

Repair of a complex abdominal wall defect with anterolateral thigh flap: a good surgical alternative

Reparación de defecto complejo de pared abdominal con colgajo una buena alternativa quirúrgica

Julio Palacios-Juárez^{1*}, Jesús Morales-Maza², Marco A. Rendón-Medina³, Moisés Ramírez-Ramírez⁴, Jorge H. Rodríguez-Quintero², and Ludivina A. Cortés-Martínez⁵

¹Department of Plastic and Reconstructive Surgery, Ixtapaluca Regional High Specialty Hospital, State of Mexico; ²Surgery Department, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City; ³Surgery Department, Ixtapaluca Regional Hospital, State of Mexico; ⁴Advanced Laparoscopic Surgery Department, Ixtapaluca Regional High Specialty Hospital, State of Mexico; ⁵Anesthesiology Department, Hospital Ángeles Lomas, Mexico City, Mexico

Abstract

Introduction: Reconstruction of the abdominal wall with major defects usually represents a surgical challenge, especially in cases where the defects are recurrent and have a large size that avoids the use of adjacent tissues for an adequate closure. According to each region the abdomen topography is divided into three regions: upper, middle and lower. Several reconstructive alternatives have been described according to the affected area of the abdomen that include the separation of the muscularis aponeurotic components of the abdominal rectus sheath, the flap of the rectus abdominus muscle with or without cutaneous island, the flap dependent on the dorsal muscle and muscular or musculocutaneous thigh flaps to reconstruct the lower area of the abdomen which is called anterolateral thigh (ALT) flap. The ALT flap has become the best option for large recurrent defects in any of the thirds due to its great versatility. **Case report:** We present the case of a 50-year-old patient with an abdominal wall defect, loss of domain and exposure of prosthetic material. Patient had a surgical history of open cholecystectomy, necrosectomy due to acute pancreatitis with open abdomen management and attempted repair of the abdominal defect twice with mesh placement. The abdominal wall was reconstructed with an ALT free flap with a fascia lata component with anastomosis to superior epigastric vessels in a successful manner. Nowadays patient remains without evidence of recurrence of the hernia at 1 year follow-up. **Discussion/conclusion:** The aim of this paper is to illustrate the ALT flap with a fascia lata component anastomosed to the superior epigastric vessels as a good option to reconstruct complex defects of the upper third of the abdomen.

Key words: Anterolateral thigh flap. Complex abdominal hernia. Abdominal wall reconstruction.

Resumen

Introducción: La reconstrucción de la pared abdominal con grandes defectos suele representar un desafío quirúrgico, sobre todo cuando los defectos son recurrentes y tienen un gran tamaño que dificulta la utilización de tejidos adyacentes para un cierre adecuado. La pared abdominal anterior se divide en tres regiones para su reconstrucción; superior, media e inferior. De acuerdo con cada región se han descrito diferentes técnicas de reconstrucción de pared, como la separación de

Correspondence:

*Julio Palacios-Juárez

Carretera Federal México-Puebla, km. 34.5
C.P. 56530, Zoquiapan, Ixtapaluca, Edo de México, México
E-mail: drpalacios.cirplast@icloud.com

Date of reception: 16-08-2018
Date of acceptance: 29-07-2019
DOI: 10.24875/CIRUE.M20000115

Cir Cir (Eng). 2020;88(2):203-207
Contents available at PubMed
www.cirugiaycirujanos.com

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componentes musculoaponeuróticos de la vaina de los rectos abdominales, el colgajo del músculo recto abdominal con o sin isla cutánea, el colgajo dependiente del músculo dorsal ancho y colgajos musculares o musculocutáneos del muslo para reconstruir el tercio inferior del abdomen, llamado colgajo anterolateral de muslo (ALT, por sus siglas en inglés). El ALT se ha convertido en una buena alternativa para los grandes defectos recurrentes en cualquiera de los tercios debido a su gran versatilidad. **Caso clínico:** Presentamos el caso de un paciente de 50 años con un defecto de pared abdominal, pérdida de dominio y exposición de material protésico (malla). Tenía el antecedente quirúrgico de colecistectomía abierta, necrosectomía por pancreatitis aguda con manejo de abdomen abierto (incisión en línea media supra-umbilical) e intento de reparación del defecto abdominal en dos ocasiones con colocación de malla (que se encontraba expuesta). El defecto existente se desmanteló y reseccó en bloque desde el interior de la pared abdominal, dejando bordes aponeuróticos sanos, quitando todo el tejido cicatricial, la malla y los bordes cutáneos enfermos. Se realizó la reconstrucción de la pared abdominal con ALT con un componente de fascia lata con anastomosis a vasos epigástricos superiores, de manera exitosa. Actualmente no hay evidencia de recurrencia del defecto herniario tras 1 año de seguimiento. **Discusión/conclusión:** El objetivo de este trabajo es describir el ALT con componente de fascia lata con anastomosis a los vasos epigástricos superiores como una buena alternativa para reconstruir defectos de pared complejos del tercio superior del abdomen.

