Treatment of Symptomatic Aberrant Subclavian Arteries

H. Jalaie [a,*], J. Grommes [a], A. Sailer [b], A. Greiner [a], M. Binnebösel [a,c], J. Kalder [a], G.W. Schurink [d], M.J. Jacobs [a,d,*]

[a] European Vascular Centre Aachen-Maastricht, University Hospital of the RWTH Aachen, Aachen, Germany
[b] Department of Diagnostic and Interventional Radiology, Maastricht University Medical Centre, Maastricht, The Netherlands
[c] Department of General, Visceral and Transplantation Surgery, University Hospital of the RWTH Aachen, Aachen, Germany
[d] European Vascular Centre Aachen-Maastricht, Maastricht University Medical Centre, Maastricht, The Netherlands

WHAT THIS PAPER ADDS

This study points out the necessity for treatment of the symptomatic aberrant subclavian artery and of aneurysms of the aberrant subclavian artery. Additionally, it shows the feasibility of a hybrid procedure as a first line treatment option.

Objective: The aim of this study is to present experience with 10 patients with symptomatic aberrant subclavian artery (ASA) and aneurysm of ASA who underwent surgical treatment.

Methods: From 2008 to 2011 10 patients with symptomatic aberrant subclavian artery (mean age 60 years [range 24–90 years]) were studied. Symptoms were dysphagia ($n = 7$), dyspnea ($n = 4$), acute chest pain ($n = 1$), respiratory distress syndrome ($n = 1$), superior cava syndrome, and shock ($n = 1$). Six patients had aneurysm formation of the ASA (mean diameter of 7.1 cm [range 3.0–12.4 cm]; rupture [$n = 1$], dissection [$n = 1$]). All data were analyzed retrospectively.

Results: Treatment was performed as a hybrid procedure in eight patients. This included thoracic endoluminal graft exclusion with revascularization of the ASA, a pure endovascular procedure with two occluders in one patient, and an open procedure in one patient with ligation of the aberrant artery through a thoracotomy. Three patients died during the early postoperative period owing to pulmonary complications. All three suffered from a symptomatic aneurysm, and two were treated as an emergency procedure. Median follow-up was 20 months (range 12–49 months).

Conclusion: A symptomatic ASA and its associated aneurysmal formation should be excluded after diagnosis. In most cases, a hybrid procedure consisting of thoracic endografting and revascularization of the ASA is feasible.

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INTRODUCTION

An aberrant right subclavian artery is the most common congenital abnormality of the aortic arch with an incidence of 0.3–3.0%.[1,2] It arises as the last branch of the aortic arch and crosses the midline between the esophagus and the vertebral column to reach the right side of the body (Fig. 1A).[3]

The embryological disorder of the aortic arch leading to an aberrant right subclavian artery is involution of the right fourth aortic arch, along with the cranial part of the right dorsal aorta, leaving the seventh intersegmental artery attached to the descending aorta. Approximately 60% may be aneurysmal at their origin as a result of non-involution of the right dorsal aorta, known as Kommerell's diverticulum.[4,5] It may be associated with other cardiovascular anomalies such as a truncus bicaroticus.[6] An aberrant left subclavian artery arising from a right-sided aortic arch is far more rare, and has an incidence of 0.1%.[7]

In 1735, Hunauld first described this anatomic rarity from autopsy studies. Some patients suffering from this anatomic abnormality develop dysphagia due to compression of the esophagus between the posterior wall of the trachea and the aberrant subclavian artery (ASA). David Bayford was the first to use the term "dysphagia lusoria" to describe the relationship between this anatomical abnormality and its associated symptoms. Bayford presented a 33-year-old woman who died as a consequence of permanent malnutrition due to long-term dysphagia.[8]

An ASA does not usually cause symptoms and can be discovered incidentally during life (during the course of evaluation of other mediastinal anomalies), or may be an incidental finding at autopsy.[9,10] If an ASA is symptomatic, it usually produces dysphagia, shortness of breath, and chronic coughing. Aneurysm formation at this location can cause serious complications, such as rupture, dissection, compression of neighboring structures, and, rarely, distal embolization.[2,9,11]

* Corresponding authors. M.J. Jacobs, H. Jalaie, European Vascular Centre Aachen-Maastricht, University Hospital of the RWTH Aachen, Pauwelsstr. 30, 52074, Aachen, Germany.

E-mail addresses: hjalaie@ukaachen.de (H. Jalaie); mjacobs@ukaachen.de (M.J. Jacobs).

