Case Report **AJSRR (2021) 4:18**

American Journal of Surgical Research and Reviews
(ISSN:2637-5087)

Intra-Operative Rupture of Giant Ascending Aorta and Aortic Arch Aneurysm In Open Heart Surgery: A Successful Peri-operative Management

Issaka Zallé M.D, Mohamed El-Alaoui M.D, Djeinaba Kane M.D, Drissi Boumzebra PhD

Cardiovascular Surgery Department, Mohammed VI University Hospital, Marrakech, Morocco.

ABSTRACT

Introduction: Giant thoracic aortic aneurysms are rare. Most of the reported cases are not a known complication of aortic coarctation repair. Otherwise intra-operative aneurysm ruptures are rare cases but a potentially fatal complication in open heart surgery.

Case report: In this article, we report the case of a 23-year-old patient with a giant ascending and arch aneurysm associated with a Standford type A chronic aortic dissection. In the patient's history a coarctation repair at age of five years old was noted. During an open heart surgery for ascending aorta and hemi-arch replacement under cardiopulmonary bypass, aneurysm rupture occurred before aortic cross-clamp. A successful intraoperative and post-operative management was performed. The course was uneventful. The patient was extubated without neurological damage. Moreover, there were no kidney function deterioration, no digestive and limbs ischemia.

Conclusion: Intra-operative aneurysm rupture is rare but is a major operative complication whose successful repair depends on an integrated intra-operative management. Cerebrovascular and heart protection are the main determinants of patient survival. Also, the surgical team's prompt response is the key to the successful execution of the procedure.

Keywords: Ascending aorta- aneurysm - Intra-operative rupture -Cerebral Protection - Open heart surgery- Successfully management

***Correspondence to Author:**
Issaka Zallé M.D
Cardiovascular Surgery Department, Mohammed VI University Hospital, Marrakech, Morocco.

How to cite this article:
Issaka Zallé, Mohamed El-Alaoui, Djeinaba Kane, Drissi Boumzebra. Intra-Operative Rupture of Giant Ascending Aorta and Aortic Arch Aneurysm In Open Heart Surgery: A Successful Peri-operative Management .American Journal of Surgical Research and Reviews, 2021, 4:18.

eSciPub LLC, Houston, TX USA.
Website: https://escipub.com/

Introduction:

An aneurysm is known as a dilation of any artery more than 50% of the normal diameter with loss of parallelism [1]. Forty five (45) patients per million present with thoracic aortic aneurysm (TAA) [2].

Atherosclerosis, hypertension, genetic diseases, infections and trauma constitutes the main etiologies [3- 4]. Timely surgical management of patients with giant ascending aortic aneurysm (AAA) contributes to improve the patient's survival [5- 6]. Traditionally, open cardiac surgery is the gold standard of treatment for aortic arch pathology [7].

Intra-operative rupture of thoracic aortic aneurysm in open surgery is a severe complication which may have an adverse effect on the outcome of the surgical procedure. Among all intra-operative ruptures of aortic aneurysm, the most difficult and uncontrolled are often the presence of dissection or a rupture of a false aortic aneurysm.

In this paper we aimed to report a case of successful management of intra-operative rupture of the ascending aortic aneurysm before aortic cross-clamp during an open-heart surgery.

Case report

A 23-year-old man was admitted to our department for surgical repair of giant ascending aorta and aortic arch aneurysm. On admission he presented with constant increasing chest and abdominal pain that started one week before. Four months before this admission he had intermittent interscapular pain, palpitation that appeared with effort. He also reported the onset of dyspnea.

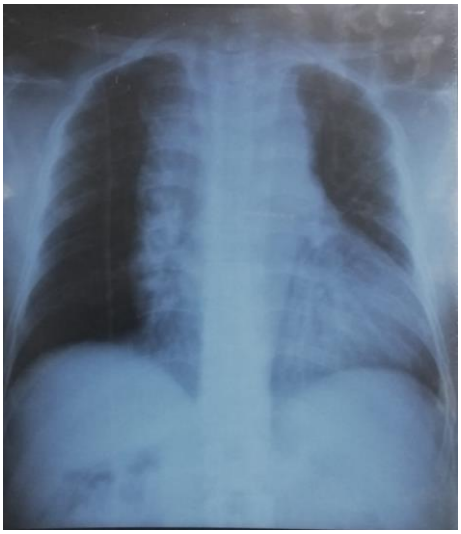

Figure 1: Chest radiography showed widened mediastinum and increased right cardiac silhouette

