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Case Report

Vascular surgery in rural areas: abdominal aortic aneurysm surgery with prosthesis in a tertiary hospital in Haiti: a case report

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ABSTRACT

Open surgery was replaced in the 1990s by endovascular repair (EVAR), a less invasive method that benefits many patients. However, he remains inaccessible in resource-limited countries, where surgery faces many obstacles. This article explores a case of aorto-iliac aneurysm in a young adult treated in a rural area with limited resources, highlighting the challenges and possibilities of surgical interventions performed under restrictive conditions. A 43-year-old hypertensive man with a 5-year history of abdominal mass presented with abdominal pain and mass. Examination revealed a left-sided pulsatile abdominal mass with thrill. Ultrasound showed a 71.8 mm infrarenal aorto-iliac aneurysm with 39 mm common iliac artery diameter. He underwent successful open repair with a bifurcated prosthesis after stabilization and optimization. CT angiography is the gold standard for diagnosing abdominal aortic aneurysm, allowing accurate assessment and planning. In our context, planning was based on Doppler ultrasound due to limited access to CT angiography. Preparing for open repair of abdominal aortic aneurysms (AAA) also involves optimizing comorbidities, a functional blood bank, and invasive monitoring. In this case, limitations included a lack of CT scanning, minimal blood resources, no invasive intraoperative hemodynamic monitoring and reports indicated that a Doppler ultrasound confirmed the success of the graft. These shortcomings theoretically increase surgical risk, reflecting realities in resource-limited hospitals. This case shows open AAA surgery is feasible in constrained environments with good preparation and adaptation. Although EVAR is effective, open surgery remains crucial in certain situations.

Keywords: Abdominal aortic aneurysm, Rural areas, Vascular surgery

INTRODUCTION

The first successful surgical repair of an abdominal aortic aneurysm (AAA) was done by Charles Dubost in 1951, initiating modern treatment for this potentially lethal condition.[1] For decades, open surgery was standard until the 1990s introduction of EVAR by Parodi, which offers a less invasive option with reduced perioperative morbidity and mortality.[2] EVAR has become the preferred method in many industrialized nations.[3]

However, significant disparities exist globally. In low-resource countries, high costs and lack of facilities limit access to EVAR, while open surgery faces challenges due to insufficient diagnostics and specialized equipment and qualified vascular surgeons.[4,5] Efforts to reduce AAA morbidity and mortality focus on improving early detection and management.[6]

In this contest, we report a case of a 43-year-old man with an aorto-iliac aneurysm treated in a tertiary hospital, highlighting the challenges and potential of vascular surgery in such contexts.

CASE REPORT

A 43-year-old man was admitted to the emergency department following a traffic accident that resulted in multiple fractures of his left lower limb. During the secondary assessment, he reported a history of poorly controlled hypertension, confirmed at triage (190/112 mmHg). Meanwhile, in the examination, we discover the presence of an abdominal mass that had been gradually increasing in size for several years, associated with chronic pain.

Abdominal examination revealed a paraumbilical and hypogastric bulge corresponding to a pulsatile mass. The femoral pulses were palpable and symmetrical. A Mindway color Doppler ultrasound with a side-fire T-Shaped linear probe was performed, showed an infrarenal abdominal aortic aneurysm measuring 71.8 mm in diameter, extending to the right common iliac artery (39 mm), with no signs of rupture (Figure 1 A and B).

Figure 1 (A and B): Marked dilation of the abdominal aorta below the kidneys with a hint of a mural thrombus in the posterior wall (arrow). B-Marked dilation of the right external iliac artery in its proximal portion.

After hemodynamic stabilization (conservative treatment by orthopedic team) and initiation of antihypertensive treatment with enalapril and amlodipine, the patient was discharged from the emergency room with close follow-up in vascular clinic. The prescribed CT (computed tomography) scan could not be performed due to financial constraints. Two months later, he was admitted in surgical floor for recrudescence of abdominal pain and the mass, in the context of a hypertensive crisis. In the meantime, additional tests, including an abnormal blood count of 10g/dl, and non-treponema test came back not reactive. However, the INR coagulation test was 1.43 and the D-dimer level was very high at 1239.3 ng/ml.

After discussion among the staff, and given our limitations, the decision to operate was made within five days of hospitalization. The patient therefore underwent open surgery via an abdominal approach.

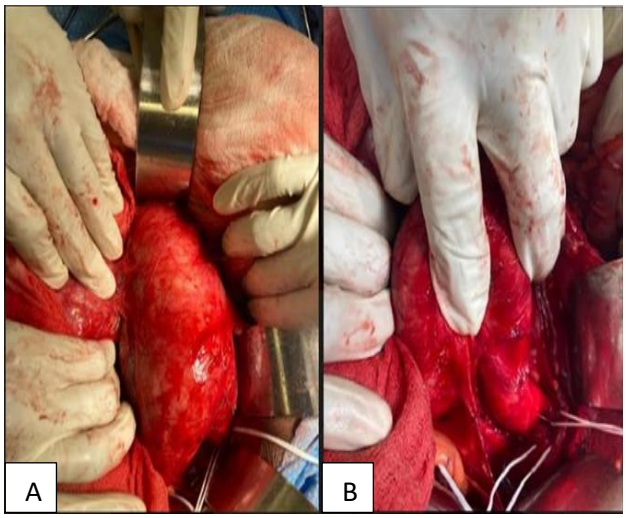

Figure 2 (A and B): Intraoperative view of the fusiform infrarenal aortic aneurysm and B-Intraoperative view of the inconsistent anatomy of the middle sacral artery.

