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Case report

Ruptured abdominal aortic aneurysm treated with open surgical repair (OSR) of a patient with active COVID-19 infection: A case report

Tareq H. Al-Samarneh [a], Kristi E. Janho [a], Muhannad O. Jalokh [a], Rami A. Abudayyeh [b], Mohammad A. Al-doud [a,*], Bashar K. Anakrih [a]

[a] Department of Vascular Surgery, Jordanian Royal Medical Services (JRMS), Amman, Jordan
[b] Department of Anesthesiology and Intensive Care, Jordanian Royal Medical Services (JRMS), Amman, Jordan

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ABSTRACT

Introduction and importance: Patients continued to present vascular emergencies during the most severe phase of the COVID-19 outbreak. An abdominal aortic aneurysm rupture was considered the most life-threatening condition.

Aim: To report a case report of a patient with active COVID-19 infection presenting as a ruptured abdominal aorta aneurysm and treated with open surgical repair at the Department of Vascular Surgery, Royal Jordanian Medical Services (JRMS), Amman, Jordan.

Case presentation: A 69-year-old male presented with an active COVID-19 pneumonic chest infection. Abdominal CT of angiography showed a 4.8-cm infrarenal abdominal aortic aneurysm unsuitable for endovascular aortic aneurysm repair (EVAR). After a rapid deterioration in his general condition, he underwent an exploratory laparotomy which revealed the diagnosis of an AAA rupture. We managed his condition operatively with repair using a tube Dacron graft.

Clinical discussion: Ruptured AAA is considered a devastating lethal vascular emergency with high mortality and morbidity rates and needs emergency intervention n eligible patients. COVID-19 patients with AAA rupture have a significantly increased risk of intervention and require special attention regarding the type of intervention and anaesthesia. The COVID-19 pandemic has changed many guidelines in management vascular emergencies, among them AAA rupture patients. The National Societies guidelines recommended limiting interventions to emergencies only.

Conclusion: The difficulties of surgical intervention, anaesthesia and the appropriate intervention selection increase the burden on the medical staff resisting the obstacles imposed on them by COVID-19 infection.

1. Introduction

The COVID-19 (SARS-CoV-2) pandemic is a widespread global catastrophe that has affected millions of people, leading to severe health, economic and social disruption worldwide [1]. The infection initially targets the respiratory system, and its early symptoms are shortness of breath and fever [1–4].

Both co-existing and COVID-19-negative patients continue to present vascular emergencies, among them abdominal aortic aneurysm rupture, the most life-threatening condition, which needs exceptional attention in patients with active COVID-19 due to challenges and difficulties of surgical intervention and anaesthesia [1–4].

We report our experience with a male patient who had a ruptured abdominal aorta aneurysm (AAA) and presented to the Department of Vascular Surgery at the Royal Jordanian Medical Services (JRMS), Amman, Jordan, in the second wave of the COVID-19 pandemic. The fundamental vascular surgery treatment principles have been preserved, with a few special considerations. The patient gave his consent to have his case published. This case report has been reported in line with the SCARE 2020 Criteria [5].

2. Case report

A 69-year-old male presented to the emergency department with fever, dry cough, myalgia and shortness of breath for one week. Abdominal pain or back pain denied. No change in his appetite. He was

* Corresponding author.
E-mail address: Mohammad.aldoud@yahoo.com (M.A. Al-doud).

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known to have hypertension well controlled on a β-Blocker (Bisoprolol, 5 mg once daily) and Amlodipine 5 mg twice daily. He was not smoking or drinking alcohol and lived in a rural area. No allergy to any drug has been documented. He had never had any abdominal surgery or trauma.

Physical examination revealed a man, fully conscious and oriented. Vital signs on arrival were: temperature 38.1 °C, pulse rate 115/min, respiratory rate 24/min, and blood pressure 160/90 mmHg. His SpO2 on room air was 84 %. Head and neck examination was negative for lymphadenopathy, jaundice or other chronic systemic disease stigmata. His lips were dry and cracked. His respiratory examination had full of crackles on top of scattered wheezes. An abdominal investigation revealed a pulsatile paraumbilical abdominal mass. The abdomen was non-tender on palpation, and there were no signs of peritonitis. The rest of the abdominal examinations were unremarkable.

