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Surgical treatment of aspergillus spondylodiscitis

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Abstract Four cases of aspergillus spondylodiscitis were treated with operative debridement and fusion. In this rarely encountered mycotic infection of the spine in immunocompromised patients rapid destruction of the intervertebral disc and vertebral bodies can occur. In advanced cases antimycotic drug therapy is thought to be ineffective and a forcing indication for surgery exists when the destruction is progressive and spinal cord compression is imminent or manifest. Spinal instrumentation can be of help in maintaining or restoring spinal stability and maintaining spinal alignment. In our four patients the aspergillus

spondylodiscitis was successfully eradicated and fusion achieved. In two of three patients with a neurologic deficit, this deficit disappeared. Two patients died within 6 months after the operative treatment, due to complications related to the underlying illness. One patient was left with a subtotal paraplegia.

Key words Aspergillosis · Spondylodiscitis · Debridement · Spinal fusion

Introduction

Aspergillosis of the spine is rarely encountered. Although many articles concerning treatment of haematogenous bacterial spondylodiscitis are found in the literature, there are relatively few reports concerning the treatment of aspergillus osteomyelitis of the spine. Aspergillus species commonly invade the respiratory tract, where they usually reside as harmless inhabitants. In immunocompromised or chronically ill patients, such as patients with AIDS [10], patients receiving chemotherapeutic or immunosuppressive treatment, and patients with chronic cavitation or allergic bronchitis, an aspergilloma can develop [1, 4].

Aspergillus is the most common cause of skeletal mycosis, and the vertebrae are the most commonly involved structures in mycotic osteomyelitis [2]. In children, aspergillus spondylodiscitis is usually related to contiguous spread from the lungs to the spine [4]. In adults, however,

these infections mostly arise through haematogenous spread from pulmonary, gastro-intestinal or cerebral locations [2]. The most common causative species is *Aspergillus fumigatus*. In fewer instances *Asp. flavus*, *Asp. niger*, *Asp. nodulans* and *Asp. terreus* have been isolated [4]. Treatment can consist of medical therapy alone [3], surgery and medical therapy or medical therapy and irradiation [2]. We present four cases in which operative treatment was performed after an insufficient course of antimycotic medical treatment.

Case reports

Case 1

A 45-year-old man was in complete remission for an acute myeloid leukaemia after chemotherapy, but developed three infiltrative lesions in the right lung. These were believed to be aspergillomas, and treatment with amphotericine B was started. Be-

Fig. 1 Case 1. CT scan showing aspergilloma in the right lung with direct spread to the T4 and T5 vertebrae

Fig. 2 Case 1. Sagittal MR image showing destruction of the T4-5 disc and neighbouring vertebrae, with anterior soft tissue swelling and local kyphosis

cause of thoracic back pain, 1 month later an MRI and CT investigation was performed, showing a spondylodiscitis of T4-T5 with a soft tissue swelling anterior to the spine from T3 to T7 (Figs. 1, 2). There were no signs of neurologic dysfunction. After receiving a maximum total dose of 3800 mg amphotericine B, the lesions in the lungs and in the thoracic spine showed no improvement and, 3.5 months after the start of the antimycotic treatment, an operation was performed. A right thoracotomy revealed lesions in the right upper and lower lung lobe, with a connection of the lesion in the lower lobe to the mid-thoracic spine. After resection of the lung lesions, no frank pus or necrosis of bone or disc was visible. The anterior part of the fibrotic and partially ossified disc was curetted, and an iliac crest graft was inserted in the disc space. A direct smear and culture of the spine and lung lesions showed no bacteria or mycotic organisms. Histologically, there was active inflammation with focal necrosis. Postoperatively the patient received itroconazol orally and a plaster corset for 3 months. Three years postoperatively, he is without back complaints. His leukaemia is in complete remission and there is radiographic fusion of T4-T5, with a local kyphosis of 26°.

