Cervical Spondylodiscitis: Presentation, Timing, and Surgical Management in 59 Patients

George M. Ghobrial[1,2], Daniel Franco[1], Thana Theofanis[1], Philip J. Margiotta[1], Edward Andrews[1], Jefferson R. Wilson[1], James S. Harrop[1], Joshua E. Heller[1]

BACKGROUND: Cervical spondylodiscitis is thought to carry a significant risk for rapid neurologic deterioration with a poor response to nonsurgical management.

METHODS: A retrospective surgical case series of the acute surgical management of cervical spondylodiscitis is reviewed to characterize the neurologic presentation and postoperative neurologic course in a relatively uncommon disease.

RESULTS: Fifty-nine patients were identified (mean age, 59 years [range, 18–83 years; SD ± 13.2 years]) from a single-institution neurosurgical database. The most common levels of radiographic cervical involvement were C4-C5, C5-C6, and C6-C7, in descending order. Overall, statistically significant clinical improvement was noted after surgery ($P < 0.05$). Spinal cord hyperintensity on T2-weighted magnetic resonance imaging was significantly associated with a worse preoperative neurologic grade ($P = 0.036$), but did not correlate with a relatively worse neurologic outcome by discharge. No significant difference was noted between potential preoperative predictors (organism cultured, presence of epidural abscess, tobacco use, early surgery within 24 hours of clinical presentation) and preoperative American Spinal Injury Association injury scale, with the exception of the duration between symptom onset and surgical intervention. A negative correlation between increased preoperative duration of symptoms and magnitude in motor improvement was observed. Relative to anteroposterior decompression and fusion, anterior treatment alone demonstrated a relatively greater effect in neurologic improvement.

CONCLUSIONS: Cervical spondylodiscitis is a rare disease that typically manifests with preoperative motor deficits. Surgery was associated with a significant improvement in motor score by hospital discharge. Significant predictors of neurologic improvement were not observed. Prolonged symptomatic duration was correlated with a significantly lower likelihood of motor score improvement.

INTRODUCTION

Spinal epidural abscesses (SEAs) are relatively rare, with a North American prevalence of 100,000 and an increasing incidence attributed to rising rates of diabetes, and both recreational and prescription intravenous drug abuse.[1-3] One recent study by Shousha et al.[4] observed an increasing incidence of cervical spondylodiscitis in tandem with an increasing age of presentation and rising rates of concurrent SEAs and septicemia.[4] Spontaneous cervical SEAs (CSEAs) are an even rarer subset, with reports from the literature confined to several small retrospective studies, which provide little insight into the natural history of treatment response.[1,5] CSEA is thought to be preceded by discitis, most commonly at one level (85%), and less often at two contiguous levels.[6]

Key words
- Abscess
- Cervical
- Discitis
- Epidural
- Osteomyelitis
- Spinal
- Spondylodiscitis

Abbreviations and Acronyms
AIS: American Spinal Injury Association injury scale
ASIA: American Spinal Injury Association
CSEA: Cervical spinal epidural abscess
MRI: Magnetic resonance imaging
SEA: Spinal epidural abscess

From the [1]Department of Neurological Surgery, Thomas Jefferson University Hospital, Philadelphia, Pennsylvania; and [2]Department of Neurological Surgery, University of Miami Hospital, Lois Pope Life Center, Miami, Florida, USA

To whom correspondence should be addressed: George M. Ghobrial, M.D. [E-mail: georgeghobrial@gmail.com]

Citation: World Neurosurg. (2017) 103:664-670.
http://dx.doi.org/10.1016/j.wneu.2017.04.119

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

Spondylodiscitis of the cervical spine often manifests with a relatively more rapid neurologic decline than that originating in the lumbar and thoracic spine.[7,8] One retrospective study identified cervical cases of osteodiscitis with SEAs as harboring an all-cause mortality rate of 21% compared to 3.6% with those involving the thoracic and lumbar spine.[8] In examining the existing literature, early and aggressive surgical management has not been shown to affect survival or rates of neurologic recovery. As a result, guidance in the literature regarding the timing in the treatment of CSEA is inconclusive. However, given the overall low quality of the available evidence body, it remains difficult to draw robust conclusions surrounding the optimal timing of surgical management for this patient population.[5,9] Furthermore, existing studies are often complicated by the variable and lengthy duration between symptoms and radiographic diagnosis, symptom onset, and neurologic decline, and between radiographic diagnosis and surgical management.[9,10]

To develop strategies for improving outcomes in relatively rare disease entities, guidance is most often in the form of retrospective surgical case series. The authors present the largest surgical series to date characterizing neurologic presentation and postoperative neurologic course.