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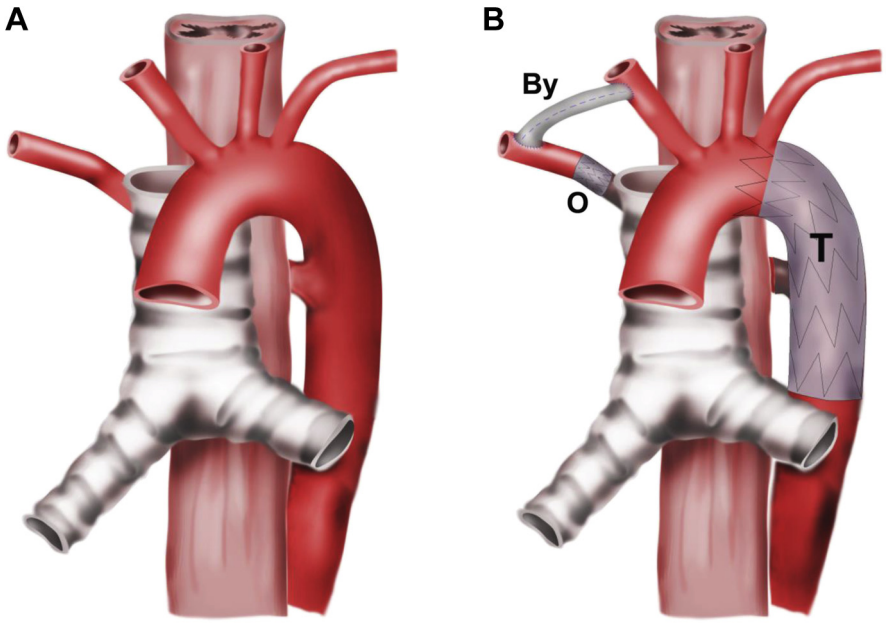

Figure 1. (A) Anatomy of an aberrant right subclavian artery, which arises as the last branch of the aortic arch and crosses the midline between the esophagus and vertebral column. (B) Hybrid procedure: endovascular occlusion of the aberrant right subclavian artery (O) and the origin of the aberrant subclavian artery is covered by a thoracic stentgraft (T). Revascularization is facilitated by carotid subclavian bypass (By) or transposition of the aberrant artery. The vertebral artery (not shown in the figure) has to be preserved in both procedures.

Treatment is indicated for symptomatic relief and for prevention of complications due to aneurysmal dilatation.[12] Open vascular surgery is associated with high mortality and morbidity, as well as with elevated rates of neurological events, mainly because of the advanced age of the patients who develop symptoms and aneurysms.[13,14] As a consequence, endovascular stent-grafting has become an alternative treatment option, which might reduce mortality and morbidity.[15] To the authors' knowledge, the outcome of patients treated for an ASA have thus far only been presented as case reports or small case series.[9]

The aim of this report is to present experience with 10 patients with symptomatic ASA and aneurysm of the ASA who underwent surgical treatment. Endovascular and open surgical techniques are presented and discussed.

METHODS

Between January 2008 and December 2011 a symptomatic aberrant right subclavian artery was diagnosed in nine patients. Another patient had a right-sided descending aorta with a symptomatic aberrant left subclavian artery. All patients were prospectively observed and all data collected were retrospectively analyzed. Beside the patients' demographic data, their past medical history, and their present medical condition (symptoms) as well as radiographic imaging, techniques of treatment, outcome, and follow-up were recorded.

The median age of the patients was 60 years (range 24—90 years). Seven women and three men were included. Reported symptoms included dysphagia ($n = 7$), dyspnea ($n = 4$), acute chest pain ($n = 1$), respiratory distress syndrome ($n = 1$), and superior cava syndrome with shock ($n = 1$). Five patients had dysphagia alone and another five patients had a combination of these symptoms. Six patients had aneurysm formation of the ASA with a median diameter of 7.1 cm (range 3.0—12.4 cm; ruptured [$n = 1$], dissection [$n = 1$]).

All patients were evaluated with computed tomography angiography (CTA) to visualize anatomy and different landmarks, and to assess the location of the aberrant artery, size of the aorta, cerebral perfusion, and other anomalies. Postoperative CTA scan during the hospital admission was performed in all patients either following hybrid or endovascular procedure.

The indication for surgical correction of the ASA included dysphagia as the only symptom in four patients, aneurysmal formation with high risk of rupture in three patients (dysphagia [$n = 1$], dyspnea [$n = 1$], dysphagia and dyspnea [$n = 1$]), ruptured aneurysm with superior cava syndrome and shock in one patient, acute respiratory distress with tracheomalacia due to aneurysm in one patient, and acute dissection of aneurysmal aberrant right subclavian artery with severe chest pain in one patient (Table 1).

One patient with an aneurysm of the aberrant right subclavian artery with a maximum diameter of 9.9 cm was detected on chest X-ray. The subsequent CTA scan confirmed the diagnosis. This patient suffered from mild dyspnea. Three patients were operated on as emergencies, and the seven other patients had elective procedures. Follow-up was by regular visits to the outpatient clinic.

RESULTS

Hybrid procedures were performed in eight patients using a Zenith TX2 TAA Endovascular Graft (diameter 24—38 mm, length 77—80 mm; Cook Medical, Bloomington, IN, USA) (Fig. 1B). All of these patients underwent revascularization