Anatomy & Physiology: Current Research

Zaets SB et al, Anat Physiol 2017, 7:2
DOI: 10.4172/2161-0940.1000e140

Editorial OMICS International

Potts Shunt in Patients with Suprasystemic Pulmonary Arterial Hypertension: Does the Size Matter?

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Received Date: January 25, 2017; **Accepted Date:** January 28, 2017; **Published Date:** February 04, 2017

Editorial

Potts shunt is an anastomosis between the left pulmonary artery and descending aorta that was suggested in 1946 to create left-to-right shunt with the aim to decrease hypoxemia in patients suffering from cyanotic congenital heart defects [1]. In the year 2004, Potts shunt was also proposed to achieve right-to-left shunt in patients with suprasystemic pulmonary arterial hypertension [2]. If cardiac septa are intact, suprasystemic pulmonary arterial hypertension leads to severe overload of the right chambers and congestive heart failure. Compression of the left cardiac chambers by enlarged right chambers results in critic decrease in systemic cardiac output. Potts shunt performed in this category of patients, transforms hemodynamics of suprasystemic pulmonary arterial hypertension into hemodynamics that is equivalent to Eisenmenger syndrome associated with patent ductus arteriosus. As a result, pulmonary hypertension goes down to systemic level, compression of the left cardiac chambers decreases, and systemic blood flow increases due to the venous blood flow coming from the left pulmonary artery to descending aorta [2-4]. Patients with pulmonary arterial hypertension subjected to Potts shunt have to pay price of moderate hypoxemia of the lower extremities. However, this is rewarded by decrease in right ventricular failure, reduced risk of syncopal episodes and sudden death as well as by improvement in functional status.

Relatively limited experience with Potts shunt in patients with suprasystemic pulmonary arterial hypertension demonstrates good immediate and follow-up results [3,4]. The intervention is being performed as a direct "unrestricted" anastomosis with a diameter that is close to diameter of the descending aorta [2-4]. Our results of 9 Potts shunts are consistent with the literature data. However, the analysis shows that the procedure may not be successful in patients with extremely high pulmonary arterial pressure that significantly exceeds systemic. The only 2 patients in our series that died in early post-operative period were those with the highest pre-operative pulmonary artery-to-aorta mean pressure ratio (1.79-1.86). The lethal outcome was caused by repeated pulmonary hypertension crises and uncontrolled hypoxemia. We may hypothesize that "unrestricted" Potts shunt is more indicated in patients with mean pulmonary arterial pressure and resistance that moderately exceed systemic.

There are no works that would determine "optimal" volume of right-to-left shunt resulted from Potts anastomosis in patients with suprasystemic pulmonary hypertension. However, this question was addressed in relation to atrioseptostomy that is also being performed in the same category of patients. Right-to-left shunt at the atrial level created by atrioseptostomy, decompresses right cardiac chambers and increases left chamber preload. At the same time, this procedure causes hypoxemia of not only the lower but also the upper part of the body that is considered to be a disadvantage if compared to Potts shunt [2-5]. Experimental studies have shown that the "ideal" volume of right-to-left shunt at atrial level after atrioseptostomy is 11-15% of the cardiac output [6,7]. It secures the most optimum balance between an increase in systemic blood flow and a decrease in blood oxygenation. If right-to-left shunt is bigger, increased systemic blood flow is unable to compensate hypoxemia.

It seems to be logical thinking that higher pressure gradient between connected great arteries after Potts shunt, compared to the pressure gradient between atria after atrioseptostomy, may have even more significant impact on the volume of blood shunting. Thus, the diameter of Potts shunt may play an important role in clinical outcome. If preoperative pulmonary arterial pressure and resistance is extremely high, "unrestricted" Potts anastomosis may lead to excessive shunting of venous blood into systemic circulation. Under these hemodynamic conditions, "restricted" Potts anastomosis looks more appropriate as it may secure "controlled" right-to-left shunt. We believe that the diameter of Potts shunt should depend on the ratio between pressures and or resistances of the pulmonary and systemic circulation as well on the body surface area. Prostheses may be used to create anastomosis of exact and desired diameter. Further experimental studies as well as larger clinical series are needed to validate our assumptions.

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