

Case Report

Comprehensive management of cervical epidural spinal abscess followed by brain abscesses: a life-threatening and tortuous case

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Abstract: Cervical epidural spinal abscess (C1-3) followed by intracranial infection is an extremely rare entity and life-threatening disease. For the very first time, we reported our clinical experience of managing such a life-threatening and tortuous case. A 58-year-old woman with neck pain was admitted to our hospital with the suspect of cervical tumor. Enhanced magnetic resonance (MRI) image demonstrated C1-3 suspected multiple abscess as well as extended inflammation of upper cervical and intracranial meninges. We conducted an urgent surgery with decompression, canaloplasty as well as debridement of the focus and then the patient was transferred to Surgical Intensive Care Unit. Head pain remained, but the intracranial infection was initially excluded. Subsequent MRI demonstrated extended endocranium lesions of middle and posterior fossa, as well as multifocal epidural abscesses. Multidisciplinary consultation was called and therapy plan was made by spine surgeons, neurosurgeons, ophthalmologists, cardiologists and infection physicians. After intrathecal injection of vancomycin for 14 + 7 days, as well as two-month administrations of a sequential order of antibiotics amoxicillin/sulbactam, levofloxacin, and fosfomycin. The patient was then successfully cured and discharged.

Keywords: Epidural spinal abscess, brain abscesses, cervical infection, intracranial infection

Introduction

Spinal epidural abscess (SEA), a severe life-changing disease, is defined by a pyogenic infection in the potential space between the vertebral periosteum and spinal dura mater [1]. SEA is an uncommon entity with 0.002-0.012% of hospital admissions [2], but its incidence was increased in the aging population, intravenous drug abuse and the spinal instruments over the past decades. Despite significant advances in diagnostic technique and therapeutic treatment, the mortality of SEA still remain 5%, and one in five SEA patients will suffer irreversible paralysis [2]. Cervical SEA are more unusual with only 5-20% cases involving the cervical segments, but they are associated with poorer prognosis and the overall mortality rate doubled into 10-12% [3]. Early diagnosis is essential, and immediate surgical intervention followed by antimicrobial therapy is crucial to manage this rare and life-threatening disease [4].

Brain abscess is another rare entity (0.001-0.008%) and the mortality is 20%, so it requires prompt neurosurgical attentions [5]. Currently, there is no literatures reporting cervical SEA followed by intracranial infection, and the clinical experience of managing such a life-threatening scenario is scarce.

Case report

A 58-year-old woman was admitted in our hospital with the main complaint of cervical pain for nearly one month. Twenty days ago, the patient underwent acupuncture, cupping as well as massage, and then she got a fever (38°C). The fever was relieved after one-day rest, and two days later the patient received acupuncture and cupping for the second time. Then the patient got fever (39.5°C) again, accompanied by head neck pain and limited activity, especially on the left side. The patient took cefoxitin and pazufloxacin, and then the fever relieved to normal but the neck pain

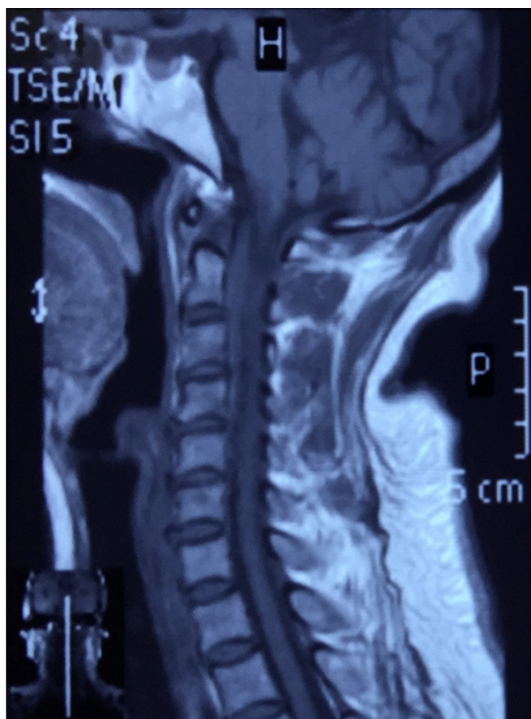


Figure 1. Outpatient magnetic resonance imaging demonstrated C1-3 intraspinal mass, slight C3-6 disc herniation as well as spinal canal stenosis.

