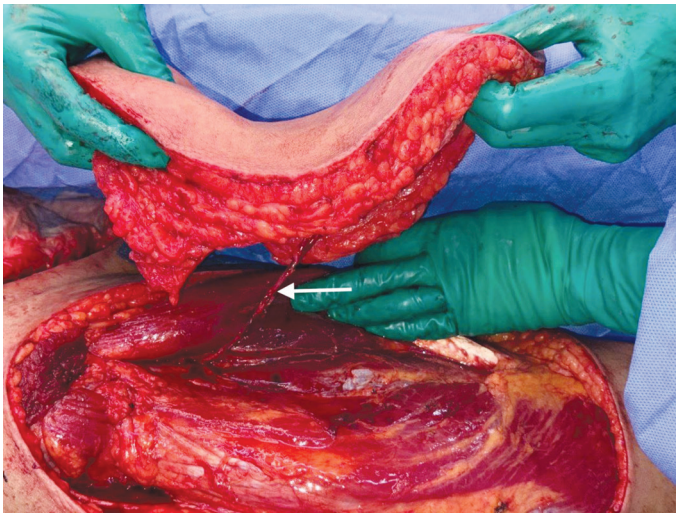


Figure 5. Identified perforator of the ALT flap shown with the solid white arrow.

Before flap inset, viability was confirmed by assessing the flap's color and turgor and observing bright-red bleeding from its edges. A tunnel was then created beneath the rectus femoris muscle and the overlying skin of the right inguinal region to allow passage of the ALT flap to the lower abdominal wall defect. A composite mesh was sutured to the remaining fascia (Figure 6). The ALT flap was then inset in layers without tension, completely covering the abdominal wall defect (Figure 7). The right thigh donor site was covered with a skin graft. Three Jackson-Pratt drains were placed: one each in the right thigh donor site, beneath the flap, and within the abdomen.

Outcome and Follow-up

Postoperatively, the patient was maintained in the supine position with her hips slightly flexed to minimize tension on the ALT flap pedicle. Flap monitoring revealed no evidence of arterial or venous compromise. The Jackson-Pratt drains were monitored for both the quality

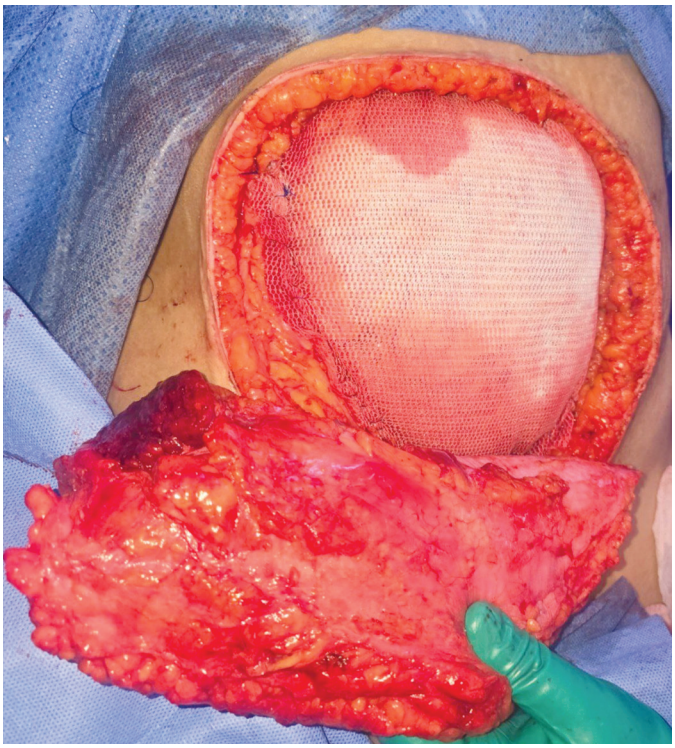


Figure 6. Composite mesh to reconstruct fascial defect of the abdominal wall before flap inset.



Figure 7. Anterolateral thigh flap after inset to the abdominal wall.



Figure 9. Post operative wound inspection showing viable flap with well apposed edges and good skin graft take on donor site.

and quantity of their output. The skin graft at the right thigh donor site was inspected on postoperative day 3 and demonstrated good graft take (Figure 8 & 9). The patient was allowed to ambulate on postoperative day 10 and was discharged on postoperative day 14.

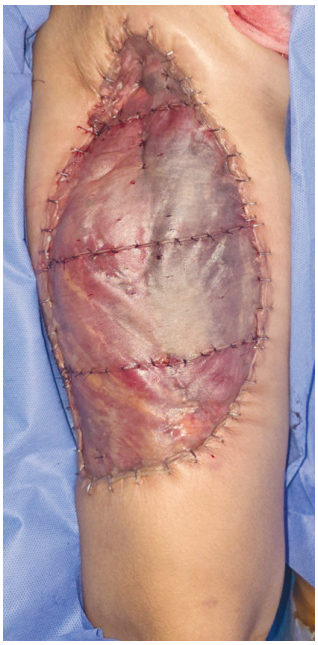


Figure 8. Right thigh donor site after skin grafting.

