Spontaneous ilioiliac arteriovenous fistulas

Søren Flarup

INTRODUCTION

An abdominal arteriovenous fistula (AAVF) was first described in 1831 by the English surgeon James Syme. The patient was a 22-year-old man with syphilitic aortitis. Since then AAVF have been classified in three groups: iatrogenic, traumatic and spontaneous (Länne and Bergqvist, 1992).

In both iatrogenic and traumatic fistulas (15–20%) a pseudoaneurysm forms which eventually penetrates the venous circulation. The spontaneous fistulas (80%) are the most common and most of them develop from an aneurysm in elderly people with generalized arteriosclerotic disease and diminished cardiac reserve, although cases of syphilitic, mycotic and dissecting aneurysms have been reported (Syme, 1831; Nennhaus and Javid, 1968; Matsubara et al, 1991).

The fistulas are most often aortocaval while aortorenal, aortoiliacal and ilioiliac are rare (Hoballah et al, 1993). The aneurysms are often large and the fistulas develop as a result of necrosis of the artery wall caused by high pressure. This in turn brings on inflammation of the adventitia which adheres to a posterior vein (Länne and Bergqvist, 1992).

An AAVF is responsible for a critical haemodynamic deterioration and sudden worsening of the patient's general condition (Salo et al, 1987). Prompt surgical repair is mandatory but operative mortality is high because of violent venous bleeding associated with opening the aneurysm and the haemodynamic changes when the fistula is closed. A preoperative diagnosis is important both from a surgical and anaesthesiological point of view, but this can be difficult because of vague symptoms.

This report describes three patients with fistulas involving the common iliac vessels (IAVF) (Kazmier and Harrison, 1993). All were caused by arteriosclerotic aneurysms — described by Zajtchuk et al (1971), and one had secondary infection in the wall which made the clinical picture even more confusing. The article will also review the pathophysiology, diagnostic possibilities and operative management of IAVF.

CASE REPORT 1

A 69-year-old previously healthy man came to the emergency room because of sudden pain in the right groin for 6 hours. He was in shock and had a tender pulsatile mass distally in the right iliac fossa. The creatinine level was in the normal range. Electrocardiography showed sinus tachycardia and normal P-waves, but no signs of myocardial ischaemia or ventricular hypertrophy. His systolic blood pressure was <70 mmHg. The central venous pressure was not measured. Emergency operation revealed a 6 x 8 cm right-sided common iliac aneurysm which had ruptured into the right common iliac vein and also retroperitoneally. A gigantic haematoma had formed in the mesentery of the small intestine and because of the tension from the haematoma the right kidney was separated from both the aorta and the inferior vena cava during dissection and retraction of the tissues. The left common iliac artery was also aneurysmatic and the aorta was ectatic. At operation an endoaneurysmal closure of the 2 cm long fistula was performed and a bifurcated aortoiliac bypass graft was inserted. The right kidney was removed. The patient lost 9 litres of blood during the operation which lasted 165 minutes. The patient died the day after the operation after anuria had developed.

CASE REPORT 2

A 68-year-old man was admitted to a local hospital with dyspnoea and left-sided lower extremity oedema for 1 month. Electrocardiography showed ischaemia in the lateral praecordial leads and left ventricular hypertrophy which was ascribed to arterial hypertension for several years. A chest X-ray demonstrated pulmonary stasis and an enlarged heart. Diuretic treatment was started. Because of severe left-sided intermittent claudication the systolic ankle pressure was measured: the ankle-brachial index (ABI) was 25%. Angiography was ordered. During that admission the clinical examination revealed an abdominal non-tender pulsatile mass with a violent bruit. Angiography showed an arteriovenous fistula between the left common iliac artery and vein with scanty contrast in the left femoral superficial artery because of large flow in the fistula. Computed tomography scanning revealed bilateral iliac aneurysms and a 4 cm infrarenal aortic aneurysm. The patient was transfered to the vascular department. Haemoglobin and creatinine were in the normal range. The blood pressure was 170/80 mmHg, heart rate was 98 beats per minute, and central venous pressure was 18 mmHg. The left iliac veins were markedly dilated and there was a thrill over the left common iliac vein. The left-sided iliac aneurysm (6 x 4 cm) was excluded from the arterial circulation and the thrill disappeared. A bifurcated bypass graft was inserted. The patient lost 2 litres of blood during the operation, which lasted 125 minutes. The postoperative course was without complications. The ABI 3 months postoperatively was 82% in the left leg and 93% in the right leg and there was no intermittent claudication.

