



## Case Report

# Hybrid Treatment of Arteria Lusoria: A Single Center Algerian Experience

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**Abstract:** Aberrant or retro esophageal subclavian arteries may develop symptoms or complications deserving treatment. Such treatment necessitates revascularization of the involved subclavian artery which may be achieved using cervical transposition or bypass along with repair of the distal aortic arch. The advent of endovascular techniques has eased this latter part of treatment. We herein report three cases treated in our department, all male, whose average age is 54 years with as risk factors: smoking, hypertension and dyslipidemia. The discovery of the aberrant subclavian artery was fortuitous, diagnosed on angioscanner during the dissection aneurysm assessment of the thoracoabdominal aorta in 02 patients and one patient for acute thoracic pain. Our patients benefited from hybrid surgery with thoracic stent placement associated with supra-aortic trunk transposition in one patient and carotid and a carotid to axillary bypasses in the second patient, while the third patient benefited exclusive endovascular treatment by placing a Multilayer Flow Modulator Stent. The postoperative evolution was good in all patients, except for one case is found in the control CT scan a type II endoleak, well tolerated by the patient, which will be taken in a second time for a complementary gesture. Our early experience is encouraging using the hybrid approach among three consecutive cases with aneurysmal or dissecting complications of right aberrant subclavian arteries using cervical transposition or bypass along with endovascular aortic repair.

**Keywords:** Arteria Lusoria, Subclavian Artery Retro-Esophageal, Aberrant Subclavian Artery, Kommerell Diverticulum, Aortic Endograft

## 1. Introduction

With reported prevalence rates of 0.5 to 2.5%, aberrant right subclavian artery (ARSA) is among the most common congenital abnormalities of the aortic arch [1]. In the normal embryological development of the aortic arches, the right dorsal aorta regresses caudal to the origin of the 7th inter segmental artery which gives rise to the right subclavian artery. In formation of an ARSA, regression occurs instead between the 7th inter segmental artery and the right common carotid so that the right subclavian artery is then connected to the left dorsal aorta via the part of the right dorsal aorta which normally regresses. During growth, the origin of the right

subclavian artery migrates until it is just distal to that of the left subclavian [2]. ARSA cross behind the esophagus in 80 to 84% of cases and may then cause dysphagia, between the trachea and esophagus in 15% of cases and seldom (5%) before the trachea [1]. Sixty percent of ARSAs have a larger ostium than their trunk and have a form of infundibulum, the diverticulum of Kommerell prone to aneurysmal degeneration and dissection [3]. Several other arch or thoracic or cervical abnormalities are common among ARSA patients: coarctation, septal defect, abnormal arising of vertebral arteries, right thoracic duct and not recurrent laryngeal nerve but the most common (60%) is a common trunk of both common carotids [4-6]. Aberrant left subclavian arteries are much less frequent

(1%) [7]. Complicated ARSA are usually treated by direct transposition into the right common carotid through cervicotomy. However, aneurysmal degeneration of the diverticulum of Kommerell requires some form of aortic repair either through the left chest or less frequently through sternotomy, especially in cases with combined heart disease. Endografts have notoriously reduced the invasiveness of aortic repair. Moreover multilayer flow modulators (MFM) have raised the hope that their use could simplify the repair of aneurysms of aortic segments giving rise to critical branches like the arch [8].

The lesser invasiveness of endovascular repair is particularly appealing in emergent countries like ours, especially if the cost of devices is compensated by a decrease of the burden of complications. However totally endovascular techniques necessitate a setup hardly found in emergent countries. The hybrid approach combining open cervical reconstruction and endovascular aortic repair seemed to us as bringing together a

good protection against stroke and the ease of aortic repair without necessitating too important infrastructures. We herein review three consecutive cases of ARSA treated using an endograft which was a MFM in one case.

