Case report

Atherosclerotic disruption of the aortic arch during coronary artery bypass operation

Friedrich Stefan Eckstein, Hans-Peter Dinkel, Aristomenis Exadactylos, Thierry-Pierre Carrel*

Clinic for Cardiovascular Surgery and Diagnostic Radiology, University Hospital of Berne (Inselspital), CH-3010 Berne, Switzerland

Received 16 May 2000; received in revised form 27 July 2000; accepted 15 August 2000

Abstract

A 70-year-old-man presented with a symptomatic three vessel coronary artery disease and was scheduled for myocardial revascularization. During extracorporeal circulation an intrathoracic bleeding occurred and aortic rupture was suspected. An iatrogenic plaque rupture in the concavity of the aortic arch was found due to cannulation attempts. The aortic arch was grafted in the so-called elephant trunk technique. Thereafter bypass grafts were anastomosed to the stenosed coronary arteries. The patient was discharged from hospital after 2 weeks in good condition. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Coronary surgery; Iatrogenic cannulation injuries; Atherosclerotic aortic arch ulcer; Aortic arch replacement; Elephant trunk

1. Introduction

We report a case of disruption of the aortic arch due to atherosclerotic ulceration after ascending aortic cannulation for coronary artery bypass grafting. The disruption was triggered after manipulation to an atherosclerotic ulcer after introduction a long aortic cannula. We describe the intraoperative findings and how this serious complication was managed.

2. Patient and methods

A 70-year-old-man presented with a symptomatic three vessel coronary artery disease and was scheduled for myocardial revascularization. Plain chest roentgenogram showed no signs of aortal atherosclerosis. Following median stenotomy the left pleural cavity was opened to harvest left internal thoracic artery while a saphenous vein graft was prepared at the same time. Arterial cannulation was performed with a long arterial cannula (flexible arterial cannula, 24 F, Sarns®) with the tip placed in the proximal descending aorta. In this patient insertion of the cannula was not possible in a satisfactory way beyond the aortic arch. After two attempts by the same surgeon the cannula was removed and transesophageal echocardiography was inserted to exclude an aortic dissection or disruption. A smaller cannula (22 F, Sarns®) was introduced 1.5 cm only in the ascending aorta under echocardiographic control and standard two-stage cannulation technique was used for venous return. Extracorporeal circulation (ECC) was instituted in stable hemodynamic condition. After 5 min of ECC blood pressure dropped and bleeding occurred out of the opened left hemithorax. At that time it was not possible to locate exactly the bleeding but an aortic rupture was suspected. The patient was cooled at a lowest temperature of 18°C. The 4th intercostal space was opened by an additional hemi-clamshell incision for getting better access to a possible disruption of the descending aorta. Immediately before deep hypothermic arrest the supra-aortic vessels were occluded and a linear oblique incision at the beginning of the aortic arch was made. This revealed a plaque rupture in the concavity of the aortic arch. The decision was made to graft the aortic arch in a fashion first described by Borst et al. in 1983 [1], the so-called elephant trunk technique. Only with this technique a stabilization of the atherosclerotic lesion formations in the distal aortic arch and the proximal descending aorta could be obtained. A 24 mm Vascutek prosthesis was invaginated, placed in the descending aorta and fixed below the perforation site. The invaginated part of the vascular prosthesis was pulled out by a stay suture and the supra-aortic vessels were sutured in the prosthesis using one aortic patch containing the three ostia. The prosthesis was finally anastomosed to the distal ascending aorta which was cannulated again to rewarm the patient. The aorta was clamped distally and antegrade cold blood cardioplegia was...
instilled. During the rewarming period two saphenous vein
grafts and the left internal thoracic artery were anastomosed
to the stenosed coronary arteries. Before removing the aortic
clamp hot-shot blood cardioplegia was instilled. The patient
was weaned off bypass, transferred in a stable hemodynamic
condition and was extubated on the second postoperative
day. Postoperative computed tomography (CT) scan was
performed to demonstrate the correct position of the
implanted aortic graft and the supraaortic vessel patch as
well as the patency of the coronary bypass grafts (Fig. 1).
The patient was discharged from hospital on postoperative
day 14 in good condition.

3. Comment

Well-known major complications of aortic cannulation
during cardiac surgery are thrombembolic events and aortic
dissection.

Disruption of an atherosclerotic ulcer during cardio-
pulmonary bypass may happen extremely rare. Lack of
publications on this topic could be explained by the mostly
fatal outcome of these patients. Only few cases of an aortic
rupture in combination with coronary artery bypass grafting
have been reported so far [2,3], hereby in association with a
dissection beginning in the aortic site of the vein anastomo-
sis.

Our 70-year-old patient presented with an atherosclerotic
lesion in the concavity of the aortic arch, not uncommon in
his age group.

We used the long aortic cannula with tip placed in the
proximal descending aorta to avoid flush of aortic debris
into the supraaortic branches [4]. Although care was taken
during insertion of the long aortic cannula, we believe that
initial plaque disruption started at this point. When problems
occur in placing an aortic cannula, we routinely introduce a
transoesophageal echocardiography probe to exclude aortic
dissection and to confirm the correct position of the aortic
cannula. When aortic rupture is present, survival is only
possible even in the elderly patient by radical operation
with total aortic arch replacement in deep hypothermic arrest.
This unusual case report shows that total arch replacement in
combination with coronary artery bypass grafting is feasible
and necessary when seldom intraoperative complications
appear during elective cardiac surgery.

References

using “elephant trunk” prosthesis. Thorac Cardiovasc Surg
and rupture of the ascending aorta. Unusual complications of aort-cor-
lier 3rd M, Ribakove GH, Marschall KE, Galloway AC, Colvin SB.
Effect of cannula length on aortic arch flow: protection of the ather-