CASE REPORT

Streptococcus pneumoniae mycotic aneurysm with contiguous vertebral discitis treated by endovascular aortic repair and antibiotics

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SUMMARY

A 61-year-old man was admitted with a history of right upper quadrant and left iliac fossa pain and raised inflammatory markers. Initial investigations, including contrast-enhanced CT scan of the abdomen and pelvis, were reported as normal. Following readmission 2 months later with thoracolumbar back pain and recurrent fevers, an MRI showed T11/12 discitis and an adjacent mycotic aneurysm of the aorta. CT angiogram confirmed an 8 cm mycotic aneurysm. A second, more distal aneurysm was found located at the left common femoral artery. The aortic aneurysm was treated by antegrade stenting. The left common femoral artery aneurysm was excised. The patient was also treated with antibiotics. He made a good recovery and was well 8 months later apart from mild residual thoracolumbar spinal pain. To date, he has been followed up for 1 year and remains asymptomatic.

BACKGROUND

The term mycotic aneurysm refers to any aneurysm that results from an infectious process involving the arterial wall. They are usually related to bacterial infection. 'Mycotic' refers to the mushroom shape of the aneurysm, not fungal.¹ It may therefore be confusing to the inexperienced. Mycotic aneurysms are now rare in clinical practice (1–3% of all aneurysms).² This is due to the effective and prompt use of antibiotic treatment. These aneurysms, however, are potentially life-threatening if not recognised early and treated appropriately.^{3–5} This is one of the reasons why we decided to report this case.

Early diagnosis of mycotic aneurysms may be difficult without awareness of this condition and a high index of suspicion.⁵ Our case highlights the importance of carefully searching for these aneurysms at initial investigation and ensuring that soft tissue and bone windows of the spine are thoroughly inspected for discitis at the initial CT investigation. Mycotic aneurysms should be considered in the differential diagnoses for abdominal and thoracolumbar back pain.

We have found few cases in the literature describing *Streptococcus pneumoniae* as the causative organism for mycotic aneurysm.^{6–8} Our case was in an adult male, our patient did not have a known previous history of chest infection or pneumonia. The patient, however, was under long-term haematology follow-up for a monoclonal gammopathy of uncertain significance (MGUS) (IgM κ). He had a persistently elevated lymphocyte count. We

suspect that this may be important and could explain why he developed a rare complication for a relatively common infection. The most likely mechanism is that he was bacteraemic at some point from a probable respiratory focus, although there is no evidence for this. We suspect, therefore, that the mycotic aneurysm was secondary (this is supported by the fact that there was a second aneurysm in the femoral artery) and subsequently led to infection of the intervertebral disc.

Our case also highlights the need to search for other mycotic aneurysms in the branches of the aorta and more distally as we found a left common femoral artery mycotic aneurysm which was synchronous with the mycotic aneurysm of the thoracic aorta.

The treatment of mycotic aortic aneurysms has traditionally been by surgical excision and antibiotics. The less invasive approach of endovascular aortic repair (EVAR) and antibiotics was introduced by Semba *et al.*⁹ This treatment is still considered an experimental procedure^{10 11} and is not as widely used as aortic aneurysm resection. However, it is particularly useful in patients with severe comorbidities where an open surgery approach carries higher risk.¹² Our case of thoracic aortic aneurysm with adjacent vertebral discitis was successfully treated by endovascular aortic repair and antibiotics. Our patient remains well at 12 months follow-up.

Apart from the reasons given above for reporting our case, we have also reviewed the literature and included discussion of the latest imaging modalities that have been applied, including the use of positron emission tomography (PET) scan by Fisk *et al.*³ and also treatment procedures such as EVAR that was used to treat our patient.

CASE PRESENTATION

A 61-year-old man was admitted with a history of right upper quadrant and left iliac fossa pain. He had not opened his bowels properly for 3 weeks. In his medical history he had had an abdominal operation 50 years ago, which he was informed was for Crohn's disease. He also had an extensive family history of bowel and lung cancer. The patient was under long-term haematology follow-up for a (MGUS (IgM κ). He had a persistently elevated lymphocyte count.

Initial investigations on 18 February 2012 showed raised inflammatory markers. C reactive protein was 46 mg/L (normal range <5 mg/L).

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Abdominal X-ray showed loops of distended small bowel in the left upper quadrant, raising the possibility of diverticulitis or Crohn's disease, but there was no evidence of perforation or obstruction. Chest X-ray did not show any lung pathology. Contrast-enhanced CT scan of the chest, abdomen and pelvis was reported as not showing any mass or obstruction and there was no evidence of bowel perforation. There was no evidence of diverticulitis and the appendix, gall bladder and bile ducts were normal. Liver, spleen, pancreas and the adrenals were normal. There were several small scattered lymph nodes within the mesenteric fat and para-aortic region, but these were not enlarged by size criteria and were therefore of doubtful significance. A prominent node noted in the left inguinal region was reported as being of normal morphology with a fatty hilum. The abdominal aorta and iliac vessels were reported as being heavily calcified, but without aneurismal dilation. However, when the scan was reviewed during preparation of this manuscript, a small mycotic aneurysm was found to have been present. No bone lesions were identified.