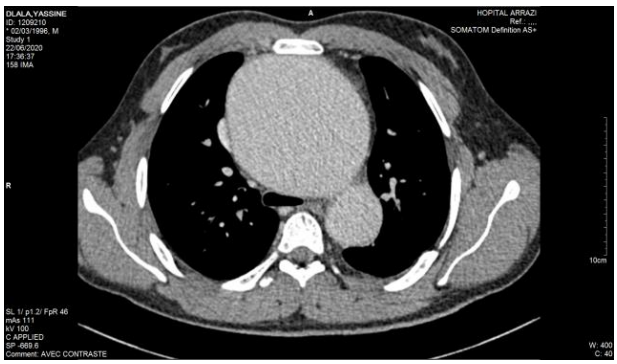

Figure 2: CT showing giant ascending aortic aneurysm

His past surgical history shows a coarctation of the aorta repair at the age of 5 years; bilateral cryptorchidism of which the right testis was surgically descended one year ago.

The medical history reveals an absence of medical and genetic diseases. No cardiac risks factors like were found. Investigations of the patient's etiopathogenesis revealed no history of trauma, systemic connective tissue, infectious or inflammatory diseases.

He had no symptoms of weight loss, dysphagia and hemoptysis.

On admission, his level of consciousness was normal.

Physical examination was found to be normal except a left posterolateral thoracotomy and right inguinal area scars.

He had a regular heartbeat, a heart rate of 90 beats/minute, no heart murmur. His blood pressure of 110/65 mmHg and an open air saturation of 100%. His respiration rate was 26 breaths/minute. He had normal peripheral artery pulses.

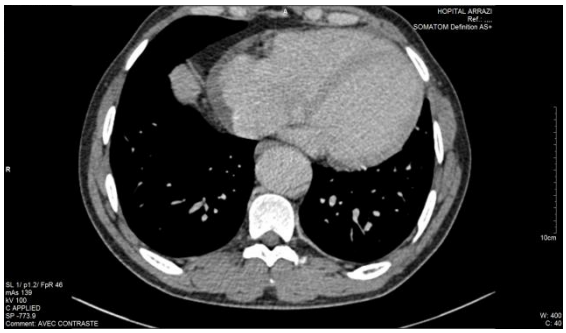

Figure 3: CT scan showing descending aortic dissection

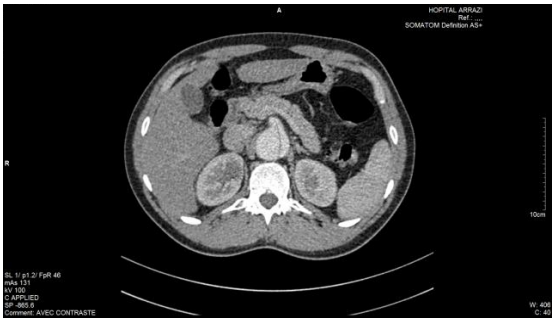

Figure 4: CT scan showing abdominal aortic dissection

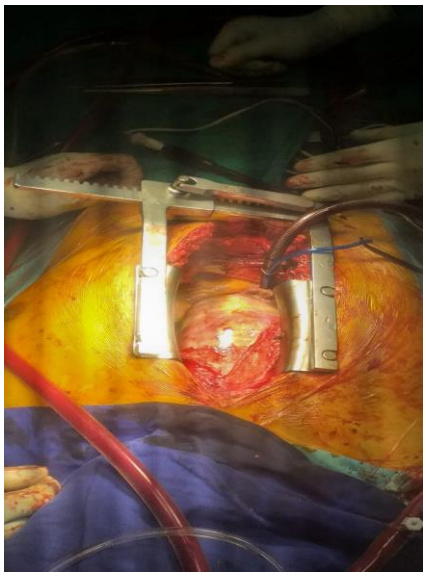

Figure 5: Intra-operative view of the giant ascending aortic aneurysm in the pericardial cavity

