J. P. Grieve
N. Ashwood
K. S. O'Neill
A. J. Moore

A retrospective study of surgical and conservative treatment for spinal extradural abscess

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J. P. Grieve (✉) · N. Ashwood
K. S. O'Neill · A. J. Moore
Department of Neurosurgery,
Atkinson Morley's Hospital, Copse Hill
Wimbledon SW20 0NE, UK
Tel.: +44-181-946 7711,
Fax: +44-181-947 8389

Abstract The management of spinal extradural abscess (SEA), particularly the choice between surgical and conservative treatment, is controversial. We therefore undertook a retrospective study of patients admitted with this diagnosis: Details of presentation, treatment and outcome were obtained by review of inpatient notes and radiology. Twenty-five individuals with SEA aged 10–79 years were admitted between 1989 and 1995. Nine were treated non-operatively with antibiotics, of which three also underwent diagnostic CT-guided biopsy, and 16 underwent surgical drainage. There was no significant difference in the neurological features at presentation between the two groups. Two patients (8%) died; 11 (44%) patients re-

mained the same and 12 (48%) improved following treatment. Four patients treated conservatively (44%) and seven treated surgically (43%) were capable of return to work or school, whilst a further seven patients (three treated conservatively and four treated surgically) were able to lead independent lives. No significant difference in outcome was demonstrated between patients treated non-operatively and those treated surgically. We conclude that certain carefully selected patients can be treated conservatively, but that surgery should remain the mainstay of management.

Key words Spinal extradural abscess · Treatment

Introduction

Spinal extradural abscess (SEA) is rare, accounting for only 0.2–2.0/10,000 hospital admissions [3], but the associated mortality and morbidity remain high. It occurs largely in the fifth to seventh decades and appears to be increasing in incidence [5]. Factors contributing to this may include the elderly population, a rise in the number of patients who are immunocompromised or intravenous drug abusers and increasing number of spinal procedures.

There is little evidence on which to base management of these patients and, as a result, there is considerable controversy as to how they are best treated. We set out to compare our experience of conservative versus surgical treatment of patients with spinal extradural abscess.

Materials and methods

A retrospective study of all patients admitted over a period of 5 years with a diagnosis of SEA was undertaken. Patient demographics, together with clinical details of presentation, investigation, treatment and outcome were obtained from review of inpatient notes and radiology. Extradural abscesses that occurred soon after surgery or other local procedures were excluded from our study. The outcome measure used was postoperative Frankel grade at last follow-up or death [2].

Results

Subjects

Twenty-five subjects aged between 10 and 79 years (median 64 years) were admitted to our unit between 1989

and 1995 with an SEA confirmed by MRI, CT myelography or at surgery. There were 14 men and 11 women (ratio 1.3:1). Possible aetiological factors were identified in ten patients: six were diabetic, two had concurrent urinary tract infections and two were known to be immunocompromised. The median follow-up was 28 months (range 9–83 months).

Clinical presentation

All but one patient presented with localised back pain. Twenty-one patients (84%) had myelopathic or cauda equina lower limb motor signs, with 13 (52%) complaining of sphincteric involvement, which ranged in duration from 1 to 5 days at the time of admission to the neurosurgical centre. Three patients (12%) had radicular signs, while one individual (4%) had a normal neurological examination. Time of onset of symptoms ranged from 1 day to 3 months (median 12 days) prior to admission, with 12 patients suffering a rapid neurological deterioration immediately prior to admission (median 2 days, range 1–7 days); one patient deteriorated significantly within hours of arrival at the neurosurgical centre. Frankel grades

at presentation were E in one (4%), D in ten (40%), C in ten (40%), B in one (4%) and A in three (12%).