## 2. Materials and Methods

### 1<sup>st</sup> case:

55 years-old male former heavy smoker under antihypertensive bitherapy was admitted for chest pain. Blood pressure was 200/100. EKG and Troponin level were normal. Contrast enhanced tomography (CT) showed a 64/60mm dissecting type I thoracoabdominal aneurysm (TAA) (Figure 1). A 40/150 MFM (Cardatis, Isnes, Belgium) was inserted through the femoral route. The patient was discharged the sixth day. A satisfactory exclusion of the aneurysm was confirmed by CT at one then six months then one and two years (Figure 2).

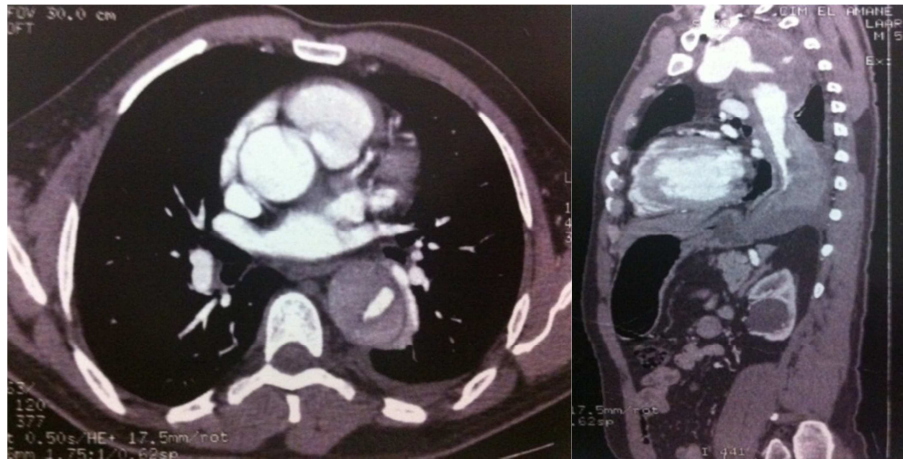


Figure 1. CT scan: before intervention.

Aneurysm of the descending aorta measuring 64/60 mm, with a dissection beginning at the ARSA. Extension of dissection to the supra and infra-renal aorta with a normal diameter.





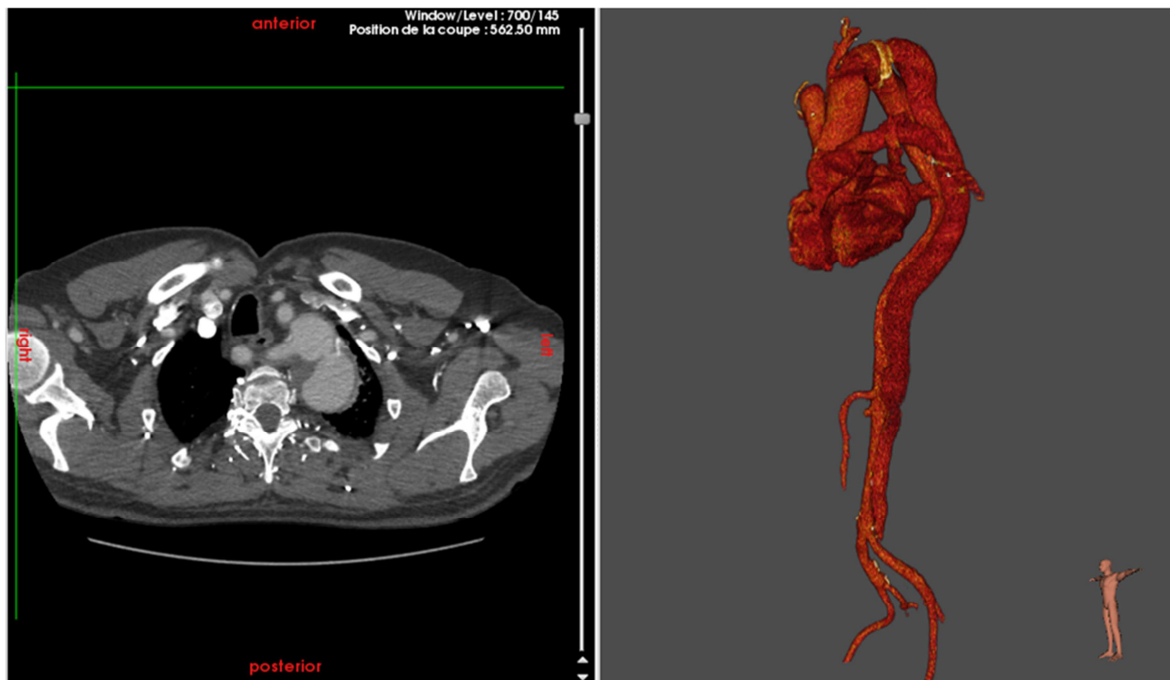
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**Figure 2.** A: Multilayer Stent, MFM: 40/150. B: Follow-up at 04 years: CT scan of the control, Endoprosthesis on place. Good evolution, none complication.

