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Epidural abscess in an infant

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Abstract We report the case of a 2-year-old infant who developed a staphylococcal septicaemia that subsequently resulted in an epidural abscess and paraparesis. The significance of early diagnosis and the roles of anterior surgery to decompress the spinal cord, debride infection and correct deformity are discussed.

Key words Septicaemia · Epidural abscess · Paraparesis

Case report

A previously well 2-year-old female infant was admitted as an emergency with status epilepticus. She was afebrile and general examination was unremarkable. Initial investigation revealed profound hypoglycaemia (glucose < 0.6 mmol/l). The seizures settled following administration of anticonvulsant medication and intravenous glucose. She remained comatose for 24 h. Mid-Chain Acyl-CoA Dehydrogenase Deficiency (MCAD) was suspected, and later confirmed on blood tests. Following the intravenous administration of L-carnitine she became more alert and responsive. At that stage she had an extensor response to painful stimuli with generalised spasticity. Electroencephalogram tests revealed a diffuse encephalopathy.

Ten days after admission she developed a pyrexia of 38.4°C ; blood cultures were negative. Further pyrexial episodes continued over the next 2 weeks, at the end of which she developed a varicella infection. The skin vesicles became secondarily infected with *Staphylococcus aureus*, which progressed to a septicaemia and pneumonitis. Her condition deteriorated; although her white cell count was elevated at $16.1 \times 10^9/\text{l}$, she was profoundly neutropenic ($1.0 \times 10^9/\text{l}$). Scalp and praecordial abscesses erupted and required formal surgical drainage.

Immediately after the above operation there was no voluntary movement of the lower limbs. She had a pyrexia of 39°C and neurological examination showed absent deep tendon reflexes and bilaterally positive Babinski reflexes. Her general condition was poor with inspiratory stridor and low blood saturation even with supplemental oxygen. Plain radiographs were initially interpreted as normal; in retrospect the lateral radiograph of the thoracic spine showed a kyphosis between T5 and T7 (Fig. 1). MRI revealed complete vertebral collapse of T6 and localised kyphosis at this

level. There was an extensive epidural abscess and extrusion of granulation tissue posteriorly causing predominant anterior compression of the spinal cord. There was marked marrow oedema of the adjacent vertebrae (Fig. 2).

Despite her condition (ASA grade 4), surgery was deemed necessary but was delayed for 12 h for further resuscitation and chest physiotherapy.

A left thoracotomy was performed and the MRI findings were confirmed. There was marked paravertebral thickening of the somatic pleura. Frank pus was obtained from within the canal. Decompression of the cord was achieved by means of a T6 vertebrectomy. A rib strut graft was used to maintain correction of the kyphosis. Confirmatory cultures of *Staphylococcus aureus* were obtained from the intraoperative specimens.

Post-operatively she was transferred to the paediatric intensive care unit. High-dose intravenous flucloxacillin, fucidin and gentamicin antibiotic therapy was commenced. The pyrexia rapidly settled and she was successfully weaned from assisted ventilation at 48 h. Spontaneous movements of the legs returned 5 days after the spinal surgery. Oral antibiotic treatment was maintained for 6 weeks. A moulded polypropylene thoracolumbar support orthosis was worn for 3 months. Six months later she was able to stand with assistance, but had some spasticity of the lower limbs. Plain radiographs at that time showed preservation of the normal sagittal alignment (Fig. 3).

Discussion

MCAD enzyme deficiency is a rare disease with autosomal recessive inheritance. There is a defect in the trans-

Fig. 1 Lateral radiograph of the thoracic spine. Collapse of T6 and local kyphus is demonstrated

Fig. 2 A T1-weighted (gadolinium-enhanced) sagittal MRI scan demonstrating extensive epidural abscess arising from T5/6. Anterior cord compression from granulation tissue can be seen (*asterisk*).

B T2-weighted scan. The collapsed T6 vertebra is well demonstrated (*arrow*). **C** Axial section demonstrating the cord (*arrow*) compressed by the granulation tissue and abscess (*asterisk*)

Fig. 3 Six-month postoperative lateral thoracic spine radiograph showing rib strut graft in situ

mitochondrial fat oxidative pathway. Infants have normal early development, but are unable to cope with the metabolic stress of minor illness or fasting. Clinical features include hypoglycaemia, convulsions and encephalopathy. The diagnosis is confirmed by finding organic aciduria which disappears after administration of intravenous glucose. Treatment is with intravenous glucose and L-carnitine [7].

Spinal epidural abscess is an uncommon entity; it comprises only 10–12% of all spinal infection. It is rare in the paediatric population; only 12 cases have been reported in infants [8]. In 45% of cases the infection is spread by the haematogenous route; vascular channels cross the end-

plate of the paediatric vertebrae and the infection usually begins as a spondylodiscitis. The most common infecting organism is *Staphylococcus aureus* [3].

