Aortocaval Fistula in Ruptured Aneurysms

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Objectives: to study incidence, clinical presentation and problems in management of aortocaval fistula in our series.

Design: retrospective study.

Materials: during a seven-year period, 112 patients operated on for abdominal aortic aneurysm, including four patients with aortocaval fistula.

Methods: standard repair of aortocaval fistula from inside the aneurysmal sac was the preferred operative technique.

Results: the incidence of aortocaval fistula was 3.6%. Three cases were found incidentally during emergency surgery for ruptured aneurysms; the fourth case was an isolated aortocaval fistula associated with inferior vena cava thrombosis, diagnosed preoperatively by angiography. In this case, inferior vena cava ligation instead of standard aortocaval repair was performed.

Conclusions: Aortocaval fistulas, although rare, should be kept in mind, because clinical diagnosis is often difficult. Furthermore, unsuspected problems during repair may necessitate appropriate change in operative technique.

Key words: Aortic aneurysm; Vena cava, inferior; Thrombosis; Aortography; Arteriovenous fistula, suture technique.

Introduction

Atherosclerotic abdominal aortic aneurysms (AAA) account for about 90% of spontaneous aortocaval fistula (ACF). The most common site of fistulisation is the inferior vena cava (IVC), with the iliac and renal veins rarely affected. Fistulas may coexist with retroperitoneal rupture or may be isolated. The formal management of the fistula is suturing from within the aorta. Rarely, aortocaval fistula may be associated with IVC thrombosis and three such cases have been reported, necessitating modification in surgical technique. During the period 1990 to May 1997, 112 patients were operated on for AAA, including 52 patients with rupture. Among them four patients had ACF, given an incidence of 3.6%. We report our experience in the management of ACF, including one patient, in whom ACF was combined with IVC thrombosis, diagnosed preoperatively by angiography, and we discuss the proposed modifications in operative technique when IVC thrombosis complicates ACF.

Case 1

An 85-year-old man was admitted as an emergency after a fall. He complained of lumbar pain and an abdominal pulsatile mass was palpable. He was haemodynamically stable. Computed tomographic (CT) scan diagnosed a ruptured aortic aneurysm. In the operating room a large suprarenal aneurysm, 10 cm in diameter, was found extending down to the common iliac arteries. Two points of fistulisation in the upper and lower segment of the aneurysmal sac were found. The fistulas were closed, but the patient died because of cardiac arrest in the operative room before aneurysm repair.

Case 2

A 59-year-old man was admitted with an eight-day history of left lumbar pain and oliguria. He was pale,
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with bruises on the lateral abdominal walls. Ultrasonography revealed a large aortic aneurysm with rupture into the retroperitoneal space. At operation a large inflammatory infrarenal aneurysm was found, with a large retroperitoneal haematoma. After the aneurysm was opened, profuse bleeding from a fistula located at the junction of the renal vein and inferior vena cava was encountered. The fistula was closed from within the aorta and a straight Dacron graft was sutured in place. The patient was transferred to the intensive care unit (ICU), where he remained anuric and hypotensive and died a few hours later from myocardial infarction.

Case 3

A 76-year-old man, with known AAA for 2 years, complained of abdominal and lumbar pain of 2 days’ duration. On admission he was in shock and at operation a ruptured infrarenal aneurysm, 10 cm in diameter, was found. After opening the aneurysmal sac, an aortocaval fistula was found, located in the middle part of the aneurysm. After digital compression of the inferior vena cava, the fistula sutured from within the aneurysm. The aneurysm was repaired with a straight aorto-aortic graft. The postoperative course was uneventful and the patient was discharged on the 10th postoperative day.

Case 4

A 70-year-old man was admitted with 2 months’ history of haematuria, fever and lumbar pain, initially diagnosed as urine infection. Four days before admission the lumbar pain became constant and severe. At the local hospital acute renal failure was diagnosed and because of extreme leg oedema the patient was transferred to our hospital. The systemic blood pressure was 130/50 mmHg and the pulse rate was 75/min and regular. Lower extremities were cool, pale, pulseless and swollen. Leg oedema extended to lower abdominal wall. No mass was palpable in the abdomen, jugular vein pressure was normal and chest X-ray and ECG were normal. Renal function was impaired with BUN levels of 93 mg/dl and creatinine levels of 7 mg/dl. Urine output became satisfactory after administration of renal doses of dopamine and frusemide.

Abdominal CT revealed a 5 cm AAA and IVC thrombosis. Intravenous digital subtraction angiography revealed an aortocaval fistula and thrombosis of the proximal segment of inferior vena cava (Fig. 1). At operation, performed 5 days after admission, a 5-cm-long fistula was located in the right posterolateral segment of aortic sac and bleeding was controlled with finger pressure. Ligation of the vena cava distal to the fistula was performed and a PTFE aorto-bifemoral graft was placed. The proximal thrombosed segment was left undisturbed. The postoperative course was complicated by left leg cellulitis and lower leg dysfunction. An EMG suggested ischaemic damage at the L4 level. The renal function progressively improved and the patient was discharged 40 days after admission. Two months later he was readmitted for amputation of his left leg, because of venous gangrene, and died suddenly on the second postoperative day, with the clinical features of massive pulmonary embolism (dyspnoea, tachycardia and hypoxaemia).