Medial management

Of the 25 patients, six were treated conservatively with antibiotics alone, three underwent CT-guided biopsy, which allowed early rationalised antibiotic treatment, whilst the remaining 16 were treated both surgically (by formal surgical drainage) and with prolonged courses of antibiotics. Of the 16 patients operated upon, four required further surgery for persisting collections and/or worsening neurological deficit. The decision regarding management to be undertaken was based on the neurological status of the patient, duration and rapidity of progression of symptoms and signs, age of the patient and associated medical factors. The patients treated conservatively had a slightly better presenting Frankel grade than those treated surgically (median Frankel grades D and C respectively), but there was no significant difference in the proportion of individuals ambulatory at presentation (six of the 16 treated surgically and five of the nine treated conservatively; Fisher's Exact test, $P = 0.43$). There was no significant

Table 1 Details of all patients presenting with spinal epidural abscess

Patient no.	Age	Sex	Location of abscess	Presenting Frankel grade	Main deficit	Duration of neurology	Management	Bacteriology	Frankel grade at last follow-up
1	76	Male	C5–6	C	Myelopathy	28 days	Surgery	Gp G haemolytic strep.	C
2	75	Female	T7–8	C	Myelopathy	1 day	Surgery	<i>Staph. aureus</i>	D
3	72	Female	T4–5	C	Myelopathy	7 days	Surgery	<i>Staph. aureus</i>	D
4	69	Female	C1–7	D	Myelopathy	3 days	Surgery	<i>Staph. aureus</i>	D
5	68	Male	T1–2	D	Myelopathy	7 days	Surgery	Negative	D
6	65	Female	C7–T10	A	Myelopathy	12 days	Surgery	<i>Staph. aureus</i>	A
7	65	Male	T4–6	C	Myelopathy	14 days	Surgery	<i>Staph. aureus</i>	D ^a
8	64	Female	C5–7	C	Myelopathy	28 days	Surgery	<i>Staph. aureus</i>	D
9	60	Male	C4–5	C	Myelopathy	7 days	Surgery	<i>Staph. aureus</i>	D
10	60	Female	L1–2	B	Cauda equina	12 weeks	Surgery	<i>Staph. aureus</i>	D
11	59	Male	C2–3	C	Myelopathy	7 days	Surgery	<i>Staph. aureus</i>	C ^a
12	57	Male	C4–6	D	Radiculopathy	16 days	Surgery	<i>Strep. mitis</i>	E
13	53	Male	T7–8	D	Myelopathy	6 weeks	Surgery	<i>Strep. viridans</i>	E
14	51	Male	T11	D	Myelopathy	28 days	Surgery	<i>Staph. aureus</i>	D
15	48	Male	T5–7	A	Myelopathy	5 days	Surgery	<i>Staph. aureus</i>	C
16	31	Male	L2	D	Radiculopathy	12 weeks	Surgery	Gram + ve cocci	D
17	79	Female	T6	C	Myelopathy	8 weeks	CT guided biopsy	Negative	C
18	72	Female	T8–11	A	Myelopathy	14 days	CT guided biopsy	<i>E. Coli</i>	A
19	65	Male	T6	D	Myelopathy	8 weeks	CT guided biopsy	Negative	E
20	66	Female	T12–L3	E	Pain	1 day	Conservative	<i>Staph. aureus</i>	E
21	64	Female	C4–5	D	Myelopathy	14 days	Conservative	<i>Staph. aureus</i>	D
22	63	Male	L1–3	C	Cauda equina	7 days	Conservative	Negative	D
23	62	Male	C4–6	D	Radiculopathy	6 weeks	Conservative	<i>Staph. aureus</i>	D
24	47	Female	T12	D	Myelopathy	6 weeks	Conservative	Gram + ve cocci	E
25	10	Male	L1–S1	C	Cauda equina	7 days	Conservative	<i>Strep. faecalis</i>	E

^aPatient died within 1 month of surgery

Fig. 1 T2-weighted MR images of a C4–5 extradural abscess seen on **A** unenhanced sagittal, **B** enhanced sagittal and **C** enhanced axial sections

difference in either the total duration of symptoms suffered at presentation (median 10 and 14 days in those treated surgically and conservatively respectively; Wilcoxon Rank Sum test, $P = 0.51$) or the proportion of patients suffering an acute neurological deterioration immediately prior to admission (nine treated surgically and three treated conservatively; Fisher's Exact test, $P = 0.41$).