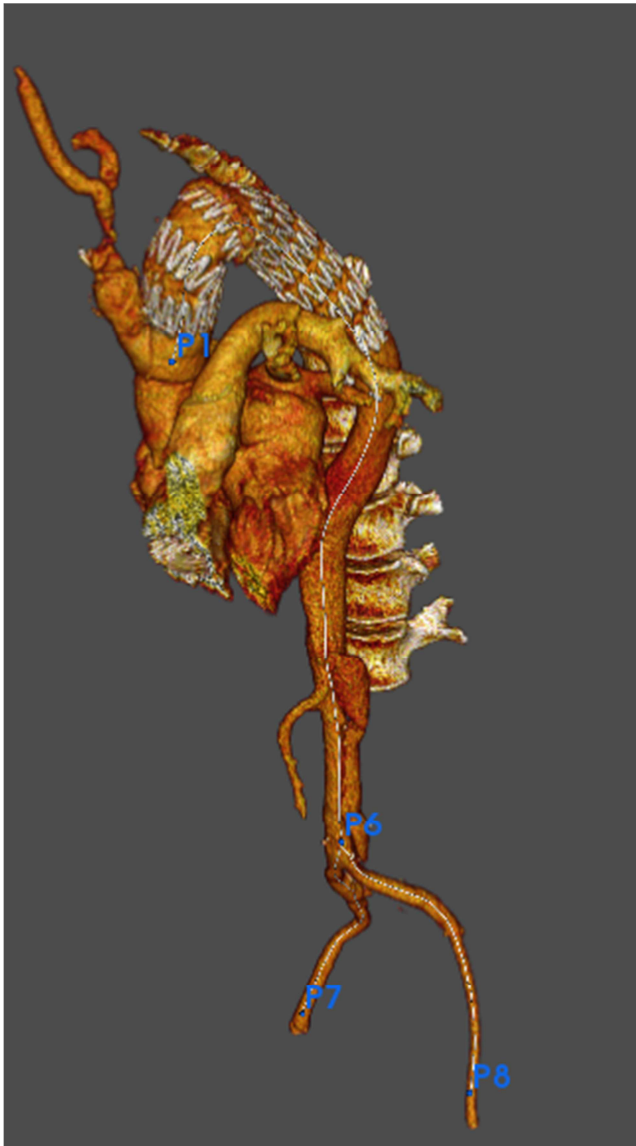
## 2<sup>nd</sup> case:

A 59 years-old male treated in emergency four years ago of a type A aortic dissection using a branched 30mm supra coronary graft under deep hypothermia was referred for a 60mm dissecting aneurysm distal to the graft involving a Kommerell diverticulum. Dissection extended onto the left common iliac artery. The Celiac trunk and the superior mesenteric artery arose from the true lumen (Figure 3). The case was treated using a stent-graft (Zenith Cook) covering from the distal extremity of the previous graft to the mid