Case 2

A 69-year-old man with silicosis of the lung was on chemotherapy for an acute myeloid leukaemia. He developed an assumed aspergillus infection of both lungs, for which amphotericine B and itroconazol were administered. Two weeks after the start of the antimycotic treatment, an electro-myographically proven paresis of the dorsoflexors of the left foot was detected. Back pain appeared 4 weeks later in the thoracolumbar area. Plain radiographs and a CT scan showed spondylodiscitis at T12-L1. A Craig needle

biopsy was negative. The neurologic deficit of the legs progressed to a bilateral proximal paresis. Distally, the dorsoflexor paresis progressed to almost a paralysis. Despite the precarious health of the patient, surgery was deemed necessary. Via a left thoraco-abdominal approach, abundant necrotic disc and endplate material was removed from the interspace T12-L1. Decompression was performed up to the posterior longitudinal ligament. A rib and iliac crest graft was inserted into the defect. Gram stains and cultures showed *Aspergillus fumigatus*. Again intravenous amphotericine B (2.07 g) and 5-flucytosine was administered, which was changed to itroconazol (400 mg/day) after 6 weeks because of deterioration of the renal function.

The patient recovered well and was ambulatory with a thoracolumbar brace by the 7th postoperative day.

Three months postoperatively, he had no pain and the neurologic symptoms had completely subsided. Radiographs showed a good fusion between the vertebral bodies of T12 and L1. The patient was asymptomatic from his spinal disease, but he died from a recurrent acute myeloid leukaemia, 4 months postoperatively. At autopsy, the mycotic lesions of the lungs and of the thoracolumbar spine were healed.

Case 3

A 39-year-old woman was in complete remission for an acute myeloid leukaemia after chemotherapy. Her situation was complicated by aspergillosis of the lungs (two localisations: one left and one right), for which amphotericine B for 2 months followed by orally administered itroconazol (400 mg/day) was given. During this treatment, she developed progressive back pain and radicular pains radiating to the upper part of both legs. Initially, an MRI investiga-

Fig.3 Case 4. MR image showing destruction of the T12 and L1 vertebral bodies and involvement of the spinal cord

Fig.4 Case 4. MR image showing increasing destruction and kyphosis following laminectomy

Fig.5 Case 4. Solid anterior fusion in good alignment, 1 year after surgery

tion and lumbar dural puncture showed no abnormalities, but a repeat MRI investigation 6 weeks later showed gross destruction of the L4-L5 disc and endplates, with epidural involvement and abscess formation. Since there was much destruction, medical treatment alone was deemed insufficient, and operative treatment without a preceding needle biopsy was advised. Operation was performed 4 months after the start of the antimycotic treatment and 2.5 months after the first back pain complaints. A lumbotomy was performed and the retroperitoneal space was entered, but there was no pus. The L4-L5 disc with remnants of the endplate was found to be totally sequestered and could be easily removed. After curetting to normal bleeding spongy bone, an iliac crest bone block was inserted. Histologic findings were very suspect for aspergillosis.

Microbiologic investigation showed *Aspergillus fumigatus*. A brace was given for 3 months and the patient received a new experimental antimycotic drug, since the aspergillus spondylodiscitis had developed despite amphotericin and itraconazole medication. The radicular pain in both legs disappeared gradually over the following 3 months. There were signs of healthy fusion on CT and MRI scans after 3 months. Unfortunately, the leukaemia recurred at the same time, and the patient received another course of chemotherapy. Amphotericin B was also given again, because the scans showed important soft tissue swelling retroperitoneally.

After a new remission, she eventually died from complications (pneumonia and respiratory insufficiency) after an allogeneic bone marrow transplantation 4 months after surgery.

Case 4

A 56-year-old woman developed significant mid-lumbar back pain during chemotherapy for acute myeloid leukaemia. She developed pareses of the dorsoflexors, and later of the plantar flexors, of the left foot 7 weeks after the first back pain complaints.

Plain radiographs and an MRI scan demonstrated bone destruction at T12-L1 (Fig.3). A Craig needle biopsy showed an *Aspergillus fumigatus* vertebral osteomyelitis.

Intravenous amphotericin B treatment was started, and a T12-L1 decompressive laminectomy was performed, with evacuation of pus from the spinal canal, 9 days after the first neurologic symptoms. The patient showed no improvement and became bedridden. The neurologic deficit in the legs increased over a few weeks to a complete motor paralysis of the entire left leg, with sensory sparing, and the dorsoflexors of the right foot became paralysed as well. There was a neurogenic bladder and rectum. There was progression of the vertebral body destruction on plain radiographs and MRI scan, with a progressive kyphosis of the thoracolumbar junction (Fig.4), which may have played a major role in the progression of the neurologic deficit, due to compression of the spinal cord by the remaining bone and disc fragments. Despite the precarious condition of the patient, operative intervention was deemed necessary. It was elected to perform a posterior stabilization first, because of the gross instability caused by the anteriorly located infection and the laminectomy. The thoracolumbar junction was stabilized with Cotrel-Dubousset instrumentation using pedicle screws, hooks and rods, 2 months after the laminectomy. Two weeks later, an anterior procedure was performed via a tho-

