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Case Report

# Ruptured Infrarenal Abdominal Aortic Aneurysm with Aortocaval Fistula: Open Surgical Repair and Clinical Outcome

**Abdoul Aziz Thiaw*, Ndeye Fatou Sow, Abdou Lahat Mbengue, Moussa Mareme Samba, Papa Amath Diagne, Momar Sokhna Diop, Dialtabe Ibrahima Ba, Mory Camara, Abdou Khoudouss Diallo, Mareme Soda Mbaye, Moussa Seck Diop, Anta Mbaye Sall, Cheikh Abdou Khadre Faye, Amadou Dioulde Diallo, Pape Ousmane Ba, Magaye Gaye, Souleymane Diatta, Papa Salmane Ba, Papa Adama Dieng, Amadou Gabriel Ciss**

Thoracic and Cardiovascular Surgery Department, National University Hospital Center of Fann, Dakar, Senegal

## Abstract

Background: Aortocaval fistula (ACF) is a rare but life-threatening complication of abdominal aortic aneurysm (AAA), occurring in approximately 1% of all AAAs and up to 6% of ruptured cases. It results from progressive erosion of the aneurysmal wall into the inferior vena cava, creating a pathological arteriovenous communication that may lead to high-output cardiac failure, venous hypertension, and renal dysfunction. Because clinical manifestations are highly variable, diagnosis is often delayed. Computed tomography angiography remains the diagnostic modality of choice, allowing visualization of early venous opacification and characterization of aneurysm morphology. Case Presentation: We report the case of a 65-year-old woman presenting with acute abdominal pain and exertional dyspnea. CT angiography demonstrated a 68-mm infrarenal ruptured AAA with early opacification of the inferior vena cava, confirming an ACF. Despite the rupture, the patient remained hemodynamically stable, with preserved renal function and normal laboratory parameters. Management: Emergency open surgical repair was performed through a midline laparotomy. After proximal and distal vascular control, the aneurysm sac was opened, revealing a large fistulous defect on the right posterolateral aortic wall. The venous defect was closed with interrupted sutures, followed by an aortobi-iliac bypass using a bifurcated prosthetic graft. Postoperative recovery was uneventful, and the patient was discharged on postoperative day 8. At 30-day follow-up, she remained asymptomatic, and Doppler ultrasound confirmed graft patency without residual arteriovenous communication. Conclusion: Aortocaval fistula remains an uncommon but severe complication of infrarenal AAA. Early recognition and prompt surgical intervention are essential to reduce morbidity and mortality. While endovascular repair is an emerging alternative in selected patients, open repair continues to be the standard approach in many settings, particularly where endovascular resources are limited or when the fistula is large or anatomically complex.

## Keywords

Aortocaval Fistula, Abdominal Aortic Aneurysm, Aneurysm Rupture, Open Surgical Repair, Endovascular Aneurysm Repair

*Correspondence: Abdoul Aziz Thiaw (azizthiaw313@gmail.com)

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## 1. Introduction

Aortocaval fistula (ACF) is an uncommon but life-threatening complication of abdominal aortic aneurysm (AAA), first described by Syme in 1831. Although AAA is relatively frequent in elderly populations, ACF remains rare, with an incidence estimated at 1% among patients with AAA and up to 6% in cases of ruptured aneurysm [1, 2]. The condition arises when progressive aneurysmal expansion leads to erosion of the aortic wall into the adjacent inferior vena cava (IVC), creating a pathological arteriovenous communication.

The pathophysiology of ACF involves a combination of mechanical pressure, chronic inflammation, and weakening of the aortic wall. Once the fistula forms, arterial blood flows directly into the low-pressure venous system, resulting in abrupt increases in venous return, preload, and cardiac output. This may lead to high-output cardiac failure, venous hypertension, renal dysfunction, and pulmonary hypertension [3, 4].

The clinical presentation is notoriously variable. Although the classic triad—abdominal pain, pulsatile mass, and continuous abdominal bruit—is well known, it is present in fewer than half of cases [5]. Many patients instead present with nonspecific symptoms such as dyspnea, lower-limb edema, hematuria, or signs of heart failure. This variability contributes to diagnostic delays and worsens prognosis.

