Case report - Aortic and aneurysmal

Rupture of Kommerell diverticulum after total arch replacement

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Abstract

A 62-year-old man was brought to the emergency room of our hospital because of chest pain. Computed tomography revealed a right aortic arch and an aberrant left subclavian artery with Kommerell diverticulum and acute aortic dissection (Stanford type A). Total arch replacement was performed emergently through a median full sternotomy. A stomach feeding tube was placed postoperatively for the patient to receive nutrition, and esophageal bleeding was observed postoperatively. The patient died because of the bleeding. Autopsy findings showed a communication between the esophagus and Kommerell diverticulum. Rupture of Kommerell diverticulum and perforation of the esophagus were indicated.

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Keywords: Aneurysm; Aorta/aortic; Esophagus; Rupture

1. Introduction

A right aortic arch with an aberrant left aortic arch is a rare anomaly [1, 2] and aneurysm of the origin of these aberrant arteries from the descending thoracic aorta occurs in a few patients with either a right aberrant subclavian artery associated with a left aortic arch or a left aberrant subclavian artery associated with a right aortic arch. These aneurysms, referred to as Kommerell diverticulum, can cause some serious complications including rupture or dissection of the aorta. Various types of surgical interventions have been recommended for this aneurysm and the outcomes of surgical interventions have been reported in some papers, although the number of patients was small.

2. Case report

A 62-year-old man on hemodialysis for chronic renal failure experienced chest pain radiating to his neck and was brought to our hospital. His vital signs and the circulatory and respiratory state were stable. The patient did not present any symptoms including dysphagia or respiratory dysfunction and an aortic anomaly was not detected before this event. Computed tomography showed acute aortic dissection from the ascending aorta to the iliac arteries bilaterally with the patent false lumen, the diameter of the ascending aorta, distal aortic arch and descending aorta were 36 mm, 38 mm and 47 mm, respectively. A right aortic arch with an aberrant left subclavian artery located behind the esophagus (Fig. 1) was observed. The aberrant subclavian artery originated from descending aorta and the origin of the aberrant subclavian artery measured 25 mm in diameter. The bilateral carotid and subclavian arteries originated separately from the aortic arch and Kommerell diverticulum was observed. The left carotid artery arose from aortic arch firstly and the right carotid artery secondly, the right subclavian artery thirdly and the left subclavian artery fourthly. Total arch replacement was performed emergently. A median full sternotomy with right collar skin incision was chosen as the surgical approach. Cardiopulmonary bypass was established with right subclavian artery and femoral artery perfusion, and drainage from the superior and inferior vena cava. Cardiac arrest was obtained by induction of retrograde cardioplegia and aortic cross-clamp, with venting via the right pulmonary vein. After transection of the aortic root, the entry to pseudolumen was found inside the aorta just distal to the sinotubular junction, and the lesion was resected. The proximal stump of the aortic root was reinforced with felt. Circulatory arrest was obtained with hypothermia (20 °C) and the carotid arteries were transected bilaterally and the perfusion catheters were inserted into them. Selective antegrade cerebral blood perfusion was induced and an open distal arch anastomosis was performed by a step-wise technique at a site just proximal to the right subclavian artery. Antegrade systemic perfusion via branch of artificial conduit was started after completion of the distal anastomosis of the branched artificial conduit to the artificial conduit which was anastomosed to the ascending aorta. The proximal anastomosis of the artificial conduit to the aorta root was performed under systemic perfusion and selective cerebral perfusion. The aortic cross-clamp was then released. The aortic arch extending from the ascending aorta to just proximal to the right subclavian artery was

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replaced by an artificial conduit. The carotid arteries were reconstructed bilaterally in position and bypass to the distal side of right subclavian artery was established using artificial conduit, which was anastomosed to the right subclavian artery and used as an initial systemic perfusion site. The right subclavian artery was ligated at its origin from the descending aorta. It was impossible to resect Kommerell diverticulum and to replace the descending aorta through the median sternotomy. During the postoperative course, a gastric tube for feeding was placed on postoperative day 4 because of hoarseness and difficulty of swallowing and aspiration. The gastric tube continued to be needed for feeding. On postoperative day 30, the patient presented syncpe due to hypotension and anemia. A gastric and esophageal endoscopic examination was performed, and showed massive bleeding from the esophagus that could not be controlled. The patient presented hypovolemic shock during the examination and died because of persistent bleeding from the esophagus. The autopsy findings showed a communication between Kommerell diverticulum and the esophagus (Fig. 2), and rupture of Kommerell diverticulum was found.

3. Discussion

A right aortic arch is a rare congenital defect of the aorta, occurring in about 0.05% of the population [3, 4]. Furthermore, an aberrant left subclavian artery is found on autopsy in about 50% of cases with a right-sided arch [4]. Kommerell diverticulum may occur with this arch anomaly. Although patients with Kommerell diverticulum may be asymptomatic, these aneurysms can cause compression of surrounding structures resulting in dysphagia, dyspnea or chest pain. Serious complications, including embolization, dissection, and rupture have been observed [1, 5, 6]. Rupture of Kommerell diverticulum occurred in 19% of 32 patients [5], and Cina and colleagues reported rupture or dissection in 53% of 32 patients [1]. Kouchoukos and Masetti observed dissection in two of 10 affected patients [7]. Surgical intervention for Kommerell diverticulum is controversial, because of the rarity of the anomaly. Cina and colleagues recommended surgical treatment for aneurysms 3 cm or greater in diameter [1], and Ota and colleagues recommended intervention for symptomatic aneurysms 5 cm or greater [8]. We concluded that Kommerell diverticulum did not need to be treated surgically because the maximum diameter of the diverticulum was 25 mm and the patient did not present any symptoms before operation and dissected aortic arch should be approached through a median full sternotomy. Total aortic arch replacement for acute aortic dissection with Kommerell diverticulum is rare, and the surgical strategy and postoperative clinical course are uncertain. Kommerell diverticulum should be treated during the surgical intervention if possible using an appropriate approach including a median full sternotomy and right thoracotomy. When Kommerell diverticulum could not be treated surgically, postoperative risk for rupture of Kommerell diverticulum should be considered.

4. Conclusion

We experienced a rare case of acute aortic dissection of the right aortic arch with aberrant left subclavian artery. The patient developed fatal esophageal bleeding in the second month after surgical repair.

References