Palabras clave: Colgajo anterolateral de muslo. Hernia compleja. Reconstrucción de pared abdominal.

Introduction

Large abdominal wall defects are usually a surgical challenge, which is why several reconstructive alternatives have been described, including component separation, free flaps, and pedicled flaps with or without mesh placement; the technique of choice depends on the size of the defect, its location (upper, middle or lower one third) and the degree of contamination of the hernia defect¹⁻³.

Traditionally, abdominal wall reconstruction has been performed with adjacent tissue. The upper one third is reconstructed with a latissimus dorsi and rectus abdominis muscle flap with or without a cutaneous island. Abdominal middle one repair is performed with separation of the musculoaponeurotic components of the rectus abdominis sheath, with transverse abdominis, rectus abdominis or external oblique muscle release. In the lower one third, muscular or musculocutaneous pedicled flaps from the thigh (vastus lateralis, gracilis and tensor fascia lata) are used. Free flaps are the following: anterolateral thigh (ALT), anteromedial, and those previously described, but in the free fashion. Free flaps have been positioned in the last two decades as first order options for repairing large abdominal defects^{4,5}.

Recurrence rate when the abdominal wall is reconstructed by primary closure ranges from 12% to 54%, and when prosthetic mesh is placed, from 2% to 36%^{6,7}. Recurrence when using pedicle or free flaps is unknown, and neither is it when dermis substitutes are used³.

To address abdominal wall reconstruction, quality of the affected anatomical structures (skin or fascia)

should be taken into account. Reconstructive options on the skin surface include primary closure, tissue expansion, and skin repair with local tissue advancement or distant flaps (pedicled or free flaps)⁸⁻¹⁰. Fascial reconstruction can be carried out with separation of the musculoaponeurotic components of the rectus abdominis sheath, prosthetic material (synthetic or biological) and other experimental alternatives, such as autologous prophylactic dermal graft¹¹.

Many flaps have been described for abdominal wall reconstruction, but ALT is becoming the ideal free flap to reconstruct different defects of the abdominal wall due to its great versatility, since it can include fascial (tensor fascia lata) and even muscular components (vastus lateralis muscle)¹²⁻¹⁴.

This work has the purpose to illustrate the case of a patient with a large and recurrent abdominal wall hernia of the upper abdominal one third, with loss of abdominal domain and surgical site infection, which was reconstructed with a free ALT with a fascia lata component (ALT-FL) and anastomosis to upper epigastric vessels, since there is little experience on abdominal reconstruction in this context.

Clinical case

The case is about a 50-year-old male patient with a history of newly-diagnosed type 2 diabetes, moderate alcohol consumption and smoking with a smoking index of 20 packs/year. Seventeen years prior, he had undergone open cholecystectomy, and experienced acute necrotizing pancreatitis, which was treated with necrosectomy and management with open abdomen and 2-month hospital stay. Repairing the abdominal

defect had previously been attempted on two occasions due to recurrence, with prosthetic material being used in both attempts. Subsequently, the patient developed an abdominal hernia with mesh exposure. Physical examination revealed a 19 x 10-cm aponeurotic defect and hernial content measuring 9 x 8 x 3 cm, where the prosthetic material was exposed (Fig. 1).

Abdominal wall reconstruction after en bloc resection of the cicatricial hernia-granulomatous complex with exposed mesh was carried out. Said reconstruction was performed using a free flap from the left thigh anterolateral region, with a fascia lata component to better support the defect repair (Fig. 2). The patient had a good evolution and was discharged without complications after a 6-day hospital stay. Below, we describe the surgical technique employed.

Surgical technique

Surgery was performed under general anesthesia with the patient in the supine position. It started with the resection of the mesh and non-viable tissue, as well as with careful dissection of the wall defect, preserving the anatomical structures to the extent possible and performing surgical lavage. The ALT-FL flap was harvested.