During the operation, fusiform dilation (Figure 2 A and B) was observed in the descending aorta 15 mm from the junction of the left renal artery, the right common iliac artery and, unexpectedly, the left common iliac artery along its entire length. After exposing the neck of the aneurysm and the bilateral iliac bifurcation, the aorta and the internal and external iliac arteries were clamped after systemic heparinization. The aneurysmal sac was opened, and *in situ* reconstruction was performed using a bifurcated vascular prosthesis (Hemashield 16×8 mm; MAQUET Holding B.V. and Co. KG, Rastatt, Germany) (Figure 3). The proximal anastomosis was performed with 4-0 Prolene suture. The right branch of the prosthesis was anastomosed end-to-end to the external iliac artery, while the right internal iliac artery was ligated. On the left side, the prosthesis was anastomosed to the internal iliac artery, and the left external iliac artery was reimplanted onto the prosthesis. The aneurysmal sac was then closed, as was the retroperitoneum. The abdomen was closed using the usual technique.

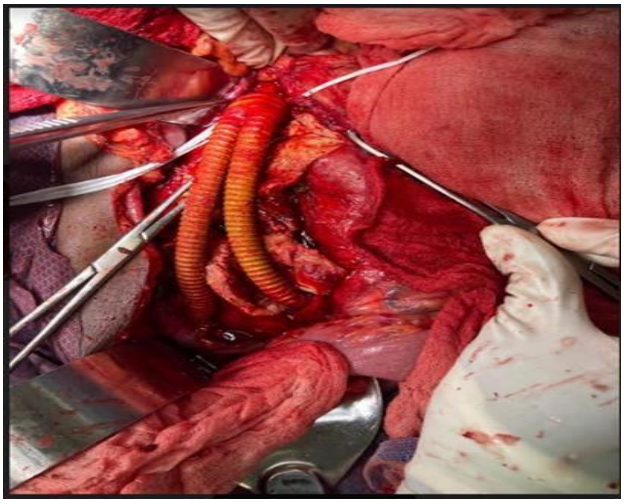

Figure 3: Intraoperative view of a bifurcated graft used to repair the aortic.

No bacteria were detected in the resected aneurysmal wall tissue, and pathological examination showed that the structure of the arterial wall had disappeared and been replaced by necrotic tissue and thrombus.

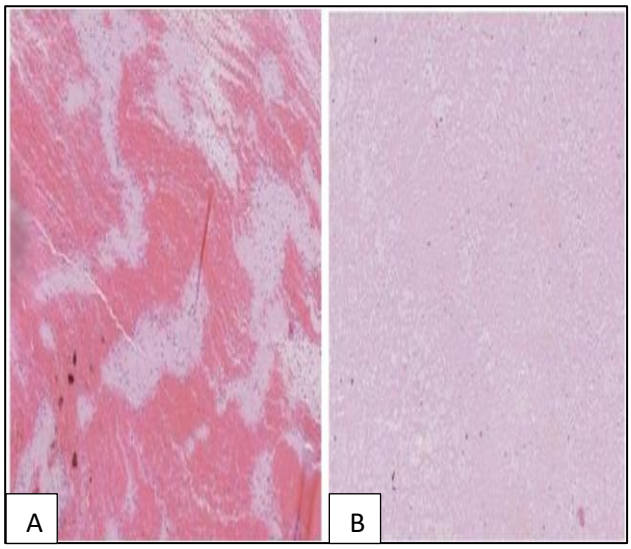

Figure 4 (A and B): Representative photomicrographs showing moderate degeneration of the media and necrotic tissue, respectively, in histological sections stained with hematoxylin and eosin.

Postoperatively, the patient resumed bowel movements on the fourth day and the drains were removed on the seventh day. No notable events disrupted the patient's recovery.

The patient was discharged 28 days after the initial onset of symptoms and 12 days after surgery. During follow-up (after 8 days post 1 month later), no signs of disease progression or leakage around the prosthesis were noted, and ultrasound showed a patent hypogastric artery with normal flow (Figure 5 A and B).