CASE REPORTS

Between February 1989 and February 1995, 256 patients had an operation for central aneurysms at Viborg Hospital, Denmark. There were 8 patients (3%) who had an AAVF. Three were ilioiliac (IAVF) and the rest were aortocaval.

DISCUSSION

The clinical features of fistulas involving the common iliac vessels vary greatly and include any combination of

Dr Søren Flarup is Specialist in General and Vascular Surgery in the Vascular Department, Aalborg University Hospital, Hobrovej 18-22, DK-9100, Aalborg, Denmark

manifestations described below. The various symptoms are shown in *Table 1* which summarizes the clinical data from these patients.

The aneurysm itself may lead to modest local pain radiating to the groin. Isolated iliac aneurysms are rare (case 3) — more often they are bilateral (case 1) and usually appear together with an infrarenal aortic aneurysm (case 2).

Iliac aneurysms usually occurs from the sixth to eight decade of life. The mean age of these patients was 70.7 years. The location of the aneurysm deep in the pelvis makes clinical detection difficult. A bruit with systolic accentuation can be heard (case 2 and 3). A thrill is uncommon.

The symptoms are primarily caused by the haemodynamic changes developing from the large amount of blood flowing through the fistula (*Table 2*) (McAuley et al, 1986; Länne and Bergqvist, 1993). The entire circulation may be involved.

A reduced peripheral vascular resistance is compensated by an increased cardiac output which may lead to cardiac failure. The first symptom of a newly developed fistula can be angina pectoris. Digitalis and diuretics have no effect on the symptoms. The heart size may increase and the ventricles hypertrophy. Diagnostic electrocardiographic changes which have useful specificity for this condition do not exist. The chest X-ray may show stasis and cardiomegaly (case 2).

Arterial pressure and flow distal to the fistula are reduced and the renin–angiotensin system mediates peripheral vasoconstriction. Acute onset of lower extremity arterial insufficiency — usually unilateral — is frequently seen (case 2).

The shift of blood through the fistula leads to high pressure in the venous system and pulsation in peripheral veins may occur. Unilateral lower extremity oedema together with an abdominal pulsatile mass and cardiac failure of recent onset are pathognomonic for a spontaneous IAVF (case 2) (McAuley et al, 1986). Haematuria can occur, although the exact cause is unclear (Salo et al, 1990). Renal function may decrease from increased pressure in the renal veins but decreased arterial flow in the kidneys may also be involved. This may result in increased aldosterone secretion and fluid retention. Creatinine levels normalize when the fistula is closed (Salo et al, 1987). Other more rare symptoms are rectal bleeding, priapism, hepatomegaly, ascites and icterus.

TABLE 1.
Summary of clinical data

Index		Case 1	Case 2	Case 3
Sex		male	male	male
Age		69 years	68 years	75 years
Aneurysm size, diameter x length (cm)		6 x 8	4 x 6	5 x 9
Hyperdynamic circulation		✘	✓	✓
Cardiac failure	Dyspnoea	✘	✓	✘
	Distended neck veins	✘	✘	✓
Abdominal findings	Pain	✓	✘	✘
	Bruit	✘	✓	✓
	Pulsatile mass	✓	✓	✘
Unilateral lower extremity findings	Oedema	✘	✓	✓
	Intermittent claudication	✘	✓	✘
Retroperitoneal rupture		✓	✘	✘
Survival		✘	✓	✘

TABLE 2.
Haemodynamic measurements before and after ligation of abdominal arteriovenous fistula

Index	Before ligation	After ligation
Systemic vascular resistance	Low	Increases
Cardiac output	High	Decreases
Stroke volume	High	Decreases
Central venous pressure	High	Decreases
Heart rate	High	Decreases
Pulse pressure	High	Decreases
Arterial flow distally	Low	Increases
Pulmonary artery wedge pressure	High	Decreases

CASE REPORT 3

A 75-year-old man was admitted to a local hospital suspected of septic shock. Antibiotic treatment was started. Blood cultures were negative. One week later venous engorgement of the left lower extremity was noted. Deep venous thrombosis was suspected and treatment with anticoagulants started. However, ultrasonography and computerized tomography combined with angiography revealed an aneurysm of the left common iliac artery, with fistulous communication to the common iliac vein on the same side. The patient was referred to the vascular department. There was no pulsatile mass in the abdomen, but a violent bruit distally. The neck veins were distended. The circulation was hyperdynamic. Blood pressure was 140/50 mmHg, heart rate was 96 bpm, and the electrocardiogram (ECG) showed sinus tachycardia and normal P waves, but no signs of myocardial ischaemia or ventricular hypertrophy. The haemoglobin level was 5.1 mmol/litre, and creatinine level was 133 μmol/litre. At operation the patient had an iliac aneurysm (5 x 9 cm) with oedema and fluid in the vicinity. Infection was suspected and confirmed by histological examination which revealed bacteria in the wall. The fistula was closed from within the aneurysm but the patient then developed hypotension with ECG ischaemic signs and asystolia occured. The patient lost 3 litres of blood during the operation, which lasted 165 minutes.