CT angiography has become the diagnostic modality of choice, allowing visualization of the fistulous tract, early opacification of the IVC, and assessment of aneurysm morphology [6]. Early diagnosis is crucial, as mortality remains high, ranging from 7% to 50% depending on hemodynamic status and treatment modality [2, 7].

Although EVAR has emerged as a promising alternative with lower perioperative morbidity, open surgical repair remains the standard of care in many regions, particularly where endovascular resources are limited or when the fistula is large or anatomically complex [3, 8]. We report a case of ruptured infrarenal AAA with ACF successfully treated by open aortobi-iliac bypass, with an excellent postoperative outcome.

## 2. Case Report

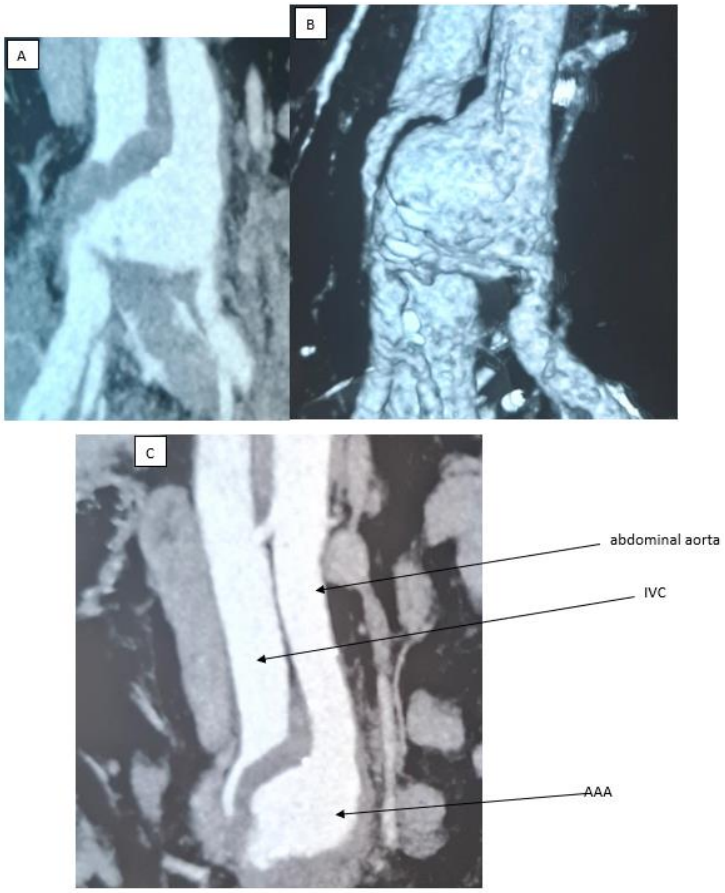


***Figure 1.*** *CT angiography revealed A 68mm infrarenal AAA; retroperitoneal rupture; opacification of the IVC and iliac veins during the arterial phase.*

A 65-year-old woman presented to the emergency department with sudden onset of periumbilical abdominal pain radiating to the back, associated with exertional dyspnea for approximately four hours. Her medical history included hypertension, type 2 diabetes, dyslipidemia, and hypothyroidism, all medically controlled. She had no history of smoking or known vascular disease.

*Clinical examination*

On admission, she was conscious, oriented, and hemodynamically stable.

Blood pressure: 117/63 mmHg; Heart rate: 67 bpm

Respiratory rate: 18/min; Oxygen saturation: 98% on room air

Abdominal examination revealed obesity and right flank tenderness without guarding or rebound. No pulsatile mass was palpable due to body habitus. Peripheral pulses were present and symmetrical. There were no signs of heart failure or lower-limb edema.

*Laboratory findings*

All laboratory values were within normal limits:

Hemoglobin: 12.4 g/dL; White blood cell count: 7,800/mm³

Platelets: 245,000/mm³; Serum creatinine: 0.9 mg/dL

Lactate: 1.4 mmol/L; Coagulation profile: normal

These results suggested preserved hemodynamic compensation despite the underlying rupture.

