

# Upper Cervical Epidural Abscess in a Patient With Parkinson Disease: A Case Report and Review

Geriatric Orthopaedic Surgery  
& Rehabilitation  
2015, Vol. 6(4) 328-333  
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DOI: 10.1177/2151458515604356  
gos.sagepub.com



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## Abstract

To our knowledge, there are no reports in the literature of patients with Parkinson disease (PD) developing upper cervical spine infections. Our objective is to present a case of upper cervical epidural abscess in a patient with PD and to review upper cervical spine infection. We present the patient's presentation, physical examination, imaging findings, and management as well a review of the literature. A 66-year-old male with PD presented to the emergency department (ED) following referral by a neurologist for a presumed C2 fracture. The preceding history was 1 week of severe neck pain requiring a magnetic resonance imaging (MRI), which was initially interpreted as a C2 fracture. On admission from the ED, further review of the MRI appeared to show anterior prevertebral abscess and an epidural abscess. The patient's neurological examination was at baseline. In the span of 2 days, the patient developed significant motor weakness. A repeat MRI demonstrated expansion of the epidural collection and spinal cord compression. Surgical management consisting of C1 and C2 laminectomy, irrigation, and debridement from anterior and posterior approaches was performed. Postoperatively, the patient did not recover any motor strength and elected to withdraw care and died. Spinal epidural abscess requires a high index of suspicion and needs prompt recognition to prevent neurological impairment. Upper cervical spine infections are rare but can lead to lethal consequences.

## Keywords

upper cervical, osteomyelitis, epidural abscess, spinal cord injury, Parkinson disease

## Introduction

Upper cervical (occiput to C2) epidural abscess is an uncommon condition. Spinal epidural abscesses (SEAs) usually represent a surgical emergency because of concurrent neurological deficits. In upper cervical spine infections, degradation of the odontoid ligaments with subsequent atlantoaxial subluxation or dislocation is a risk. The incidence of osteomyelitis at this level has increased significantly over the past decades primarily due to immunocompromised hosts, intravenous drug use, and infective endocarditis. However, there remains a lack of literature on factors influencing neurological impairment or the prediction of neurological and functional recovery.<sup>1,2</sup> Parkinson disease (PD) is associated with progressive neurological deficit as well as musculoskeletal abnormalities,<sup>3</sup> which means a higher index of suspicion is required for rarer conditions in the atlantoaxial skeleton. In this study, we present a patient with PD who developed quadriplegia following C1–C2 epidural abscess.

## Case Report

Institutional review board approval was not required for this study. The patient is a 66-year-old male with PD for the last 12 years and osteoporosis (T score: 3.1). He initially presented to his neurologist with a 1 week history of neck pain. There was no history of antecedent trauma, and the patient was unaware of any precipitating factors. The patient's baseline neurology was positive for mild rest tremor in both hands. He had also been

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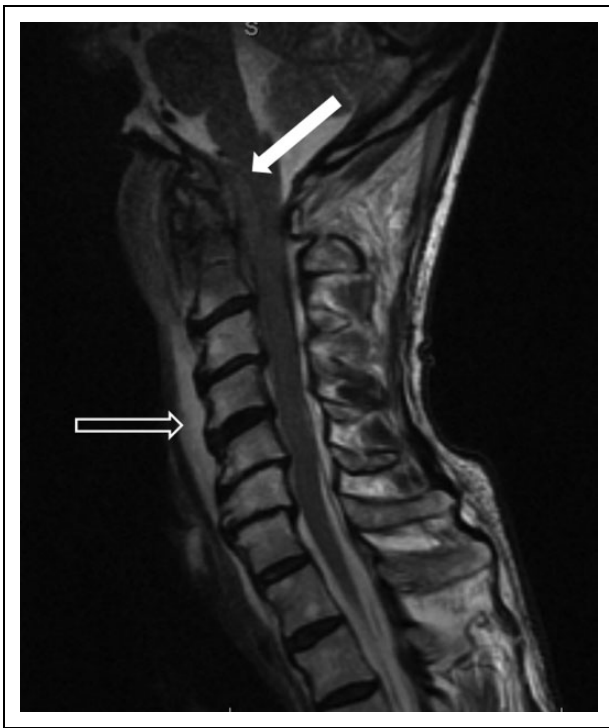
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**Figure 1.** Sagittal T2-weighted magnetic resonance imaging (MRI) demonstrating the fluid collection anterior to the C1–C2 spinal cord (white arrow) and prevertebral fluid collection (open arrow).