Laboratory studies in the ER included complete blood count (CBC), kidney function and electrolytes, arterial blood gases (ABGs), and liver function tests. Leukocytosis of 19,000/μL was present with normal hematocrit and platelet count. A marked increase in C-reactive protein level 190 mg/L (range 0.0–5.0) and erythrocyte sedimentation rate of 33 mm/h (range < 25). D-Dimer was 0.29 μg/mL. Kidney function test and electrolytes showed elevated BUN/creatinine ratio as well as hyponatremia (BUN: 46 mg/dL; Creatinine 2.37 mg/dL; Na^+ 131 mEq/L). Arterial blood gases showed respiratory alkalosis (pH: 7.48; CO2: 32 mmHg; HCO3: 21 mmol/L).

Transthoracic echocardiography (TTE) was performed to exclude infective endocarditis, showed no cardiac vegetation and was excepted. A high-resolution chest CT (HRCT) scan showed diffusely infiltrated lung fields by Ground glass opacities (GGO) and consolidation, mainly at lower zones suggesting atypical pneumonic infection. RT-PCR (real-time–polymerase-chain-reaction) test for COVID-19 was positive. The patient had a 4.8 cm aneurysm documented by abdominal ultrasound without any sign of rupture.

Initial resuscitation was performed in the emergency room with fluid resuscitation by administering 1000 mL of normal saline, and oxygen was given via an oxygen mask (10 L/min). A urinary catheter was inserted to monitor urine output.

After his admission to the COVID-19 isolation ward, supportive treatment measures were applied according to the approved guidelines of international COVID-19 protocols and based on standard COVID-19 care. On entry, he was given oxygen via an oxygen mask (10L/min; oxygen saturation [SpO2], 92 %), which was replaced by High-flow nasal cannula (initial flow rate, 50L/min; oxygen concentration, 80 %; temperature, 37 °C). Under HFNC, he gradually relaxed, his respiratory rate gradually slowed, and his SpO2 rose to 94 %.

He developed severe central abdominal pain that suddenly spread to the back. Abdominal computed tomography angiography (CTA) showed a 4.8 cm infrarenal abdominal aneurysm extending to the aortic bifurcation, a 34 mm neck aneurysm, and a 5 mm neck aneurysm that contained a circumferential thrombus, and fat stranding was observed [Fig. 1].

After the patient experienced worsening abdominal symptoms, the decision was made to perform an emergency laparotomy to repair the aneurysm. The patient was prepared and transferred to the operating room for open surgical repair (OSR).

After receiving confirmation of approval, our anaesthesia team made the preoperative arrangements. The procedure was performed with appropriate bundles of complete personal protective equipment (PPE) for all operating room personnel. General anaesthesia was performed with endotracheal intubation. Antibiotics were administered before surgery as prophylaxis. Urinary catheter and nasogastric drainage tubes had already been inserted.

The abdomen was prepped and draped routinely. A midline lower abdominal incision was made with a subsequent opening in layers. A transperitoneal approach was used to expose a retroperitoneal aortic aneurysm with findings of a central retroperitoneal hematoma resulting from AAA rupture [Fig. 2]. Successful supraceliac cross-clamping was

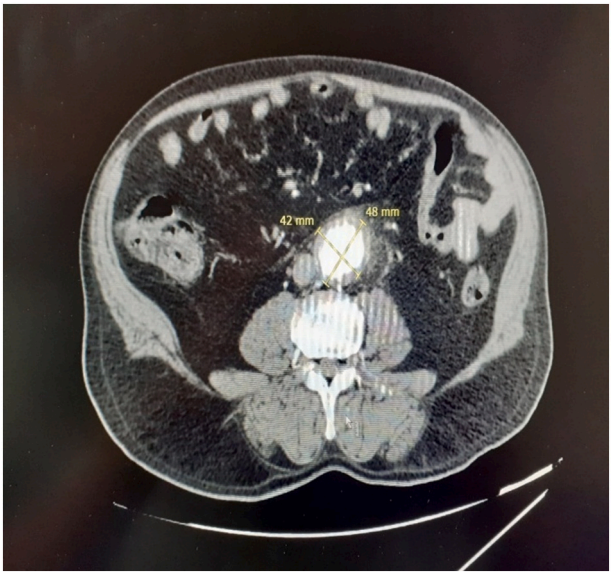

Fig. 1. Selected images of abdominal computed tomography angiography (CTA): showing 4.8 cm infrarenal abdominal aortic aneurysm with fat stranding.