If the aneurysm ruptures intra- or retroperitoneally the symptoms from the fistula will be masked because signs of hypovolaemic shock dominate the picture (case 1). Patients with a large fistula can be admitted in severe shock because the rapid loss of arterial blood volume in an extendible venous system with low pressure levels and high capacity initially equals an external blood loss, thus presenting as hypovolaemic shock.

The incidence of infection in preexisting atherosclerotic aneurysms is 3–4% (Rutherford, 1995). The aetiology is bacteraemia. The risk of rupture is heightened, especially with Gram-negative organisms. Two years previously the patient in case 3 suffered from acute colonic diverticulitis with a free perforation.

A number of diagnostic methods may be helpful to a preoperative diagnosis. Spiral computed tomography (CT) scanning and intravenous digital subtraction angiography will show the fistula, while contrast enhanced CT scanning reveals equal and simultaneous enhancement of the common iliac vessels on one side (McWilliams et al, 1995). The fistula itself is usually difficult to locate. CT scanning without contrast may show obliteration of the fat plane usually seen between the vein and the artery (Epstein and Higgins, 1986). Alternative methods are ultrasound, particularly in combination with Doppler (Duplex scan). Ultrasound itself will only show dilatation of veins and/or pulsation in veins.

Measurement of venous pressure and oxygen concentration in the inferior caval vein may be useful (Länne and Bergqvist, 1992).

The patients have a hyperdynamic circulation with high cardiac output, increased pulmonary artery wedge pressure and high central venous pressure, with high oxygen concentration in the right atrium. Measurements of such haemodynamic parameters may support the preoperative diagnosis.

During operation the surgeon may suspect IAVF if he/she notices violent subcutaneous bleeding, venous dilatation, venous pulsation or thrill.

Surgical treatment of an AAVF was first tried in 1938 by Lehman who ligated the four legs of the fistula but the patient died 15 hours after the operation. The first successful surgical repair of an AAVF was performed in 1955 by Cooley who used the technique of endoaneurysmal closure (case 1 and 3). With a few modifications, this technique is still used today. The orifice of the fistula is closed by continuous suture from within the aneurysm. Bleeding may be controlled by digital compression proximal and distal to the fistula. Balloon catheters can also be inserted in the vein through the fistula or from the femoral vein guided by ultrasound (Naito et al, 1994). Finally vascular clamps can be placed on the veins over and below the fistula but these vessels are often fragile and dilated.

If the fistula is very large or tears in the wall of the vein arise, it can be necessary to ligate the vein above and below the aneurysm. Patients treated in this way do well because a collateral venous drainage will have developed as a result of high pressure in the inferior caval vein and on ligation this collateral drainage takes over (Phipps, 1988). Reconstruction of the vein is possible by insertion of a Teflon™ graft (Kiskinis et al, 1994). The fistula can even be excluded from the arterial circulation (case 2) (Wolley and Spence, 1995).

The aneurysm has to be treated very carefully because a thrombus in the aneurysm can cause paradoxical pulmonary embolus with fatal consequences.

The aorta should be gradually clamped in stable patients during operation since cardiac arrest may occur from a sudden increase in cardiac afterload with a concomitant fall in venous return (case 3) (*Table 2*).

When the fistula is closed a bifurcation bypass graft is inserted. In case of unilateral iliac aneurysm an aortoiliac or femoral bypass can be inserted. Crossover bypass by way of ilioiliac or iliofemoral bypass is also possible.

In these operations there is a high risk of extensive blood loss and autotransfusion should be used. It is also important that before, during and after the operation the patient has a Swan–Ganz catheter. Just after closure of the fistula massive oedemata are mobilized with a risk of overhydration. Diuresis increases which leads to a reduced weight. Intraoperative monitoring of fluid balance and early postoperative intensive care are of utmost importance.

CONCLUSION

A spontaneous IAVF is rare and diagnosis is often delayed because of vague symptoms and varied nature of manifestations illustrated by our three cases. The diagnosis has to be considered in any elderly patient with heart failure of recent onset, if examination also reveals lower abdominal murmur associated with unilateral leg swelling and concomitant aggravation of ischaemic symptoms of the same leg. HM

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