

A non-resective therapy for abdominal aortic aneurysm: intravascular thrombosis by dropping inflatable balloons

S. Chocron, S. Claudel, P. Rozette, B. Caplan and B. Baehrel

Department of Thoracic and Cardiovascular Surgery, R. Debre's Hospital, 51 Rheims, France

A case of subrenal abdominal aortic aneurysm treated by unipolar exclusion and axillobifemoral bypass is reported. The exclusion was performed by inserting inflatable balloons through a femoral access and obstructing the iliac arteries. This technique may be useful in poor-risk patients with a symptom-free aneurysm.

Keywords: aortic aneurysm, therapy

Resection combined with bypass grafting is the best way of treating an infrarenal aortic aneurysm. The mortality rate of elective aneurysms is around 5%¹. Thromboexclusion combined with an extra-anatomical bypass (axillobifemoral) is an alternative option²⁻⁸. The technique described in this report consists of a thromboexclusion which requires neither transabdominal nor retroperitoneal access. It consists of obstructing both iliac arteries with inflatable balloons introduced through the common femoral artery.

Case report

A 61-year-old man presented with a 50-mm diameter aneurysm of the subrenal abdominal aorta, found fortuitously during coronary arteriography. The patient's previous history included major respiratory insufficiency related to asthmatic diseases. Blood gases at rest were as follows: PO_2 58 mmHg; PCO_2 43 mmHg; pH 7.43. Pulmonary function tests revealed a functional vital capacity of 2.25 l, a maximal expiratory volume of 0.79 l/s, and a Tiffeneau test of 29%.

The patient also had a myocardial infarction. The isotopic injection fraction was 0.6% with a thrombosed first segment of the right coronary artery, confirmed by arteriography. He also had acute pancreatitis for which a laparotomy had been performed to drain a pancreatic 'pseudo' cyst. Because of the patient's previous medical history it was felt that laparotomy should, if possible, be avoided. He underwent an endoluminal unipolar

thromboexclusion with an inflatable balloon followed by a subclavian-to-bifemoral artery bypass.

Surgical technique

A simultaneous approach was made to the right subclavian artery and both femoral arteries. Both femoral arteries were clamped after heparin had been given. A 1-cm longitudinal arteriotomy was made over both common femoral arteries. Using an image intensifier screen and controlled hypotension, a catheter was placed into the left femoral artery and intraoperative arteriography performed. A balloon, inflated with a contrast medium, was inserted through the right femoral artery and positioned in the iliac artery. Proximal arteriography revealed a total obstruction of the right common iliac artery, with a patent internal iliac artery. After removal of the catheter, the same procedure was performed on the left side. The operation was concluded by performing a subclavian-to-femoral bypass with a ringed No. 8 GORE-TEX graft (W. L. Gore, Flagstaff, Arizona, USA).

Postoperative imaging

Postoperative radiography showed both balloons positioned above the stenosis and herniating into the top part of the aortic window. On day 7 (*Figure 1*) the right balloon was totally flat, but had not migrated, whereas the left balloon has lost some of its volume. The abdominal radiograph with injection of contrast performed on day 5 (*Figure 2*) confirmed thrombosis of the subrenal abdominal aorta. A confirmatory arteriogram taken on day 10 showed the subclavian-to-bifemoral

Correspondence to: Professor B. Baehrel

bypass to be patent and total thrombosis of the aneurysm. The patient was discharged on day 15 and maintained on anticoagulant therapy (acenocoumarol).



Figure 1 Abdominal radiography at day 7: the right balloon is totally flat whereas the left balloon has lost its volume



Figure 2 Abdominal radiographic scanning at day 5 confirms the thrombosis of the subrenal abdominal aorta

Discussion

Numerous thromboexclusion techniques have been proposed, including bipolar exclusion with a single ligation of the Carpentier clamp to avoid ligating all collaterals⁹, unipolar exclusion by obstructing both the common and external iliac arteries⁸, or by external iliac and internal iliac artery obstruction¹⁰. This type of exclusion is generally completed by injection of thrombogenic agents (for example, Gelfoam or Bucrylate) proximal to the ligature¹¹. Thrombogenic drugs may be injected with a Fogarty catheter^{12,13} while there is temporary occlusion of the iliac arteries.

Occlusion was achieved in the present case by inserting balloons into both common iliac arteries.