Surgical planning of the free flap was performed on the left leg, as described by Song et al.¹⁴, based on the more constant perforating artery, which irrigates the vascular territory of the thigh middle one third on its anterolateral surface. Said perforating artery is usually located at the midpoint of a vertical line that connects the anterior superior iliac spine with the superior and lateral border of the patella. In a radius of 3 cm from the above-described point, acoustic Doppler scanning was performed to identify the exact site of the perforating artery emergence, and it was marked in order to enable designing a flap of the necessary dimensions, leaving said perforating artery in the center. We designed a flap with a skin component of 14 x 8.5 cm, with an area of 93.4 cm², and a larger fascia lata component of 24 x 18 cm, with an area of 339.3 cm² (using an ellipse equation, for a more accurate description of the area) (Fig. 2).

Flap dissection was carried out in a subfascial plane, identifying the perforating artery with its concomitant veins and dissecting the pedicle of said flap (descending branch of the lateral circumflex femoral artery) to up to 12 cm in length, where we found the vessels of appropriate caliber and size for their

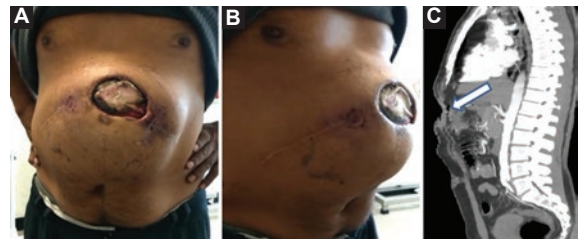


Figure 1. Evidence of abdominal wall defect with prosthetic material exposure. **A:** abdominal defect frontal view. **B:** right oblique view of the defect. **C:** abdominal tomography left sagittal section showing the hernia defect.



Figure 2. **A:** flap skin island marking on the left thigh. **B:** wound resulting after harvesting the flap (direct closure). **C:** planning of the flap contemplating the fascial component with the perforating artery identified by portable acoustic Doppler. **D:** dissected ALT-FL flap with its pedicle in downward direction at the image.

anastomosis with the superior epigastric vessels (2.5-mm-diameter artery and 3.5-mm-diameter veins). The left thigh donor site was covered with a medium thickness partial graft, taken from the same thigh. The flap was placed onto the site to be repaired, in the upper one third of the abdomen, and after dissection of the recipient pedicle, vascular anastomosis was performed with the aid of a microscope to the superior epigastric artery and concomitant veins, using

separate 8-0 microvascular sutures. Once adequate arterial flow to the flap was verified, the abdominal defect was covered by first suturing the fascial component of the flap with the healthy aponeurotic borders that were dissected; said suture was carried out with absorbable material (2-0 polydioxanone), with continuous stitches. Subsequently, the fatty component was closed with absorbable material, and finally, the skin was closed with separate stitches. A closed drain was left for 8 days, until an output of less than 30 mL was obtained, and then it was removed (Fig. 3).

The patient was discharged on the sixth day of hospital stay, without complications. At the 1-week follow-up, he had a complication consisting of a seroma at the abdominal surgical site, which was treated with a vacuum-assisted syringe system that solved it on the fourth day of follow-up¹⁵. The patient has attended the follow-up appointments with adequate healing, and after 1 year of follow-up, he shows abdominal wall good continence (Fig. 4).

Discussion

We present the case of a patient with an abdominal wall defect on the upper one third with loss of domain, who had been previously operated on twice with prosthetic material without a satisfactory result being obtained, this time even with clinical signs of infection, with foul-smelling exudate and mesh exposure. Among the described reconstructive options, we chose ALT-FL flap transfer to close the defect. The patient had a Kocher-type scar from an open cholecystectomy and Chevron from a necrosectomy, which affected the quality of adjacent skin and prevented the use of rectus abdominis and latissimus dorsi muscles to repair the defect. We did not consider tissue expansion as an option, since prosthetic material exposure might contaminate the expander placement site and further complicate reconstruction.

Ting et al.¹² reported the case of a 60-year-old man with rectal adenocarcinoma and metastatic activity in the anterior abdominal wall, with reconstruction of a 20 x 20 cm defect with a pedicled ALT flap with 180° rotation, placing it below the rectus femoris and Sartorius muscles. In this case, it was not the optimal option due to the size of the defect and the distance from the pivotal rotation point, which prevented these distances from being reached.

