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Complex Abdominal Wall Defect after Abdominal Aneurismatic Rupture: A Case Report of a Basic Approach

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Abstract

Complex abdominal wall defects are a challenging problem, especially when the options available for reconstruction are limited, such as in patients with multiple comorbidities. In this article, we present a case of complex abdominal wall defect following a complication after an emergency aneurism surgery in an elderly patient with limited reconstructive options. We applied the bowstring technique successfully and without further complications. This technique offers a simple approach to large defects by redistributing forces from the skin. We emphasize the importance of this procedure for the reconstruction of defects in this type of patients without other choices.

Keywords: Abdominal wall; Bowstring technique; Plastic surgery; Reconstruction.

Introduction

Abdominal wall defects are a common problem in surgical practice, whose reconstructive algorithm often depends on the availability of viable tissue. Acquired defects can be due to trauma, previous surgery, infection, and tumor resection. A high proportion of patients have significant comorbidities and/or wound contamination, which increases the risk of complications (Ghazi et al., 2011).

When dealing with complex abdominal wall defects, there are two main issues to overcome: first, the abdominal muscle defect, and second, the skin defect. The complexity of these occurs mainly when the abdominal muscles, essentially in the ventral component, are severely retracted or even completely atrophied. The classic surgical treatment is the component separation (Ghazi et al., 2011), (Mathes et al., 2000) in which the abdominal muscles are individualized to expand the entire coverage area, allowing muscular containment of the intra-abdominal content. This procedure allows to overcome the first muscular problem, but it has no solution for the skin scarcity, which becomes a real problem in large open wounds (Rohrich et al., 2000).

In these kind of patients there are multiple regional and distant flaps that can serve as a wound closure (Rohrich et al., 2000). However, these patients often go through multiple surgeries which narrow down the possible reconstructive options. On the other hand, the presence of multiple coexisting diseases, such as in patients with peripheral vascular disease, makes the solution more complex and low down the possibilities of flap coverage.

The purpose of this report is to illustrate the application of a basic approach to wound closure applied to the reconstruction of complex abdominal wall defects in patients without other reconstructive options.

Case Report

A 74 year-old man presented to emergency room with abdominal and left thigh pain with 3 hours onset. The patient gave a history of high blood pressure, atrial fibrillation, ischemic heart disease, two previous strokes, cognitive impairment, and aortic artery aneurism. Physical examination and computed tomography studies revealed a broken aneurysmal lesion of the common iliac artery. The patient also had an arterial fistula to the common iliac vein (Figure 1).

Figure 1: Preoperative vascular CT-Scan showing A: aneurismatic lesion of the common iliac artery with signs of rupture B: arterial fistula to the common iliac vein.

On the postoperative day 5, after emergency open surgery of iliac repair with end-to-end graft interposition, the patient developed an abdominal evisceration. It was treated with a sandwich technique with an intraperitoneal biologic and an onlay polypropylene mesh and direct closure.

In the first postoperative week, the patient developed fever with signs of wound infection and dehiscence. Debridement and negative pressure therapy were administered to decrease wound contamination and treat infection. The resultant defect was approximately 17x14 cms, exposing the abdominal mesh (Figure 2).

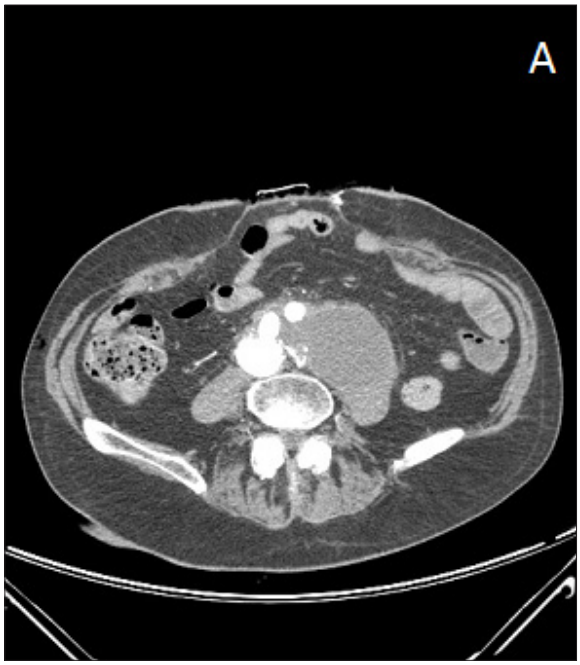


Figure 2: Pictures of the complex abdominal wall defect. A: CT-scan picture showing the abdominal wall muscular and skin disruption; B: photograph of the abdominal wound defect showing mesh exposure in the deep.

Due to the multiple comorbidities of the patient, there were no local flaps or recipient vessels to treat the skin defect. To address this problem, we applied the Bowstring technique first described by Pelaez (Paredes & Flores, 2019). This technique is based on the principle of funicularity where the central points of a Bow (a curved Kirschner Wire of 2 mms in diameter, one on each side) pulled vertically and perpendicularly develop a lateral force, redistributing the tension of the wound from horizontal to craniocaudal (Figure 3). To do this, several 0 prolene sutures are placed on different points of the bow as strings to simulate these forces. A vacuum-assisted dressing was also placed over the wound to protect it. Intra-abdominal pressure was measured by urinary catheter and kept below 15 cm H_2O.