remained. For better treatment, the patient went to the Outpatient Department of our hospital. Outpatient MRI demonstrated C1-3 intraspinal mass, slight C3-6 disc herniation as well as spinal canal stenosis (**Figure 1**). Then the patient was admitted into our hospital and underwent a series examinations. Positron emission tomography-computed tomography (PET-CT) showed C2-3 intraspinal mass and the radiologist suspected primitive neuroectodermal tumor considering elevated fluorodeoxyglucose (**Figure 2**). However, the patient began to present with evident head neck pain, left-deviated tongue, as well as irritating cough and vomiting after drinking. The administration of morphine did not relived the pain. Subsequent enhanced MRI demonstrated C1-3 suspected multiple abscess as well as extended inflammation of upper cervical and intracranial meninges (**Figure 3**). Blood routine examination showed elevated white blood cell ($16.7 \times 10^9/L$), neutrophilic granulocyte% (89.1%), erythrocyte sedimentation rate (ESR) (62 mm/h) and C-reactive protein (CRP) (17.6 mg/L). Medical consultation with oncologist and infection physician was called. Considering the high risk of irreversible neurologic impairment, we conduct-

ed an urgent surgery with vivid decompression, canaloplasty as well as debridement of the focus. Yellowish white pyogenic fluids were drained and sent for microorganism culture, and the focus was flushed with gentamicin. Microorganism culture was negative and pathological report demonstrated inflammatory tissue (**Figures S1, S2**). The surgery was successfully completed, and the patient was transferred to Surgical Intensive Care Unit (SICU). Post-operative administration of antibiotics (vancomacin + meropenem) was continued, and the patient was carefully monitored. One day after the surgery, the patient was complaint with eye pain and forehead pain. After medical consultation, ophthalmologist suggested the exclude of intracranial lesions. Neurosurgeon conducted physical examination and found no signs of meningeal irritation. Several hours later, however, the patient presented mild agitation with a suddenly elevated blood pressure (200/100 mmHg). The consciousness was sober, but the head pain was dramatic and irritating cough was presented. Phentolamine, dolantin and mannitol were administrated. Two days after the surgery, the patient still felt forehead pain and presented with irritating cough. Physical examination revealed no pathological signs, weak muscular tension and grade III muscular force. Intracranial infection was initially excluded, and dexamethasone was administrated to reduce nerve edema. Eight days after the surgery, the patient described less head pain, but the reexamination enhanced MRI demonstrated extended endocranium lesions of middle and posterior fossa, as well as multifocal epidural abscesses (**Figure 4**). Medical consultation was called, and lumbar puncture was conducted while the administration of vancomacin and meropenem were continued. Twelve days after the surgery, organism culture of cerebrospinal fluid was negative, but the patient presented with vertigo, retarded response, drowsiness, and deviated mouth. No microorganisms were identified in the blood, and tuberculosis antibody test was (\pm). After medical consultation, vancomacin was replaced by linezolid and intrathecal injection of vancomacin was employed. Considering the severe infection of the lung and plentiful phlegm, fiberoptic bronchoscope and tracheotomy was conducted. After intrathecal injection of vancomacin for 14 days, the antibiotics administration via venous was downgraded