raco-abdominal approach. A vascularized rib graft (costa 10) was prepared, and after debridement of massive amounts of necrotic bone and disc remnants, resulting in an anterior decompression of the spinal cord, the vascularized rib graft and an iliac crest strut graft were inserted in the gap from T11 to L2. This was covered by a vascularized omentum majus graft to promote the healing of the infection. The intravenous amphotericin B medication was continued to the maximal total dose of 3 g, followed by orally administered itraconazole. The patient recovered well, but the paraplegia progressed in a few months to a bilateral paralysis of the legs with incomplete sensory sparing. Following verticalization with a bivalved plastic brace, a sound fusion of the anterior strut grafts was noted after 6 months (Fig. 5). With a follow-up of 63 months, the patient is alive with a total motor paraplegia below the T12 level and incontinence for urine and stool. Her spine is stable, but she suffers chronic thoracolumbar back pain.

Discussion

The presented four cases illustrate the fact that *Aspergillus* species almost exclusively invade an immunocompromised host, e.g. persons with long-term steroid or immunosuppressive therapy for malignancy or transplantation. Patients with long-term antibiotics, intravenous drug abuse, AIDS and chronic granulomatous disease are at risk as well [4, 7]. Infection with *Aspergillus* is also described after surgery for a prolapsed lumbar disc [6]. Although some patients with aspergillosis of the spine and without predisposing factors have been described [4], we never saw such patients. Cases 1 and 2 illustrate that the diagnostic process is often difficult; differentiating between tuberculous and fungal infection can be especially difficult [4]. Serological tests on *Aspergillus* antigen and antibodies are available, but false-negative results of these tests do exist. Moreover, a needle biopsy does not always provide a diagnosis [1, 4].

In our cases, the very rapid evolution of the destructive process in cases 2, 3 and 4 is noticeable. It is stressed that after a period of back pain with negative radiographs or even negative MRI investigation in an immunocompromised patient without previous back pain, a strong suspicion for a fungal infection of the spine must arise. This is even more relevant if aspergillomas of the lung are already present.

In three of our four patients, there was extensive destruction of disc and bone from the vertebral bodies. These three patients shared what is believed to have been a haematogenous origin of the infection. In the first described patient, the involvement of the spine was due to

continuous spread from an aspergilloma of the lung to the thoracic spine. In this patient, we found no obvious destruction of bone and the spondylodiscitis was almost healed at operation. An explanation for this difference in destruction could be a lower virulence of the presumed *Aspergillus* infection (there was a negative culture) or more effective treatment with antimycotics. Continuous spread, however, as opposed to haematogenous spread, can also result in severe destruction and even paraplegia [8, 9]. In advanced disease, as in our cases 2, 3, and especially in case 4, we believe that there is too much sequestration of bone and disc material to be effectively treated with antimycotic drugs alone [1, 5]. Most authors favour surgical treatment if the response to medical treatment alone is poor or if there is neurologic impairment [1, 2, 4–6]. Cortet et al., however, describe nine patients who were all cured with medical treatment alone. They regarded itraconazole, alone or in combination with other antimycotic drugs, as the best antimycotic drug regime for aspergillosis. They do not, however, describe in detail, how much destruction of spinal elements was present in their patients. There were no patients with a neurologic deficit, which suggests that their cases were less severe. Another indication for surgery is side effects of drug treatment, which can preclude pure medical treatment.

If only laminectomy is performed in case of severe anterior destruction, serious instability will result. Progressive kyphosis and even dislocation of the spine can develop, as is shown in our fourth case. This patient was the first of the four described patients to be treated. Comparing the outcome of this patient to the other three, it seems advisable to operate at a rather early stage, as soon as failure of the antimycotic drug therapy is evident or medication has to be discontinued because of toxicity. We adopted this regime after the unfavourable outcome of the first patient (case 4). Anterior operation should be the preferred approach with fungal infections involving vertebral bodies and discs. Only then is it possible to achieve an adequate debridement and decompression followed by fusion, with (near) total eradication of the diseased tissue [1, 5, 8]. Posterior stabilisation is only necessary if multiple vertebral bodies and discs are destroyed or when posterior stability is also compromised. Since the anterior approach can be performed safely, even in patients with compromised health as in this patient group, it should be considered early in the course of this debilitating disease.

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