On 6 March 2012, the patient was readmitted with severe right upper quadrant pain and tenderness, also general abdominal pain. An ultrasound scan of the abdomen was carried out. This was reported as suboptimal due to overlying bowel gas, but liver, spleen, pancreas, gall bladder and the biliary tree were reported as normal (figure 1). The abdominal aorta was reported as being of normal calibre. A thoracolumbar spine X-ray was reported as normal. The patient was again discharged without a firm diagnosis. He was readmitted 5 weeks later with thoracolumbar back pain and chest pain. He reported that the thoracolumbar back pain was worsening. He also had recurrent fevers with raised temperature on admission (39.3°C). C reactive protein (CRP) was persistently high (46 mg/L). He had thrombocytosis and anaemia. Haemoglobin was 11 g/dL. Platelets were $450 \times 10^9/L$ (normal = $150\text{--}400 \times 10^9/L$). White cell count was $10.66 \times 10^9/L$ (normal = $4\text{--}10 \times 10^9/L$). Blood cultures were negative. Diagnosis of fever of unknown origin was made and an MRI was requested to look for discitis. This demonstrated signal hyperintensity within the T11/T12 disc space extending to the end plates and consistent with discitis (figure 2). A mycotic aneurysm of the aorta was also demonstrated abutting the spine at T11/T12. Two blood cultures taken on 12 April 12 grew *S pneumoniae*, identified as serotype 10a (present in the 23-valent non-conjugated vaccine (Pneumovax), but not in the 13-valent conjugated vaccine (Prevnar-13)). The penicillin minimum

Figure 1 Ultrasound scan of 6 March 2012 reported as normal, but in retrospect it shows a mycotic aneurysm (white arrow).

Figure 2 Sagittal T2-weighted MRI showing mycotic aneurysm abutting the T11 and T12 vertebral bodies. The scan also shows high signal in the disc space at T11/T12 in keeping with discitis (white arrow).

inhibitory concentration (MIC) was 0.008 mg/L (sensitive MIC breakpoint ≤ 0.06 mg/L).¹³ A CT angiogram was carried out on 16 April 12. This confirmed the presence of an 8 cm mycotic aneurysm of the thoracic aorta at T10–12 (figures 3 and 4). An angiogram (figure 5) also demonstrated the aneurysm. The aneurysm expanded laterally to the left side. Active leakage of the aneurysm into the left pleural cavity was also demonstrated by high density material layering posteriorly and a large pleural effusion. There was bone destruction of the T11 vertebral body anteriorly, associated with the T11/T12 vertebral discitis. A second aneurysm was also found located at the left common femoral artery. The aortic aneurysm was treated by antegrade stenting and the left common femoral artery aneurysm was excised. The patient was then treated with 2.4 g intravenous benzylpenicillin 6 hourly for 4 weeks while in hospital. He was discharged 4 weeks later on 2 g ceftriaxone intravenously once daily for 2 weeks, followed by amoxicillin orally 1 g three times a day for 6 weeks. He made a good recovery and was well apart

Figure 3 CT scan showing contrast in the aorta (black arrow) and the aneurysm which is of lower density (white arrow). The aneurysm extends posteriorly behind the aorta and is eroding the adjacent vertebral bodies.

from residual thoracolumbar spinal pain. He then continued to take amoxicillin orally 500 mg three times a day for 1 year. To date, he has been followed up for 1 year and remains asymptomatic.

Figure 4 Sagittal CT scan showing mycotic aneurysm eroding T11 and T12 vertebral bodies.

Figure 5 Angiogram showing mycotic aneurysm (black arrow).

INVESTIGATIONS

- ▶ 18 February 2012: abdominal X-ray did not demonstrate obstruction or perforation, chest X-ray was normal. Contrast-enhanced CT of the chest, abdomen and pelvis was reported normal (but retrospectively, a small mycotic aneurysm of the thoracic aorta was seen).
- ▶ 6 March 2012: thoracolumbar spine X-ray reported normal. Ultrasound of the abdomen was reported normal.
- ▶ 13 April 2012: CRP was 46 mg/L. Urea and electrolytes were normal. Liver function tests were normal. Haemoglobin was 11 g/dL and white cell count was $10.66 \times 10^9/L$ (normal range: $4\text{--}10 \times 10^9/L$). MRI scan of the lumbar sacral spine demonstrated T11/12 vertebral discitis and a (5.4 by 6.3 cm) mycotic aneurysm of the aorta abutting the spinal column. Two blood cultures grew *S pneumoniae*.
- ▶ 16 April 2012: CT angiogram of the aorta demonstrated enlarging mycotic aneurysm at T10–12 (8 cm) and a large left haemothorax as a result of leakage of the aneurysm into the left pleural cavity. There was also further bone destruction of the T11 vertebral body. A second aneurysm of the left common femoral artery was also demonstrated (12 mm).

