The pump

Paulo Roberto PRATES[1]

The surgery took a long time to establish itself as a useful therapeutic method for heart diseases.

Although extremely necessary, the first attempts were criticized by clinical medicine at that time. "The heart surgery probably reached the limits imposed by nature to all operations: no new method and no new discovery can overcome the difficulties that accompany a heart injury", wrote Stephen Paget on his textbook called Surgery of the Chest, published in 1896, about the attempts at cardiac sutures [1].

Earlier in 1883, the great Austrian surgeon Theodor Billroth had declared that, the surgeon who tried to suture a heart wound would lose the respect of their colleagues. [1,2].

But in spite of this statement, our cardiac surgery has advanced. The difficulties were due to the fact that the heart is considered the source of life. *"The heart alone of all the viscera cannot withstand injury. This is expected because when the main source of strength is destroyed no strength can be brought to the organs wich depend on it"* stated Aristotle in 384 BC [3] and this was true until the 1950s with the arrival of cardiopulmonary bypass machine (CBM) to replace the heart during surgery.

Before this machine, many lives were saved with perseverance and determination of surgeons, such as Charles Bailey, performing mitral commissures in 1948, and Clarence Walton Lillehei, addressing congenital intracardiac defects using the father and mother's circulation to support the small patient in 1954, which was called cross circulation [4].

Nevertheless, it was the emergence of the so-called extracorporeal circulation pump (ECP) with Gibbon Jr., Clarence Dennis, De Wall, Kirklin, Cooley and many others that the Cardiac Surgery reached its apex [5,6].

Discredited by the early complications that could bring, especially neurological problems, it was accepted because it was necessary to save lives of both adults and children, and the cardiopathies were solved until the complete heart replacement with Shumway and Barnard in 1967 [7].

In this same year, Favaloro began the modern era of the surgical treatment of coronaropathy with the coronary artery bypass grafts and then with the use of internal thoracic arteries [8].

It was combated because it underwent clinical treatment. The procedures were finally consolidated, and surgery reached its definite place.

The modern era and progress have brought the percutaneous treatment for the coronariopathies with angioplasty and stents. But the surgery continued to have its place and has shown that CABG could be performed without the use of the extracorporeal circulation (EC) [9].

It was a breakthrough in the cases where the EC could add risks. However, the EC has also been developed and it is nowadays a safe and necessary method to perform the correction of most heart diseases, without any other capable method to replace it.

The percutaneous treatment of valvular heart diseases is a new reality, especially for aortic stenosis. However, a study published in the *European Journal of Cardiothoracic Surgery* in June of 2010, shows that the aortic exchange in octogenarian patients with associated risk factors can be performed with the same results, and may be better than the percutaneous treatment, of course, with the use of EC [10].

But, what have we been witnessing now? Groups defending the off-pump CABG. As an argument to defend their method, they mentioned all the defects and complications for the use of EC. The pump is only a pump and can make a surgeon famous all over the world.

The study *"Five-year follow-up of a randomized comparison between off-pump and on-pump stable multivessel coronary artery bypass grafting. The MASS III trial"* concluded that there is no difference in the five-year follow-up between the two methods, although the off-pump CABG is related to a smaller number of bypasses and more episodes of atrial fibrillation. [11] It confirms some other published studies [12,13].

On the other hand, complications related directly and exclusively to EC are minimal in comparison to the benefits it provides, and its use is well tolerated when properly conducted during the time strictly necessary [14].

The idea that a surgical method can be used in all cases is flawed. The right thing to do is to adequately evaluate the patient and choose the method that will bring more benefits to them, since the studies show similar results.

The surgeons complete an off-pump surgery and go to another operationg room to perform an aortic exchange or a tetralogy of Fallot with EC. What should we say to a patient who asks: “You’re going to use a pump in my surgery? What is that?”

The CPB machine was a major advance in our specialty and allowed all the developments so far. It has its problems, as any other surgical treatment, because it may be considered an aggression toward nature, and it is extremely necessary, as well as the surgical aggression. We had so much progress since the machines made in our workshops, with bubble oxygenators and silicone sponges. All the researches must continue, thus it may become better and safer.

It is still our greatest ally.

REFERENCES

1. Miller GW. The true story of the maverick who pioneered open heart surgery. New York: Times Books; 2000. p.51.

2. Gott VL. King of hearts: The true story of the maverick who pioneered open heart surgery. Bull Hist Med. 2001;75(2):350-2.

3. Lockwood AL. Surgery of the pericardium and heart. Arch Surg; 1929;XVIII:417.

4. Lillehei CW. The Society Lecture. European Society for Cardiovascular Surgery Meeting, Montpellier, France, September 1992. The Birth of open-heart surgery: then the golden years. Cardiovasc Surg. 1994;2(3):308-17.

5. Braile DM. História da Cirurgia Cardíaca. Arq Bras Cardiol. 1996;66(6):329-37.

6. Cooley DA, Beall AC Jr, Grondin P. Open-heart operations with disposable oxygenators, 5 per cent dextrose prime, and normothermia. Surgery.1962;52:713-9.

7. DiBardino DJ. The history and development of cardiac transplantation. Tex Heart Inst J. 1999;26(3):198-205.

8. Favaloro RG. Saphenous vein autograft replacement of severe segmental coronary artery occlusion: operative technique. Ann Thorac Surg. 1968;5(4):334-9.

9. Buffolo E, Andrade JC, Branco JN, Aguiar LF, Ribeiro EE, Jatene AD. Myocardial revascularization without extracorporeal circulation. Seven-year experience in 593 cases. Eur J Cardiothorac Surg. 1990;4(9):504-7.

10. Florath I, Albert A, Boening A, Ennker IC, Ennker J. Aortic valve replacement in octogenarians: identification of high-risk patients. Eur J Cardiothorac Surg. 2010;37(6):1304-10.

11. Hueb H, Lopes NH, Pereira AC, Hueb AC, Soares PR, Favarato D, et al. Five-Year follow-up of a randomized comparison between off-pump and on-pump stable multivessel coronary artery bypass grafting. The MASS III trial. Circulation (Aceito para publicação).

12. Shroyer Al, Grover FL, Hattler B, Collins JF, McDonald GO, Kozora E, et al. On-pump versus off-pump coronary-artery bypass surgery. N Engl J Med. 2009;361(19):1827-37.

13. Moller C, Perko MJ, Lund JT, Andersen LW, Kelbaek H, Madsen JK, et al. No major differences in 30-day outcomes in high-risk patients randomized to off-pump versus on-pump coronary bypass surgery: the best bypass surgery trial. Circulation. 2010;121(4):498-504.

14. Taylor RL, Borger MA, Weisel RD, Fedorko L, Feindel CM. Cerebral microemboli during cardiopulmonary bypass: increased emboli during perfusionist inteventions. Ann Thorac Surg. 1999;68(1):89-93.

1. Full Member of the Brazilian Society of Cardiovascular Surgery (SBCCV) ; Cardiovascular Surgeon at the Cardiovascular Institute of Rio Grande do Sul / University Cardiology Foundation.