DEVELOPMENT OF THREE PSEUDOANEURYSMS IN A BIFURCATED GRAFT

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An eighty-year-old man had been operated on for atherosclerotic obliteration of the abdominal aorta and its major branches 15 years ago and an aorta-bifemoral anastomosis had been performed in an end to side fashion. On his readmission, it was observed that 3 anastomotic aneurysms had developed in each suture line of the bifurcation graft. A reimplantation of a bifurcation graft was performed in an end to end fashion. Progression of atherosclerosis, hypertension, diabetes mellitus, existence of a prosthetic material, using end to side anastomosis and anticoagulation were thought to be the major causative factors in the occurrence of the anastomotic aneurysms.

Key words: ***Arterial reconstructive surgery, anastomotic aneurysms, arterial obstructive disease***

An anastomotic aneurysm occurs rarely, but when it occurs it is usually at any site of a vascular suture, most commonly at the site where a prosthesis has been used (1). Although suture deterioration, pathologic prosthetic dilation, and infection are clearly etiologic in some instances, the most common operative finding in many recent series has been a complicated dehiscence of the prosthesis from arterial anastomosis with intact suture remaining attached to the prosthetic material (2).

CASE REPORT

An 80-year-old male patient was admitted to our center with the complaints of pain and bilateral swelling in his groins.
In 1982, he had been operated on for atherosclerotic obliteration of the abdominal aorta and its branches and a Cooley double velour synthetic (Meadox Medicals, Inc. Oakland, USA) bifurcation graft

Figure 1. Bilateral masses in the patient's groins.

had been anastomosed to the aorta, and femoral arteries in an end to side fashion. He had an uneventful recovery and all his peripheral pulses were palpable on his discharge. One year after the operation he had experienced a gastrointestinal bleeding due to a diverticulum in duodenum and he had an asymptomatic period of fifteen years until his readmission.

In 1997, on his readmission, he had bilateral 10x10 cm pulsatile masses in his groins and a systolic murmur was audible on auscultation (Fig 1).

In his history, he was suffering from claudication upon a fifteen meters walk and dyspnea on exertion. His physical examination was in normal limits except for hypertension (160/100 mm Hg) and all his peripheral pulses were palpable. He has been under medication for diabetes mellitus for the last 10 years.

A digital subtraction angiography (DSA) was performed and revealed three huge false aneurysms on each site of the anastomosis (Fig 2), and a reaorta-bifemoral anastomosis was performed in an end to end fashion by using a 16x8 mm Hemashield (Meadox Medicals, Inc. Oakland, USA) bifurcation graft.

In the first and second operations, prolene (Ethicon Ltd. Ediburgh UK) was used as the suture material. The early postoperative period was uneventful. But on the 6th postoperative day he had an acute gastrointestinal bleeding and despite vigorous medication, the patient died on the 9th postoperative day.

DISCUSSION

Despite major advances in arterial reconstructive surgery in parallel with the advances in suture materials and prosthetic grafts, aneurysm formation still continues to be a major complication.

An anastomotic aneurysm is a false aneurysm which may occur at any location of the vascular system, but it occurs most frequently where a prosthetic graft has been used (1).

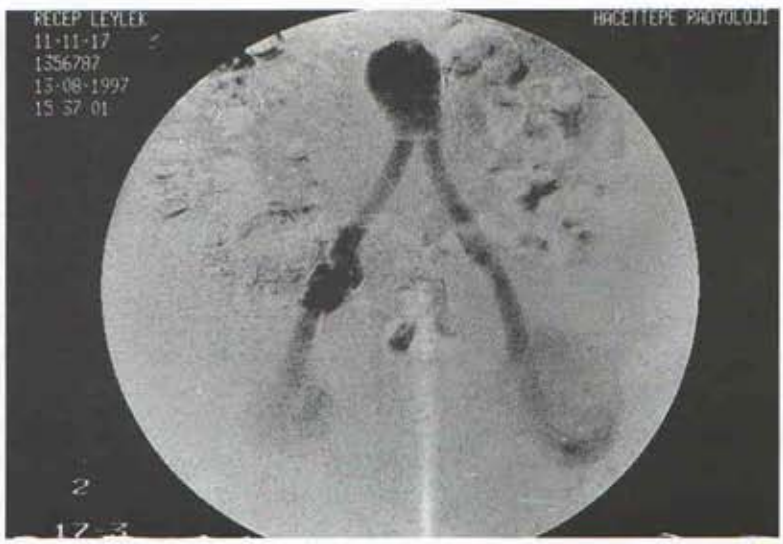

Figure 2. Digital subtraction angiography (DSA) showing pseudo aneurysms in each site of the anastomosis of the bifurcated graft.