*CT angiography revealed:*

A 68mm infrarenal AAA; Retroperitoneal rupture; Early opacification of the IVC and iliac veins during the arterial phase. These findings confirmed the diagnosis of ACF.

*Surgical Management*

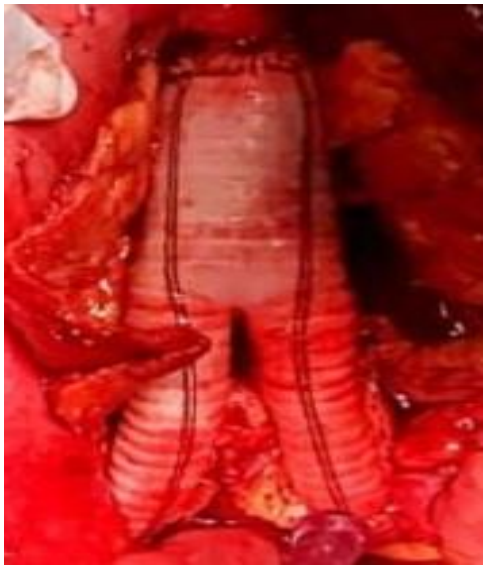

***Figure 2.*** *Aortobi-iliac bypass after venous breach closure.*

The patient underwent emergency open repair under general anesthesia. Through a midline laparotomy, the aneurysm was exposed, and proximal and distal vascular control was obtained. After opening the aneurysm sac, a large fistulous defect was identified on the right posterolateral wall of the aorta communicating with the IVC.

The venous defect was closed using interrupted 5-0 Vicryl sutures, after digital compression of the venous breach. Aortobi-iliac bypass grafting was performed using a bifurcated prosthesis. Estimated blood loss was 900 mL, requiring transfusion of three units of packed red blood cells.

*Postoperative course*

The patient was admitted to the intensive care unit for four days. Hemodynamic parameters remained stable, and renal function was preserved. She was transferred to the surgical ward on postoperative day 5 and discharged home on day 8.

At 30-day follow-up, she exhibited good clinical recovery, with appropriate wound healing. Doppler ultrasound demonstrated a patent aortic graft with triphasic flow and no residual arteriovenous communication.

## 3. Discussion

Aortocaval fistula is a rare but severe complication of ruptured AAA, occurring in 3–4% of cases [7]. The IVC is the most commonly involved venous structure due to its close anatomical proximity. The pathogenesis involves chronic mechanical pressure, inflammatory degradation of the aortic wall, and eventual erosion into the venous system [9].

Clinical presentation and diagnostic challenges:

The clinical manifestations of ACF are diverse. High-output cardiac failure may occur due to increased preload, while venous hypertension can lead to lower-limb edema, varicosities, or deep venous thrombosis. Renal dysfunction may result from venous congestion or reduced renal perfusion [10]. Pulmonary hypertension and embolic events have also been reported.

Because these signs are nonspecific, preoperative diagnosis is achieved in only 30–50% of cases [5]. CT angiography is the diagnostic modality of choice, with key findings including early opacification of the IVC during the arterial phase, loss of the fat plane between the aorta and IVC, and visualization of the fistulous tract [6].

Management considerations

Open surgical repair has long been the standard treament. The Society for Vascular Surgery (SVS) guidelines also emphasize that open repair remains the preferred approach in complex situations such as rupture or associated fistula, where direct control of the venous defect is required [11]. It allows direct closure of the fistula and replacement of the aneurysmal segment. However, the procedure is technically demanding due to the risk of massive bleeding, hemodynamic instability, and abrupt changes in preload following shunt interruption [2].

EVAR has emerged as a less invasive alternative, particularly in high−risk patients [3, 12]. Several reports have demonstrated successful exclusion of the aneurysm and reduction of

shunt flow. However, complete closure of the fistula is not always achieved, and persistent arteriovenous communication may require secondary intervention [13]. Greenberg et al also highlighted that EVAR can be considered even anatomically challenging situation, provided that careful planning and advanced endovascular expertise are available, although complete fistula exclusion is not always guaranteed [14].