Cervical epidural spinal

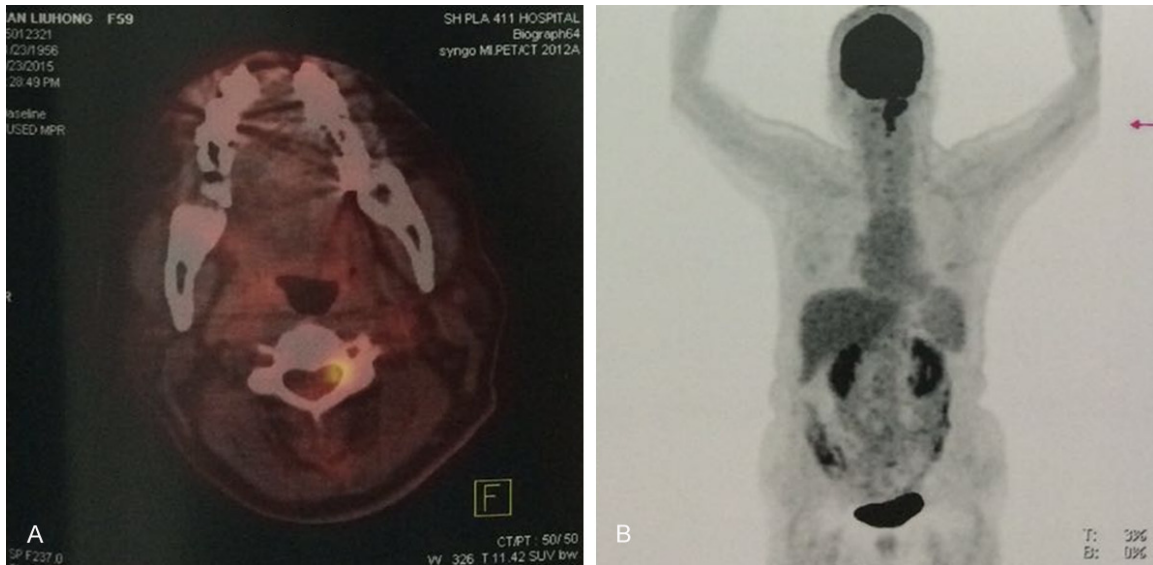


Figure 2. Positron emission tomography-computed tomography showed C2-3 intraspinal mass. A: Elevated fluorodeoxyglucose; B: C2-3 intraspinal mass.