Zhou et al.¹⁶ reported the case of a 37-year-old male patient with a recurrent fibroma in the lower abdomen. The lesion measured 18 x 16 cm after resection, and

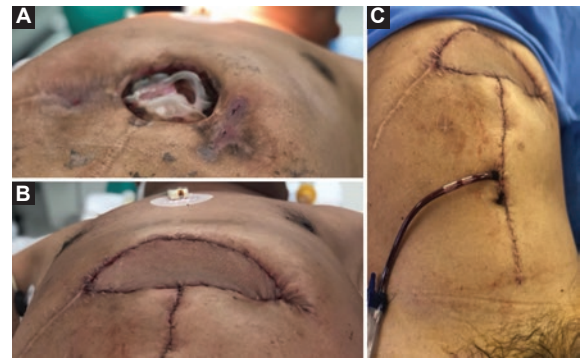


Figure 3. A: before surgery. B-C: after surgery.

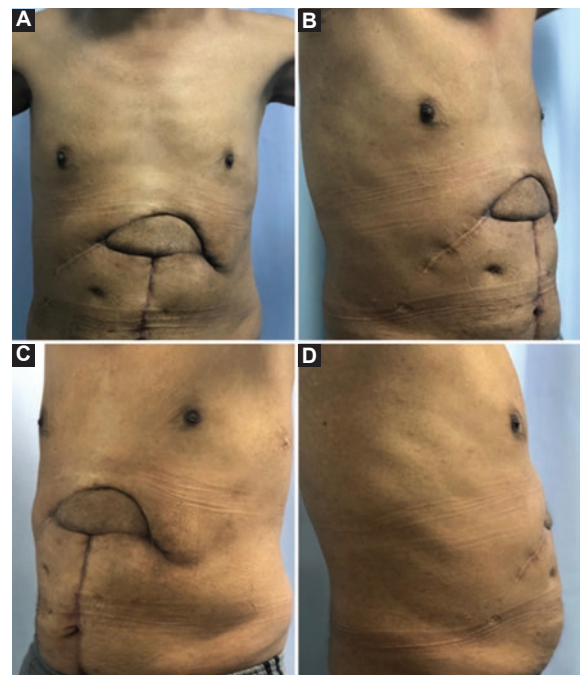


Figure 4. Patient follow-up at one year with no evidence of recurrence of the hernia defect. A: frontal view of the abdomen. B: right oblique view of the abdomen. C: left oblique view. D: right lateral view of the abdomen, with good continence of abdominal wall.

a 22 x 18 cm defect was reconstructed with a prosthetic mesh (Proceed®, PCM, Ethicon, USA) and two pedicled ALT flaps. The defect was in the lower abdominal wall and was wide, which explains why they used two pedicled ALT flaps or two tissue-free transfers.

A controversial issue is the use of prosthetic material in contaminated wounds. Recent evidence is emerging that reports acceptable morbidity with the use of synthetic material in these scenarios. Ideally, the use of biological materials, such as porcine

acellular dermis, has been proposed, but the cost precludes their systematic use, at least in developing countries like ours¹.

Carbonell and Cobb¹⁷ reviewed several studies that demonstrated that the paradigm of not using prosthetic material in contaminated fields could be inappropriate; however, further randomized controlled studies are still required to verify this hypothesis.

Conclusions

Anterolateral thigh flap is a good alternative to reconstruct abdominal wall complex defects at any of its thirds owing to its anatomical characteristics, including the fascial component that can be added to give greater strength and support to the abdominal wall. Its versatility is due to the constant location and length of its pedicle, and its easy dissection when there is training to perform these flaps. The flap can be dissected very thin, thin, or composed with a tensor fascia lata or muscular component (or both), depending on the needs of the abdominal defect and of each patient. The drawback of this type of flap is that it requires a microscope, microsurgical sutures, and well-trained personnel in microsurgical techniques, which are not always available in all hospital centers of Mexico.

Conflict of interests

The authors declare that they have no conflicts of interest.

Ethical disclosure

Protection of people and animals. The authors declare that the procedures followed were in agreement with the ethical standards of the responsible human experimentation committee and in accordance with the World Medical Association and the Declaration of Helsinki.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained informed consent from the patients and/or subjects referred to in the article. This document is in the possession of the corresponding author.

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