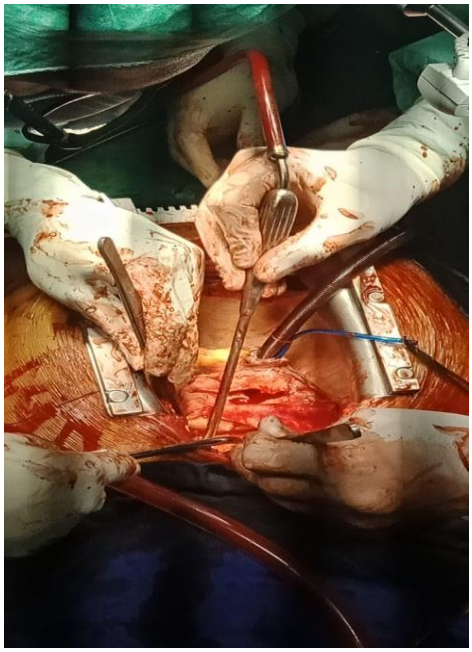

Figure 6: Intra-operative view of the aneurysm rupture

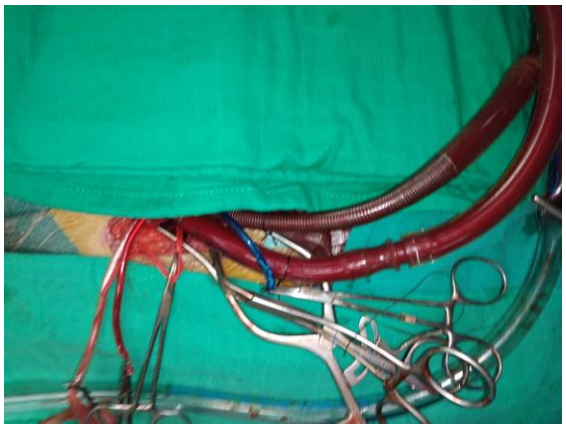

Figure 7: Femoro-femoral cannula

The biologic report was the following: leukocyte count, 5610/μL; red blood cell count, 445 × 10^4/μL; hemoglobin, 13.9 g/dL; platelets, 171 × 10^3/μl; C-reactive protein, 1.86 mg/dL; prothrombin 70,5%.

Biochemical and serological analyses were normal.

Chest radiography showed an increased right cardiac silhouette **(Figure 1).**

A contrast computed tomography (CT) scan confirmed revealed ascending aortic aneurysm with maximum diameter at 10.7 cm extended to the brachiocephalic artery trunk (BCAT) and the aortic arch. It showed also chronic aortic dissection extended from descending thoracic aorta to the abdominal aorta at its iliac bifurcation **(Figures 2, 3, 4)**. CT did not show any sign of ascending aorta dissection. Transthoracic echocardiography (TTE) showed minimal aortic regurgitation and normal cardiac function.

It was decided a prompt open surgical repair as an appropriate treatment option, due to the high risk of rupture. After informing the patient about the surgery and obtaining the informed surgical consent from the patient, he was transferred to the operation room.

Surgical Approach

Under general anesthesia, the right common femoral and vein vessels (**Figure7**), axillary artery (**Figure 8**) were exposed by small incisions and cannulated in order to establish

cardiopulmonary bypass with systemic hypothermia (18-20^{o}C). And then a median full sternotomy was performed after initiation of CPB. Intra-operative view found a giant AAA extended to the aortic arch which occupied most of the space in the pericardial cavity **(Figure 5)**. Aneurysm rupture occurred near the innominate artery while performing dissection in order to control the distal arch for aortic cross clamp **(Figure 6).**

Figure 8: Axillary Cannula

A circulatory arrest with selective high flow cerebral perfusion through axillary artery was performed. The innominate artery was not snared. The mean cerebral perfusion pressure was 40 mmHg. A cardiac protection with cold blood cardioplegia was given via coronary ostia. Night (9) minutes were needed to snare the innominate artery end.

At the same time packed Red Blood Cells and Fresh Frozen Plasma were transfused. There was not a physiological state of shock intra-operatively.

The time of the doubt of cerebral ischemia was 9 min.

Aortic tissue exploration revealed a chronic type A dissection of the ascending aorta and the arch with complete and circular intimal rupture with no extending to the Valsalva Sinus. The sinus was not dilated. We did not find residual coarctation.

Under circulatory arrest we started by the distal anastomosis at the isthmus with Dacron polyester (size 28 mm), then we re-implanted the aortic arch branches cuff. After the prosthesis was clamped, the AAA was excised and the ascending aorta was replaced with a size 28mm Dacron polyester prosthesis by using 4-0 prolene supra-coronary sutures, without performing any aortic valve and coronary artery surgery. The two segments of the prosthesis were anastomosed, aortic cross clamp was removed. The heart activity resumes sinus rhythm. Circulatory arrest was 26mn; CPB, 155mn; Aortic cross-clamp time, 53 min; heart assistance time, 18 min; Doubt of cerebral ischemia, 9min.

Post-operative management

The patient's condition required blood transfusion and fluid replacement; the patient remained hemodynamically stable under low dose of noradrenaline. Patient left the operation room with packing. In the intensive care unit (ICU) there were any hemodynamic complications. . Evaluation following the end of sedation showed no neurological abnormalities, such as motor paralysis, disturbance of consciousness or paralysis of the extremities. After 24 hours stay in ICU packing was removed in operation room. Patient was extubated at 36 hours post-operative and the drains also were removed. The patient was able to hold a conversation and respond appropriately when prompted.