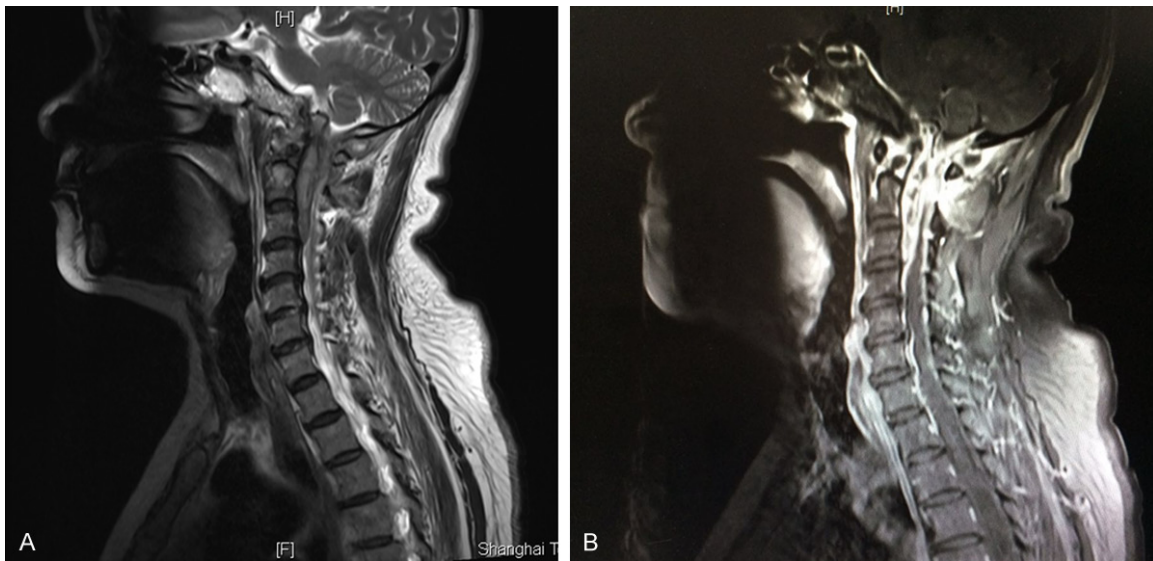


Figure 3. Reexamined magnetic resonance imaging demonstrated C1-3 suspected multiple abscess as well as extended inflammation of upper cervical and intracranial meninges. A: Normal; B: Enhanced.

into amoxicillin/sulbactam, levofloxacin, and fosfomycin. Afterwards, intrathecal injection of vancomycin was resumed for another 7 days, and the patient improved bit by bit. After consolidation therapy and observation for another month, the patient was finally cured and discharged ([Figure S3](#)).

Discussion

Cervical ESA (C1-3) followed by intracranial infection is an extremely rare entity and life-

threatening disease. To the best of our knowledge, this was the first case of cervical ESA (C1-3) followed by brain abscesses successfully cured by prompt spinal surgery and conservative treatment with sequential order of antibiotics.

The diagnosis delay of SEA is reported in 5%-89% patients, mainly due to few clinical experience of this rare entity, nonspecific markers of laboratory tests, as well as overlap of nonspecific symptoms in elderly patients [6].

Cervical epidural spinal

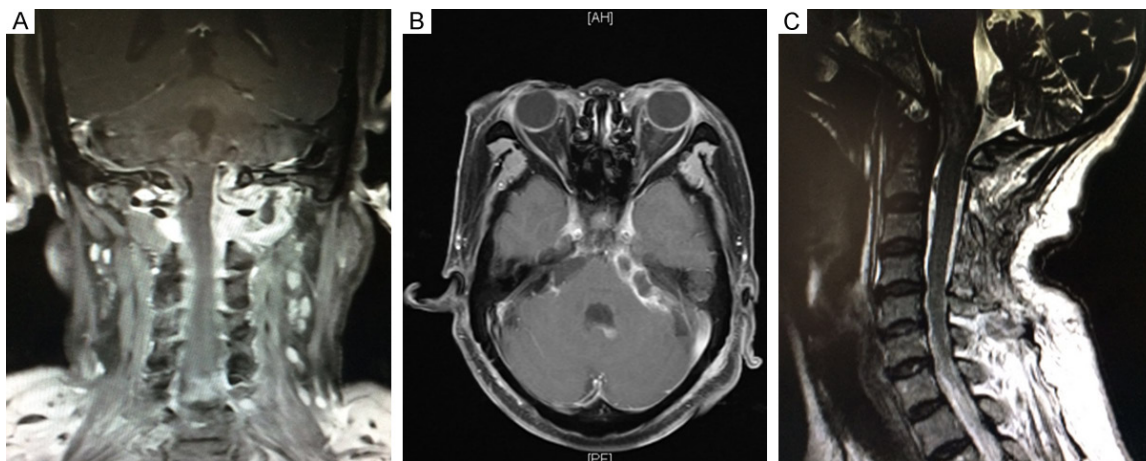


Figure 4. Postoperative magnetic resonance imaging demonstrated extended endocranium lesions of middle and posterior fossa, as well as multifocal epidural abscesses. A: Coronal view; B: Horizontal view; C: Cervical sagittal view showed absence of epidural spinal abscess.

Initially, we suspected the cervical intraspinal mass as primitive neuroectodermal tumor by PET-CT, and ascribed the neck pain to the C3-6 disc herniation as well as spinal canal stenosis demonstrated by MRI. Subsequently, we noticed that the patient suffered enhanced neck pain, which could not be relieved by morphine. Moreover, neurogenic symptoms were presented with irritating cough and vomiting. Therefore, we conducted enhanced MRI and identified C1-3 suspected multiple abscess as well as extended inflammation of upper cervical and intracranial meninges. This prompt diagnosis was essential, because we subsequently conducted an immediate surgery to remove this life-threatening occupying focus, which was very close to the medulla oblongata.