exhibiting speech changes consistent with PD and in particular a quieter muffled voice for which he was undergoing Lee Silverman voice treatment. The patient did not show any other changes typical of his condition such as rigidity, bradykinesia, postural/gait changes, or micrographia. He was independently mobile, and his wife reported he was able to mow the lawn and shovel snow, despite his condition. He was being medicated with carbidopa–levodopa and entacapone and calcium carbonate/Vitamin D for his osteoporosis. Neurological examination was otherwise unremarkable with normal tone in all limbs, 5/5 power in all myotomes, normal sensation in all dermatomes, normal coordination and proprioception, and active reflexes 2+ which were not brisk. He had no ankle clonus. Hoffman test was negative. Cranial nerves were intact, and pupils were equal and reactive to light and accommodation. A magnetic resonance imaging (MRI) of the cervical spine was ordered by the neurologist, which was read as a fracture of the lateral mass of C2 with possible involvement of the odontoid with subdural collection (Figure 1). The patient was sent to the emergency department for management. A computed tomography (CT) of the cervical spine did not show any fractures. He was admitted to the medicine service and noted to be afebrile with an initial white blood cell (WBC) of 15.2 (normal: 4.2–9.1), C-reactive protein of 248 (normal 0–10), and 84.5% neutrophils (normal: 34%–67.9%).

An orthopedic spine consult was requested, and on examination, the patient had no motor deficits. On review of the MRI, no fracture was identified, but there was concern regarding the

prevertebral fluid collection, and an otolaryngology (ENT) consultation was requested. The ENT team did not believe that surgical debridement was necessary at this point, and following discussion with the interventional radiologists, a CT-guided aspirate was not recommended, as the collection was not sizeable enough to safely aspirate or drain. Blood cultures were positive for alpha-hemolytic *Streptococcus*. The patient was started on vancomycin.

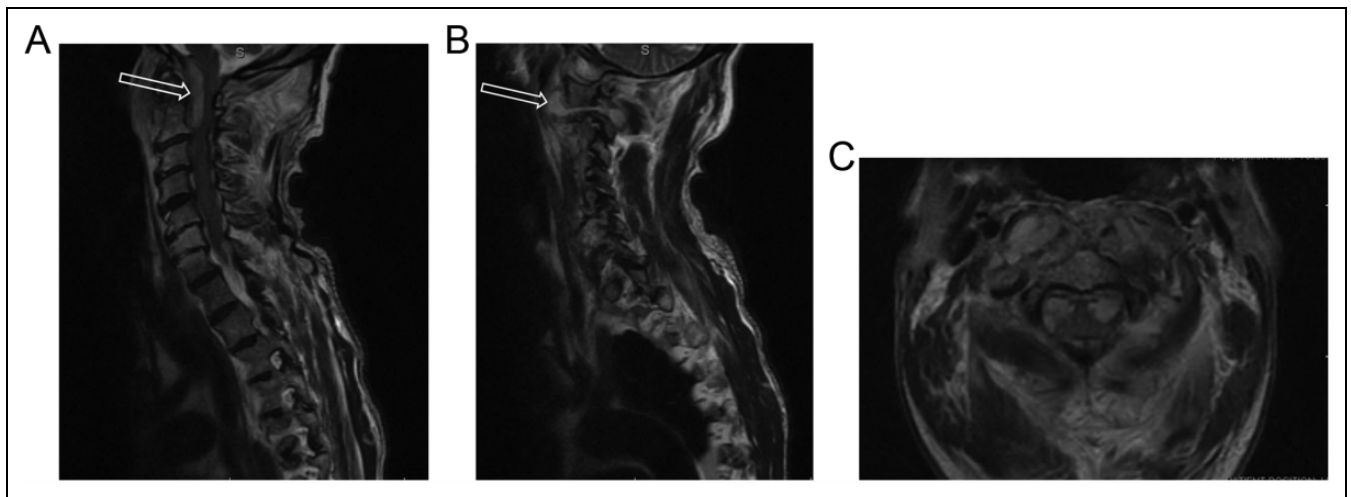
The patient was assessed daily by the orthopedic team and remained stable clinically and neurologically for the next 48 hours. Unfortunately 2 days later, the patient's neurology deteriorated rapidly and significantly overnight with the period being approximately 8 hours. On immediate evaluation by the orthopedic team, he was found to have flaccid quadriplegia in all 4 extremities with a sensory level at T2. His reflexes diminished to 1 throughout and had downgoing toes on Babinski testing. His rectal tone remained intact. An urgent MRI of the cervical spine demonstrated significantly increased epidural collection, C2 osteomyelitis, and increased anterior prevertebral collection (Figure 2A and C). After discussing with the patient and family, a decision was made for urgent posterior decompression, irrigation, and debridement followed by anterior-based irrigation and debridement with the ENT service. A microscopic-assisted C1 and C2 laminectomy was performed, and the epidural abscess was drained. During the decompression, the bone quality was consistent with the patient's known osteoporosis. Pus communication from the anterior to the posterior prevertebral tissue via the C1–C2 lateral mass articulation was noted (Figure 2B). Unfortunately, the patient did not regain any motor function. Intraoperative cultures returned as alpha-hemolytic *Streptococcus*. On postoperative day 5, the patient and his family elected to withdraw ventilator support after consulting with palliative care of his end-of-life wishes. The patient died within 3 hours of ventilator support removal.