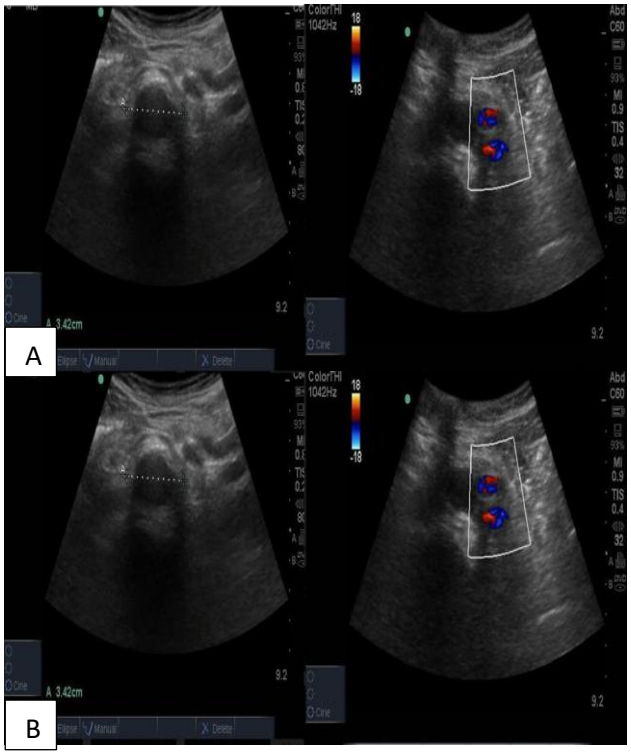

Figure 5 (A and B): Visualization of the aortic prosthesis with no evidence of leakage and of patent external iliac arteries.

DISCUSSION

Abdominal aortic aneurysm (AAA) is a permanent dilation of the abdominal aorta, measuring more than 3 cm or 50% greater than normal[7]. Commonly located below the renal arteries, AAAs can extend to the aorto-iliac region. Major risk factors include age (typically over 60), male gender, smoking, and a family history of AAA.[8] Men are 5 to 10 times more likely to develop AAAs than women.[9] Additional predisposing factors are atherosclerosis, hypertension, obesity, and high salt intake. Hypertension shows a significant association with AAA (OR 1.25) (95% CI, 1.21-1.2).[10] In this case, the young age of the patient is unusual; typically, AAAs affect older males, primarily smokers. Identified risk factors were male gender and high blood pressure, suggesting a need to explore potential predispositions linked to early atherosclerosis or environmental influences.

Most AAA are asymptomatic in 66 to 75% of cases.[8,11] However, large-diameter aneurysms may present as a pulsatile abdominal mass. A study of aortic aneurysms in younger patients found that this group had more symptoms at presentation, as well as larger aneurysms.[12] This was the case for this patient, who was already symptomatic when he presented to the emergency department. Approximately 90% of AAAs can be detected by palpating the pulsations felt in the horizontal and sagittal planes.[13] Our patient had a visible pulsatile

mass with a diameter of 71.8 mm. The risk of rupture significantly increases when AAA diameter reaches 5.5 cm (11%) to 6 cm (25%).[10,14] However, these symptoms are not specific to AAA and must be corroborated by imaging or additional diagnostic tests.

Preparing for open repair usually requires several prerequisites: high-resolution imaging (CT scan), preoperative optimization of comorbidities (particularly hypertension), availability of a functional blood bank, and implementation of invasive intraoperative hemodynamic monitoring.[15] In our case, these elements were limited: no scanner, reduced blood resources (only three units of packed red blood cells available), and no invasive monitoring (no arterial line or central venous catheter). In addition, most rural hospitals do not have a specialist physician, healthcare team members, or the cardiac imaging equipment essential to aid in decision-making for the diagnosis and management of most cardiovascular diseases.[16] These shortcomings theoretically increase the risk of surgery, but they reflect the reality of many resource-limited hospitals.

Repair is a relatively safe and effective way to minimize the risk of death associated with rupture.[17] It is usually done by using prosthetic grafts into 2 ways: open surgery and EVAR.[18] Open AAA surgery has significantly higher perioperative mortality and morbidity compared to endovascular techniques, although longer-term benefits have been observed in some studies, particularly in patients with comorbidities.[19,20] The limited availability of blood products was a major constraint. In our case, the restriction of transfusion resources required maximum anticipation of blood loss and strict intraoperative management. The recommended follow-up after OAR is much less intensive and less costly compared to EVAR.[21] Patients do not require annual CTAs. As in this case, a transabdominal Doppler ultrasound was performed eight months p/s showing patency of the vascular graft and potent arterial flow in the reimplanted left hypogastric artery (Figure 5 A and B).

Rural hospitals are low-volume centers that often lack expertise in conservative or minimally invasive surgical procedures. Consequently, even when minimally invasive options offer clear advantages, rural patients are often not presented with this choice due to the lack of trained specialists and supporting equipment.[16,23] Despite the absence of optimal conditions (diagnosis limited to ultrasound, lack of invasive monitoring, reduced transfusion resources), the procedure was successfully performed. This case highlights the feasibility of open AAA surgery in a constrained environment, provided there is good preparation, interdisciplinary coordination, and adaptation of practices to local realities.

CONCLUSION

This case shows that open AAA surgery is viable in constrained settings with adequate preparation. It highlights the need for training rural medical staff on serious conditions. Addressing the urban-rural healthcare access gap is essential, achievable through increased access to cardiovascular imaging and specialists. It is therefore essential to develop innovative and tailored solutions to optimize care and reduce cardiovascular inequalities in rural areas.

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