

## Importance of early diagnosis of acute spinal extradural abscess

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Seventeen patients with acute spinal extradural abscess were treated in the Glasgow neurosurgical unit between 1973 and 1988. All presented with malaise and severe, often excruciating, spinal pain exacerbated by movement. The commonest early physical findings were fever and local tenderness. The peripheral white count was raised in 14 patients and the erythrocyte sedimentation rate (ESR) was raised in all except one patient. Plain radiographs showed soft tissue swelling or vertebral body collapse in five patients, but were normal in the other 12. Of eight patients with normal limb power or moderate weakness (MRC grade 3-5) at the time of diagnosis, six made a complete recovery, one is able to stand but not walk, and one died from a haematemesis. Of the nine patients with a flaccid paraplegia or quadriplegia before diagnosis, three died and none made a full recovery. Thirteen patients had urinary retention, only four of whom regained voluntary bladder control.

Delayed diagnosis or treatment of this uncommon but important condition is often followed by permanent neurological deficit or even death. Earlier diagnosis based on a careful history, clinical signs, ESR, and plain radiographs, could prevent much of the morbidity of this condition.

### Introduction

Acute spinal extradural abscess (epidural abscess) is an important diagnosis to consider in any patient with severe spinal pain. Although it is uncommon<sup>1</sup> it is readily treatable. If left untreated or treated late, a patient may remain paraplegic or quadriplegic. Despite this, the diagnosis was delayed until paraplegia had developed in more than half of the patients in previous reports<sup>2-6</sup>, and this proportion has not changed over the past 40 years. Patients present to family practitioners and to a wide variety of hospital specialists. It is therefore important to be able to differentiate the patient with an extradural abscess from the many patients who have back pain from less serious causes.

The pain of acute spinal extradural abscess is characteristic. It is excruciatingly severe, exacerbated by movement, and associated with local muscle spasm. The level of the pain corresponds with the level of the abscess. There are often signs of toxicity, or an apparent infective source. This helps to differentiate it from an acute disc prolapse<sup>7</sup>. The abscess most commonly forms in the thoracic spine, in the extradural fat, connective tissue and blood vessels, originating either from the adjacent vertebral body, or by haematogenous spread from elsewhere. Granulation tissue forms with beads of liquid pus, causing pressure on the spinal cord. It also produces a spreading thrombophlebitis which may give rise to

cord infarction, explaining the deterioration within hours from mild paraparesis to paraplegia that may occur. As a result spinal shock develops, with a flaccid paraplegia and loss of deep tendon reflexes. In order to prevent this irreversible step, the diagnosis must be made early, and must rely on simple clinical guidelines.

We have reviewed patients with this condition to ascertain the important clinical, laboratory and radiological features which help to distinguish acute spinal extradural abscess from 'benign' causes of back pain, in the hope that this may enable earlier referral and treatment.

### Patients and methods

We reviewed the case records of all patients who had an operation for spinal extradural abscess between 1973 and 1988 in the Institute of Neurological Sciences, Glasgow, which provides the only neurosurgical service for the population of 2.7 million in the west of Scotland. We excluded patients with postoperative extradural sepsis, and also those with chronic extradural abscess, defined as cases with a history of longer than three weeks, who usually present with features of spinal cord compression or symptoms from vertebral osteomyelitis.

Clinical, radiological and laboratory findings were recorded at presentation to the referring hospital and at the neurological unit. Outcome was recorded at discharge from hospital or at the last follow-up appointment.

### Presentation

Seventeen patients were treated for acute spinal extradural abscess in the 15 year period. They presented to a wide variety of clinicians: family practitioners, staff in accident & emergency departments, general physicians, rheumatologists, diabetologists, infectious disease physicians, urologists, orthopaedic surgeons and neurologists. Age at diagnosis ranged from 16 to 70 years (median 37 years).