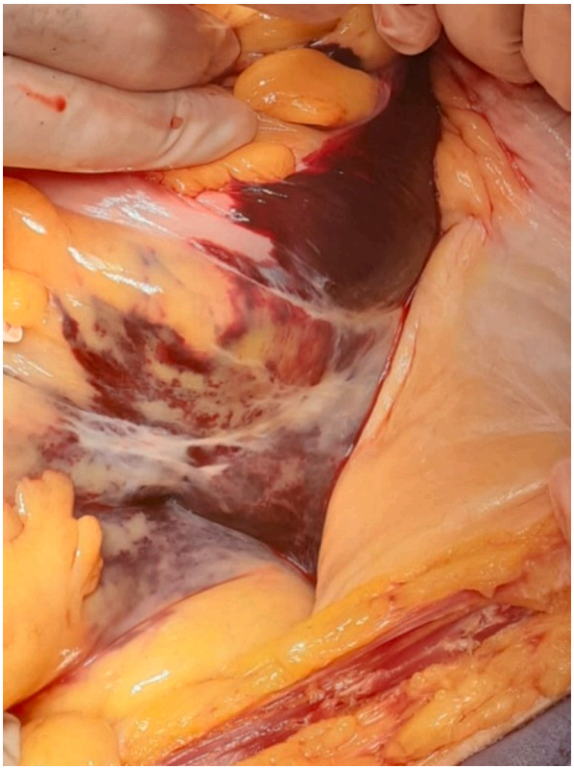

Fig. 2. Intra operative photos demonstrating central retroperitoneal hematoma caused by ruptured AAA.

achieved through the lesser sac. We repaired the AAA rupture without immediate complications with an 18-mm straight Dacron graft. Intraoperatively, [Fig. 3]. Other abdominal organs were assessed and were intact.

Immediately after the surgery, the patient was transferred to the intensive care unit and received care from a group of highly trained nurses working under the supervision of a vascular surgeon and his assistants. The patient was successfully extubated after ten days period of

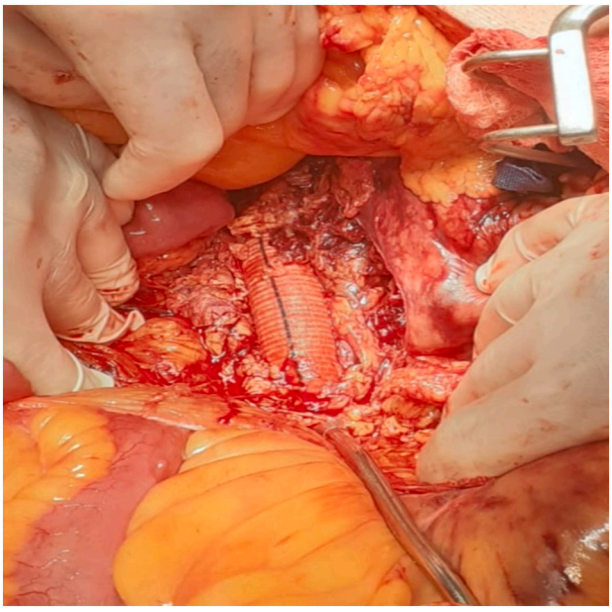

Fig. 3. Intra operative photos demonstrating open surgical repair of AAA using straight Dacron tube 18 mm graft.

mechanical ventilation. After recovery, the patient was transferred to a floor designated for infection with the Coronavirus. The patient took azithromycin and hydroxychloroquine; the regimen was given to all COVID-19 patients hospitalized.

3. Discussion

An abdominal aortic aneurysm (AAA) is a life-threatening condition that requires treatment or monitoring depending on the size of the aneurysm and/or symptoms. An abdominal aortic aneurysm may be discovered incidentally or at the time of rupture. Ruptured AAA is considered a devastating lethal vascular emergency with high mortality and morbidity rates and needs emergency intervention in eligible patients [1,2].

The increased incidence of ruptured AAA during the pandemic period is related to several risk factors: (1) COVID-19 infection leads to activation of metalloproteinases and digestion of the collagen of the aneurismal wall; (2) A reduced number of abdominal ultrasound and computed tomography (CT) studies in the general population for abdominal aortic aneurysm (AAA) screening; as a result, the patients did not know they had an AAA and had no symptoms before the rupture; (3) Postponed follow-up in asymptomatic patients with small AAA by serial abdominal ultrasound studies during the pandemic period; (4) The reluctance to seek medical attention or delayed surgery is due to fear of patients getting infected in an overwhelming outbreak pandemic or organizational problems. We must add stress and the resulting hypertensive crises during the pandemic [6]. COVID-19 patients with ruptured AAA have a significantly increased risk of intervention and require special attention regarding the type of intervention and anaesthesia [1,2]. The COVID-19 pandemic has changed many guidelines in the management of vascular emergencies, among them AAA rupture patients [1]. For example, the National Societies guidelines recommended limiting interventions to emergencies only [7].