Comparison with published cases

Most published cases describe patients presenting with hemodynamic instability, renal impairment, or signs of heart failure [1, 7]. In contrast, our patient presented with preserved vital signs and normal laboratory parameters, highlighting the variability of clinical presentation. Early diagnosis and rapid surgical intervention likely contributed to the favorable outcome.

***Table 1.*** *Comparison of our case with the main series and case reports published on aortocaval fistulas.*

| Study / Reference | Number of cases | Mean age | Dominant clinical presentation | Preoperative diagnosis | Treatment | Mortality |
|---|---|---|---|---|---|---|
| Brewster et al., 1991 [1] | 18 | 67 years | Heart failure, abdominal pain | 50% | Open repair | 22% |
| Davidovic et al., 2005 [2] | 25 | 64 years | Pain, shock, continuous bruit | 48% | Open repair | 28% |
| Saers & Scheltinga, 2005 [4] | 81 (review) | 65 years | Classic triad <50% | 40–50% | Open repair | 30–50% |
| Antoniou et al., 2009 [3] | 22 | 69 years | Heart failure, pain | 55% | EVAR | 10–15% |
| Hinchliffe et al., 2002 [8] | 3 | 71 years | Heart failure | 67% | EVAR | 0% |
| Kopp et al., 2002 [7] | 7 | 68 years | Pain, hypotension | 43% | Open repair | 29% |
| Sohail et al., 2023 [15] | 1 | 73 years | Incidental ACF in unruptured AAA, minimal symptom | 100% | EVAR | 0% |
| Gomes et al., 2023 [16] | 1 | 72 | Abdominal pain, heart failure signs, ruptured AAA | 100% | EVAR | 0% |
| Vaz Dias et al., 2024 [17] | 1 | 79 | Generalized edema, dyspnea, abdominal pain, | 100% | EVAR | 0% |
| Oderich et al., 2010 (case series, endovascular caution) [18] | 3 | 65-78 years | Heart failure, abdominal pain, high-output state | 67% | EVAR | 0 – 33% |
| Present case | 1 | 65 years | Acute abdominal pain, exertional dyspnea | 100% | Open repair | 0% |

Compared with recent reports favoring EVAR in high-risk or elderly patients [1-4], our experience supports the continued role of open repair as a definitive option, particularly where endovascular facilities are limited or when direct fistula closure is deemed necessary.

## 4. Conclusion

Aortocaval fistula is a rare but severe complication of infrarenal AAA. Its diagnosis may be challenging due to variable clinical presentation. Open surgical repair remains the standard treatment in many settings, particularly where endovascular options are limited. The growing use of EVAR reflects its potential advantages, although long-term outcomes and indications continue to be refined.

## Abbreviations

| | |
|---|---|
| AAA | Abdominal Aortic Aneurysm |
| ACF | Aortocaval Fistula |
| AVF | Arteriovenous Fistula |
| BP | Blood Pressure |
| CT | Computed Tomography |
| CTA | Computed Tomography Angiography |
| DVT | Deep Venous Thrombosis |
| EVAR | Endovascular Aneurysm Repair |
| HF | Heart Failure |
| HR | Heart Rate |
| ICU | Intensive Care Unit |
| IVC | Inferior Vena Cava |
| POD | Postoperative Day |

| | |
|---|---|
| RR | Respiratory Rate |
| $SpO_2$ | Peripheral Oxygen Saturation |

## Author Contributions

**Abdoul Aziz Thiaw:** Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Writing – original draft, Writing – review & editing

**Ndeye Fatou Sow:** Funding acquisition, Project administration, Resources, Supervision, Validation

**Abdou Lahat Mbengue:** Methodology, Software, Validation, Visualization

**Papa Adama Dieng:** Formal Analysis, Validation, Visualization

## Conflicts of Interest

The authors declare no conflicts of interest.

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