The diagnosis is often delayed because the triad of back pain, radicular pain and weakness/paralysis described by Heusner [4] is not easily detected in infants. Instead these children may be investigated for fever, poor feeding and weight loss, meningism or inability to weight bear. All infantile cases in the literature presented with severe neurological deficit; only half had a full recovery.

The introduction of MR imaging has been a great advance. Confirmation of the diagnosis together with the location and extent of the abscess can be made with only

minor sedation of the child. It is non-invasive and as accurate as CT-myelography [9]. In the first days of a pyogenic discitis, T2-weighted sequences will demonstrate increased signal intensity in the disc and adjacent end-plates [2].

Crawford et al. [1] reviewed 36 children with discitis at an average interval of 29 months. Some had been treated on traction alone or had only had oral antibiotic therapy. The functional outcomes were good and they suggested that the 'natural course of the disease is benign'. The development of an epidural abscess suggests that immune defence mechanisms may be overwhelmed (or as in our patient, become secondarily incompetent) and the clinical course in infants assumes a poor prognosis. Epidural abscesses have been treated successfully with intravenous antibiotics alone. However, these were in older adults with minor neurologic deficit [5, 6]. In infants surgery is the preferred option; in one review, six of seven children who did not have an operation (because of missed diagnoses or they were considered too ill for general anaesthesia) died [8].

Previous surgical approaches to epidural abscesses have involved laminectomies. This may be appropriate where the majority of the abscess is located posteriorly. This situation is rare in children as the abscess is usually preceded by a discitis. Extensive laminectomies in children (especially below the age of 12 years) carries a 50% risk of progressive kyphotic deformity [11, 12].

In tuberculous abscesses and kyphosis a costotransversectomy approach allows decompression of the spinal

cord. However, restoration of the anterior column and sagittal profile is difficult using this method. Although our patient was very ill when the paralysis was noted, we chose the anterior approach. This allowed decompression of the spinal cord and eradication of the focus of infection as well as restoration of the sagittal alignment of the spine. Short anterior spinal fusions in children do not result in progressive kyphosis in later years, even when performed at an early age. Posterior spinal overgrowth (with resultant kyphosis) does not occur; prophylactic fusion of the posterior elements is not required [10].

Conclusion

This case illustrates the paucity of signs associated with an epidural abscess in infancy. A high index of suspicion is required if the morbidity and mortality associated with this condition at an early age is to be reduced. Children presenting with fever, irritability and reluctance to weight bear warrant imaging of the spine if appendicular sepsis can be excluded. MRI is the modality of choice due to its sensitivity and safety.

The anterior approach offers the advantages of cord decompression, eradication of the infective focus and correction of spinal deformity. Laminectomies should be rarely performed.

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References

1. Crawford AH, Kucharzyk DW, Ruida R, Smitherman P (1991) Diskitis in children. *Clin Orthop* 266:70–79
2. Gabriel KR, Crawford AH (1988) Magnetic resonance imaging in a child who had clinical signs of discitis. *J Bone Joint Surg [Am]* 70:938–941
3. Glazer PA, Hu SS (1996) Paediatric spinal infections. *Orthop Clin North Am* 27:111–123
4. Heusner AP (1948) Non-tuberculous spinal epidural infections. *N Engl J Med* 239:845–854
5. Leys D, Lesom F, Viand C, et al (1985) Decreased morbidity from acute bacterial spinal epidural abscess using computed tomography and non surgical treatment in selected patients. *Ann Neurol* 17:350–355
6. Mampalam TJH, Rosegay H, Andrews BT, et al (1989) Nonoperative treatment of spinal epidural infections. *J Neurosurg* 71:208–210
7. Roe CR, Millington DS, Maltby DA, Kinnebrew H (1986) Recognition of Mid-Chain Acyl-CoA Dehydrogenase deficiency in asymptomatic siblings of children dying of Sudden Infant Death or Reye-like syndrome. *J Paediatr* 108:13–18
8. Rubin G, Michowiz S, Ashkenasi A, Tadmor R, Rappaport ZH (1993) Spinal epidural abscess in the paediatric age group: case report and review of the literature. *J Paediatr Infect Dis* 12:1007–1011
9. Szalay EA, Green NE, Helier RM, Horer GH, Kuchner GH (1987) Magnetic resonance imaging in the diagnosis of childhood discitis. *J Paediatr Orthop* 7:1641–1647
10. Upadhyay SS, Saji MJ, Sell P, Yau AC (1994) The effect of age on the change in deformity after radical resection and anterior arthrodesis for tuberculosis of the spine. *J Bone Joint Surg [Am]* 76:701–708
11. Yasuoka S, Peterson HA, Laws ER, et al (1981) Pathogenesis and prophylaxis of post-laminectomy deformity of the spine after multiple level laminectomy: difference between children and adults. *Neurosurgery* 9:145–152
12. Yasuoka S, Peterson HA, MacCarty CS (1982) Incidence of spinal column deformity after multilevel laminectomy in children and adults. *J Neurosurg* 57:441–445