### Possible predisposing factors

A source of infection was clearly identified in six patients: septicaemia (after insertion of a central venous line), pyoderma, pyelonephritis, septic arthritis, an infected ingrowing toe nail, and a decubitus ulcer. Six patients had a history of back injury within the past six months, one of whom was an intravenous drug abuser. Two patients had diabetes mellitus, two had chronic renal failure, and one suffered from systemic lupus erythematosus. Four patients had more than one predisposing factor, and four had none.

Table 1. Initial or referral diagnosis

Acute spinal extradural abscess	3
Meningitis	5
Hysteria	3
Disc prolapse	2
Mechanical back pain	2
Transverse myelitis	2
Guillain-Barré syndrome	1
Retropharyngeal abscess	1
Retroperitoneal abscess	1
Cervical spondylosis	1
Pleurisy	1
Chronic obstructive airways disease	1
Undiagnosed chest pain	1
Perinephric abscess	1
Herpes zoster	1

*Differential diagnosis*

In only three patients was the diagnosis of acute spinal extradural abscess considered in the referring hospital. Other diagnoses are shown in Table 1. More than one diagnosis was entertained at different stages of the illness in some patients.

*Clinical features*

All patients had severe unremitting back or neck pain for at least two days and at most 21 days (median 10 days). The pain was in the cervical region in five patients, thoracic region in eight, and lumbar region in five (one patient had pain in both the cervical and lumbar regions). Nine patients also had radicular pain. Thirteen had fever at initial presentation, and 15 were systemically unwell. Three became confused as a result of electrolyte disturbances or septicaemia. Local spinal tenderness was recorded in eight patients, and nuchal rigidity in five, reflecting local muscle spasm.

Fifteen of the 17 patients had abnormal neurological signs in the limbs on admission to the neurosurgical unit. Nine of these patients were paraplegic (MRC grade 0-1 power), and six were paraparetic (MRC

grade 2-4 power). Only two patients had normal power. Tone and deep tendon reflexes were reduced in all except these two. All patients who developed paraplegia did so within 36 hours of the onset of weakness, and in most it was within 12 hours. Fourteen patients had a partial or complete loss of pinprick sensation to a specific level. Proprioception was diminished or absent in ten. Thirteen patients had urinary retention, and one had urinary hesitancy. These findings are summarized in Table 2.

*Laboratory data*

The peripheral white cell count was normal in only three patients, and the ESR normal in only one. All eleven patients who had a record of the examination of the cerebrospinal fluid (CSF) showed findings consistent with a parameningeal infection or cord infarction. The CSF white cell count was between 4 and 840 cells per cubic millimetre, over 80% of which were polymorphonuclear leucocytes. The CSF protein was raised in four patients. No organisms were cultured from the CSF in any patient, but blood cultures were positive in four.

*Radiology*

All patients had plain radiographs of the spine. Three had evidence of soft tissue swelling, associated with the level of the extradural abscess. Three of the patients with a history of recent trauma had vertebral body collapse. In the neurosurgical unit, all patients had a myelogram, via lumbar injection. A complete extradural obstruction to CSF flow was demonstrated in 10 patients, and a partial obstruction in the remaining seven. The level of obstruction was related to the level of pain; cervical in five, thoracic in eight and lumbar in five (one patient had a partial obstruction in both the lumbar and the cervical spine; patient 1, Table 2).

*Surgical findings*

All patients underwent laminectomy as an emergency. None had an anterior approach to the spinal canal,

Table 2. Clinical presentation and outcome of acute spinal epidural abscess

Patient number	Site	Age (years)	Power:	Sensation:	Proprioception present/absent	Urinary continence●	Outcome
			MRC grade (0-5)	Pinprick level			
1	C+L	17	0	C5	-	-	paraplegic
2	C	16	5	normal	+	+	dead
3	C	57	1	C6	-	-	walking, continent
4	C	45	0	C8	-	-	dead
5	C	58	4	T1	+	-	full recovery
6	T	59	4	T3	+	-	standing, incontinent
7	T	19	1	T4	-	-	walking, incontinent
8	T	37	0	T4	-	-	paraplegic
9	T	70	1	T6	-	-	dead
10	T	16	0	T7	-	-	walking, incontinent
11	T	68	0	T8	-	-	dead
12	T	50	1	T11	-	-	walking, incontinent
13	T	19	4	normal	+	-	full recovery
14	L	27	3	T10	-	+	full recovery
15	L	18	5	normal	+	+	full recovery
16	L	25	4	L5	+	+	full recovery
17	L	56	4	S2	+	-	full recovery

