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LETTER TO THE EDITOR • SPINE - INFECTION

Timing of surgical interventions for upper cervical epidural abscess: a case report and review of the literature

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We report a rare case of upper cervical (occiput to C2) epidural abscess (UCEA) unsuccessfully treated with antibiotics. An 88-year-old man presented with a 5-day history of fever, neck pain, and a limb weakness. Laboratory tests revealed a white blood cell count of 26,600/mm^3 and a C-reactive protein level of 295 mg/L. T2-weighted magnetic resonance imaging of the cervical spine demonstrated a high-signal intensity lesion surrounding the dens. Blood cultures revealed the presence of methicillin-sensitive *Staphylococcus aureus*; thus, antibiotics were initiated. However, he suddenly developed limb paralysis and respiratory failure, leading to rapid decoration in his condition; subsequently, he died 35 h after admission. Autopsy findings revealed an UCEA that resulted in fatal spinal cord compression.

Subsequently, we reviewed the literature pertaining to surgical interventions and antibiotics for the treatment of UCEA to investigate the timing of surgical interventions, which can prevent permanent limb paralysis or death. A systematic review was performed according to the preferred reporting items for systematic reviews and meta-analyses statement. Relevant articles published in the English language (as of December 2018) were retrieved from the PubMed database. Articles that did not contain detailed patient outcomes or timing of treatments were excluded.

In 43 cases, UCEAs were identified [1–4]. For clinical presentations, 40 patients showed neck pain and/or neck stiffness (93.0%). Among the 40 patients, 16 had limb weakness (37.2%); four of those suffered limb paralysis, which resulted in death due to respiratory failure (9.3%). Patient and treatment characteristics are summarized in Table 1.

A flowchart of clinical presentations, treatments, and outcomes of UCEA is summarized in Fig. 1. Of 27 patients without limb weakness or paralysis who received antibiotics, 19 achieved full recovery, but seven of these patients suffered permanent neck pain and/or stiffness. None of the patients without limb weakness or paralysis had permanent limb paralysis or died. Nine of 16 patients with limb weakness or paralysis who received antibiotics underwent surgical intervention before limb paralysis developed, whereas seven underwent surgery after limb paralysis developed. The former nine patients had a favorable neurological outcome (permanent limb paralysis or death; before, 0/9; after, 5/7; $P = 0.005$).

The treatment for UCEA remains controversial with a trend toward surgical interventions plus antibiotics in modern times, and a lack of evidence remains to delineate the indications for the timing of surgical interventions [1]. UCEA-associated spinal cord compression may induce fatal respiratory dysfunction [1–4], whereas lower cervical epidural abscess may not [5]. Thus, the treatment strategy of epidural abscess (including UCEA) may depend on whether suffering a spinal cord lesion was associated with respiratory motor control. Surgical intervention has pivotal roles in UCEA to prevent respiratory failure and improves neurological outcomes [1, 5]. Our systematic review indicated that there is little time for respiratory failure to develop after the appearance of paralysis, and surgical intervention after paralysis could not prevent permanent limb paralysis or death [1]. Therefore, limb paralysis appearance can determine the indication for surgical intervention for UCEA and early surgery for UCEA before paralysis is recommended as soon as possible.

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Table 1 Characteristics of 43 patients with upper cervical epidural abscess

Country	USA, 18; Japan, 7; UK, 4; Czech Republic, 3
	Germany, 2; Sweden, 2; Poland, 2; other countries, 6
Age	51.6 (0–88)
Sex	Female, 15; male, 28
Clinical presentation	Neck pain or neck stiffness, 40; fever, 18
	Weakness or paralysis, 16; respiratory failure, 5
Level	C1, 2; C1–C2, 27; C2, 7; C2–C3, 3; others, 4
Organism	*Staphylococcus aureus*, 26; *Streptococcus* spp., 5; NI, 10
Treatment	Abx, 17; Abx and surgical drainage, 7
	Abx and surgical debridement, 9
	Abx and surgical decompression, 10
Outcome	Full recovery, 27; neck pain or neck stiffness, 8
	Weakness or paralysis, 3; death, 5

NI none identified, *Abx* antibiotics

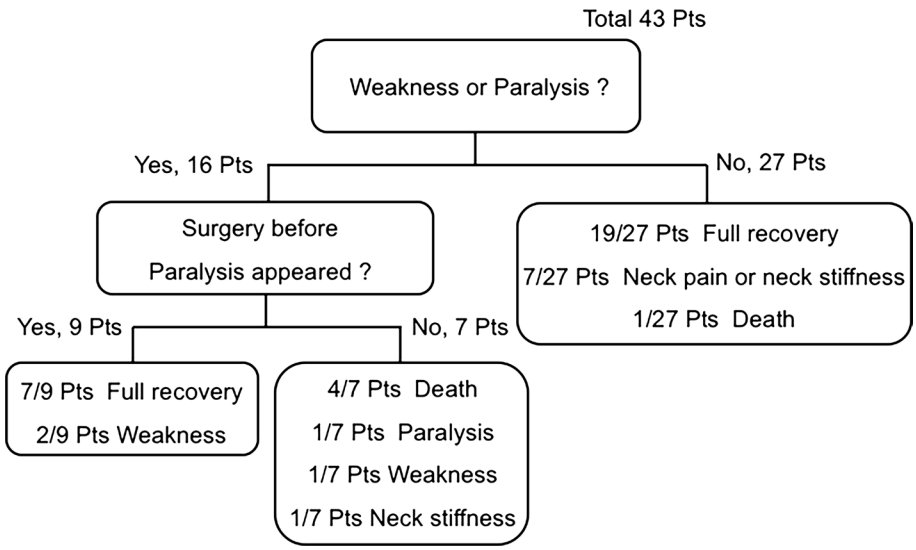

Fig. 1 Flowchart: clinical presentations, treatments, and outcomes of UCEA. *Pts* patients

Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

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