The patient's respiratory kidney status was not deteriorated. Post-operative TTE revealed

minimal pericardial effusion that did not need surgical drainage. Post-operative contrast enhanced computed tomography performed at 20 days post-operative stay showed aortic prosthesis in the correct position **(Figure 9).**

Figure 9: Post-operative CT showing aortic prosthesis in correct position

Discussion

Sixty percent (60%) of thoracic aortic aneurysms involve the ascending aorta, aortic arch or aortic root [8]. In older patients the most common etiological is arteriosclerotic, degeneration, while Marfan syndrome or bicuspid aortic valve is the main etiology in younger patients. Other etiological reasons of AAA are trauma, aortic pseudoaneurysms, aortic dissection and several forms of vascular diseases such as Takayasu arteritis and giant cell arteritis. The majority of patients with AAA are asymptomatic [9].

Otherwise the finding of a thoracic aortic aneurysm after aortic coarctation repair is not rare. Aneurysm formation after aortic coarctation repair is a serious complication which may occur either on the site of repair or within the proximal aorta and is associated with the significant risk of aortic rupture. Knyshov et al. [10] reported 5.4% cases of aneurysm formation in a series of 891 patients followed for up to 20 years post-operatively Our case is the typical example. Larger aneurysms are rare but are the main factor for ruptures or dissection.

Giant AAA is defined as an aneurysm with maximal diameter greater than 10 cm [11]. Surgical management of a giant AAA is challenging since it poses some complication risks such as bleeding, end organ ischemia, underlying disease and staged repairs [12-13-14].

Timely surgical management of such patients often contributes to prolong the life span.

Our case was technically difficult because of the over aortic wall weakness due to the chronic dissection and the inaccessibility of the BCAT which was refueled by the ascending aorta aneurism. That explained the difficulty of tissue dissection and the high risk of intra-operative rupture.

In our case we decided to perform an AAA and aortic arch repair under open heart surgery in line with American Heart Association and European Society of Cardiology guidelines which show that, surgical indications of AAA are based on size and growth rate of aneurysm, and

the existence of symptoms. In fact, American College of Cardiology, American Heart Association and European Society of Cardiology guidelines [15-16] have recommended the surgical repair for all symptomatic AAA (ruptured, associated with dissection, causing pain) regardless of aneurysm size. For asymptomatic patients, these guidelines recommend:

- The surgical repair in the existence of degenerative thoracic aneurysm

- Chronic aortic dissection, intramural hematoma

- Penetrating atherosclerotic ulcer, mycotic aneurysm or pseudoaneurysm

- Patients whom the ascending aorta or aortic sinus diameter is 5.5 cm or greater.

Surgery of AAA and arch need necessary peri-operative management. The successful repair of the AAA and aortic arch associates many factors:

-Reinstitution of the blood flow from the ascending to the descending aorta

-Reinsertion of the supra-aortic branch

- Neurocognitive function

- Protection of the abdominal viscera.

Intraoperative aneurysm rupture is rare and the successful progress of the surgery requires appropriate intra-operative and post-operative management. [17] Among all intraoperative ruptures of aortic aneurysm, the most difficult and uncontrolled are ruptures of aortic aneurysm with presence of dissection which was the case for this patient.

During the intra-operative aortic rupture, the first priority of the surgical team consists of urgent achievement of maximal temporary hemostasis and an adequate replenishment of blood loss, while achieving neurocerebral protection. That is why we performed cannulation of femoral and axillary vessels for the establishment of cardiopulmonary bypass before median sternotomy for successful management.

Moreover, it is essential that the surgeon has a fast and methodical approach to avoid additional iatrogenic injury to the aorta.

Conclusion

Intra-operative aneurysm rupture is a rare but major operative complication in which its successful repair depends on the overall intra-operative management. Cerebral and heart protection are the main determinants of patient survival. Also, the surgical team's attitude and prompt response contributed to the success of the procedure.