●+continent at the time of diagnosis; -incontinent, needing catheterization at the time of diagnosis  
C, cervical; T, thoracic; L, lumbar

although vertebral body collapse was present in three. At operation, inflammatory tissue was found in the extradural space in all patients, and pus in 15 cases. In the two patients where no pus was found the acute inflammatory material was mistaken for extradural tumour; but peroperative Gram staining revealed gram positive cocci in both.

The number of vertebral levels explored was between two and 10 (median four), and the extradural space was irrigated in all cases. In no patient was the dura opened. A wound drain was used in all except three patients. Two of these developed infective complications; one had a recurrence of the extradural abscess one month later (patient 12, Table 2). A second patient developed a discharging wound sinus. No such complications were recorded in those patients in whom the wound was drained. Local antibiotics were not used in any patient.

#### *Bacteriological findings*

Staphylococci (*Staph. aureus* in 14 cases, *Staph. albus* in one) were grown from the abscess in 15 patients. All were sensitive to both flucloxacillin and fusidic acid, with which they were treated. *Escherichia coli* was cultured from the extradural pus in one patient with a coliform pyelonephritis. *Streptococcus milleri* was cultured from the abscess of the other patient. The organism cultured from blood was the same as that from the abscess in each of the four cases with positive blood cultures.

#### *Outcome*

Outcome was measured between one and 36 months after operation in all survivors. Table 2 summarizes the findings. Only six patients made a full recovery. Five improved but were still disabled, and two remained paraplegic. Four patients died; from pulmonary embolus, haematemesis after developing acute renal failure, chronic renal failure, and pneumonia. Recovery of pinprick sensation preceded recovery of power or proprioception. Of the nine patients who were paraplegic on admission, three died, two remained paraplegic, and four were able to walk only with sticks. In contrast, of the eight patients with normal or moderately reduced limb power, six made a full recovery, one could stand but not walk, and one died (Table 2). The difference in outcome between these two groups is statistically significant ( $P < 0.01$ ).

Of the 13 patients who were catheterized for urinary retention, only four regained bladder control, and the remaining nine needed long-term catheterization or a urinary condom. The site of the abscess had a bearing on outcome; four of the six patients who made a full recovery had an abscess in the lumbar spinal canal.

One patient developed a recurrent abscess, at the same level, one month after laminectomy. It was associated with vertebral osteomyelitis and slight collapse of the vertebral body. The abscess was drained by reopening the previous laminectomy, after which the patient recovered to be able to walk, but he remained incontinent of urine (patient 12, Table 2).

#### **Discussion**

In 1948 Heusner wrote 'in far too many cases [of acute spinal extradural abscess] the patient reaches the surgeon only after paralysis is complete and all hope of restoration of function has vanished'<sup>4</sup>. Eleven of the 20 patients in his series were paraplegic

at the time of operation. Forty years later, this proportion has not changed; nine of the 17 patients in this series were paraplegic at the time of admission to the neurosurgical unit. How can we improve on this?

The most significant factor causing delay in diagnosis was the late recognition of the condition; it was not considered until neurological signs had developed. Because of the rapid progression from paraparesis to paraplegia this often meant that treatment was instituted too late.

Where radicular pain was associated with fever, more common disorders such as pleurisy, perinephric abscess, and retroperitoneal abscess were considered, and valuable time was spent investigating them. Where meningism was a feature, delay resulted whilst misguided, repeated attempts were made to isolate an organism.

