

Sutureless Technique to Fix the Great Saphenous Vein along the Atrioventricular Groove Using Fibrin Glue in Off-Pump Coronary Artery Bypass Grafting

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ABSTRACT

We describe a simple method to fix the great saphenous vein graft (SVG) to the right coronary artery along the atrioventricular groove using fibrin glue in off-pump coronary artery bypass grafting (OPCAB). After completion of the proximal anastomosis, the SVG was placed along the atrioventricular groove to the acute margin. Fibrin glue was sprayed using pressurized carbon dioxide gas. A distal anastomosis was subsequently performed after rotating the heart to expose the posterior descending artery. It is a straightforward and reproducible technique to determine the optimal length of the SVG and prevent kinking or stretching of the graft, especially in OPCAB.

INTRODUCTION

The internal thoracic artery is a key graft in coronary artery bypass grafting. However, the great saphenous vein graft (SVG) is still an important conduit to achieve complete revascularization [Desai 2004]. Determining the optimal length of the SVG is considered to be one of the important factors to achieve long-term graft patency. An overlong graft would cause kinking, and a graft that is too short would generate excessive stress on the anastomosis site [Dobrin 2001]. In off-pump coronary artery bypass grafting (OPCAB), it is sometimes difficult to determine the optimal length of the SVG to the right coronary artery.

Here, we describe a simple method to fix the SVG along the atrioventricular groove to the acute margin using fibrin glue after the proximal anastomosis, when distal anastomosis to the posterior descending artery (PDA) is performed while elevating the apex of the heart. It is a straightforward technique to determine the appropriate length of the SVG to the PDA in OPCAB.

TECHNIQUE

OPCAB was performed through a median sternotomy [Ohira 2015]. After the proximal anastomosis of the SVG was performed with a proximal anastomotic device, Enclose (Novare Surgical

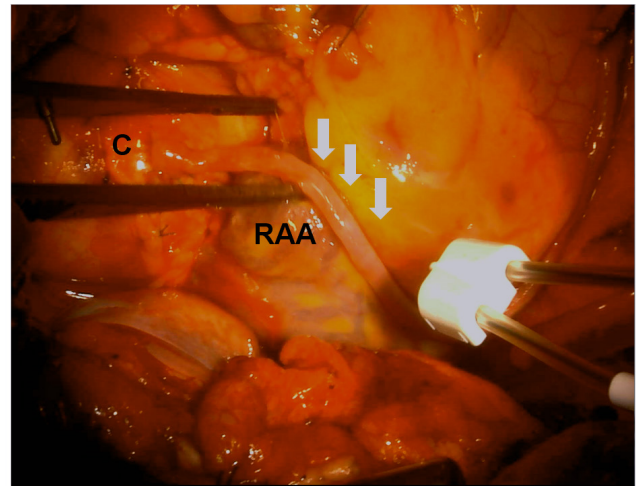


Figure 1. Intraoperative photograph of the surgeon's view. A great saphenous vein graft (arrow) was placed along the atrioventricular groove to the acute margin, and fibrin glue was sprayed. C indicates proximal anastomosis of the great saphenous vein graft; RAA, right atrial appendage.

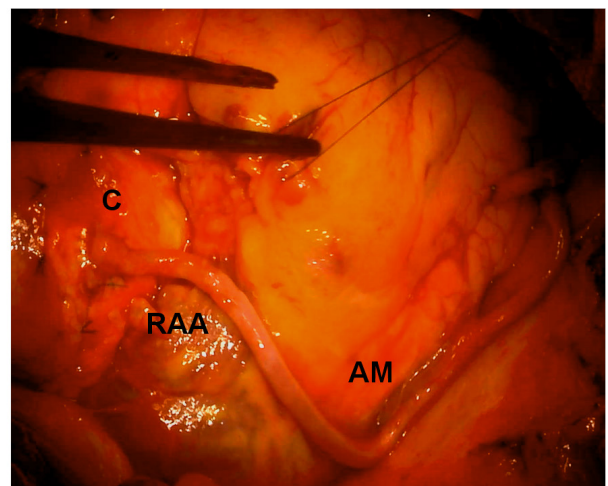


Figure 2. Intraoperative photograph of the surgeon's view. After fibrin glue was sprayed, the great saphenous vein graft showed a natural configuration along the atrioventricular groove to the acute margin. C indicates proximal anastomosis of the great saphenous vein graft; RAA, right atrial appendage; AM, acute margin.

