

Infected Abdominal Aortic Aneurysm Treated by In Situ Replacement with Cryopreserved Arterial Homograft

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Abstract. Infected abdominal aortic aneurysms are uncommon but not rare (1-3% of all abdominal aortic aneurysms). This life-threatening disease can lead to rapid uncontrolled sepsis and/or aortic rupture. We report one case that underlines two notions. Firstly computed tomography is effective to detect early stages of the pathology providing complete depiction of the anatomical abnormalities. Secondly infected aortic aneurysm can be successfully treated by antibiotherapy and in situ replacement with cryopreserved arterial homograft.

Introduction

In 1851, KOCH (1) reported the first clinical case of an infected aneurysm of the superior mesenteric artery. In 1885, OSLER (2) introduced the term “mycotic aneurysm” to describe the appearance of a “fresh fungus vegetation” within an aneurysm wall in a patient with bacterial endocarditis. The term “mycotic aneurysm» has since been applied to arterial infections of all types. To avoid confusion with fungi, JARRETT *et al.* (3) suggested to use instead the term “infected aneurysm”.

An infected aneurysm is an aneurysm developing in a septic context with a positive culture coming from thrombus or aortic wall. Signs of infection at histology of the aortic wall is equivalent to positive culture (4).

Infected aortic aneurysms (IAA) are uncommon but not rare : 1 to 3% of the aortic aneurysms (5). Moreover incidence seems to rise. Significant morbidity and mortality result from sepsis and/or acute haemorrhage.

Prompt diagnosis is important to lead adequate treatment that have to combine antibiotherapy and surgery.

We report a well illustrated case of IAA that was diagnosed preoperatively and treated by in situ replacement with cryopreserved arterial homograft.

Case report

A 59-year old woman was admitted with fever (38.5°C), chill, back and hypogastric pain. She used to smoke 20 cigarettes per day and to drink wine at every lunch. She had undergone appendectomy and salpingectomy. She was treated with cefadroxil since one week. No pulsatile abdominal mass was noted at physical examination. C reactive protein was 4.6 mg/dl, fibrinogen 6.75 g/l, leucocyte count 8900/mm³ with 88.5% of



Fig. 1

Irregular, eccentric rim adjacent to the normal sized aorta

neutrophils. Blood culture was positive : *Streptococcus pneumoniae*. Abdominal computed tomography (CT) showed already periaortic anatomical abnormalities but without lumen enlargement (Fig. 1). Diagnosis was not suspected at that time.

The patient was treated with amoxicillin-clavulanic acid for septicaemia of unknown origin. Despite improvement of the biology, fever, hypogastric and back pain still remained. Another abdominal CT was realized on day 3. For the first time infrarenal infected aortitis was suggested. Antibiotherapy was continued and two other abdominal CTs were realized respectively on day 6 and day 17 (Fig. 2). The latter evidenced an aneurysmal formation of 3,6 cm in diameter and prompted us to operate the patient.

In situ replacement of IAA with cryopreserved arterial homograft (CAH) was decided. The woman underwent arteriography (Fig. 3) on day 19 and operation on



Fig. 2

Enlargement of aortic lumen with disruption of intimal calcifications.

day 20. Aortography was typical with saccular, eccentric aneurysm in an otherwise normal appearing aorta.

Surgical technique consisted of a complete aneurysm resection followed by a wide debridement of the surrounding tissues and, in situ, aortic replacement with cryopreserved aortic bifurcation homograft. We had received the graft from the European Homograft Bank (EHB International Association C/O Military Hospital Rue Bruynstraat B-1120 Brussels, Belgium). Pus was seen during operation. Samples of the blood, thrombus and soft tissues were sent for culture but results were negative. The surgical field was irrigated with rifamycin. Microscopic examination of the aneurysm revealed neutrophilic infiltration, pus and destruction of vessel wall components (intima, media, internal and external elastic lamina). Postoperative course was marked by thrombosis of the left renal artery without biological repercussion. Penicillin V was administered intravenously (4 000 000 UI per day) for three weeks and continued per os (8 000 000 UI per day) for five weeks. The patient was discharged on the 21th postoperative day. Fourteen months after the operation, the patient is doing well. Abdominal CT showed atrophy of the left kidney and normal appearance of the homograft and the retroperitoneum.