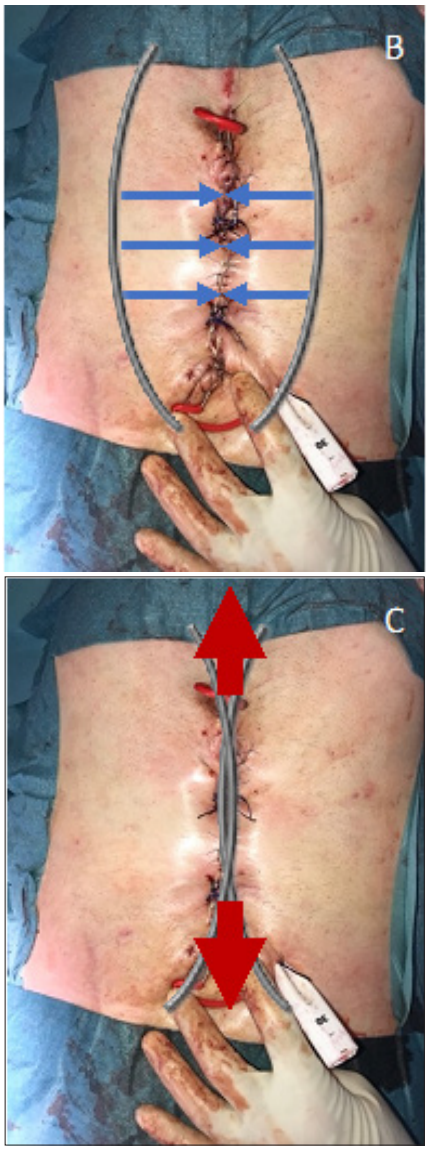
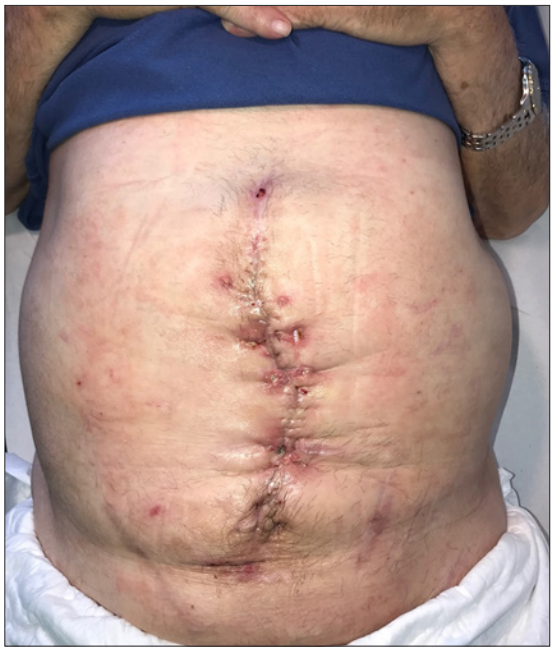


Figure 3: Postoperative pictures of the bowstring procedure A: image showing the disposition of the kirschner wires protected with vessel loops and interconnected with 0 prolene sutures. B and C: simulation of the funicular principle where the wires (grey lines) act as bows and the prolene sutures (blue arrows) as the string forces finally developing lateral forces (red arrows) to redistribute the skin wound tension.

At the third week postoperative, both Kirschner wires were removed and the patient wore an abdominal girdle for another three weeks (Figure 4). No eventration or wound dehiscence developed.



Discussion

In this paper, we report the first case of abdominal wall reconstruction using the bowstring technique. We emphasize the importance of this procedure for the reconstruction of defects in patients with multiple comorbidities with no other available reconstruction options.

There is a varied arsenal for complex abdominal reconstruction. For small to medium defects there is the option of using mesh reconstruction and/or component separation (Mathes et al., 2000), (Patel et al., 2018), (Stylianides & Slade, 2016). But for larger defect there is the need to transfer regional or distant flaps often associated with meshes. We can use the rectus or lateral femoral muscle, tensor fasciae latae or anterolateral thigh flaps as regional flaps for reconstruction of this defects. In this sense, the mobilization of innervated locoregional flaps is of special importance to maintain functionality and containment of the wall (Mujadzic et al., 2018).

There is also the possibility to enlarge the abdominal tissue with expanders placed between external and internal oblique muscles (Wooten et al., 2017), which solves the skin problem but does not address the muscular problem, with medium rates of hernia recurrence.

All of these reconstructive techniques become scarce when there is microvascular and peripheral vascular disease. In these patients with complex defects, the options remain limited. In addition, the complexity of their comorbidities contraindicate difficult procedures. This is why simple approaches as the bowstring technique can have a place.

The bowstring technique has been described to assist the secondary closure of wounds located in the limbs, due to the scarcity of tissue in these areas. It has been proven to be a undemanding, reliable and efficient technique with few

complications and a short surgical time (Paredes & Flores, 2019).

It is based in the principle of funicularity. This is a physical principle where compressive forces (tension of the wound) are transformed into traction forces (in opposite directions to the wound forces). This is the same principle used in architectonic arches or suspension bridges.

Since this procedure has demonstrated no complications in other locations, we postulated its usefulness for complex wounds without other reconstruction options, such as the one from our case.

In conclusion, the bowstring technique offers a simple and effective approach for complex wall defects in patients with multiple comorbidities. It would be extremely important to include this option in the reconstructive algorithm and increase the number of procedures to compare their complications.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Funding Sources

None.

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