Microbiological factors

The infecting organism was isolated in 21 cases (84%). Organisms were isolated from pus in 14 (found at surgery in 12 and aspirated under CT guidance in two), from blood cultures taken at the time of admission in six (three of whom were managed surgically and three conservatively) and in one individual (treated conservatively) from urine. Organisms most commonly identified was *Staphylococcus* and *Streptococcus* species.

In one patient treated surgically and in three treated non-operatively no organism was identified. The patient treated surgically was diagnosed on the basis of his severe back pain, raised white blood cell count and erythrocyte sedimentation rate and his MRI appearance. Of the three patients treated conservatively, one patient underwent CT-guided biopsy, histology of which revealed pus and inflammatory cells, and the other two patients had raised inflammatory markers with evidence of discitis and extradural extension on MRI.

Radiological features

The extradural spinal abscesses were confirmed on MRI and/or CT scan with or without myelography. Their location is shown in Table 1.

Outcome

Two patients (8%) died within 4 weeks of presentation; both of these had been treated surgically. One was a 59-year-old man who presented with a 1-week history of tetraparesis with sphincteric loss, Frankel grade C. MRI scan revealed a C2/3 epidural abscess lying anteriorly. He underwent a C2/3 anterior cervical decompression on the day of admission together with high-dose broad-spectrum intravenous antibiotics. Four weeks after surgery he became progressively hyponatraemic and hypotensive, had a cardiopulmonary arrest and died. The second patient was a 65-year-old man who presented with a 2-week history of back pain, progressive paraparesis and mild sphincteric disturbance, Frankel grade C. CT myelography revealed a block at T4/5. He had a cardiopulmonary arrest 2 weeks following surgery, and at post-mortem was found to have suffered a pulmonary embolus. At the time of death the neurological examination of both these individuals had improved, but one remained non-ambulatory.

A further three patients, all of whom had been treated conservatively, died within 1 year, resulting in an overall 1-year mortality rate of 20%: 12.5% in those treated surgically and 33.3% in those treated conservatively. One died after 5 weeks from myocardial infarction, the second of chronic obstructive airway disease at 10 months and the third of complications of paraplegia at 4 months. The outcome data from the last follow-up have been used in this group. All but one of the deaths occurred in patients who were non-ambulatory or paraplegic on admission.

Of the remaining 23 patients, 11 remained the same and 12 improved following treatment, using Frankel grade as the outcome measure. Following treatment, four patients (44%) treated conservatively and seven patients

Table 2 Pre- and postoperative Frankel grades in patients treated conservatively and surgically

Preoperative Frankel grade		Postoperative Frankel grade					Died within 1 month of surgery
		E	D	C	B	A	
E	Conservative	1					
	Surgical						
D	Conservative	2	2 ^a				
	Surgical	2	4				
C	Conservative	1	1	1 ^a			
	Surgical		4	1			2
B	Conservative						
	Surgical		1				
A	Conservative					1 ^a	
	Surgical			1		1	

^aOne patient died within 1 year of presentation

(43%) treated surgically were capable of returning to work, whilst a further seven patients – three (33.3%) treated conservatively and four (25%) treated surgically – were able to lead independent lives. There was no significant difference in the number of patients who improved between the surgery and the conservative management groups (Fisher's Exact test, $P = 0.68$) or in the number of patients having a good outcome, defined as Frankel grades D and E (Fisher's exact test, $P = 1.0$).

Discussion

Classically, patients with SEA present with back pain and an associated pyrexia, although this is not universal, particularly in the immunocompromised. *Staphylococcus aureus* is the commonest infecting organism, as seen in our series; however, in up to 50% of cases, no organism is identified [6, 8]. Nussbaum et al. [5] found that organisms isolated from positive blood cultures are always the same as those in the extradural space, and concluded that positive blood cultures could be used as strong suggestive evidence of the causative infective organism.