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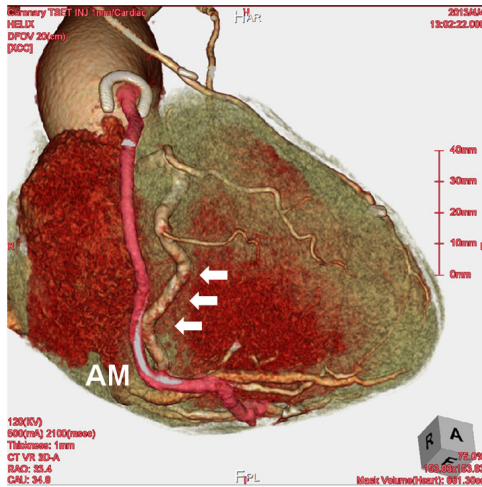


Figure 3. Three-dimensional computed tomography after the operation. A patent great saphenous vein graft (red-colored graft) was placed along the atrioventricular groove without kinking. The arrows indicate the right coronary artery. AM indicates the acute margin.

Systems, Cupertino, CA, USA), the SVG was routed along the atrioventricular groove to the acute margin. Fibrin glue (Beriplast, Centeon, Marburg, Germany) was sprayed onto the SVG using a spray-kit with pressurized carbon dioxide gas (Figure 1). It is necessary to wait a few moments for it to dry (Figure 2). Distal anastomosis to the PDA was subsequently performed while the apex of the heart was elevated. The appropriate length of the SVG was judged as the length from the acute margin to the PDA, because the proximal segment of the SVG had already been measured and fixed to the atrioventricular groove before elevating the heart. After the completion of distal anastomosis, the acute margin to the distal anastomotic site was sprayed with fibrin glue in the same manner. Computed tomography after the operation demonstrated a patent SVG along the atrioventricular groove without kinks (Figure 3).

DISCUSSION

There is no doubt that the internal thoracic artery is a key graft in coronary artery bypass grafting. However, the number-three graft option graft following the bilateral internal thoracic arteries is still controversial [Desai 2004]. The SVG is widely used in coronary artery bypass grafting because of its ease of handling and harvesting. However, if the length is inappropriate, the SVG tends to become kinked [Dobrin 2001]. Fibrin glue is widely used to achieve hemostasis for surgical bleeding [Minato 2009; Matsushita 2011]. Other applications of fibrin glue, such as in the fixation of autologous tissue or artificial materials, were reported in other fields [Foster 2008; Ceccarelli 2008]. Graft fixation

using other material was previously reported in conventional coronary artery bypass grafting [Di Lello 1989]. In OPCAB, it is sometimes difficult to fix the graft to the pericardium by suturing because of the cardiac motion. The point of suture fixation may represent a hinge that leads to a graft kink, and may cause injury to the graft or epicardium, especially with a beating heart. Thus, fibrin glue fixation could be a favorable technique in OPCAB to prevent these complications and achieve natural fixation. In addition, to prevent kinks, fixation of the SVG along the atrioventricular groove to the acute margin is the shortest way to reach the PDA, and to easily determine the appropriate length during anastomosis to the PDA while elevating the heart. This is a reproducible and technically simple method. As an external fibrotic reaction can occur, one of the major concerns about using fibrin glue is the patency rate of the SVG. Previous studies demonstrated that fibrin glue facilitates healing, and is completely degraded over time [Evard 1996; Kroez 2005]. From 2005, we employed this technique for 463 patients. Early and midterm (≥ 1 year) patency rates of the SVG were 96.6% and 86.0%, respectively, and were comparable with those in the previous studies. [Desai 2004; Shah 2105; Kaya 2015]. Therefore, we considered that the influence of fibrin glue on the graft patency is low. The cost of using fibrin glue is another important issue, and its routine use may not be cost effective compared to suturing.

In conclusion, we described a simple technique to fix the SVG along the atrioventricular groove to the acute margin using fibrin glue in OPCAB. It is a useful and reproducible technique to determine the optimal length of the SVG and prevent kinking or stretching of the graft.

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