Histopathologic examination revealed an atypical cystic neoplasm with negative resection margins. Additional immunohistochemical studies were performed, and the final diagnosis was a serous borderline tumor of the peritoneum. At 1.5 years postoperatively, the patient had a viable flap, healed wounds, and no apparent abdominal wall hernia.

Discussion

Serous borderline tumor of the peritoneum is a rare condition that requires adequate clinical, radiologic, histopathologic and immunohistochemical confirmation.[7] It can be mistaken for other benign and malignant conditions presenting as an abdominal mass. It is characterized histologically as epithelial proliferations with associated psammoma bodies on the peritoneal surfaces of viscera.[8]

Appropriate reconstruction of the abdominal wall after tumor resection avoids long term com-plications such as hernias, incarceration, or strangulation. Guided by defect location, size, and depth, musculofascial repair ideally utilizes synthetic or bioprosthetic mesh, while skin and soft tissue coverage requires a regional pedicled or free flap.[1]

The introduction of synthetic meshes enabled large fascial defects to be reconstructed as long as there is no contamination or no opening of any bowel viscus which otherwise increases the likelihood of mesh infection. Although clean conditions are required to avoid mesh infection, polypropylene mesh remains a durable and accessible choice for hernia repair. For complex reconstructions, composite mesh is preferred despite higher cost, as it promotes host-tissue integration while preventing visceral adhesions that would complicate future reoperations be-neath a large flap which was the basis for using it in the present case.[8]

Reconstruction of partial defects with only skin involvement can be done by healing thru secondary intention, primary closure, skin grafts, local flaps, or application of negative pressure wound therapy (NPWT). For partial musculofascial defects, options include autologous reconstruction—such as primary closure, components separation, or distant flaps with or without prosthetic materials, based on defect location (upper, middle, or lower third). Finally, complete anterior abdominal wall defects can be reconstructed using muscle flaps (rectus abdominis, extended latissimus dorsi, or extended tensor fascia lata) alone or combined with skin grafts/other flaps, provided vascular pedicles are intact. For complete defects >15 cm, free tissue transfer (e.g., latissimus dorsi, tensor fascia lata, or anterolateral thigh flaps) is recommended to ensure adequate size and pedicle length for vascular anastomosis.[1]

The use of these flaps as pedicled or free flaps has their own advantages and disadvantages. Latissimus dorsi flaps can only be used as a free flap, has a large size but needs repositioning in the lateral or prone position for harvest, which can prolong operative times. The rectus abdominis muscle as a pedicled flap is easy to elevate but has limited size and commonly has a compromised vascularity if the defect is large and the resection margins include its main blood supply. The TFL flap also has good size when used as a pedicled flap but may be unable to cover larger defects due to its shorter pedicle. Finally, the ALT flap is a workhorse flap as a free flap or pedicled flap to reach the abdomen. It may consist of fascia and skin only, so no muscle is sacrificed for preservation of function. It has a large size, has a long, reliable pedicle and can be harvested simultaneously with surgical excision without change in position thus limiting operative times. The main blood supply is the descending branch of the lateral circumflex femoral artery. From the first report by Song until recently it remains reliable and can be harvested as a fasciocutaneous flap or with muscle (vastus lateralis) if bulk is needed in reconstruction. If a large size is harvested, there may be a need to skin graft the donor site producing less than ideal aesthetic results. Several reports of large ALT flaps harvested have been reported.[2,3,4,5,6] Fukui et al reported two similar cases of full thickness abdominal wall reconstruction after surgical excision of abdominal tumors with a pedicled anterolateral flap including the vastus lateralis muscle (11 cm x 15 cm and 10 cm x 20 cm in dimension) with good results.[3] Nagaprasad et al also reports of the use of a 20 cm x 20 cm pedicled ALT flap for full thickness abdominal wall defect after trauma also with good outcomes.[5] Other reports would combine two flaps for such a large defect but in the present case, a single flap was enough for coverage. In the patient in the present case, a contralateral groin flap or TFL flap was planned in case the defect was not entirely covered by the single ALT flap. But even with a large skin dimension, the flap remained viable and was able to cover the entire defect. Together with a composite mesh, the ALT flap remained stable to restore form and function for the patient.

Unlike in high volume centers of other countries, our local setting cannot routinely use free flaps as the first-line option, even when they may best meet the size and tissue-composition requirements of complex reconstructions. Regional or pedicled flaps are still widely used because they require shorter operative times and incur lower costs. Moreover, recipient vessels in the abdomen may be limited.[1] With adequate patient selection and planning, one step back from the reconstructive ladder, a pedicled flap can be an effective approach to abdominal wall reconstruction. The ALT flap is a reliable option for coverage of full thickness defects of the lower abdominal wall.

Conclusion

Reconstruction of complex abdominal defects entails adequate preparation and knowledge of all possible

reconstructive options. The use of a pedicled anterolateral thigh flap is a reliable option in select patients. And the combination of a pedicled anterolateral thigh flap and composite mesh is useful in full thickness abdominal wall reconstruction.

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