Case report - Coronary

Ostial left coronary stenosis following aortic root reconstruction with BioGlue

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Received 21 April 2011; received in revised form 2 May 2011; accepted 4 May 2011

Abstract

Haemorrhage is a major concern during repair of acute aortic dissection. In such circumstances, glue is often used for tissue reconstruction and also to fortify vascular anastomoses. In this report, we describe a rare case of ostial left main coronary artery stenosis potentially related to previous use of BioGlue.

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Keywords: Aortic dissection; Cardiac reoperation; Complication; Fibrosis

1. Case report

A 57-year-old male presented with chest pain and coronary ischaemia on an electrocardiograph. In view of his presentation and previous stenting of the obtuse marginal artery, nine years previously, he was thrombolysed. Following thrombolysis, he developed expressive dysphasia and haemopericardium, which was drained. A computed tomography (CT)-scan of the head and chest was performed which did not reveal any intracerebral pathology; however, it demonstrated a type A aortic dissection. This was not a cardiac-gated scan, and no calcification was noted in the left main stem.

At the operation, a right ventricular haematoma was noticed that resulted in right ventricular dysfunction. Cardiopulmonary bypass (CPB) was instituted between the right atrium and the left common femoral artery. The aorta was transected above the sinotubular junction. The aortic dissection was involving the entire ascending aorta including the aortic root and both coronary ostia. The heart was arrested and protected with intermittent antegrade cold blood cardioplegia infused directly into the coronary ostia. There was no difficulty in ostial cannulation, and cardioplegia was delivered with good flow rates. On direct inspection, an obvious intraluminal lesion was not present in the proximal left main coronary artery. The aortic root was not dilated enough to warrant a root replacement, and the aortic valve leaflets were normal. The dissected layers in the aortic root were glued together using BioGlue (CryoLife Europa, Guildford, Surrey, UK), which eliminated the false lumen in the root; this also effectively resuspended the aortic valve. An interposition 28 mm Dacron Gelweave (Vascutek, Renfrewshire, UK) graft was anastomosed between the sinotubular junction and distal ascending aorta using Teflon-buttressed continuous polypropylene sutures at both ends.

The patient was weaned from CPB without the need for coronary artery bypass grafts. He was discharged from hospital on the tenth postoperative day with mild left ventricular dysfunction due to inferior wall hypokinesis.

Three months later, he developed unstable angina. A coronary angiogram revealed severe ostial left coronary stenosis (Fig. 1). A transthoracic echocardiogram demonstrated moderate left ventricular dysfunction due to an akinetic mid to distal anterior wall and lateral wall, and a hypokinetic inferior wall. Mild central aortic regurgitation was present with a left ventricular end-diastolic diameter of 4.9 cm. A CT-scan demonstrated increased attenuation in the tissues surrounding the lumen (Fig. 2) of the left main stem, which may signify fibrosis. The aortic annulus and root diameter were 23 mm and 42 mm, respectively.

The patient underwent successful surgical myocardial revascularisation without any major adverse cardiovascular complications.

2. Discussion

BioGlue is a tissue adhesive comprising purified bovine serum albumin and glutaraldehyde. Coselli et al. reported a significant reduction in intraoperative anastomotic site bleeding when BioGlue was used as an adjunct on standard vascular anastomoses [1].

However, the glutaraldehyde component is a toxic fixative, and its cross-linking of proteins immediately kills the cells exposed to that application. Lemaire et al. reported dystrophic mineralisation, dense adventitial inflammation and fibrosis surrounding eosinophilic islands of BioGlue in
piglet aorta [2]. Such findings were absent in control animals. Similarly, severe active inflammation surrounding BioGlue and a foreign body reaction at three months following application has been demonstrated by Erasmi et al. [3].

BioGlue is relatively more fluid than gelatin-resorcin-formalin (GRF) glue. In the supine patient who is undergoing aortic dissection repair, the left coronary ostium lies in a dependant position. Upon application of BioGlue between the dissected layers of the aortic root, the liquid glue would track under the influence of gravity towards the left coronary ostium. Over and above the aortic dissection, the glue serves as an additional nidus for tissue inflammation and hence more fibrosis. The fibrosis around the aortic root and the left coronary ostium is well demonstrated by increased tissue attenuation on CT-scan. In our patient, this eventually resulted in severe ostial coronary stenosis and unstable angina three months after the dissection repair.

Although BioGlue is an effective haemostat, it is of paramount importance that surgeons are aware of its potential dangers. In order to avoid this complication, we suggest that the aortic root should be reinforced with Teflon (PTFE) strips alone or that glue should be used sparingly with extreme caution. Teflon (PTFE) strips alone or that glue should be used sparingly suggests that the aortic root should be reinforced with potential dangers. In order to avoid this complication, we paramount importance that surgeons are aware of its repair.

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Fig. 1. Left coronary angiogram revealing ostial stenosis with a smooth out-
line that indicates extrinsic compression by fibrosis/glue.

Fig. 2. Coronal oblique view on computed tomography scan demonstrating abnormal aortic wall thickening adjacent to the left coronary ostium, consistent with fibrosis.

eComment: Biological glue: a word of careful assessment!

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doi:10.1510/icvts.2011.273094A

Modi et al. [1] have reported on the complication of ostial left coronary stenosis following aortic root reconstruction with BioGlue. The authors illustrate, apart from the basic knowledge of the pathophysiology of biologic glue complications, the important role of careful assessment and judgment of its use [1]. We take this opportunity to share our experience and knowledge in this topic.

In 2004, Mahmood et al. reported the fatal right ventricular infarction caused by BioGlue coronary embolism in a 74-year-old woman six days after ascending aorta and hemiarch replacement due to type A aortic dissection [2]. BioGlue was injected within and around the false lumen at the level of the sinotubular junction and arch as well [2]. The glue emboli was confirmed with comparison between the BioGlue from the patient’s coronary arteries and freshly prepared BioGlue from the glue tube by means of dissecting microscopy [2].

LeMaire et al. in 2005, have supported experimentally the concerns related to the threat of adhesive embolization because of BioGlue leaks through needle holes in aortic tissue and prosthetic grafts [3].

In 2006, Szafranek et al. reported the successful management with thoracoscopic intervention of an aseptic mediastinal cyst caused by BioGlue seven months postoperatively in a 66-year-old man who underwent CABG and removal of thrombus from the apex of the left ventricle plus BioGlue application on the area of ventriculotomy [4].

In 2011, Ferraris et al., on behalf of the Society of Thoracic Surgeons (Blood Conservation Guideline Task Force) and the Society of Cardiovascular Anesthesiologists (Special Task Force on Blood Transfusion) provide recommendations for patients undergoing cardiac operations with difficult-to-control bleeding [5].

The authors, in their recommendation (class IIb) related to the use of topical hemostatic agents suggest that these agents may be considered for local hemostasis and as a part of a multimodality approach (level of evidence C) [5]. Regarding the use of BioGlue there is a prospective randomized controlled trial in its favour for the control of the anastomotic bleeding, however, there was no difference in blood transfusion and chest tube drainage [1, 5]. There are anecdotal reports of complications such as embolization, nerve injury, inflammatory and foreign body reaction, coronary stenosis [4, 5]. BioGlue has limited use in pediatric cardiac surgery (contraindication in growing tissues) [5].

References


It is very important to remember that there is no substitute for good operative technique and furthermore the biologic glues are not a hemostatic ‘panacea’ for cardiac surgery.

References


