Traumatic rupture of a right aortic arch in a patient with an aberrant left subclavian artery

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Traumatic rupture of a right aortic arch (RAA) with an aberrant left subclavian artery (LSCA) is an extremely uncommon condition. It requires a precise anatomic preoperative diagnosis because its repair involves a special strategy. We report a case of traumatic rupture of an RAA with an aberrant LSCA due to blunt chest trauma caused by an automobile crash.

Clinical Summaries

A 69-year-old woman was admitted with severe chest pain after being involved in a violent car crash. An urgent computed tomographic (CT) scan showed a collection of fluid in the mediastinum, massive left pleural effusion, and a focal bulge of the aorta, suggesting aortic rupture. Aortography was then performed, which demonstrated a large pseudoaneurysm located just proximal to the aberrant LSCA stemming from a Kommerell diverticulum (Figure 1).

Surgery was performed urgently. Axillo-axillary artery bypass was performed first with the patient in a supine position. The patient was repositioned and the right fourth intercostal space was entered. The azygos vein was divided. Partial cardiopulmonary bypass was established with cannulation to the right atrium and the lower descending thoracic aorta. The aorta was crossclamped between the right subclavian artery (RSCA) and LSCA and proximal to the arterial cannulation site. Aortotomy was done, leaving the LSCA orifice open. Buried deep in hematoma, the posterior one third of the aorta was transected. The orifice of the LSCA was closed with a 4-0 polypropylene running suture followed by replacement of the aorta with a 22-mm prosthetic graft. Total aortic crossclamp time was 109 minutes and bypass time was 112 minutes. Her postoperative course was uneventful.

Discussion

RAA is a rare congenital anomaly of the aorta, with 50% of them being associated with aberrant LSCA.¹ To the best of our knowledge, only two cases of traumatic rupture of an RAA have been reported^{2,3} (Table 1). Interestingly all cases, including the present one, were caused by automobile crashes, associated with an aberrant LSCA and in the juxta-ligamentum region near the aberrant LSCA.

The anatomic pattern of our case, RAA with an aberrant retroesophageal LSCA and bilateral ductus arteriosus, is classified as subgroup III B3 in the classification of Stewart, Owings, and Edwards.⁴ In this anatomy, the aortic arch angulates to the left just distal to the RSCA and again angulates to the right just distal to the aberrant LSCA. A right lateral thoracotomy is believed to be the most suitable procedure for the repair of a traumatic rupture in the case of subgroup III B2, which has no angulation of the descending aorta.² However, this approach also seemed appropriate for the current case.

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Figure 1. Thoracic aortography. A, Frontal view. B, Left lateral view. The left common carotid artery (1) branches first. The right common carotid artery (2), right subclavian artery (RSCA, 3), and aberrant left subclavian artery (LSCA, 4) stemming from Kommerell's diverticulum follow in order. The aortic arch angulates to the left just distal to the RSCA and angulates to the right just distal to the aberrant LSCA in the frontal view. A pseudoaneurysm is in the greater curvature of the aorta just proximal to the aberrant LSCA.

TABLE 1. Summary of reported cases of a traumatic rupture of the right aortic arch

Authors, year	Age/sex	Location	Relation to aberrant LSCA	Edwards' classification	Surgical approach	Type of repair
Berkoff, 1984	39/F	Greater curvature	Distal	Subgroup III B2	Right thoracotomy	GR
Singh, 1998	20/M	Lesser curvature	Proximal	Unknown	Median sternotomy	Unknown
Present case	69/F	Greater curvature	Proximal	Subgroup III B3	Right thoracotomy	GR with ax-ax bypass

GR, Graft replacement; ax-ax bypass, axillo-axillary bypass.

Currently, thin-slice spiral CT angiography is the standard of care for diagnostic and therapeutic purposes. Unfortunately, this has not been available in our hospital and therefore aortography was done as our most reliable diagnostic option.

In summary, a careful preoperative anatomic assessment is essential particularly in this unique condition, since the surgical approach is different from that used for repair of a left aortic arch aneurysm. A right lateral thoracotomy is recommended for the surgical repair of traumatic rupture of an RAA at the juxta-ligamentum region.

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