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

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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.1,2 Parkinson disease (PD) is associated with progressive neurological deficit as well as musculoskeletal abnormalities,3 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 neurological examination was at baseline for mild rest tremor in both hands. He had also been

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which were not brisk. He had no ankle clonus. Hoffman test. O np o s t Increased anterior prever-
Streptococcus abscess was drained. During
10 and debridement followed by
iatrogenic, 13 and debridement with the ENT ser-
and to the authors’ knowledge,
Sometimes, cases remain idiopathic. In our
hematogenous spread,
neutrophils 329
Upper cervical epidural abscess (UCEA; occiput to C2)
otitis media,
laryngitis/rhinophar-
2 normal coordination and proprioception, and active reflexes
power in all myotomes, normal sensation in all dermatomes,
was otherwise unremarkable with normal tone in all limbs, 5/5
nate/Vitamin D for his osteoporosis. Neurological examination
with carbidopa–levodopa and entacapone and calcium carbo-
shovel snow, despite his condition. He was being medicated
mobile, and his wife reported he was able to mow the lawn and
postural/gait changes, or micrographia. He was independently
changes typical of his condition such as rigidity, bradykinesia,
tory function. Intraoperative
cultures returned as alpha-hemolytic Streptococcus. On post-
operative 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 ventila-
tor support removal.

Discussion
Spinal epidural abscess was first described almost 250 years
ago.4 Upper cervical epidural abscess (UCEA; occiput to C2)
in particular remains rare,5,6,7 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 tonsilllectomy,5 otitis media,9 laryngitis/rhinopharyn-
gitis/parotitis,10 iatrogenic,11 hematogenous spread,12 and
immunocompromised hosts (intravenous drug use, diabetes,
and HIV).13 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 intrao-
perative 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 inflam-
matory markers, and pyrexia. Magnetic resonance imaging is
the ideal imaging modality to identify early changes, neural

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).
compromise, and to delineate specific soft tissue anatomy.\textsuperscript{14} Identifying the causative organism is possible in up to 75\% of cases,\textsuperscript{15} with CT-guided biopsy crucial in the diagnostic pathway. Streptococcus species and Staphylococcus aureus are by far the most common causative organisms,\textsuperscript{16,17} 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.\textsuperscript{13,18-24} Nonoperative management with antimicrobials alone may be sufficient in some cases.\textsuperscript{1} 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.\textsuperscript{25,26} 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.\textsuperscript{27} 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.\textsuperscript{28} This was built on by Johnell et al who further demonstrated a higher risk of osteoporotic bone fractures in those with PD.\textsuperscript{29} This is particularly relevant for our study, as a vertebral fracture has been described as a potential cause of epidural abscess formation,\textsuperscript{30} mainly through the formation of a hematoma that can lead to an infection nidus.\textsuperscript{31,32} 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.\textsuperscript{33} The combination of poor balance and poor bone quality leads to an increased incidence of falls and fragility fractures such as the hip.\textsuperscript{33,34} 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.
| Authors                     | No. | Age/Sex | Relevant Comorbidities                        | Level of Infection | Presentation | Organism                  | Treatment                                                                 | Outcome                                             |
|----------------------------|-----|---------|-----------------------------------------------|-------------------|--------------|---------------------------|----------------------------------------------------------------------------|-----------------------------------------------------|
| Yuceer et al, 2000         | 35  | 72/M    | None                                          | C2/C3             | Neck pain and 4 limb weakness | Staphylococcus aureus          | Decompression and IV Abx                                                   | Full resolution by 6 months                        |
| Noguchi et al, 2000        | 36  | 68/M    | Type 2 diabetes mellitus, HTN                  | C2-C5             | Fever, cervical neck pain and stiffness | Streptococcus pneumonia      | IV Abx and Philadelphia Collar                                            | Full recovery at 2-year follow-up                  |
| Suhomel et al              | 52  | M       | Obese, Laryngitis                             | C1/C2             | Cervical neck pain and stiffness | Staphylococcus aureus         | Surgical debridement, Halo frame, IV Abx, and oral Abx                  | Full recovery at 3-year follow-up                  |
| Hardias et al, 2003        | 65  | M       | Chronic renal failure                         | C1/C2             | Cervical neck pain and fever | Staphylococcus aureus, Proteus Mirabilis     | Surgical decompression and IV Abx                                       | Full-resolution focal neurology, Cervical pain and stiffness |
| Curry et al, 2005          | 37  | F       | N/A                                           | C1/C2             | Left neck stiffness and pain | N/A                        | Halo fixation (destructive change in the atlantoaxial joint)              | Full recovery at 6-month follow-up                  |
| Paul et al, 2011           | 54  | M       | Type 2 diabetes mellitus                      | C1/C2             | Mostly C2 neck pain and suppurative osteitis | Pseudomonas                 | Surgical drainage, Cervical collar, IV Abx                               | Full recovery at 6-month follow-up                  |
| Reid and Holman, 2011      | 37  | M       | Type 2 diabetes mellitus                      | C2/C3             | Cervical neck pain and fever | N/A                        | Posterior decompression and IV Abx                                       | Full recovery at 6-month follow-up                  |
| Ueda et al, 2009           | 37  | M       | Previous conservative treatment mandible 3/12 | 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
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