

A novel sutureless technique for the repair of coronary sinus injuries

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Abstract: Coronary Sinus injury related to cardioplegia catheter insertion is a rare complication associated with significant morbidity and mortality risk. We describe a simple, safe and effective sutureless technique for the management of coronary sinus injury. This technique was developed in a porcine haemostatic workshop in Hamburg, Germany.

Keywords: Coronary sinus injury; myocardial protection; haemostatic agents

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Introduction

Retrograde cardioplegia represents a well-established technique that provides excellent myocardial protection with low complication rates (1). Although cardioplegia catheter related coronary sinus (CS) injuries is a rare event ranging from 0.053% to 0.093% it can be associated with significant morbidity and mortality risk (2). Several different surgical techniques have been proposed for the management of CS injuries as the direct suture can be challenging with a possibility of stricture, distortion and CS thrombosis (3-5). We describe a sutureless simple and effective technique for the management of CS injuries and we present our experience with this novel technique in our department.

Operative techniques

In our department from 2013 to 2015, four cases of CS injury occurred in 700 consecutive cardiac surgery procedures requiring cardiopulmonary bypass. Three patients were male undergoing coronary artery surgery, one was female undergoing emergency mitral valve replacement combined with coronary artery surgery. The same CS catheter was used in all cardiac cases (14 Fr × 27 cm; Edwards Lifescience, Irvine, CA). CS injuries were identified intraoperatively as unexpected bleeding during cardioplegia delivery. The heart was arrested with the antegrade cardioplegia and the CS injury was directly

repaired before performing the rest of the planned surgery.

The sutureless patch in our technique is comprised of three layers. From outside: a 2 cm × 4 cm layer of Surgicel (Johnson & Johnson Medical Inc., Arlington, TX) followed by a layer of Surgicel Fibrillar (Johnson & Johnson Medical Inc., Arlington, TX) (*Figure 1*) and finally by a layer of Evicel (Johnson & Johnson Medical Inc., Arlington, TX) (*Figure 2*). The CS injury was inspected and the surgical field was carefully kept dry. The three layer patch was applied directly with the Evicel layer facing the CS injury with a topical pressure for 3 min. The surgicel layer in the outer layer of the patch, following that period of time the patch can remain attached on the area of CS injury. No sutures were necessary to secure the patch.

The repair was tested with the delivery of antegrade cardioplegia and the planned cardiac surgical procedure was continued without technical difficulties. The postoperative course was unaffected by the CS injury.

In the porcine haemostatic workshop in Hamburg, Germany the three layer sutureless patch was applied successfully in more than 50 injuries to the low pressure venous system of the porcine model, both in the abdomen and at various sites on the heart itself. Once the results of the “sticky plaster” technique were seen and found to be reproducible in the porcine model, the sequential use of these haemostats were used in the human by the senior author with good result.

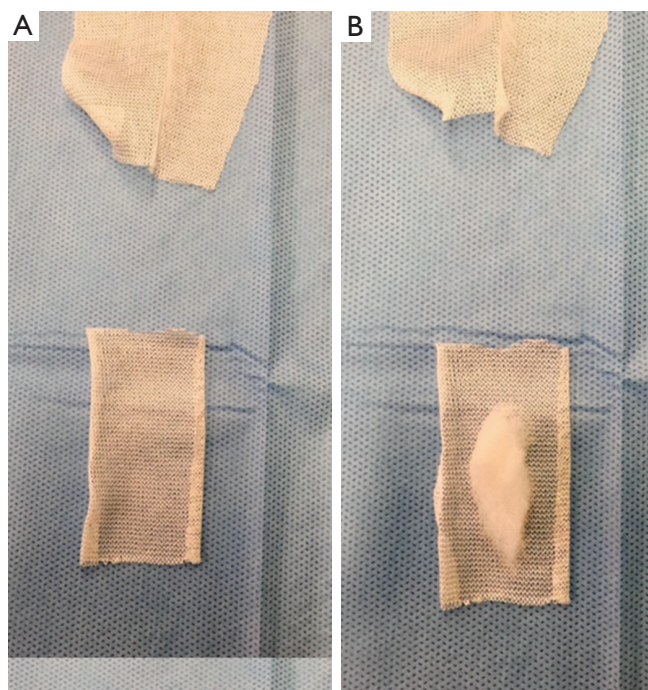


Figure 1 A layer of Surgicel Original (Johnson & Johnson Medical Inc.) (A) and a layer of Surgicel Fibrillar (Johnson & Johnson Medical Inc.) (B) have been added.

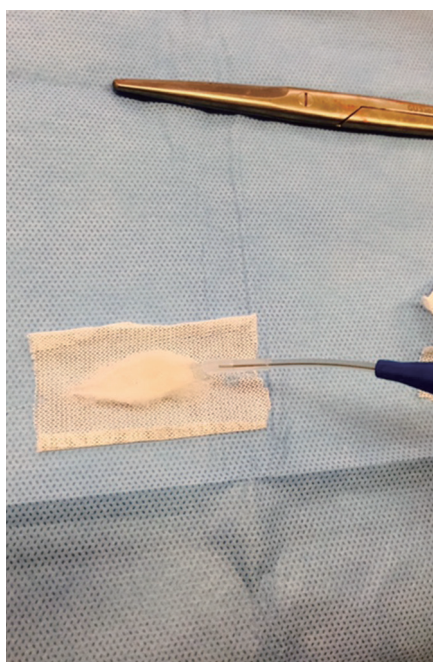


Figure 2 A layer of Evicel (Johnson & Johnson Medical Inc.).

Discussion

CS injury related to cardioplegia catheter insertion can represent a technical challenge correlated with significant morbidity and mortality risk (1-5). Aim of CS injury repair is to obtain complete haemostasis and a good venous drainage through the coronary veins (2). Different surgical techniques have been developed for the management of CS injuries secondary to retrograde cardioplegia catheter insertion (3). A direct suture of the injured CS edges can potentially lead to stricture, distortion and CS thrombosis. On the other hand there are sutureless methods including the use of pericardial or saphenous vein patches that can be effective, simple and safe. Our technique has been developed in a porcine haemostatic workshop in Hamburg, Germany and has been successfully applied in all cases of CS injury in our department. It represents a totally sutureless technique and its effectiveness is related to improvements in surgical adhesive and gluing substances.

Surgicel (Johnson & Johnson Medical Inc., Arlington, TX) is a local haemostatic bioabsorbable gauze consisting of oxidized regenerated cellulose (6). It provides a scaffold on which platelets can commence the adhesion and aggregation process leading to coagulation. There is evidence of absorption within first 24 hours and complete absorption can be observed between 4 to 8 weeks.

Evicel (Johnson & Johnson Medical Inc., Arlington, TX) is a fibrin sealant consisting of two components, human clottable protein (predominantly human fibrinogen) and human thrombin (6). Evicel differs from Quixil/Crosseal in that its fibrinogen component does not contain the antifibrinolytic agent tranexamic acid which is potentially neurotoxic.

This method has also been successfully applied in cases such as right ventricular perforation from pacing wires during transcatheter aortic valve implantation (TAVI) procedures and traumatic right atrium and ventricle injury.

In conclusion repair of the CS injury is challenging and can be complicated by inadequate myocardial protection, inadvertent coronary artery injuries and possible CS thrombosis. Our experience with the sutureless glue haemostatic patch technique indicates that it is a safe, simple and effective method for the management of CS injuries.

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None.

Footnote

Conflicts of Interest: N Roberts is participating as funded faculty for Ethicon educational events. All the other authors have no conflicts of interest to declare.

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