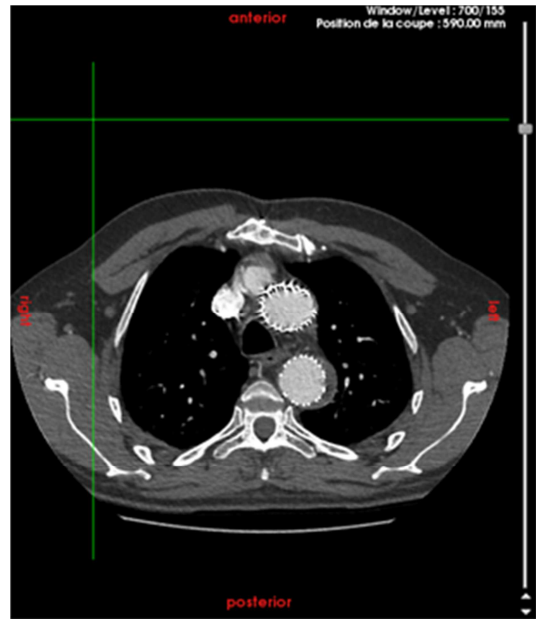
descending aorta while the ARSA was transposed to the right common carotid. One day after surgery, acute ischemia of the right lower limb revealed a thrombosis of the right superficial femoral artery. Surgical exploration for thrombectomy showed a stenosis of the common femoral artery at the previous cannulation site which was grafted using 7 mm Dacron. Subsequent follow up was satisfactory with thrombosis of the false lumen, no endoleak and shrinking of the aneurysm (Figure 4, 5).



**Figure 3.** Aneurysm with a retrograde dissection of the proximal descending thoracic aorta of 60 mm diameter associated with the ARSA.



**Figure 4.** CT scan of control, at 06 month.

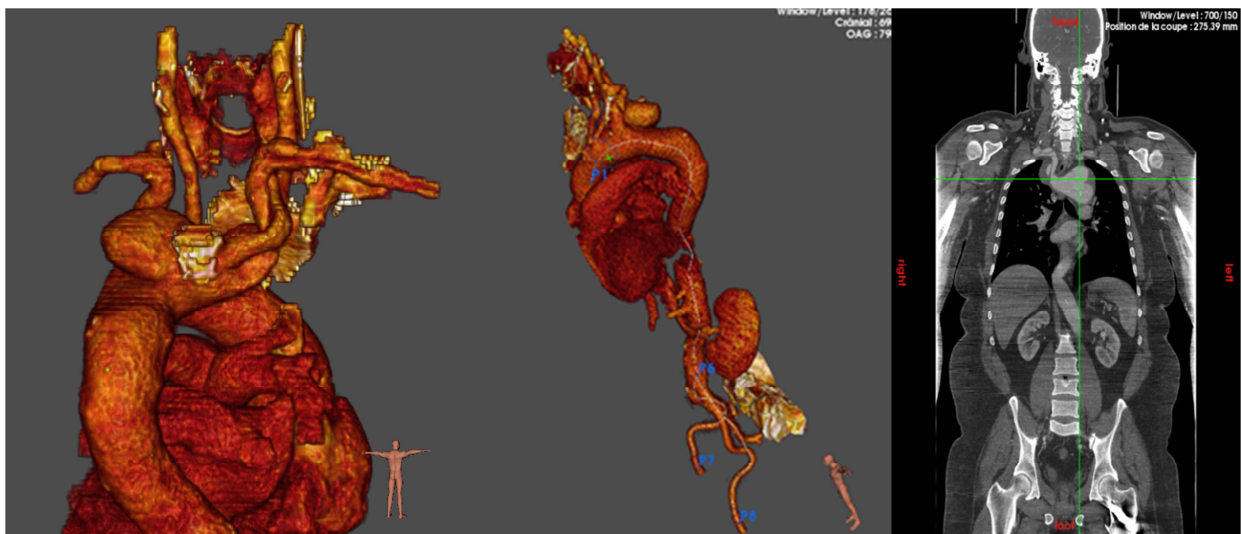


**Figure 5.** CT Scan of control, at 02 years, good evolution, at 02 years: thrombosis of the false lumen.

3<sup>rd</sup> case:

A 50 years-old male obese (125 Kg) hyperlipemic heavy smoker under tri therapy for hypertension was admitted for chest pain and paresthesia of the right arm since 15 days. Cardiac studies were normal as a

CT showed a 70 mm dissecting aneurysm of a Kommerell diverticulum extending onto the axillary artery (Figure 6). The case was treated using a stent-graft (Valiant Medtronic 44x150 mm impacted by « Reliant, Medtronic » balloon 46/100mm) inserted through the right femoral artery combined with a crossed carotid and a carotid to axillary bypasses. The early postoperative course was simple and CT showed a thrombosis of the sac. However the follow up CT at six months showed a type II endoleak. Follow up is continued (Figure 7).



**Figure 6.** Aneurysm of the kommerll's diverticulum (diameter=70mm) next to the ostium of the Arteria Lusoria which is dissected. Extension of the dissection to the axillary artery.





**Figure 7.** CT scan of control. Stent-graft « Valiant Medtronic » 44x150 mm' + carotid - carotidian bypass + Ligation of the ARSA and right Carotid-axillary bypass. Follow - up: thrombosis of the aneurysmal sac with graft patency.

### 3. Discussion

Our three cases confirm that endografts, stent-grafts or MFMs ease the treatment of complicated ARSAs.

ARSAs are often asymptomatic, however, complications may occur. Dysphagia, chronic cough or dyspnea secondary to esophageal compression are known under the term dysphagia lusoria. ARSAs may also be dealt with while treating nonspecific disease like atherosclerosis [9], trauma [10] inflammatory disease [11]. Kommerell's diverticulum is particularly prone to aneurysmal degeneration or proper or aortic dissection [11, 12]. Aneurysmal complications of ARSAs are well described since the eighties [13, 14] and were reviewed in the literature by Fisher in 2005 on 67 cases [15]

The most severe complications in his review were rupture and embolization to the upper limb [16]. The rate of rupture was 20%, fatal in 36% in his review [16] and high in others [1]. This led to propose surgical treatment to complicated aneurysmal degenerations or aneurysms with a diameter over 4 cm [17, 18]. CT has been crowned as the best diagnostic and planning tool when dealing with ARSAs, complicated or not [19]. Mechanisms and topography of dissecting or aneurysmal complications of ARSAs vary [16] but their treatment often necessitates aortic control or even replacement, especially in the presence of concomitant intra thoracic disease on CT [20]. Uncomplicated asymptomatic ARSAs only deserve surveillance.

In 1946, Gross was the first at proposing open surgery of complicated ARSAs [21]. Since then, combined cervical subclavian transposition or bypass and aortic repair through the chest has been adopted as a standard. This standard has then been challenged by the advent of endovascular techniques. Aortic repair with an endograft [22] or closure of the proximal stem of an ARSA using an occluder [17] proved less invasive than open chest repair.

In 1998, the trend towards endovascular thinking was pushed forward by Davidian who was the first to publish a case treated using only endovascular techniques [14]. Endovascular exclusion was reported to obtain a 4% [23] or even 50% [24] shrinking of aneurysmal ARSAs. Chimney techniques proved feasible however with a rate of endoleak of 18% [25] and a definite risk of stroke.

With about 40 cases in the literature, aortic dissection is a probably underreported complication or association of ARSAs. It is relatively more reported for left aberrant subclavian arteries [26]. The hybrid combination of an open cervical reconstruction and endovascular aortic repair following Tanaka [27] appeared to us and others [28] as the best compromise and was chosen for our three cases. Primary success was indeed obtained in all three cases with no strokes however with one endoleak.

### 4. Conclusion

Endovascular therapy or hybrid approach would certainly be the treatment of choice for complicated or aneurysmal ARSA.

Our cases confirm the feasibility, safety and durability of endovascular therapy. Longer term surveillance of these three cases as well as forthcoming cases will have to prove the stability of the results but we already consider the chosen strategy as the most appealing whenever dealing with the aneurysmal or dissecting complications of ARSAs where the economic burden of devices is clearly compensated by a simpler perioperative setup.

### Disclosure Statement

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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