Differential diagnosis can be wide, and this is reflected in the variety of specialists who are faced with making a diagnosis in these patients. Waddell has shown that simple features in the history help distinguish patients with 'spinal pathology' from those with 'mechanical back pain', which afflicts over half the population at some time in their lives<sup>8</sup>. These can be useful in distinguishing the patient with possible acute spinal extradural abscess from the patient requiring less urgent investigation and treatment. Age, the site and character of the pain, systemic malaise and fever, local muscle spasm and bony tenderness are all important. Age of less than 20 and greater than 55 years is associated with a higher proportion of patients with spinal pathology, whereas between 20 and 55 mechanical back pain is much more common. Only five of the 17 patients were in the 20-55-year-old age group. Thoracic pain also is associated with a higher proportion of patients with spinal pathology; the thoracic spinal canal is the most common site for acute spinal extradural abscess. The pain is characteristic in being excruciating, unremitting and exacerbated by movement. This severity of pain led to misdiagnosis of herpes zoster or hysteria in four patients.

Neurological examination revealed a sensory level to pinprick in 14 patients, proprioceptive loss in 10 and paraplegia in nine, suggesting that the initial effects on cord function involve the spinothalamic tracts, followed by dorsal columns, and finally anterior columns. Sensory examination in the early stages of the disease is therefore very important.

The most useful laboratory investigations were the peripheral white cell count and the ESR, which were normal in only three patients and one patient respectively. The level of the peripheral white cell count or of the ESR did not correspond with the clinical progression of the illness. Plain radiographs contributed to the diagnosis in five patients, and myelography via lumbar injection showed extradural cord compression in all 17. Some radiologists prefer the cisternal route, particularly if the abscess is likely to be in the lumbar spinal canal, where there would be a risk of introducing infection into the subarachnoid space. An alternative to myelography is magnetic resonance imaging, if available<sup>9</sup>.

Laminectomy was performed in all patients, including three with vertebral body collapse. An alternative in these three patients would have been an anterior approach to the vertebral body to avoid the risk of spinal instability. Only one of the three

survived more than five months after operation, and he did not develop spinal instability. Of the other 14, one developed vertebral body collapse a month later. This was the patient with recurrence of extradural abscess, who developed vertebral osteomyelitis (patient 12, Table 2). Bed rest and antibiotic treatment, after drainage of the abscess, led to bony fusion.

In all 17 patients granulation tissue was found in the extradural space. In the two others, where pus was not seen, the diagnosis relied on peroperative demonstration of gram positive cocci in the granulation tissue. This underlines the value of such a service, which enables surgical drainage to be performed and antibiotic treatment to be started immediately. Of the three patients treated without a drain, two developed local complications, suggesting that wound drainage is worthwhile. All staphylococcal infections were sensitive to flucloxacillin and fusidic acid, which must remain the antibiotics of choice until an organism is demonstrated.

A quarter of the patients died, and of the remainder, half were persistently disabled, and half made a full recovery. Mortality is highest in the elderly, those who are already debilitated, and those who become paraplegic, a third of whom died and all of whom remained severely disabled. Bladder function returned in less than a third of those patients who were catheterized, but in half of those treated within 24 hours of insertion of the catheter.

In conclusion, delayed diagnosis of acute spinal extradural abscess is usually due to late recognition of the disease, probably because it is uncommon. Clinical suspicion should be aroused by severe spinal pain particularly in the thoracic region, with associated tenderness or muscle spasm, especially in a patient aged less than 20 or greater than 55, or one

who is systemically unwell or pyrexial. The peripheral white cell count and ESR are useful. Plain radiographs may show vertebral collapse or soft tissue swelling. The diagnosis is confirmed by myelography or magnetic resonance imaging. Treatment consists of urgent decompression of the cord and drainage of the abscess, from which a bacteriological diagnosis can be made. The appropriate antibiotics, which are usually a combination of flucloxacillin and fusidic acid, should be given intravenously. The earlier treatment is instituted, the better the outcome.

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