incision or endoscopic port or cannula where there may be an increased risk of rupture of the adenoma. Therefore parathyromatosis may become a condition that is seen more regularly and must be considered in cases of recurrent hyperparathyroidism. HM

Fitko R, Roth SI, Hines JR, Roxe DM, Cahill E (1990) Parathyromatosis in hyperparathyroidism. *Hum Path* **21:** 234–7

Kollmorgen CF, Aust MR, Ferreiro JA, McCarthy JT, van Heerden JA (1994) Parathyromatosis: a rare yet important cause of persistent or recurrent hyperparathyroidism. *Surgery* **116**(1): 111–5

Palmer JA, Brown WA, Kerr WH, Rosen IB, Watters NA (1975) The surgical aspects of hyperparathyroidism. *Arch Surg* **110:** 1004–7

Reeve T, Babidge W, Parkyn R, Edis A, Delbridge L, Devitt P, Maddern G (2000) Minimally invasive surgery for primary hyperparathyroidism. *Arch Surg* **135:** 481–7

Riddick RL, Costa JC, Marx SJ (1977) Parathyroid hyperplasia and parathyromatosis [Letter]. *Lancet* **1:** 549

Sokel MS, Kavolius J, Schaaf M, D'Avis J (1993) Recurrent hyperparathyroidism from benign neoplastic seeding. A review with recommendations for management. *Surgery* **113:** 456–61

IMAGES IN MEDICINE

Aorto-caval fistula

Tony Geoghegan, Thara Persaud, Helen O'Grady, Sean Tierney, William C Torreggiani

CASE HISTORY

A 62-year-old male patient was referred with a 6-hour history of abdominal pain and a palpable abdominal mass consistent with an aortic abdominal aneurysm, which had been demonstrated by grayscale ultrasound at another hospital.

Examination revealed the presence of a palpable thrill and audible abdominal bruit consistent with an aorto-caval fistula. Contrast-enhanced computed tomography (*Figure 1 and 2*) confirmed the presence of a fistula between an infra-renal aortic aneurysm and the inferior vena cava. The patient underwent repair of the abdominal aortic aneurysm and closure of the associated fistula and made an uncomplicated recovery.

DISCUSSION

The development of a fistula between the aorta and inferior vena cava is a rare clinical entity complicating abdominal aortic aneurysms necessitating prompt diagnosis and in most cases emergency surgical repair. The clinical manifestations are related to the size of the shunt.

The examination findings include palpable thrill, continuous abdominal bruit, acute high-output cardiac failure

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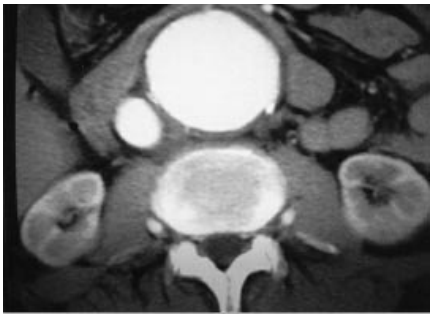

Figure 1. Contrast-enhanced computed tomography demonstrates abnormal early enhancement of the inferior vena cava during the arterial-dominant phase of the examination adjacent to an infra-renal abdominal aortic aneurysm.

(Marcelletti et al, 1997) and development of haematuria in patients with known aortic aneurysm (Salo et al, 1987).

Pre-operative clinical diagnosis of aorta-caval fistula is difficult because the classical triad of abdominal pain, pulsatile abdominal mass and abdominal bruit may be absent in up to 50% of patients. The diagnosis may be established using ultrasound, contrast-enhanced computed tomography, and aortography or breath-hold gadolinium-enhanced three-dimensional magnetic resonance angiography (Gaa et al, 1999).

Rupture of aorto-iliac aneurysms into the iliac veins or inferior vena cava carries a better prognosis then intra-peritoneal, retroperitoneal or ectopic rupture (Davis et al, 1998). The only effective treatment is surgical. Aorto-caval fistula is an uncommon complication of abdominal aortic aneurysm, which is associated with a high mortality rate approaching 40% requiring early recognition and treatment (Schmidt et al, 1994). HM

Davis PM, Gloviczki P, Cherry K et al (1998) Aorto-caval and ilio-iliac arteriovenous fistulae. *Am J Surg* **176**(2): 115–8

Gaa J, Bohm C, Richter A, Trede M, Georgi M. (1999) Aorto-caval fistula complicating aortic aneurysm diagnosis with gadolinium-enhanced three-dimensional MR angiography. *Eur Radiol* **9:** 1438–40

Marcelletti C, Astolfi D, Pinto FD et al (1997) Abdominal aorta-caval fistula: treatment with aortic caval synthetic grafts (one year follow up). *J Cardiovasc Surg* **18**(2): 137–40

Salo JA, Verkala K, Ketonen P, Perhoneimi V, Harjola PT (1987) Diagnosis and treatment of spontaneous aorto-caval fistula. *J Cardiovasc Surg* **28**(2): 180–3

Schmidt R, Burns C, Walter M, Erasmi H (1994) Aorto-caval fistula- an uncommon complication of infra-renal aortic aneurysms. *Thorac Cardiovasc Surg* **42**(4): 208–11

Figure 2. Contrast-enhanced computed tomography demonstrates the presence of a fistula between the infra-renal aortic aneurysm and the inferior vena cava.