Discussion

Aortocaval fistula, complicating AAA, was reported for the first time in 1831 by James Syme. Since then about 200 cases of ACF had been reported up until 1992. Rupture into the vena cava may be asymptomatic and the fistula only recognised during elective operation for AAA after evacuation of luminal thrombus. A fistula may also present with symptoms characteristic of arteriovenous shunting and/or symptoms indicating aneurysm rupture. The classic presentation of a fistula, although rare, is a pulsatile abdominal mass with an audible machinery bruit, high-output cardiac failure and regional venous hypertension. Rarely, thrombi formed in the venous system may cause pulmonary embolism.
The frequency of ACF reaches 6%, when considering only ruptured AAA, and was 5.7% in our series. In about 13.5% of cases retroperitoneal rupture of AAA may coexist. In these cases, symptoms due to the rupture usually predominate, as was seen in the first three of our cases. Therefore, it is not surprising that the fistula can be overlooked preoperatively in 50% of cases. This can also be attributed to occlusion of the fistula by a luminal clot, external compression of the IVC by the aneurysm, small size of the fistula, or IVC thrombosis, as in our last case.

Our patient with isolated ACF presented with symptoms and signs due to peripheral venous hypertension without systemic complications (i.e. lung congestion and cardiac failure). There was no characteristic bruit nor pulsatile mass. The absence of systemic complications was the result of IVC occlusion due to thrombosis. This reduced blood return to the heart, preventing high output cardiac failure.

IVC thrombosis is thought to be the result of expansion of the luminal clot in the IVC through ACF. Alternatively, an unrecognised thrombus may dislodge during repair and remain postoperatively in IVC, acting as a source of pulmonary emboli, or even progress into a complete iliofemoral obstruction in the postoperative period. CT scanning is often the initial imaging technique used in the evaluation of aortic aneurysm. Findings that suggest aortocaval fistula include IVC enlargement and enhancement of infra renal IVC at the time of maximal enhancement of the aorta, in contrast-enhanced dynamic CT. In our case CT scan revealed IVC thrombosis but it was not diagnostic for the fistula. Aortography, in general, helps in diagnosing ACF, although it is rarely performed in stable patients. In our case, aortography depicted not only the exact site of communication, with early opacification of the distal to the fistula segment of IVC, but also thrombosis of its proximal segment. To our knowledge, this radiological feature is unique.

Preoperative diagnosis increases survival, because the surgeon is more careful in controlling the intraoperative bleeding and preventing air, thrombus or atherosclerotic debris emboli from passing into the IVC through the fistula. This is a dangerous complication which can be avoided by IVC compression, or by insertion of balloon catheters into the IVC. Preoperative insertion of IVC balloon catheters through the femoral vein has also been recommended. Thomas has proposed that, after controlling the neck of the aneurysm, the vena cava should be examined by palpation for evidence of intracaval thrombus. If detected, the cava should be controlled by higher compression which may allow the thrombus to be removed via the fistula. If IVC thrombosis is found, it must be decided whether it seems fresh or chronic. In the former case thrombectomy is preferable. However, before any manipulation, higher IVC compression or partial interruption should be considered. Fresh thrombosis may cause partial or total obstruction of the caval lumen. In the first case there is backbleeding and the possibility for pulmonary embolism is 27%. If obstruction is total, there is little risk of pulmonary embolism. If thrombectomy is not possible, partial interruption of the IVC is also indicated. Chronic thrombosis is interpreted by the presence of distended collateral veins and palpation of organised thrombus. These cases of chronic thrombosis should be left undisturbed. In our case thrombectomy was neither possible nor advisable, because chronic thrombus was broadly based and closely adherent to the IVC wall.

Aortocaval fistula repair can be achieved by suturing the fistula from within the aorta. When the fistula is large or the caval wall is friable, IVC ligation may be necessary because IVC trauma after suturing may predispose to pulmonary embolism. Alternatively, in the latter case, the replacement of the destroyed part of IVC with graft interposition has been proposed, although this carries a risk of cava thrombosis. Others have used a Dacron patch, to avoid IVC stenosis. A fourth alternative solution is the aortic exclusion procedure, i.e. proximal and distal ligation of the aorta and bypass with a graft. In this way the fistula remains undisturbed but only communicates with the excluded segment of the aorta. This procedure could, however, cause deep venous thrombosis (DVT) in lower limbs and risks continued aneurysm expansion. Following closure of ACF, all authors perform standard AAA repair techniques, with the exception of the above described aortic exclusion procedure. In the three reported cases of ACF with concurrent IVC thrombosis, thrombectomy and IVC ligation below the renal veins and above the iliac veins, confluence was performed in the first case, while, in the second one the IVC and the ACF were left undisturbed. In the third reported case, thrombectomy via the fistula and suturing from inside was performed. In our case, the proximal total IVC obstruction was left undisturbed and the distal free communication was ligated. Inferior vena cava ligation is not the procedure of choice when repairing ACF. Although IVC ligation is generally well tolerated, many complications may ensue. These complications include leg oedema (30%), recurrent DVT (16%), varicose veins (21%), venous ulceration and venous claudication (15%). The presence of DVT is critical for the development of late complications of IVC ligation and studies on venous haemodynamics.
in these legs show venous reflux.\textsuperscript{23} We conclude that
in our fourth case the preceding IVC thrombosis and
venous hypertension were the main causes of sub-
sequent venous gangrene. Furthermore, it is interesting
that, irrespective of operative technique, venous
thrombosis can complicate repair of aortocaval
fistula,\textsuperscript{6,21} as mentioned above.

In conclusion, IVC thrombosis or aneurysm rupture
modifies the clinical presentation of ACF, as the signs
of classical hyperdynamic circulation are often absent.
We recommend that in the case of ACF–IVC throm-

bosis, the standard management with ACF repair from
within the aneurysmal sac is combined with throm-

bectomy when fresh thrombus is present. If chronic
total occlusion of IVC is found at operation, it can be
left undisturbed.

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