The French Society of Vascular Surgery has restricted the surgical activity of acute aortic syndromes in favour of endovascular interventions over open repair in eligible patients [1].

The UK Aortic Surgery Group and Society of Cardiothoracic Surgery of Great Britain and Ireland classified vascular emergencies into three levels based on emergency status, from large asymptomatic aneurysms classified as Level 1 to ruptured aneurysms as Level 3 [7].

The American College of Surgeons recommended that AAA repair be deferred until the size is >6.5 cm [8,9].

Patients with abdominal aortic rupture usually present with sudden onset of abdominal or back pain with hypotension and a pulsating abdominal mass [10]. A free intraperitoneal rupture has a worse prognosis than a retroperitoneal rupture. With or without contrast, abdominal computed tomography remains the gold standard in diagnosing AAA ruptures that aids in the management and choice of intervention in stable patients [10,11]. However, emergency transport to the operating room with dynamically compromised patients is needed without delay [10].

The gold standard has been an open surgical repair (OSR) via retroperitoneal or transabdominal approach. However, endovascular repair is now applied for most repairs with a femoral arterial approach, especially in patients at higher risk. The choice between open surgical repair (OSR) and endovascular repair (EVAR) remains a challenging factor for managing eligible patients who have good prospects for survival [11,12].

EVAR was appropriate for anatomically suitable patients by many vascular surgeons, inspired by the low mortality rate, low pulmonary complications rate, short hospital stay duration and admission to the intensive care unit [11,12]. In addition, it can be performed under local anaesthesia to avoid complications of general anaesthesia, thus reducing the potential for major risks [9,12].

Open surgical repair is still reserved for patients unsuitable for EVAR, where endovascular facilities are inaccessible, and patients with severe hemodynamic compromise [9,12].

The risks of surgery are affected by the patient's age, the presence of renal failure, and the state of the cardiopulmonary system [13].

In our case, the patient had impaired renal function, presenting a significant risk to EVAR due to nephrotoxicity and risk of renal failure. In addition, the parameters of the aneurysm, including aortic neck measurements (neck length 5-mm, diameter 34-mm) and the presence of thrombus, rendered it anatomically unsuitable for EVAR. However, considering the risks and benefits and the available resources, we felt open surgical repair (OSR) would still be preferable at this time. Therefore, we decided to treat him with open repair using Daron straight graft despite the high risks of surgery and anaesthesia that would accompany the repair.

It heightens the importance of having a wide range of endovascular devices available. In addition, it offers the possibility of safe treatment of various forms of aortic aneurysms, such as the use of Fenestrated devices and chimney methods that were not accessible in our hospital.

4. Conclusion

Abdominal aortic aneurysm ruptured remains one of the most devastating and morbid vascular surgery emergencies, with an overall mortality rate of approximately 90 %. The difficulties of surgical intervention, anaesthesia and the appropriate intervention selection increase the burden on the medical staff resisting the obstacles imposed on them by COVID-19 infection. The guidelines for commitment to the Global Strategy are mandatory despite the equipment, supplies and staff availability shortage.

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Ethical approval

Ethical approval has been taken from The Ethical Committee at King Hussein Medical Center, Amman, Jordan. The reference number is 21/10/2021.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Registration of research studies

The authors don't need to register this work.

Guarantor

Mohammad A. Al-Doud.

Provenance and peer review

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CRediT authorship contribution statement

Category 1:

- Interpretation of the CT images: Mohammad A. Al-Doud**.**

- Pre-Operative care: Muhannad O. Jalokh, Rami A. Abudayyeh.

Operation:

- Main Surgeon: Tareq H. Al-Samarneh.

- Assistants Surgeon: Kristi E. Janho, Muhannad O. Jalokh, Mohammad A. Al-Doud, Bashar K. Anakrih.

Post-Operative Care: Muhannad O. Jalokh, Rami A. Abudayyeh, Mohammad A. Al-Doud.

Category 2:

- Drafting the manuscript: Muhannad O. Jalokh, Mohammad A. Al-Doud.

- Revising the manuscript critically for important intellectual content: Tareq H. Al-Samarneh, Muhannad O. Jalokh, Mohammad A. Al-Doud.

Category 3:

Approval of the version of the manuscript to be published (the names of all authors must be listed): Tareq H. Al-Samarneh, Kristi E. Janho, Muhannad O. Jalokh, Rami A. Abudayyeh, Mohammad. A. Al-doud, Bashar K. Anakrih.

Declaration of competing interest

None of the authors have conflicts of interest.

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