Upper cervical spinal epidural abscess

Upper cervical spinal epidural abscess (UCEA) (occiput to C2) is an uncommon condition. In upper cervical spine infections, degradation of the odontoid ligaments with subsequent atlantoaxial subluxation or dislocation is a risk. The prevalence of osteomyelitis at this level has increased significantly over the past decades primarily due to immunocompromised hosts, intravenous drug use, and infective endocarditis [1)]

However, there remains a lack of literature on factors influencing neurologic impairment or the prediction of neurologic and functional recovery [2)].

Epidemiology

34 cases were published in the literature since the early 1900s. Although this condition is less common than other spinal epidural abscesses, it is arguably more destructive than its counterparts. Many of the long-term clinical sequelae are secondary to its proximity to both the atlas and axis [3)].

Clinical features

Specifically, Upper cervical spinal epidural abscess seems to initially present with neck pain, neck stiffness, and/or fever.

More insidious presentations included disorientation, headaches, sore throat, and pain on swallowing. The rapidity of symptom onset remains highly variable. The combination of neck pain or stiffness along with fever should raise suspicion for UCSEA.

Diagnosis

A full neurologic examination including cranial nerves is mandatory and may elicit sensorimotor deficit; however, a normal neurologic examination does not exclude the diagnosis. Respiratory compromise may also ensue. An ear, nose, and throat examination as part of the patient workup is also recommended and may identify a potential etiology such as tonsillitis or suppurative otitis.

As part of the evaluation, inflammatory markers such as erythrocyte sedimentation rate, C reactive protein, and white blood cell count should be ordered. Although these markers are not specific to UCSEA, they remain supportive of a diagnosis if UCSEA is in the differential. In the cases we examined, erythrocyte sedimentation rate, C-reactive protein, and white blood cell count were elevated in most of the patients. These laboratory findings can be considered diagnostic only within the context of the complete clinical picture suspicious for UCSEA [4)].

Imaging

The initial imaging should include plain radiographs to assess for any common causes of neck pain such as cervical spondylosis or fractures. Additionally, it may show signs of vertebral osteomyelitis

such as vertebral collapse or bony erosions. The odontoid view and/or flexion and extension views are indicated if osseous changes in the upper cervical spine are noted.

Magnetic resonance imaging (MRI)

A high index of suspicion is required to diagnose this rare condition with magnetic resonance imaging being the imaging modality of choice.

Magnetic resonance imaging (MRI) remains the modality of choice with the greatest diagnostic accuracy. The reported predictive values include sensitivity up to 95% and specificity over 90%.

Gadolinium enhancement can further increase these values due to its ability to differentiate between abscess and the surrounding neurologic structures. It is useful to compare T1- and T2-weighted images because in T2-weighted images, an epidural abscess will show uptake of signal whereas in T1-weighted images, the epidural abscess and spinal cord have a similar intensity.

Computed tomography (CT)

Computed tomography (CT) is invaluable in the evaluation of vertebral end plate and facet erosions associated with osteomyelitis.

CT is also useful for surgical planning because instrumentation and stabilization are needed if there is significant facet and vertebral destruction.

If MRI is contraindicated, then CT myelography would be an option; however, this imaging presents its own risks including introduction of infection, bleeding, and nerve injury as well as the risks associated with radiation. Generally, CT myelography is no longer recommended but is an alternative if MRI is not available or contraindicated.

Treatment

Cervical spinal epidural abscess of the upper cervical spine, is a rare surgical emergency. Despite increasing incidence, uncertainty remains as to how it should initially be managed.

Risk factors include immunocompromised hosts, diabetes mellitus, and intravenous drug use.

There has been a shift toward surgical management of this condition in recent times, with favorable outcomes

---

The treatment options for UCEA include nonoperative or operative management. Nonoperative management consists of immobilization and parenteral antibiotics, and operative management consists of surgical decompression, possibly stabilization and parenteral antibiotics. Nonoperative management with antimicrobials alone may be sufficient in some cases. The type of management largely depends on the case, with medical management alone being reserved for those with

significant comorbidities rendering them unfit for surgery, patients with UCEA but no neurologic sequelae, and patients with neurologic deficit lasting more than 48 hours. Patients with rapidly developing neurologic signs and those with worsening inflammatory markers and radiologic signs 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 (decompression/stabilization) or separate second-stage procedure.

From reviewing the cases available to Al-Hourani et al., they did note a trend for nonoperative management of these cases certainly up to the 1980s, and thereafter there was a discernible shift toward operative management [5].

Case reports

2015

Burns et al., present two cases of ventral epidural abscess and osteomyelitis at the craniocervical junction involving C1/C2 that were successfully treated via the endoscopic transnasal approach. Both were treated in staged procedures involving posterior cervical fusion followed by endoscopic transnasal resection of the ventral C1 arch and odontoid process for decompression of the ventral spinal cord and medulla. Dural repairs were successfully performed using multilayered, onlay techniques where required. Both patients tolerated surgery exceedingly well, had brief postoperative hospital stays, and recovered uneventfully to their neurologic baselines. Postoperative magnetic resonance imaging confirmed complete decompression of the foramen magnum and upper C-spine. These cases illustrate the advantages and low morbidity of the endonasal endoscopic approach to the craniocervical junction in the setting of frank skull base infection and immunosuppression, representing to our knowledge a unique application of this technique to osteomyelitis and epidural abscess at the craniocervical junction [6].

There are no reports in the literature of patients with Parkinson disease (PD) developing upper cervical spine infections.

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 [7].

1)
Grewal S, Hocking G, Wildsmith J A. Epidural abscesses. Br J Anaesth. 2006;96(3):292–302.

2)
Gellin B G, Weingarten K, Gamache F W, Jr, Philadelphia: Lippincott-Raven; 1997. Epidural abscess. In: Infections of the Central Nervous System. 2nd ed; p. 507.
3) , 4) , 5)
Al-Hourani K, Al-Aref R, Mesfin A. Upper Cervical Epidural Abscess in Clinical Practice: Diagnosis and Management. Global Spine J. 2016 Jun;6(4):383-93. doi: 10.1055/s-0035-1565260. Epub 2015 Oct 13. Review. PubMed PMID: 27190742; PubMed Central PMCID: PMC4868579.
6)
Burns TC, Mindea SA, Pendharkar AV, Lapustea NB, Irime I, Nayak JV. Endoscopic Transnasal Approach for Urgent Decompression of the Craniocervical Junction in Acute Skull Base Osteomyelitis. J Neurol Surg Rep. 2015 Jul;76(1):e37-42. doi: 10.1055/s-0034-1395492. Epub 2015 Jan 16. PubMed PMID: 26251807; PubMed Central PMCID: PMC4520966.
7)
Al-Hourani K, Frost C, Mesfin A. Upper Cervical Epidural Abscess in a Patient With Parkinson Disease: A Case Report and Review. Geriatr Orthop Surg Rehabil. 2015 Dec;6(4):328-33. doi: 10.1177/2151458515604356. PubMed PMID: 26623170; PubMed Central PMCID: PMC4647191.