Discussion

PATRA *et al.* divided IAAs in accordance with their pathogenesis into 3 types : primary IAA, secondary IAA and IAA by proximity (6). Primary IAAs appear because of the implantation of circulating bacteria in the aorta that is usually already involved by acquired diseases (atherosclerotic or aneurysmal aorta) or congenital anomalies. Our case belongs to this type. The atheromatous nature of the aorta is closely related with some epi-

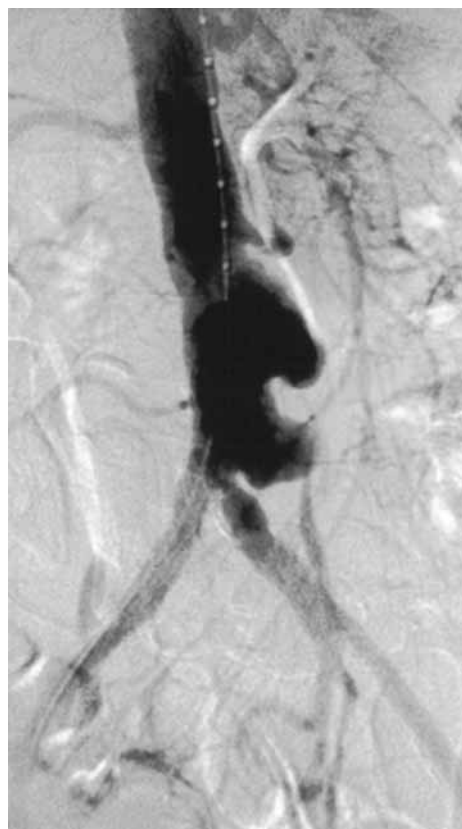


Fig. 3

Eccentric, lobulated infrarenal aortic aneurysm

demiological characters of the IAA : mean age over than 60 years, male to female ratio of 2:1 to 3:1 and location of the lesions (abdominal aorta) (6).

Secondary IAA are the “mycotic aneurysms” described by OSLER. They are the complication of bacterial endocarditis. With successful treatment of this valvular disease, the incidence markedly declined (7). IAAs by proximity proceed from adjacent infectious process, for instance osteomyelitis, iatrogenic trauma by arterial catheterization or illicit drug use.

The most frequent reported organisms are *Salmonella*, *Staphylococcus*, *Streptococcus*, *Escherichia coli* (7-8). Many others may be found : *Streptococcus pyogenes* and *pneumoniae* were predominant in the pre-antibiotic era. Now *Salmonella* species and *Staphylococcus aureus* are dominant infecting organisms. Gram negative infections are associated with a worse prognosis. Transmural infection can proceed rapidly to aneurysmal growth and destruction of the vessel wall (9). Aneurysmal rupture may occur within a week, although it is usually longer.

The main clinical manifestations of IAA present in most patients are fever and abdominal or back pain. Another sign is abdominal pulsatile mass (8). Diagnosis

may be difficult. An elevated leukocyte count and repeated episodes of bacteraemia with positive blood cultures should add suspicion of an IAA. CT study appears to be the most sensitive radiological investigation and can best reveal early signs of aortic infection (10). As GOMES et al., we have described, in our case, that early findings include normal sized aorta, an adjacent, eccentric, irregular, soft tissue mass with rim enhancement, and intimal calcifications. Later this periaortic soft tissue becomes thicker, more irregular. At this stage, intimal calcifications may be disrupted or disappear. Then enlargement of the aortic lumen develops, until rupture occurs. Presence of periaortic gas, periaortic abscess or adjacent vertebral osteomyelitis will help to the correct diagnosis. Traditionally, arteriography has been considered indispensable in the evaluation of IAA. In our case it was performed for preoperative planning. This invasive technique is unable to appreciate early changes in aortic wall and periaortic tissue. Thus, an earlier and more accurate diagnosis can be provided by CT instead of by angiography. Although nuclear magnetic resonance should help to investigate an IAA, its accuracy compared to CT remains to be evaluated.