Pathogenesis of false anastomotic aneurysm has been debated since the early days of the introduction of vascular prosthesis many years ago (1).

Failure of suture materials and prosthetic grafts have been repeatedly implicated (3,4), whereas the extend and progression of the atherosclerotic disease and weakness of the host artery are also well known factors (5,6). Mechanical stress (chronic hypertension, placement of the graft near an active joint, shearing and vibratory strain, end to side anastomosis and physical exertion), complications that were cured (infectious or non-infectious) and postoperative anticoagulation have also been suggested as causative factors in the occurrence of false aneurysm formation (4,6).

When an anastomotic aneurysm develops in the early postoperative period, infection or technical errors may be incriminated, but prosthetic materials have been found to be the initiating factor in late aneurysm formation (1). When it occurs, an anastomotic aneurysm is mostly seen in the femoral anastomosis but rare sites of anastomosis could be involved like the abdominal aorta (6,7). False aneurysms have occurred in all sites of anastomosis of the bifurcation graft in our case.

Szilagyi et al. (6) noted a 1.7% incidence of anastomotic aneurysm formation in a series of 9561 anastomotic sites (prosthetic bypass, autogenous vein graft and endarterectomy). By far, the most common site of occurrence was the femoral region with a per site incidence of 3.0%.

Anastomosis between a synthetic graft and a recipient vessel never heals completely, therefore the suture material must be of a permanent type (7). Although strong opinions in favor of incriminating suture materials have been raised in the past by authors like Starr and colleagues (3), today prostheses are blamed for initiating the weakness in the native vessel adjacent to the anastomosis.

The degeneration of the vessel wall is also a well known factor of anastomotic aneurysm (6). A number of factors contribute to the overall weakening of the vessel wall. Atherosclerotic process and dissection of periadventitial connective tissue from the arterial wall may contribute to devascularization and subsequent necrosis (9).

A prosthesis has two weak non-physiological characteristics, non-distensibility and a dilatation tendency (1). These two factors cause an increase in shearing stress at the anastomosis site after a while. Nunn et al. (10) have described dilatation of prosthetic grafts in association with junctional aneurysms and suspected a causal relationship. Considering that wall tension increases with an increase in the radius of a tube (Laplace's law), dilatation of a prosthesis could conceivably increase the tension on the sutures and non-distensibility increases shearing stress, both of which act to pull sutures away from the native wall. The geometry of the end to side anastomosis used in most aortofemoral bypasses contributes to the production of wall vibrations (11). Vibrations in the audible range may have a deleterious effect on elastic tissue, producing loss of tensile strength, wall disruption, and aneurysm formation (12).

In addition, an end to side anastomosis, especially when the graft and artery is wide, predisposes to turbulence and stress on the suture line (13). In our case, in the first operation anastomoses were in an end to side fashion. But, one must always keep in mind that end to end anastomosis is an excellent one in patients in whom the external iliac artery is occluded, but obviously it would be fraught with grave risks in patients with open iliac and common femoral arteries.

Anticoagulants should generally not be used postoperatively, since they tend to increase suture line leakage and result in hematomas and false anastomotic aneurysm formation (14). In our case, after the first operation the patient's medications included coumadin.

In the occurrence of a false aneurysm, two or more factors may be present and the assignment of their respective roles is a matter of difficult judgement. But a late false aneurysm formation, 15 years later, in an 80-year-old patient leads us to think about the progression of atherosclerosis, hypertension, diabetes mellitus, prosthetic materials, end to side anastomosis and anticoagulation as the major causative factors.

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