## Discussion

Spinal epidural abscess was first described almost 250 years ago.<sup>4</sup> Upper cervical epidural abscess (UCEA; occiput to C2) in particular remains rare,<sup>5,6,7</sup> and to the authors' knowledge, this is the first case of UCEA in a patient with PD.

Previous reports on UCEAs have shown various etiologies including tonsillectomy,<sup>8</sup> otitis media,<sup>9</sup> laryngitis/rhinopharyngitis/parotitis,<sup>10</sup> iatrogenic,<sup>11</sup> hematogenous spread,<sup>12</sup> and immunocompromised hosts (intravenous drug use, diabetes, and HIV).<sup>13</sup> Sometimes, cases remain idiopathic. In our patient, we were unable to conclusively give an etiology for his condition, however, positive blood cultures are strongly suggestive of a hematogenous route of infection with intraoperative cultures confirming the same organism.

Upper cervical epidural abscess can present with a variety of signs and symptoms including neck pain and stiffness, headaches, visual disturbance, focal neurology, raised inflammatory markers, and pyrexia. Magnetic resonance imaging is the ideal imaging modality to identify early changes, neural



**Figure 2.** A, Sagittal T2-weighted magnetic resonance imaging (MRI) taken 3 days later demonstrating significant increase (arrow) in the epidural abscess. B, Communication (arrow), via the left C1–C2 joint, of the paravertebral collection to the epidural collection can be seen. C, Axial T2-weighted MRI at the level of C2 demonstrating epidural abscess collection compressing the spinal cord.

compromise, and to delineate specific soft tissue anatomy.<sup>14</sup> Identifying the causative organism is possible in up to 75% of cases,<sup>15</sup> with CT-guided biopsy crucial in the diagnostic pathway. *Streptococcus* species and *Staphylococcus aureus* are by far the most common causative organisms,<sup>16,17</sup> and in our patient, an alpha-hemolytic *Streptococcus* was isolated.

Two main modalities for the management of epidural abscess are used, either intravenous antibiotics or antibiotics with surgical decompression.<sup>13,18–24</sup> Nonoperative management with antimicrobials alone may be sufficient in some cases.<sup>1</sup> The type of management remains largely case dependent, with medical management alone being reserved for those with significant comorbidities rendering them unfit for surgery, patients with extensive SEA without neurological sequelae, and those with complete paraplegia lasting more than 48 hours.<sup>25,26</sup> Patients with rapidly developing neurological signs and those with worsening markers and radiological signs, despite conservative management should be treated operatively if possible. Patients with a destructive osteomyelitis or instability may need further surgery for arthrodesis/instrumentation as part of a combined single-stage or separate second-stage procedure.

A review of the literature specific to UCEA management and outcome indicates early diagnosis and identification of the causative organism leads to a good outcome both operatively and nonoperatively (Table 1).

Babat et al have previously warned of the increased complications of spinal surgery in patients with PD due to the combination of neuromuscular pathology and poor bone stock due to demineralization in addition to the degenerative risks of the general population.<sup>27</sup> Those with PD were also found to have abnormal bone metabolism due to inadequate levels of vitamin D, thereby leading to decreased Z scores and bone mineral density as reported by Sato et al.<sup>28</sup> This was built on

by Johnell et al who further demonstrated a higher risk of osteoporotic bone fractures in those with PD.<sup>29</sup> This is particularly relevant for our study, as a vertebral fracture has been described as a potential cause of epidural abscess formation,<sup>30</sup> mainly through the formation of a hematoma that can lead to an infection nidus.<sup>31,32</sup> Parkinsonian patients are certainly more prone to traumatic incidents compared to the normal populations partly due to the above-mentioned issues with bone density. However, this could also be related to medications such as levodopa. Parkinson disease is known to affect balance and gait, and levodopa is administered in order to help with mobility, however, it does not improve balance.<sup>33</sup> The combination of poor balance and poor bone quality leads to an increased incidence of falls and fragility fractures such as the hip.<sup>33,34</sup>