References

1. Hiratzka LF, Bakris GL, Beckman JA, et al.2010ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM guidelines for the diagnosis and management of patients with thoracic aortic disease: a report of the American College of Cardiology Foundation, American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine.*Circulation 2010*; 121:266-369.
2. Nadir Görülen Bir Vaka. Torasik Aort Anevrizması: Thoracic Aortic Aneurysm: A Rare Case Report. Turk Toraks Derg 2013; 14: 78-80.
3. Şenturk T, Yetgin ZA, Doğan T, Aydınlar A. Torasik aorta nevrizmasında endovaskuler stent greft implantasyonu. Anadolu. Kardiyol Derg 2009; 9:5-9.
4. Akin I, Kische S, Rehders TC, et al. Endovascular repair of thoracic aortic aneurysm. Arch Med Sci 2010; 6:646-52.
5. Moutakiallah Y, Houssa MA, Seghrouchni A, Atmani N, Drissi M, Asfalou I, et al. A giant aneurysm of ascending aorta revealed by superior vena cava syndrome. Heart Lung Circ. 2014; 23(12):e264-6.
6. Hela BJ, Nesrine G, Taieb C, Abdessalem H, Aiman D, Faten D, et al. Giant ascending aortic aneurysm complicated by a tracheal compression: a case report and review of the literature. J Clin Exp Cardiolog. 2016; 7:418.
7. Martin Czerny (EACTS Chairperson) and Ju¨rg Schmidli (ESVS Chairperson). Current options and recommendations for the treatment of thoracic aortic pathologies involving the aortic arch: an expert consensus document of the European Association for Cardio-Thoracic surgery (EACTS) and the European Society for

Vascular Surgery. European Journal of Cardio-Thoracic Surgery 55 (2019) 133–162.
8. Chiba-Nishi General Hospital, 107-1 Kanegasaku Matsudo-shi, Chiba-ken 2702251, Japan Isselbacher. EM. Thoracic and abdominal aortic aneurysms. *Circulation* 2005; 111(6):816-28.
9. Srivastava V, AlHadid K, Saravanan P, Zacharias J, Bittar MN. Giant aneurysm of the ascending aorta. *BMJ* CaseRep.2011; 2011.pii:bcr112010354.
10. Knyshov GV, Sitarr LL, Glagola MD, Atamanyuk MY. Aortic aneuvrysms at the site of repair of coarctation of aorta: a review of 48 patients. *Ann thorac surg* 1996; 61:935-9.
11. Agarwal V, Yaliwal C, Ofo E, Kolvekar S. Giant ascending aortic aneurysm-a case report and review. Heart Lung Circ. 2007; 16(5):385-38.
12. Carvalho RG. New information technology in cardiac surgery: development of an applicative about ascending aortic aneurysm ("aortic surgery"). Rev Bras Cir Cardiovasc. 2013; 28(3):315-6.
13. Silveira LMVD, Tagliari AP, Costa RDD, Martins CB, Wender O. Aortic valve replacement combined with ascending aortic aneurysmectomy in a patient with sickle cell disease: a case report. *Braz J Cardiovasc Surg.* 2018; 33(2):203-5.
14. Huliyurdurga Srinivasasetty NS, Thagachagere Ramegowda R, Kharge J, Bachahalli Krishnanayak G, S Patil S, Raj V, et al. Unusual non progressive idiopathic giant ascending aortic aneurysm-A rarity. Int J Surg Case Rep. 2016; 25:203-6.
15. Hiratzka LF, Bakris GL, Beckman JA, Bersin RM, Carr VF, Casey DE Jr, et al. 2010ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR /STS/SVM guidelines for the diagnosis and management of patients with thoracic aortic disease. A report of the American college of cardiology foundation/American heart association task force on practice guidelines, American association for thoracic surgery, American college of radiology, American stroke association, society of cardiovascular anesthesiologists, society for cardiovascular angiography and interventions, society of interventional radiology, society of thoracic surgeons, and society for vascular medicine. J Am Coll Cardiol 2010; 55(14):e27-129. Erratum in: J Am Coll Cardiol. 2013; 62(11):1039-40.
16. Erbel R, Aboyans V, Boileau C, Bossone E, Bartolomeo RD, Eggebrecht H, et al. 2014 ESC guidelines on the diagnosis and treatment of aortic diseases: document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The task force for the diagnosis and treatment of aortic diseases of the European society of cardiology (ESC). Eur Heart J. 2014; 35(41):2873-926. Erratum in: Eur Heart J. 2015; 36(41):2779.
17. Sven Peterssab, Maximilian Pichlmaiera, Alexander Curtisc,Maximilian Luehra, Frank Borna, Christian Hagla. Patient management in aortic arch surgery Department of Cardiac Surgery, University Hospital Munich, Ludwig Maximilian University, Munich, Germany Aortic Institute, Yale University School of Medicine, New Haven, CT, USA Oxford University Hospitals NHS Foundation Trust, Oxford, UK Corresponding author. Department of Cardiac Surgery, University Hospital Munich, Ludwig Maximilian University, Marchioninistrasse 15, 81377 Munich, Germany. European Journal of Cardio-Thoracic Surgery 51 (2017) i4–i14 REVIEW.