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Warm Blood Retrogrades Coronary Sinus Perfusion in Beating Heart Technique for Aortic Valve Replacement in 73 Cases

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Abstract

Purpose: Explore the clinical value of warm blood retrograde coronary sinus perfusion in beating heart for aortic valve replacement surgery.

Methods: Clinical retrospective analysis of 73 patients with warm blood retrograde coronary sinus perfusion in beating heart method is used for aortic valve replacement surgery.

Results: No death in all 73 cases with method of warm blood retrograde coronary sinus perfusion in beating heart for aortic valve replacement surgery. There was no severe arrhythmia, given a small amount of vasoactive drugs and no death occurred in 71 cases with postoperative follow-up for one year, and all the patients recovered well.

Conclusion: Method of warm blood retrograde coronary sinus perfusion in beating heart for aortic valve replacement surgery can be effective in preventing more damage to myocardial lesion, greatly reduce postoperative low cardiac output syndrome and severe arrhythmias, compared to traditional methods of myocardial protection.

Keywords: Warm blood/Retrograde coronary sinus perfusion; Beating heart / Aortic valve replacement surgery

1. Introduction

Beating heart valve replacement surgery is a procedure with cross clamping or without cross clamping of ascending aorta, sustained oxygenated blood perfusion to myocardium through a coronary artery sinus.

Recent years our hospital carried out beating heart aortic valve replacement surgery, which shortens operative time, reduced the incidence of postoperative complications, access to satisfactory efficacy.

2. Materials and methods

2.1 General Information

From July 2008 to July 2012, our hospital carried out mild hypothermia beating heart aortic valve replacement surgery for 73 cases of rheumatic heart disease patients with aortic valve disease (29 cases of aortic stenosis, 44 cases of aortic insufficiency). 41 males, 32 females, mean age (43.23 ± 1.25), cardiothoracic ratio of 0.65 ± 0.42, diameter of left ventricular end-diastolic (LVED) 67.3mm, 1.6mm, Cardiac function grade ii - iv.

2.2 Methods

2.2.1 Cardiopulmonary Bypass

After conventional aortic cannulation and venous cannulation through right atrium, infusion tube inserted into coronary sinus for retrograde, and cardiopulmonary bypass established, nasopharyngeal temperature control at 32±1 ℃, after cross clamped ascending aorta, warm blood retrograde coronary sinus perfusion began, extracorporeal 200~300ml/min, retrograde perfusion pressure was maintained at 40~50mmHg. After incising aortic root, conformed the returning blood flow of left and right coronary sinus to coronary ostia, after empting heart, aortic valve replacement surgery began. Aortic cross clamped time 32.5± 2.3min, cardiopulmonary bypass time 41.1± 3.5 min, after finishing major operational procedure, started warming up to 37-37.5 ℃, after proper assistance, CPB has stopped.

2.2.2 Valve Replacement

Imported or domestically produced mechanical or biological aortic valve is replaced through interrupted suture fixation with polyester suture with gasket.

3. Results

No death in all patients. Postoperative care time 1.7± 0.5days. 1 patient with low cardiac output (recovered), 1

patient with brain complications (right limb movement disorder), bleeding requiring reoperation in 1 patient. No serious arrhythmias, given small amount of vasoactive drugs. Blood gas analysis, blood biochemical parameters (lactic acid, creatine kinase and its isoenzyme and cardiac troponin, superoxide dismutase, etc) and hemodynamic monitoring results showed that this method is more effective to protect myocardium compared to traditional methods.

Lost 2 cases of postoperative follow-up, 71 patients followed up for 1 year, no death during follow-up, all the patients recovered well.

4. Discussion

Since the "warm heart surgery" concept [1] in the last century has been proposed, lead to wide public attention and discussion. Experimental study and clinical application of some scholars [2,3] proved oxygen consumption by empty heart beating operation with CPB is about 40% for normal rhythm of normal condition, which benefit distribution of blood flow to different myocardial layer. While in a State of mild hypothermia, body temperature declined, lead to metabolic rate also declined, which helps to protect the heart, lungs, liver, kidney and, brain. Due to heart beating state, it doesn't induce non-physiological blow by high K+ cardioplegia, cardiac arrest and recovery, can effectively reduce myocardial local pro-inflammatory cytokines, and produce sustained normal myocardial energy metabolism, and stable membrane function, reduce maximum degree of myocardial cell injury due to ischemia and hypoxia, and reperfusion injury, effectively prevented myocardial lesion and further damage, reduced postoperative low cardiac output syndrome and prevented serious arrhythmia.

Except severe calcified valvular disease, complex congenital malformations, as well as abundant collateral circulation returned to heart, beating heart surgery is suitable for most congenital and acquired heart disease and vascular disease, especially in patients with significant enlarged heart and heart dysfunction, beating heart surgery can be beneficial.

Warm blood retrogrades coronary sinus perfusion beating heart surgery is suitable for aortic valve and vascular disease above ascending aorta. Empty heart beat decreased, heart rate to 50/min. during warm blood retrograde perfusion in the mild hypothermia aortic valve replacement surgery. Empty heart beat lead to soft myocardium, which gives good operation manipulation and good exposure. Minimal coronary and non-coronary blood flow on operation field is important and basic step to keep good exposure, in most cases left ventricular drainage can provide better surgical exposure. We can consider this method as long as the exposure is good under beating heart surgery [4]. Stop left heart drainage during ascending aortic incision suture, so the left ventricle and aorta are full of blood. Before unclamping aorta, insert de-airing needle to prevent air embolism. For patients with frail aorta, de-airing needle may cause aortic bleeding. For last few stitches, ask anesthetist to expand lung for de-airing, to get better result.

Warm-blood retrograde coronary sinus perfusion beating heart aortic valve replacement surgery still has some shortcomings [5]. First, this method does not provide clear and bloodless surgical field, therefore demand higher surgical operative technique, and require adaptive process, needed widened aortic insufficiency patients for surgery. Second, increased risk of mechanical blood component injury. Therefore, surgery method should be carefully chosen with significant patients.

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