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for the initial symptoms on admission included cholecystitis, diverticulitis, duodenal ulcer, constipation, inflammatory bowel disease or bowel obstruction. Differential diagnosis for subsequent admission with thoracolumbar back pain and chest pain, fever, raised CRP, thrombocytosis and anaemia included septicaemia, intra-abdominal or spinal focus of infection or malignancy.

TREATMENT

The thoracic aortic aneurysm was treated by antegrade endovascular stenting. The left common femoral artery aneurysm was surgically excised. A left plural drain was inserted to evacuate

the chest effusion. Antibiotics 2.4 g intravenously benzylpenicillin 6 hourly (4 weeks), then 2 g ceftriaxone intravenously once daily (2 weeks) and amoxicillin orally 1 g three times a day (6 weeks). He then continued to take amoxicillin orally 500 mg three times a day (1 year).

OUTCOME AND FOLLOW-UP

The patient made a good recovery. Inflammatory markers and body temperature returned to normal. At 8 months follow-up his only symptom was residual back pain at the site of previous vertebral discitis. To date, he has been followed up for 1 year and remains asymptomatic.

DISCUSSION

Mycotic aneurysms result from infection of the arterial wall which is usually bacterial.^{5–14} Although they are now relatively rare in clinical practice (1–3% of all aneurysms),² they remain potentially life-threatening if not diagnosed and treated early.^{3–5} Mycotic aneurysms can form via three mechanisms. Infectious arteritis that is not associated with infection elsewhere is considered a primary mycotic aneurysm. Arteritis associated with concurrent infection, for example, septicaemia or endocarditis, is referred to as a secondary mycotic aneurysm. A tertiary mycotic aneurysm results from direct extension from an adjacent inflammatory process, notably lumbar osteomyelitis or a psoas abscess.¹⁵ Although, in our case the spondylodiscitis and subsequently the mycotic aneurysm were initially diagnosed at MRI scan, contrast-enhanced CT and CT angiography is frequently the initial investigation for patients presenting with abdominal pain which is subsequently discovered to be due to aneurysm. It is therefore essential to have a high index of suspicion in order to ensure early diagnosis.⁵ MRI may also be carried out early if there is a history of back pain, or in cases suspected of having fever of unknown origin. This is in order to exclude discitis. Fisk *et al*³ also reported the value of using PET scan in addition. The authors suggest that PET not only augments sensitivity and specificity, but also distinguishes inflammatory from non-inflammatory aneurysms, highlights synchronous lesions and monitors remission and recurrence. This is particularly important if a long-term antibiotic treatment strategy is adopted in patients deemed to be at high surgical or anaesthetic risk.³

Surgical management and antibiotics is the most effective and standard treatment for mycotic aneurysms. However, for patients with severe comorbidity, open surgical procedures carry a high perioperative risk.¹² Medical management without surgery is fatal in over 90% of cases.¹⁶ In the largest case series with combined surgical and antibiotic treatment, an early mortality of 11–36% is documented.^{11–17} Semba *et al*⁹ devised a less invasive approach involving endovascular aortic repair and antibiotics. In their report, Carol Strahm *et al*¹⁸ conclude that based on data currently available, the early mortality rate associated with stent grafts appears to be lower than that associated with conventional surgery. However, late aneurysm-related events, including mortality and complications, appear to be more common in EVAR than with surgery.¹¹ This is because there is no possibility to debride the infectious tissue and the infected aortic wall.¹⁹ Most of the late events were due to inadequate control of infection and inappropriate preoperative antibiotic treatment. Carol Strahm *et al*¹⁸ therefore suggest that preoperative antibiotic treatment, preferably with clearance of bacteraemia, as well as long-term treatment (12 months) after EVAR is mandatory.

Learning points

- ▶ Although mycotic aneurysms are now rare in clinical practice, they are potentially life-threatening if not recognised early and treated appropriately.
- ▶ Lumbar vertebral infections associated with mycotic aneurysms of the contiguous aorta are most commonly due to *Salmonella* infection. Other causative organisms include, in descending order of frequency, *Mycobacterium* spp., Gram-negative bacilli (other than *Salmonella*), mixed bacteria and fungi.
- ▶ The initial investigation for patients presenting with abdominal and back pain is usually contrast-enhanced CT scan. It is therefore essential that mycotic aneurysm with contiguous discitis is considered as a possible cause. The aorta should be closely examined for aneurysm and the spine for discitis.
- ▶ Multiple aneurysms may exist and therefore careful search and evaluation of the images and the more peripheral vessels is required in order to identify these.
- ▶ Endovascular aortic repair can be a successful treatment for mycotic aneurysm associated with discitis.

Contributors KW carried out the literature search, prepared the manuscript and obtained the images and reports from the radiology department, then submitted the finished article. MW provided microbiology information, advise and test results, also information on patient follow-up and treatment. He advised on information to be included in various parts of the manuscript. He suggested references of previous relevant studies. MK was the consultant looking after the patient and offered advise on the manuscript preparation.

Competing interests None.

Patient consent Obtained.

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