



Innovative CCC Solution for Open Heart Surgery

Gurdov Shatlyk^{1*} and Chovdyrov Orazmyrat¹ and Chachayev Begench²¹Hospital with a Scientific and Clinical Center of Cardiology, Ashgabat, Turkmenistan²International Cardiology Center, Ashgabat, Turkmenistan***Corresponding Author:** Gurdov Shatlyk, Hospital with a Scientific and Clinical Center of Cardiology, Ashgabat, Turkmenistan.**DOI:** 10.31080/ASCR.2024.05.0511**Received:** December 01, 2023**Published:** January 20, 2024© All rights are reserved by **Gurdov Shatlyk, et al.****Abstract****Introduction:** Miocardial effects during and after ischemia were studied using cryoprotective crystalloid cardioplegic (CCC) solution colled below 0o C to -5o C during open heart surgery.**Objective:** Comparison of structural and functional parameters of the heart in cardiopulmonary bypass patients undergoing cardioplegia.**Methods:** Protected by patent No. 819 dated 02.2020, it contains: pH 7,74; pCO₂ is low; pO₂ 163,1 mmHg; BE +4,9 mmol/l; K⁺ 10,0 mmol/l; Ca⁺⁺ 0 mmol/l; less Na⁺ mmol/l; Cl⁻ 110 mmol/l; Glucose 273 mmol/l; Lactate 0 mmol/l. The composition of the solution includes: Glucose 5% 450,0 ml; 10 ml of potassium chloride 4%; 31 ml of sodium bicarbonate 4%; cryoprotectants 9 ml. The tests were conducted on pigs between 2016 and 2018. Since the beginning of 2020, it has been used in our hospital during cardiac surgery in patients with congenital heart defects, later acquired heart failure and ischemic heart disease.**Results:** The dose of the solution is 7,5-10,0 ml/kg of the patient. The effect of the introduction of this solution into the coronary arteries occurs after 35-45 seconds through bradycardia, after which asystole continues for more than 90 minutes. If it is necessary to extend the myocardial protection time to 120 minutes, half the calculated dose of this solution should be administered. Restoration of the heart rhythm after removing the clamp from the aorta occurs after 3-4 minutes on its own through bradycardia (nodal rhythm) or large-wave fibrillation without cardioversion and cardiotonics. The solution acts due to a non-penetrating cryoprotectant of general action and membrane-stabilizing, enzyme-differentiating penetrating cryoprotectors with conformational flexibility and refrigerant capacity. Histological studies of the myocardium after 60 and 120 minutes of cardioplegia revealed edema in 25% and 45% of cardiomyocytes. After 15-30 minutes of myocardial reperfusion, cardiomyocyte edema disappears. Cardiomarkers: Creatine kinase - MB - initially less than 1.0 ng/ml; after cardioplegia 1,0 ng/ml. Myoglobin - initially 56,9 ng/ml; after 51,2 ng/ml. Troponin - initially 0,03 µg/l; after 0,03 µg/l. All myocardial structures during heart surgery remain intact.**Conclusion:** With a 500 ml volume of a new CCC solution, the heart can be protected from ischemia continuously, safely and the best during surgery.**Keywords:** Heart Surgery; Cardioplegic Solution; To Cool; Myocardial Effects; Reliable; Seamless; Patent**Abbreviations**

CCC: Cryoprotective Crystalloid Cardioplegic

Introduction

Throughout the history of cardiac surgery, there has been a worldwide debate over the years to ensure safe and robust protection of the heart during surgery [1-6,10,11]. It has been shown to be safe, well preserved, and effective for organs in cold conditions in transplantation and heart surgery [7]. Our new cryoprotective, crystalloid cardioplegic (CCC) solution has a strong, reliable and safe protection of the heart during cold-based surgery. This application aims to improve the quality of myocardial protection during surgery for patients [8].

Advantages of a new CCC solution for myocardial protection during surgery

The main advantage of the new cardioplegia solution is that it does not freeze at temperatures below 0 °C. If cardioplegia is used by lowering the temperature to -4 - -5 °C, a small amount of solution is used, to rapid cessation of myocardial activity, leads to an extension of the duration of its protection, allowing spontaneous initiation of myocardial perfusion after aortic clamp removal [9,12]. This, in other words, ensures a strong, safe and secure protection of the myocardium [13-16].

Personal usage plans

The use of this solution depends on the characteristics of each patient’s heart disease, the duration of their operation, the parameters of the myocardium (size, fraction, state of hypertrophy) and activity [17,18,21]. Based on myocardial measurements, it is important to use a solution of 7.5-10.0 ml/kg according to the patient’s weight [19,20]. Depending on the duration of the operation, cardioplegic protection should be repeated every 90-120 minutes.

Improving surgical efficiency using a new CCC solution

Studying the properties of a new CCC solution has been of great importance. It has given advantages in the efficiency of operations in the field of cardiac surgery. Using a new CCC solution at temperatures below 0 °C, will hold an important place in the evolution of cardioplegia [22,23].

Materials and Methods

Limited patent of invention No. 819 was issued by the State Service for Intellectual Property of the Ministry of Finance and Economy of Turkmenistan, myocardium protection during open heart surgery with an innovative CCC solution, aimed at the efficacy of myocardial parameters and activity during the pre and post operative period [24-27]. How it affects myocardial protection during surgery in cardiac surgery [28].

Conclusion

The use of a new CCC solution during surgery in the cardiac surgery system provides a strong, reliable and safe protection of the myocardium [29,30]. When the aortic clamp is removed during surgery, the activation and contraction of the myocardium is preserved, which is the reason for the success of the operation [31,32]. The efficacy of the new CCC solution is known to have a major impact not only on the cardiac surgery system but also on the transplantology system [33].

Conflict of Interest

The authors have no conflict of interest or funding resource to disclose.

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