

Combined Treatment of Aortic Type A Dissection: Ascending Aorta Repair and Placement of a Stent in the Descending Aorta

(#2003-22344)

Saed Jazayeri, Etienne Tatou, Marie Carmen Gomez, Olivier Bouchot, Montajab Saleh, Roger Brenot, Michel David

Department of Cardiovascular Surgery, Dijon University Hospital, Dijon, France



Dr. Jazayeri



ABSTRACT

Background: The established treatment modality of acute Stanford type A dissection includes repairing the ascending aorta and a variable part of the aortic arch and leaving the descending aorta untreated. We report a simultaneous approach of open repair of the ascending aorta with the transluminal placement of a stent in the descending aorta to minimize the consequences of an untreated descending aorta.

Methods: Two cases of type A aortic dissection are described, one case with the entry port in the descending aorta and the second case with the entry port in the aortic arch. Both patients were treated by the replacement of the ascending aorta (and the aortic arch in the second case) and the placement of a stent in the descending aorta with a new device as the patients were under circulatory arrest and deep hypothermia. The device consists of a Djumbodis stent mounted on a compliant balloon. This stent is made of 316L stainless steel and can be adapted to the shape of the aortic arch or descending aorta. Three different lengths are available: 4 cm, 9 cm, and 14 cm. The device used in these patients has a diameter of 9 mm.

Results: The early results were satisfactory with a completely thrombosed false lumen in one case and a partially thrombosed false lumen in the other, according to immediate postoperative transesophageal echocardiography control. A follow-up computed tomographic chest scan was done at 12 months in the first case and at 7 months in the second case and confirmed the good surgical results.

Conclusions: This preliminary study shows that combined surgical and endovascular treatment of acute type A dissection is feasible and that at least partial thrombosis of the false lumen can be achieved, potentially minimizing the risk of further dilatation or rupture. The early results are encouraging, but more cases and long-term results are required to demonstrate the effectiveness of this new combined treatment modality.

Presented at the 9th Annual CTT Meeting 2003, Miami Beach, Florida, USA, March 19-22, 2003.

Address correspondence and reprint requests to: Dr. S. Jazayeri, C.H.U. de Dijon, 2 BD de Lattre de Tassigny, 21000 Dijon, France; 33-03-80293352; fax: 33-03-80293385 (e-mail: saed.jazayeri@chu-dijon.fr).

INTRODUCTION

The classic treatment of the type A dissection consists of replacing the ascending aorta and various portions of the aortic arch to prevent lethal complications, such as aortic rupture, cardiac tamponade, aortic regurgitation, and myocardial infarction [DeBakey 1982, Borst 1987]. However, because this surgical treatment in recent years has improved the life prognosis for patients in the acute phase [Svensson 1990, Sabik 2000], the discussion has been changing from the acute phase mortality rate to postoperative morbidity and the prognosis of residual dissection in the chronic phase [Haverich 1985, Crawford 1992]. Within 5 years of the acute event, in 20% to 28% of patients aneurysmal dilatation of the descending thoracic aorta will require an operation that carries significant risk of mortality and morbidity, even in the most experienced hands. Accordingly, efforts to reduce the risk of aneurysmal expansion of the remaining aorta are of importance to patients and physicians. In an effort to improve the outcome, Dake et al described total arch replacement with selective cerebral perfusion and endovascular stent grafting through the femoral artery [Dake 1994]. However, even though this technique is associated with lower rates of death and complications, the results can be unsatisfactory. Open stent grafting was then used as a less invasive operation for aortic arch disease [Kato 2002]. We have used a new device [Roux 2002] in 2 cases of aortic type A dissection in the descending aorta.

CASE REPORTS

Patient 1

A 55-year-old man presented with chest pain and shock. The diagnosis of acute type A aortic dissection was made from a transesophageal cardiac echocardiogram. The entry port was located in the descending aorta 5 cm distal to the left subclavian artery. The dissection extended distally to the descending and abdominal aorta and proximally into the ascending aorta.

The right axillary artery was cannulated through a polyethylene terephthalate fiber (Dacron) graft (as the arterial line), and the right atrium was also cannulated by means of a double-pore cannula (as the venous line). Cardiopulmonary bypass and profound hypothermia (17°C) were established. During the period of cooling, the proximal anastomosis between the ascending aorta and an impregnated Dacron



Figure 1. Computed tomographic scan: complete thrombosis of the false lumen with the stent in regular position.

graft was made. Then, we positioned the radioscopia apparatus in front of the aortic arch and prepared the device.

The device consists of a Djumbodis stent (Saint Côme Chirurgie, Marseille, France) mounted on a compliant balloon. The stent is made of 316L stainless steel and can be adapted to the shape of the aortic arch or the descending aorta. Three different lengths are available: 4 cm, 9 cm, and 14 cm. The device we used has a diameter of 9 mm.

When the patient's core temperature reached 17°C, the device was positioned in the descending aorta under the control of transesophageal echocardiography and radioscopia at the level of the entry port during a short period of circulatory arrest (18 minutes) with selective cerebral perfusion through the right axillary cannula (perfusion rate, 350 mL/min). The balloon was inflated under radioscopic control with a syringe containing a mix of physiological saline and a contrast medium (50:50). When the stent was well impacted in the aortic wall and the internal and external cylinders were well coapted, the balloon was deflated. The distal anastomosis was then performed after the injection of gelatin-resorcinol-formaldehyde glue through the false lumen.

Control transesophageal echocardiography was done immediately postoperatively and showed the stent in a good position and well opened. It also showed the presence of spontaneous echocardiographic contrast in the false lumen (clot formation). There was no circulation in the false lumen. A tomographic chest scan 12 months later confirmed the good surgical result.