Residual patency

Leather *et al.*¹⁰ estimated that 72 h were required for thrombosis to occur: however, the presence of an accessory renal artery arising from the aneurysm, or very close to it, represents a contraindication to this technique. There is a risk of renal infarction during the aneurysm thrombosis and the sac may not remain obliterated. Insufficient development of the Riolan arch may cause mesenteric ischaemia. The diameter, quantity and patency of the lumbar arteries arising from the aneurysm may prevent the sac from thrombosing.

Rupture¹⁴⁻¹⁷

Before thrombosis occurs the pressure inside the sac may increase. Patients suffering from a painful aneurysm should be excluded. The patient's blood pressure must be carefully monitored and controlled after surgery.

Both the risk of residual patency and early rupture are points in favour of bipolar exclusion. Nevertheless, Kwaan and colleagues^{15,16} reported a case that ruptured 16 days after treatment: the rupture was located between the normal aorta and the thrombosed aneurysm.

A suprarenal extension of the thrombosis is a contraindication to this technique in patients suffering from a bilateral stenosis of the renal arteries. Deflation of the balloon is a specific problem associated with the authors' technique and one which can be embarrassing if it happens before the aneurysm thromboses. In the present case, the right balloon deflated at day 7 but was included in the thrombosis and did not migrate, whereas the left balloon deflated but the occlusion persisted.

References

1. Hicks GL, Eastland MW, DeWeese JA *et al.* Survival improvement following aortic aneurysm resection. *Ann Surg* 1975; 181: 863-9.
2. Blaisdell FW, Hall AD. Axillary femoral artery bypass for lower extremity ischemia. *Surgery* 1963; 54: 563-6.

3. Blaisdell FW, Hall AD, Thomas AN. Ligation treatment of an abdominal aortic aneurysm. *Am J Surg* 1965; 109: 560-5.
4. Hicks GL, Rob C. Abdominal aortic aneurysm wiring: an alternative method. *Am J Surg* 1976; 131: 664-6.
5. Johansen K. Treatment options for aneurysms in high-risk patients. *Surg Clin North Am* 1989; 69: 765-74.
6. Karmody AM, Leather RP, Goldman M *et al.* The current position of non-resective treatment for abdominal aortic aneurysm. *Surgery* 1983; 94: 591-7.
7. Lynch K, Kohler TR, Johansen K. Non-resective therapy for aortic aneurysm: results of a survey. *J Vasc Surg* 1986; 4: 469-72.
8. Savarese RP, Rosenfeld JC, DeLaurentis DA. Alternatives in the treatment of abdominal aortic aneurysms. *Am J Surg* 1981; 142: 226-30.
9. Kwaan JHM, Khan RJ, Connolly J. Total exclusion technique for the management of abdominal aortic aneurysm. *Am J Surg* 1983; 146: 93-7.
10. Leather RP, Shah D, Goldman M *et al.* Non-resective therapy of abdominal aortic aneurysms. *Arch Surg* 1979; 144: 1402-8.
11. Goldman MI, Sarrafizadeh MA, Philip PK *et al.* Bucrylate embolization of the distal abdominal aorta: an adjunct to non-resective therapy of abdominal aortic aneurysm. *Am J Radiol* 1980; 135: 1195-2000.
12. Berguer R, Schneider J, Wilner HL. Induced thrombosis of inoperable abdominal aortic aneurysm. *Surgery* 1978; 84: 425-9.
13. Berguer R, Feldman AJ, Karmody AM. Intravascular thrombosis of abdominal aortic aneurysm in high-risk patients. *Vasc Diagn Ther* 1984; 1: 24-31.
14. Cho SI, Johnson WC, Buch HL *et al.* Lethal complications associated with nonresective treatment of abdominal aortic aneurysms. *Arch Surg* 1982; 117: 1214-17.
15. Kwaan JHM. Rupture after non-resective treatment of abdominal aortic aneurysm. *Surgery* 1985; 97: 249-50 (Letter).
16. Kwaan JHM, Dahl RK. Fatal rupture after successful surgical thrombosis of an abdominal aortic aneurysm. *Surgery* 1984; 95: 235-7.
17. Schanzer H, Papa MC, Miller CM. Rupture of surgically thrombosed abdominal aortic aneurysm. *J Vasc Surg* 1985; 2: 278-80.

Paper accepted 14 February 1994