METHODS

Study Selection Criteria

Institutional review board approval was obtained. Surgical records were retrospectively reviewed from January 1, 1997, to January 1, 2016, at a single institution for adult patients age 18 years and older undergoing surgery for cervical spondylodiscitis. ICD-9-CM codes and diagnosis terms that were queried in electronic medical records were "cervical epidural abscess" "osteomyelitis," "osteodiscitis," "vertebral abscess," and "spondylodiscitis." Individual spine surgeon case records were cross-matched to ensure that all consecutive patients cases were captured.

Diagnosis

The diagnosis of cervical spondylodiscitis was initially made by radiographic confirmation with cervical magnetic resonance imaging (MRI) with or without T1 post-gadolinium sequences and confirmed by a staff neuroradiologist. Patients with positive intraoperative microbacterial cultures were included. In the presence of sterile cultures, final study inclusion was made by the intraoperative clinical determination of the staff neurosurgeon. This determination was guided by the presence of frankly purulent material, phlegmon, or the setting of frank soft tissue inflammation.

Clinical and Radiographic Predictors

Data collected included potential predictors of outcome including age, medical comorbidity, recreational drug use, duration of symptomatology, duration between hospital admission to radiographic diagnosis by MRI, the presence of a neurologic deficit, duration between radiographic diagnosis and surgical decompression, and the number of levels fused were documented.

Radiographic confirmation of cervical spine MRI noting an epidural abscess was documented for all patients for localization and preoperative planning. An assessment of the number of levels of discitis, the presence or absence of spinal stenosis, epidural involvement, and the presence of spinal cord T2-weighted signal hyperintensity were evaluated as potential predictors. The number of vertebral segments treated, the extent of improvement in neurologic examination results, and the organism cultured were also evaluated as potential positive predictors of outcome.

Neurologic Presentation

The American Spinal Injury Association Impairment injury scale (AIS)[11] is routinely used in the management of spine patients at our institution. A retrospective review of hospital inpatient records, including admission examination by a neurologic surgeon and discharge examination, was performed. AIS scores were then quantified to assess the relative degree of improvement among patients with and without T2 cord hyperintensity.

Statistical Analysis

Statistical analysis was performed using SAS version 9.4 (Cary, North Carolina, USA). The relationship between preoperative predictor variables and both preoperative and postoperative neurologic status (ASIA Impairment Scale Grade), as well as change in ASIA motor score from preoperative to postoperative, was assessed using a bivariate linear regression analysis. Univariate analysis was conducted with a paired Student t test and Wilcoxon rank sum test to evaluate the effects of surgery on ASIA motor score and AIS grade, respectively. Statistical significance was set at a P value of 0.05.

RESULTS

Baseline Characteristics

Fifty-nine consecutive patients (mean age, 59 years [range, 18–83 years; SD ± 13.2 years]) were identified from the surgical database. The most common comorbidity was elevated body mass index (n = 21; 36%), tobacco use (n = 9; 15%), and intravenous drug abuse (n = 10; 17%; Table 1). The most common levels of cervical involvement were C4-C5, C5-C6, and C6-C7, in descending order. Most commonly, patients had motor deficits on

Table 1. Baseline Characteristics in Patients with Cervical Spondylodiscitis

Comorbidity	N (%)
Diabetes mellitus	6 (10)
Malignancy	6 (10)
Tobacco use	9 (15)
Body mass index (kg/m^2)	
Normal (20–24.99)	38 (64)
Overweight (25–29.99)	15 (25)
Obese (30–39.99)	6 (11)
Intravenous drug use	10 (17)
Ethanol abuse	6 (10)
Neck radiation	6 (10)