Patient 2

A 53-year-old man was transferred from a regional hospital to our department with a suspected acute aortic dissection. He arrived with congestive heart failure with acute pulmonary edema and tamponade and therefore was intubated. The diagnosis was confirmed through transesophageal echocardiography. The port of entry was situated between the left common carotid artery and the left subclavian artery.

There was a second entry port in the descending aorta. The dissection extended distally to the descending and abdominal aorta and proximally into the ascending aorta. We performed the same procedure as used in the first patient. The only difference was that the entry port in this patient was in the aortic arch. In this case, the replacement of the ascending aorta was extended to the aortic arch with the patient under circulatory arrest (42 minutes) and selective cerebral perfusion through the right axillary artery cannula.

Postoperative transesophageal echocardiographic results showed a completely thrombosed false lumen. A computed tomographic chest scan 7 months after surgery confirmed the good surgical results and the presence of a thrombosed residual false lumen (Figures 1 and 2).

DISCUSSION

The standard treatment for acute type A aortic dissection is surgery. The possibility of fatal complications, such as a cardiac tamponade, myocardial infarction, and aortic regurgitation, justifies urgent operation.

Despite a successful repair of the ascending aorta and, in some cases, the aortic arch, most patients with type A aortic dissection are left with a chronic and potentially lethal disease that demands long-term follow-up and, in some cases, a high-risk reoperation.

A persistent false lumen can be expected in 60% to 80% of patients undergoing traditional repairs despite attempts to resect the entry port. Within 5 years of the acute event, aneurysmal dilatation of the descending thoracic aorta will require 20% of patients to undergo surgery that carries a high risk of mortality and morbidity. Superior rates of survival and freedom from reoperation are associated with thrombosis of the false lumen.



Figure 2. Computed tomographic scan: second view of complete thrombosis of the false lumen with the stent in regular position.

Accordingly, efforts to reduce the risk of aneurysmal dilatation of the descending aorta are of importance to the patient and the physician. In an effort to improve the outcome, Dake et al described total arch replacement with selective cerebral perfusion and endovascular stent grafting through the femoral artery [Dake 1994]. However, even though this technique is associated with lower rates of death and complications, the results can be unsatisfactory. Open stent grafting was then used as a less invasive operation for aortic arch disease and achieved good surgical results [Kato 2002, Fleck 2002].

We have used a new technique in which we implanted an endovascular stent in the descending aorta from a surgically opened aortic arch simultaneously with graft replacement of the ascending aorta in one case and of the aortic arch in another. This stent was first used by Roux et al [Roux 2002] in type A aortic dissection with an entry port in the aortic arch to limit the replacement of the aorta to the ascending part. In these cases, the authors replaced only the ascending aorta and placed a stent at the level of the entry port in the aortic arch with the patient under circulatory arrest. We have used the same device to cover the entry port in the descending aorta. In the first case, the entry port was situated in the proximal descending aorta 5 cm distal to the left subclavian artery, and in the second case there was a second entry port in the descending aorta. This technique is intended to bring about clotting formation of the false lumen by continuous compression. By this means, we hope to avoid enlargement of the residual dissected aorta and a difficult reoperation in the chronic phase. We achieved a complete thrombosis of the false lumen in one patient and a partial thrombosis in the other.

In conclusion, this preliminary study suggests that combined surgical and endovascular treatment of acute type A dissection is feasible and that at least a partial thrombosis of the false lumen can be achieved, potentially minimizing the risk of further dilatation or rupture. The early results are encouraging, but more cases and long-term results are

required to demonstrate the effectiveness of this new combined treatment modality.

REFERENCES

- Borst HG, Laas J, Haverich A. 1987. A new look at acute type-A dissection of the aorta. *Eur J Cardiothorac Surg* 78:186-9.
- Crawford ES, Kirklin JW, Naftel DC, Svensson LG, Coselli JS, Safi HJ. 1992. Surgery for acute dissection of ascending aorta: should the arch be included? *J Thorac Cardiovasc Surg* 104:46-59.
- Dake MD, Miller DC, Semba CP, Mitchell CP, Walker PJ, Liddell RP. 1994. Transluminal placement of endovascular stent-grafts for the treatment of descending thoracic aneurysms. *N Engl J Med* 331:1729-34.
- DeBakey ME, McCollum CH, Crawford ES, et al. 1982. Dissection and dissecting aneurysms of the aorta: twenty-year follow-up of five hundred twenty-seven patients treated surgically. *Surgery* 92:1118-34.
- Fleck T, Hutschala D, Czerny M, et al. 2002. Combined surgical and endovascular treatment of acute aortic dissection type A: preliminary results. *Ann Thorac Surg* 74:761-6.
- Haverich A, Miller DC, Scott WC, et al. 1985. Acute and chronic aortic dissections: determinants of long-term outcome for operative survivors. *Circulation* 72:II-22-34.
- Kato M, Kuratani T, Kaneko M, Kyo S, Ohnishi K. 2002. The results of total arch graft implantation with open stent-graft placement for type A aortic dissection. *J Thorac Cardiovasc Surg* 124:531-40.
- Roux D, Brouchet L, Concina P, Elghobary T, Glock Y, Fournial G. 2002. Type-A acute aortic dissection: combined operation plus stent management. *Ann Thorac Surg* 73:1616-8.
- Sabik JF, Lytle BW, Blackstone EH, McCarthy PM, Loop FD, Cosgrove DM. 2000. Surgery for acquired cardiovascular disease: long-term effectiveness of operations for ascending aortic dissections. *J Thorac Cardiovasc Surg* 119:946-62.
- Svensson LG, Crawford ES, Hess KR, Coselli JS, Safi HJ. 1990. Dissection of the aorta and dissecting aneurysms: improving early and long-term results. *Circulation* 82:IV-24-38.