

## Chapter 7

# CARDIOPLEGIA METHODS FROM PAST TILL PRESENT

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### INTRODUCTION

All cardiac surgical interventions are associated with varying degrees of myocardial injury. This is one of the major causes of postoperative mortality and morbidity, and may be a reason for surgical failure. Various methods have been developed for myocardial protection in arrested heart. The procedure in which cardiac pump and pulmonary gas exchange functions are undertaken by the heart-lung machine during cardiac surgery is called as “cardiopulmonary bypass” (CPBP) or “extracorporeal circulation”. It is important to sustain cardiac arrest and maintain a blood-free surgical field in the interventions where this procedure is performed. Cardioplegia is a temporary cessation of myocardial contractions during CPBP, which is performed through administration of cardioplegic solutions, an important tool for myocardial protection (Buckberg & Athanasuleas, 2016). Cardiac arrest with cardioplegic solutions is also called pharmacological arrest.

### History of cardioplegic solutions

Sealy et al., who worked on elective cardiac arrest in the 1950s, applied cardioplegia with a solution containing potassium, magnesium, and neostigmine (Sealy et al., 1958). Cardiac arrest solutions were continued to develop and used in open heart surgery in the 1960s (Holscher, Just & Mercker, 1961; Bretschneider, 1964). In the 1970s, Kirsch et al. published their clinical study on cardioplegia (Kirsch, Rodenwald & Kalmar, 1972). In San Francisco, Benson Roe et al., reported safe cardioplegia by the “cold Ringer’s solution” which contained 20 mEq of potassium (Roe et al., 1977). In the 1970s, Bretschneider’s solution was first used as organ protection solution and then used to provide cardiac arrest in

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serves as the buffer, tryptophan provides membrane stabilization. Ketoglutarate was reported to prevent ischemia-reperfusion injury by providing high energy production via ATP during reperfusion. The anti-edema property of mannitol also helps to reduce myocardial edema. Today, HTK solution could protect the myocardium by providing cardiac arrest for 90, 120, or 180 minutes during heart surgery (Edelman et al., 2013). It may be used both in anterograde and retrograde fashion. It is still most costly cardioplegic solution.

### **Conclusion**

While cardioplegic solutions are useful for myocardial protection, controversies still exist about its composition, warmth, and way of administration. Different institutions use various cardioplegic solutions. New large-sized randomized controlled trials are needed to demonstrate evidence-based methods that provides effective myocardial protection.

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