Treatment consists in antibiotherapy and surgery. Bactericidal antibiotics must be given intravenously before and after surgery, oral therapy for at last 6 weeks will follow (8). Surgery includes wide debridement of infected tissue (IAA and surrounding tissues) and vascular bypass.

Two types of aortic replacement are possible: extraanatomic or in situ bypass. Some authors recommend extraanatomical bypass, usually an axillo-bifemoral graft, for infrarenal infected aortic aneurysms (11). The extraanatomical bypass is more effective than in situ prosthetic reconstruction to eradicate vascular infection (11). Unfortunately aortic stump rupture or thrombosis of extraanatomical bypass may occur.

Cryopreserved heart valve homografts were primarily used for treatment of valvular endocarditis (4). After demonstration of good results, infected aortic grafts and IAA were treated by in situ replacement with cryopreserved arterial homograft (5, 12). Moreover in situ replacement is feasible for infra- and suprarenal IAA.

Such homografts resist better to bacterial colonization and present better mechanical properties than vascular prostheses. Unfortunately the long-term behaviour

of CAH is unknown. Deterioration of the homograft is described (12). In such a case, the arterial homograft can be replaced by a synthetic prosthesis at distance from the sepsis.

Conclusion

The reported case indicates that CT is an effective non invasive technique for early detection and follow-up of primary IAA. This life-threatening disease can be successfully treated by in situ replacement with cryopreserved arterial homograft and antibiotherapy.

References

1. KOCH L. Ueber Aneurysma der Arteriae Mesenterichae Superioris. *Inaug Dis Erlangen*, 1851, 5-23.
2. OSLER W. The Gulstonian lectures on malignant endocarditis. *Br Med J*, 1885, **1**: 467-9.
3. JARRETT F., DARLING R. C., MUNDTH E. D., AUSTEN W. G. Experience with infected aneurysms of the abdominal aorta. *Arch Surg*, 1975, **110**: 1281-6.
4. LAVIGNE J. P. Les infections prothétiques artérielles. Thèse de Doctorat en Sciences Cliniques, Université de Liège, 1998.
5. ALONSO M., CAEIRO S., CACHALDORA J., SEGURA R. Infected Abdominal Aortic Aneurysm: in situ replacement with cryopreserved arterial homograft. *J Cardiovasc Surg*, 1997, **38**: 371-5.
6. PATRA P., RAFFI F., CHAILLOU P., GENIER F., NOËL S. F. Anévrysmes infectieux de l'aorte. In: KIEFFER E., GODEU P. (ed.). Maladies artérielles non athéroscléreuses de l'adulte. Paris: AERCv, 1994, pp. 235-50.
7. GOMES M. N., CHOYKE P. L., WALLACE R. B. Infected aortic aneurysms. *Ann Surg*, 1992, **215**: 435-42.
8. FLAMAND F., HARRIS K. A., DE ROSE G., KARAM B., JAMIESON W. G. Arteritis due to Salmonella with aneurysm formation: two cases. *Can J Surg*, 1992, **35**: 248-52.
9. SCHILS F., SAKALIHASAN N., SENTE J. M., LIMET R. Rupture couverte d'un anévrysme infectieux post-typhique de l'aorte abdominale sous-rénale. *Rev Med Liège*, 1999, **54**: 786-8.
10. GOMES M. N., CHOYKE P. L. Infected aortic aneurysms: CT diagnosis. *J Cardiovasc Surg*, 1992, **33**: 684-9.
11. MONETA G. L., TAYLOR L. M., YEAGER R. A., et al. Surgical treatment of infected aortic aneurysm. *Am J Surg*, 1998, **175**: 396-9.
12. VOGT P. R., TURINA M. I. Management of infected aortic grafts: development of less invasive surgery using cryopreserved homografts. *Ann Thorac Surg*, 1999, **67**: 1986-9.

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