World Journal of Vascular Surgery

Short Communication
Published: 28 Nov, 2018

Hybrid Approach in Surgical Treatment of the Pulmonary Artery Disease in Patients with Complex Congenital Heart Disease

Bockeria LA[1], Petrosian KV[2]*, Pursanov MG[2], Sobolev AV[2], Shatalov KV[3], Berishvilli DO[4], Chiaurelli MR[5], Kim AI[6] and Baveyan AO[2]

[1]Department of Interactive Pathology, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia

[2]Department of Endovascular Diagnostic and Treatment of Cardiovascular Disease, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia

[3]Department of Emergency Surgery in Patients with Congenital Heart disease, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia

[4]Department of Emergency Surgery in Newborn, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia

[5]Department of Congenital Heart Disease, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia

[6]Department of the Reconstructive Surgery in Newborns, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia

Short Communication

Stenosis and hypoplasia of the pulmonary arteries are one of the major risk factors for the surgical repair of complex Congenital Heart Diseases (CHD) [1]. Most of the stenotic lesions of the Pulmonary Arteries (PA) are successfully treated by balloon angioplasty and/or stenting [2]. However, in some situations when it is impossible to effectively perform percutaneous balloon angioplasty and/or stenting, due to the features of intracardiac anatomy, due to vein thrombosis or specific anatomical features in infants and young children. It is also not always possible to treat these lesions in a traditional surgical way, especially when they are located in the peripheral segments of the PA. Anatomically, the Left Pulmonary Artery (LPA) often originates and grows in the sagittal direction, from front to back, extending beyond the surgical field, which makes longitudinal incisions complicated and dangerous for its repair. The Right Pulmonary Artery (RPA) is located in front and under the aorta; when performing surgical accessing surgeon must cross or displace the ascending aorta and perform patch plastic of the stenotic segment [3]. Therefore, in case of impossibility/high risk of endovascular or surgical intervention, hybrid intraoperative approach is justified.

At the AN Bakulev National Medical Research Center of Cardiovascular Surgery we performed Hybrid Pulmonary Balloon Angioplasty (HBPA) and stenting in 34 patients with various CHD (36 segments). Intraoperative stenting was often used in cases with difficult or impossible vascular access due to venous thrombosis, a low weight infants and young children unsuitable for Cardiopulmonary Bypass (CPB), with severe tortuous vascular anatomy. Adequate choice of access site for HBPA and stenting significantly simplified and shorten the procedure, and with no need for a patch plastic of the PA overall time of CPB was also shortened. Hybrid interventions were carried out in the standard cardio-thoracic surgical theatre using the mobile C-arm unit GE 9,900. We performed 9 (26.5%) procedures in patients with hemodynamic correction of complex CHD; 9 (26.5%) with radical correction of CHD; 8 (23.5%) in the treatment of complications after surgical repair of complex CHD; 8 (23.5%) in the treatment of left hypoplasia syndrome of the heart. The age of patients varied from 10 months. Up to 19 years (average 4.4 years + 4.6 years), and weight from 5.3 kg's to 77 kg's (18.6 kg + 18.7 kg). There were 20 (58.8%) patients under the age of 3 years old, from 3 years to 6 years old-8 (23.5%), over 6 years old-6 (17.7%). PA stent implantation in small children had its own specifics: these patients needed stents of a large diameter, with possibility for further expansion as the child growth. Often in children we had to implant "short" stents (from 16 mm to 22 mm) due to the small size of the pulmonary vessels. These stents were manually mounted on a short balloon catheter, since when after inflation the risk of vascular rapture was significantly reduced. In 28 patients operations were performed on schedule, and in 6-as an emergency intervention. Stenting of the left

OPEN ACCESS

Correspondence:
Petrosian KV, Department of Endovascular Diagnostic and Treatment of Cardiovascular Disease, AN Bakulev National Medical Research Center of Cardiovascular Surgery, Russia, E-mail: dr.petrosian@gmail.com

Received Date: *12 Nov 2018*
Accepted Date: *26 Nov 2018*
Published Date: *28 Nov 2018*

Citation:
Bockeria LA, Petrosian KV, Pursanov MG, Sobolev AV, Shatalov KV, Berishvilli DO, et al. Hybrid Approach in Surgical Treatment of the Pulmonary Artery Disease in Patients with Complex Congenital Heart Disease. World J Vasc Surg. 2018; 1(2): 1014.