It is important to differentiate between a cervical fracture and an UCEA. The majority of cervical fractures will have a preceding high- or low-energy traumatic event. Cervical tenderness may be present in both fractures and UCEA. Upper cervical epidural abscess will more likely present with atraumatic cervical spine pain and tenderness and neck stiffness on range of movement. Systemic signs and symptoms are more likely with UCEA if hematogenous spread is present including signs of sepsis, changes in heart rate and temperature as well as raised inflammatory markers. On imaging, especially with CT, one should be able to diagnose the presence or absence of cervical fractures as was performed in our case. In either unstable cervical spine fractures or UCEA, serial neurological examinations should be performed.

In conclusion, UCEA remains a rare occurrence with no common identifiable cause. Neurologic compromise can result in high morbidity as encountered in our case even with prompt surgical management. We wish to highlight the need for a particular high index of suspicion for UCEA in a patient with PD having neck pain and raised inflammatory markers.

**Table 1. A Review of Cases With UCEA, Focusing on Presentation and Management.**

Authors	No. Patients, UCEA	Age/ Sex	Relevant Comorbidities	Level of Infection	Presentation	Organism	Treatment	Outcome
Yuceer et al, 2000 <sup>35</sup>	1	72/M	None	C2/C3	Neck pain and 4 limb weakness	<i>Staphylococcus aureus</i>	Decompression and IV Abx	Full resolution by 6 months
Noguchi et al, 2000 <sup>36</sup>	1	68/M	Type 2 diabetes mellitus, HTN	C2-C5	Febrile, cervical neck pain and stiffness	<i>Streptococcus pneumoniae</i>	Iv Abx and Philadelphia Collar	Full recovery at 2-year follow-up
Suhomel et al <sup>10</sup>	3	52/M	None	C1/C2	Cervical neck pain and stiffness	<i>Staphylococcus aureus</i>	Surgical debridement, Halo frame, and IV Abx then oral Abx	Full recovery
		51/F	Obese, Laryngitis	C1/C2	Fever and cervical neck pain/stiffness	<i>Staphylococcus aureus</i>	Surgical debridement, haloframe, IV Abx, and then oral Abx	Full recovery at 1-year follow up
		50/M	Type 2 diabetes mellitus, HTN, previous parotitis/ rhinopharyngitis	C1/C2	Fever, neck pain radiating both arms, and neck stiffness	<i>Staphylococcus aureus</i>	Surgical drainage, haloframe, and IV Abx then oral Abx. Second-stage stabilization	Full recovery 3-month follow-up
Hardias et al, 2003 <sup>37</sup>	1	65/M	Chronic renal failure	C1/C2	Febrile, cervical neck pain. Progressing neurology	<i>Staphylococcus aureus</i> / <i>Proteus Mirabilis</i>	Surgical decompression and haloframe IV Abx	Full-resolution focal neurology
Paul et al <sup>9</sup>	1	54/M	Type 2 diabetes mellitus	Mostly C2 (some C3/C4 involvement)	Neck pain. chronic suppurative otitis media	<i>Pseudomonas aeruginosa</i>	Surgical debridement, Cervical haloframe, oral Abx	Resolution neck pain 3 months
Sasaki et al, 2006 <sup>38</sup>	1	76/F	N/A	C1/C2	Left neck stiffness and pain	N/A	Halo fixation (destructive change in the atlantoaxial joint) and IV Abx	Full recovery
Curry et al <sup>8</sup>	1	37/F	None	C2/C3	Post-tonsillectomy	N/A	Debridement, IV Abx	Full recovery
Reid and Holman <sup>11</sup>	1	58/M	Type 2 diabetes mellitus	C1/C2	Cervical neck pain	<i>Staphylococcus aureus</i>	Surgical decompression and haloframe. IV Abx then oral Abx	Full recovery at 6-month follow-up
Ueda et al, 2009 <sup>39</sup>	1	37/M	Previous conservative treatment mandible 3/12 prior	C1	Cervical pain and fever	Alpha-Streptococcus	Cervical collar, IV Abx, and oral Abx	Full recovery at 2-year follow-up

Abbreviations: HTN, hypertension; IV Abx, intravenous antibiotics; N/A, not available; UCEA, upper cervical epidural abscess.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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