Most authors suggest treatment with 4–6 weeks of intravenous antibiotics followed by a course of oral antibiotics [4]. The drugs chosen need to be active against *Staphylococcus* species, although commonly, with an increasingly divergent spectrum of causative organisms [1], they also need activity against Gram negative bacteria. They require the ability to diffuse into bone in cases of discitis and osteomyelitis and need to be of low toxicity for prolonged administration.

Most infections spread haematogenously [3]. The commonest site for extradural abscesses is the thoracic spine, where the extradural space is at its widest and the venous plexus its most extensive [8], as seen in this series. The next most common site is the lumbosacral spine followed

by the cervical region. The abscesses most commonly lie dorsolaterally to the spinal cord, as the ventral dura is tightly adherent to the posterior longitudinal ligament. Ventrally situated abscesses are often associated with vertebral body osteomyelitis.

Opinion is divided as to the most appropriate method of treatment of spinal extradural abscesses. Many authors recommend surgical drainage in all cases, but there are increasing reports of successful conservative treatment. We have shown no significant difference in outcome between patients treated conservatively or surgically, but the small numbers involved in this study made accurate comparison difficult. It may be argued that CT-guided biopsy allows decompression of the SEA, and therefore these patients cannot be regarded as having been treated conservatively. In our experience, however, CT-guided biopsy was taken from the inflammatory mass demonstrated on imaging that was accessible posteriorly, and in no case did it allow aspiration of free pus. It is unlikely that this was of any decompressive benefit, but it did allow earlier treatment with appropriate antibiotics in several individuals; these patients were therefore included in the conservatively treated group.

We have confirmed that SEA can be treated conservatively with antibiotics with or without CT-guided biopsy and agree with the recommendations made by Leys et al. [4], who reviewed 13 cases that they had treated in this way. Their conclusions were that, unless the diagnosis is uncertain or the patient develops overwhelming sepsis, certain groups of patients could be treated conservatively:

1. Patients who are poor surgical candidates because of significant concomitant medical problems
2. Patients whose epidural abscess involves a considerable length of the vertebral canal
3. Patients without significant neurological deficit
4. Patients who have had complete paralysis for more than 3 days, because those who present with severe neurological deficit are unlikely to recover function however they are treated and are at high risk of post-operative complications

We suggest that patients presenting at the extremes of neurological deficit (normal examination or complete paraplegia/quadraplegia) should initially be treated conservatively, whilst those presenting in the middle of the range should be treated surgically unless other risk factors are present.

There are clearly exceptions to these statements; in particular, those who initially present with a normal examination or only minor neurological deficit but then deteriorate rapidly should be operated on as soon as possible. Any patient who is neurologically intact and is treated conservatively will need close neurological observation in a unit with facilities for emergency decompression [7]. There have been instances of sudden neurological deterioration despite prolonged courses of antibiotics [3].

Surgical treatment of SEA does have an early mortality (12.5% in our series) not seen in those treated conservatively. However, there is a significant risk of mortality in association with long-term immobility. Two individuals treated conservatively, who were non-ambulatory with Frankel grades C and A at presentation and final follow-up, died of long-term effects of immobility.

Conclusion

This study was subject to several limitations. It is a retrospective study of a small number of patients presenting with spinal extradural abscess. Although no difference

was shown in the demographics and presenting neurological status of patients treated surgically or conservatively, decisions were still made regarding what was considered to be the most appropriate form of treatment in each individual case. However, we have shown that conservative treatment can be safe and effective. A large prospective randomised study is required to compare the two treatments in suitable patients.

In the meantime we suggest that certain carefully chosen patients can be managed conservatively, but that surgery should remain the mainstay of treatment. Any patient treated conservatively requires carefully monitoring in a unit facilities for emergency decompression.

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