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**HYBRID SURGICAL MANAGEMENT OF KOMMERELL'S
DIVERTICULUM IN A PATIENT WITH MULTIPLE
COMORBIDITIES - A CASE REPORT**

***Abstract.** We report about 68-year old patient with aortic arch aneurysm and right Kommerell's diverticulum, treated by aortic stent-graft and total brachiocephalic arteries debranching. Patient successfully discharged on 22th postoperative day. We use this case as a platform to discuss open surgical management of that rare pathological vascular condition.*

***Keywords:** arteria lusoria, hybrid surgical treatment, diverticulum of Kommerell, CT-angiography*

Introduction

Kommerell's diverticulum - an aneurysmal dilatation of an aberrant subclavian artery also known as arteria lusoria that can be found both on the left and right side. For the first time that vascular anomaly in a living person was presented by B.Kommerell in 1936[1,2]. Despite the fact that arteria lusoria is one of the most common aortic arch anomalies (up to 2,5% individuals in population), Kommerell's

diverticulum is a rare entity[2,3].

We report about a 68 years old male with aortic arch aneurysm and Kommerell's diverticulum treated by hybrid surgery. Patient had a lot of comorbidities.

Case presentation

A 68-year man was admitted to the hospital complaining of dysphagia, dyspnea during physical activity, weight loss (about 9 kg for 3 months). Patient had an outstanding medical history: stroke, ischemic heart disease with myocardial infarction 27 years before admitting, arterial hypertension with medicamentation, normotension, chronic kidney disease (IIIb stage), diabetes melitus, chronic duodenal ulcer.

Multispiral computer tomography revealed dilatation of descending aorta, aortic arch aneurysm, right aberrant subclavian artery with Kommerell's diverticulum, dislocation of esophagus, trachea, common carotid arteries, compression of esophagus and azygos vein.

Patient laboratory examinations result was normal and he did not have absolute contraindications for surgical treatment. Patient underwent aortic repair with Evita Open № 30 stent-graft and total open debranching of the brachiocephalic arteries. Time of circulatory arrest was 54 minutes, and the total time of artificial circulation – 126 minutes.

In the postoperative period appeared signs of acute respiratory and renal failure, and the patient received hemodialysis and artificial respiration, 696 ml of erythrocyte mass. Patient was discharged on the 22th postoperative day.

Discussion

Kommerell's diverticulum - congenital vascular anomaly that develops from the fourth dorsal aortic arch. This formation can be found in both the left and right aortic arch with an aberrant subclavian artery grows to the contralateral side[4]. Most common clinical signs of diverticulum are dysphagia (dysphagia lusoria) due to esophagus compression, cough, chest pain, and repeated lower respiratory tract infections. Asymptomatic cases of lusoria diverticulum are usually found accidentally during clinical examination. The complications include rupture of the

aneurysm with mediastinal hemorrhage, recurrent pneumonias, obstructive emphysema, aortic dissection[5]. It can be confused with double aortic arch, but these two conditions should be differentiated because the vascular ring in Kommerell's diverticulum is incomplete[6].

The prevalence of aberrant subclavian artery in the population reported up to 2% for left aortic arch and less than 0,5% for right aortic arch[4]. Nearly 20–60 % of patients with this vascular anomaly are associated with Kommerell's diverticulum[7,8]. Most important task for diverticulum diagnosis is to differentiate it from other diseases that would cause dysphagia like malignant tumors, gastroesophageal reflux, left atrium dilatation or vascular ring. CT and MRI angiography seems like “gold standard” for diagnosis, because they show vascular anomaly with surrounding organs[4,9]. Chest X-ray, Barium swallowing test and echocardiography or endoscopic ultrasound also can be an option[4].

Indications for surgical management of Kommerell's diverticulum still seem controversial. Diverticulum treatment options depend on the patient's age, anatomy, comorbidities, aneurysm size. Now open and endovascular or hybrid interventions can be considered for a patient's healing[10]. Traditional open surgery requires thoracotomy, cross-clamping of aorta and possible cardiopulmonary bypass[11]. The optimal surgical treatment for Kommerell's diverticulum is carotid – subclavian artery bypass with a vascular graft following surgery with a synthetic graft under cardiopulmonary bypass[4,12].

As for endovascular treatment, TEVAR can be an opportunity. Several endovascular techniques are presented in English medical literature: using fenestrated aortic covered stents[13], covering the ARSA with three barreled thoracic endovascular grafts[14], implantation of ‘periscope’ covered stent[15].

Open and endovascular treatment usually have similar outcomes and low risk of complications and mortality. Most common complications are bleeding, stroke, vocal cord paralysis, phrenic nerve damaging[11,16]. Controversially, some authors report higher risk of postoperative complications after endovascular interventions [11].

Hybrid methods of treatment contain a component of both open and endovascular procedures. Comprehensive data about outcomes after hybrid treatment of Kommerell's diverticulum is limited, but it seems like an acceptable opportunity for this pathology management[11]. There are several variants for hybrid treatment of this pathology were reported: frozen elephant trunk sewn to the aortic arch via mini upper sternotomy with TEVAR, total aortic debranching via midsternotomy with TEVAR, partial aortic debranching with cervical incision with TEVAR, and coiling of the diverticulum and revascularization of the aberrant subclavian artery with TEVAR, carotid to subclavian bypass and ligation the proximal left subclavian artery with endovascular stent grafting covering the aortic arch distal to the brachiocephalic arteries[4].

This method is safe, practicable and efficient. Authors strongly believe that hybrid management should be the preferred choice for Kommerell's diverticulum repair.

Conflict of interests

Authors declare no conflict of interests.

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