PA was performed in 27 cases, right PA-in 8, and in 1 case-stenting of main PA. For stenting of 36 PA segments following access sites were used: right PA-in 16 cases, main PA-7, right ventricle (RV)-9, common femoral vein-2. Hybrid stenting with parallel perfusion was performed-in 10 patients, with CPB-in 14, without CPB-in 10. Direct stenting of 20 stenotic PA segments LA segments were performed in 20 patients and in 14 patients a preliminary BPA of 16 segments were performed prior to stent implantations. Bifurcation stenting of the right and left pulmonary artery with was performed in 2 patients. Overall 38 stents were implanted in 34 patients: Palmaz Genesis XD (Cordis, USA)-in 9, Palmaz Genesis (Cordis, USA)-in 4, CP stent (NuMed, Canada)-in 4, Intrastent LD max (Medtronic, USA)-in 2, Androstent (Andramed, EC)-in 1, Valeo (Bard, CIIIA)-in 15, Covered CP (NuMed, Canada)-in 1 and NexGen (Meryl, India)-in 2 patients. Intraoperative stenting of the pulmonary arteries under visual control was performed in 2 patients. The use of angiographic guidance during the hybrid PA stenting (32 patients) significantly simplified the procedure and allowed us to perform most accurate position of the stent and avoid complications. In 32 (94.1%) of 34 patients, hybrid PA stenting was effective. Intraoperative complications occurred in two (5.9%) cases. In one patient a rupture of the pulmonary artery occurred, after a preliminary BPA of the stenotic segment of the right PA, which managed by implanting a Covered CP stent over the area of perforation, with successful outcome. In the second case, when the balloon was inflated, the stent migrated in the proximal direction, which required surgical removal and plastic expansion of the ostia of the left pulmonary artery. After stent implantation, in all cases it PA obstruction was eliminated successfully. Hospital mortality was 5.9% (two patients). One patient died from an increasing multiple organ dysfunction syndromes after surgical repair of PA atresia and another patient died after acute left pulmonary artery thrombosis resulting in acute heart failure. The remaining 32 were discharged from the hospital with improved clinical status.

Intraoperative hybrid stenting is effective and save procedure [4,5]. Vascular access should be determined individually, according to patient anatomy and morphological specifics of CHD. Hybrid procedure allows more effective and safe hemodynamic and primal surgical repair. In cases of complications, they can be safely managed with direct surgical intervention.

References

1. Schwartz MC, DeCampli WM, Pourmoghadam K, Iacono K, Nykanen D. Hybrid pulmonary artery stenting at the bidirectional glenn or fontan operation in patients with single ventricle congenital heart disease. World J Pediatr Congenit Heart Surg. 2016;7(3):299-305.
2. Menon SC, Cetta F, Dearani JA, Burkhart HA, Cabalka AK, Hagler DJ. Hybrid intraoperative pulmonary artery stent placement for congenital heart disease. Am J Cardiol. 2008;102(12):1737-41.
3. Chakraborty B, Hagler D, Burkhart HM, Dearani JA. Intraoperative hybrid left pulmonary artery stenting. Ann Pediatr Cardiol. 2013;6(1):43-5.
4. Lynch W, Boekholdt SM, Hazekamp MG, de Winter RJ, Koolbergen DR. Hybrid branch pulmonary artery stent placement in adults with congenital heart disease. Interact Cardiovasc Thorac Surg. 2015;20(4):499-503.
5. Agrawal H, Alkashkari W, Kenny D. Evolution of hybrid interventions for congenital heart disease. Expert Rev Cardiovasc Ther. 2017;15(4):257-66.