Original Article

Reversal of tetraplegia in patients with cervical osteomyelitis – epidural abscess using anterior debridement and fusion†

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Objective: Aggressive anterior debridement and fusion has been advocated for the treatment of cervical osteomyelitis/epidural abscess (COEA) for many years. In this study we review our experiences with severely neurologically impaired (tetraplegic) patients with COEA.

Methods: From 1989–1999 we identified 20 cases of COEA treated with anterior debridement and fusion. Patients were identified from a prospectively maintained database. All inpatient and outpatient records were reviewed. Six patients were identified as being tetraplegic prior to surgery. Tetraplegia was defined as complete absence or only flicker movement of the extremities.

Results: The age range was 41 to 74. There were five men and one woman. Anterior corpectomy and fusion with either iliac crest auto- or allograft was performed in all patients. In four of six patients an anterior cervical plate was utilized for internal fixation. Four of six patients were ambulatory at last follow-up.

Conclusion: Aggressive debridement and fusion in patients with COEA can result in successful outcomes even in patients who are tetraplegic prior to surgery.

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Introduction

The use of anterior debridement and fusion for non-tuberculous cervical osteomyelitis/epidural abscess (COEA) was first described in the medical literature by Barta *et al* in 1972.¹ Since that initial report other authors have described the use of anterior surgery for COEA.^{2–7} However, there are few reports regarding the neurologic outcome in the most neurologically impaired patients (tetraplegic).^{6,8–12} For this review we define tetraplegia as complete absence or only flicker movements below the level of the lesion.

Methods

From 1989 to 1999 we identified 20 cases of COEA. The patients were identified from a prospectively maintained database. All inpatient and outpatient records were reviewed. Moreover, all spinal radio-

graphs were reviewed (including computerized tomography, and magnetic resonance imaging). Patients were followed postoperatively at 1, 3, 6 months and 1 year. Plain X-rays of the cervical spine were obtained at each follow-up visit. Flexion/extension X-rays were obtained at 6 months post operatively. An independent radiologist reviewed all postoperative X-rays.

The diagnosis of COEA was made in all cases on the basis of MRI. All patients underwent emergent anterior debridement (partial corpectomy) and fusion using either iliac crest strut autograft or strut allograft. All patients were placed in a halo fixation device prior to surgery. In four patients an anterior cervical plate (Synthes Corporation Paoli, PA, USA) was placed spanning the strut graft. A Spetzler catheter (Codman Corporation Boston, MA, USA) was threaded in the epidural space above and below the area of decompression in order to drain any purulence above or below the site of the corpectomy. Moreover, saline was gently irrigated through the catheter to aid in evacuating any additional purulence. All patients underwent a MRI at 1 month after surgery in order to document resolution of the epidural abscess.

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Table 1 Summary of cases of osteomyelitis/epidural abscess

Age/Sex	Risk factors	Duration of tetraplegia	Procedure	Organism	Outcome (months)
1. 50/male	IVDA	3 h	C5 Corpectomy	Streptococcus Sanquis	Ambulatory w/walker Bladder intact (12)
2. 59/male	IVDA	8 h	C5, 6 Corpectomy ICAG	Staph aureus	Ambulatory w/walker Bladder intact (12)
3. 41/female	IVDA	<24 h	C5, 6 Corpectomy IALG, CP	Staph Aureus	Ambulatory without assistance Bladder intact (13)
4. 74/male	none	>24 h	C3, 4, 5 Corpectomy ICAG, CP	Staph Aureus	Functional tetraplegic Expired - pulmonary embolus (6)
5. 49/male	none	>24 h	C4 Corpectomy IALG, CP	Enterococcus	Functionally tetraplegic Expired - respiratory failure (9)
6. 43/male	none	<24 h	C5 Corpectomy IALG, CP	Staph Aureus	Ambulatory without assistance Bladder intact (15)

IVDA = intravenous drug abuse; ICAG = iliac crest autograft; IALG = iliac crest allograft; CP = cervical plate

Figure 1 Sagittal MRI showing ventral epidural abscess at the C5/6 level and associated signal changes of the vertebral bodies consistent with osteomyelitis

Figure 2 Lateral cervical spine X-ray 1 year after surgery showing fusion from C4 to C6 and an anterior cervical plate

Results

We identified six patients who were tetraplegic (absent motor movement below the level of the lesion) preoperatively. There were five men and one woman identified. The age range was 41–74 (mean age = 52). The most common risk factor for developing the infection was intravenous drug abuse (IVDA). Three patients had a history of IVDA and three patients developed the infection spontaneously (no clear risk factors). Four of six patients were tetraplegic for less than 24 h and two patients were tetraplegic for greater than 24 h prior to surgery. Follow-up represents the

patients' status at 1 year after surgery (four of six cases) or at the time of death (two cases).

Four of six patients were ambulatory at 6 months after surgery. Two of the four ambulatory patients had to utilize assistive devices (eg walker) in order to ambulate. Two patients improved neurologically but were functionally tetraplegic at the time of their death. Both patients who demonstrated no significant neurological improvement after surgery, had been tetraplegic for greater than 24 h prior to surgery (see Table 1 for summary of patients).

Case example

A 51-year-old male with a long history of IVDA presented to our institution with a 3 week history of lower extremity weakness and 3 days of upper extremity weakness. Initial neurologic examination revealed 4/5 strength in the upper extremities in the deltoid muscle group distribution. He exhibited complete absence of motor movement below the C5 level. In addition, a C6 sensory level to pinprick was noted. It was estimated that he was tetraplegic for approximately 3 h. An MRI of the cervical spine was performed demonstrating COEA at the C5–6 level (Figure 1).

The patient was taken for emergency surgery. He was placed in a halo fixation device intraoperatively. Through an anterior approach a C5 corpectomy was performed with drainage of the abscess. An iliac crest strut autograft was placed between the C4 and C6 vertebral bodies. An anterior cervical plate was placed across the C4 and C6 vertebral bodies (see Figure 2). The patient was maintained in a halo orthosis for 1 month postoperatively. *Streptococcus sanguis* was grown from cultures taken at the time of surgery. The patient was treated with intravenous antibiotics for 10 weeks. At last follow-up (1 year after surgery) the patient was ambulatory with a walker with functional neurologic recovery in the upper extremities (case 1, Table 1).

Discussion

Advantages of the anterior approach for the treatment of COEA include: (1) it allows one to directly address the area of spinal cord compression, which may be a critical factor in improving patients who are tetraplegic; (2) it provides a greater amount of tissue for culture (diagnosis) than posterior approaches; (3) it provides much greater ability to eradicate necrotic bone; (4) it diminishes the chances for latent kyphotic deformities as compared to patients who have been treated with laminectomy (posterior) drainage; (5) laminectomy (posterior) approaches have been associated with acute neurologic deterioration in the immediate postoperative period.^{13–15}

Previous authors have reported that COEA patients with severe preoperative neurologic deficits greater than 36 to 48 h did not improve after surgery.^{3,6,9,16–18} In our series tetraplegia greater than 24 h did not improve significantly after surgery. Based on our own and previous series, it is clear that time is a critical factor. If one is to obtain satisfactory outcomes in this condition. Even in cases of catastrophic neurologic impairment one can achieve significant improvement with prompt surgical intervention.

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