The optimal management of SEA remains unknown, because large clinical controlled trials are absent [7]. Typically, SEA is treated by urgent surgical decompression and drainage of the abscess followed by multiple weeks of intravenous antibiotics therapy [8, 9]. Although SEA can be successfully managed by minimally invasive techniques or with antibiotics alone [10] in selected patients, the latter is quite controversial. When the SEA involved cervical segments, however, we strongly recommended an immediate surgical decompression and drainage of the abscess once the cervical SEA was diagnosed. Although the following antibiotic treatment period still remained controversial, a continuous antibiotic administration of no less

than 4 weeks was considered to be essential [11]. Additionally, we also regarded systematic life support and all-round monitoring as significant factors contributing to the successful management of such a serious case.

The source of SEA still remains unclear in many patients, although it could be spread from skin lesions, oral and enteric foci, as well as other distant lesions [12]. The underlying spread mechanisms includes hematogenous spread (50%), direct extension from adjacent infection (33%), inoculation from spinal procedures (15%), or unknown mechanisms [13]. Many studies have reported that acupuncture might account for the source of SEA [14]. Similarly, we also suspected the source of SEA was due to direct extension from acupuncture site in the present case, as the patient got repeated fever after two-time acupuncture. Unfortunately, we could not identified the specific pathogenic bacterium by pathological examination or blood tests, which was also reported in some SEA cases [15]. *Staphylococcus aureus* is reported to account for 66.4% SEA cases, while 13.9% cases could not be identified with specific organisms [15], which might be due to the administration of antibiotics.

Brain abscesses can be stemmed from direct contiguous invasion from an adjacent infection (dental infection), or from a primary lesion at a distant site (endocarditis). It has been estimated that contiguous spread accounted for 1/2 cases, and hematogenous dissemination ac-

counted for 1/3 cases, while other cases remained unknown [16]. It was unclear how the infection spread into the brain from cervical focus in our case, although we have tried our best to conduct the surgical procedure and protect the dura mater. The pathogenic bacterium might enter the brain through intermuscular space, haematogenous spread, or other unknown mechanisms. For the record, we strongly recommended a higher-head, lower-leg position during the surgery, which might minimized the risk of infection spreading into the brain due to gravity.

Once the brain infection is identified, it is imperative that appropriate surgical and medical intervention should be conducted to manage this serious condition, because of the higher risk of devastating neurological sequelae [17]. Due to the extended endocranium lesions of middle and posterior fossa, we did not conduct a surgical intervention but adopted a conservative treatment with sequential order of venous administration of antibiotics plus intrathecal injection of vancomycin. After antibiotics administration with over two months, the patient was successfully cured and the neurogenic impairment was reversible, which indicated that conservative treatment could be an alternative option in selected patients with brain abscess.

Urgent surgery with vivid decompression and debridement was essential for epidural spinal abscess. The intracranial infection can be cured by conservative treatment with sequential order. Comprehensive scheme of urgent surgery and systematic conservative therapy with multidisciplinary collaboration is an essential management of such a life-threatening and tortuous case.

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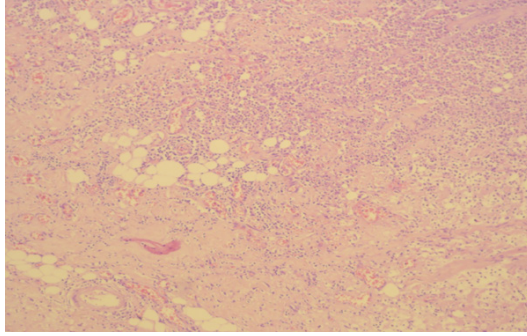


Figure S1. Purulent inflammation of infected tissue.

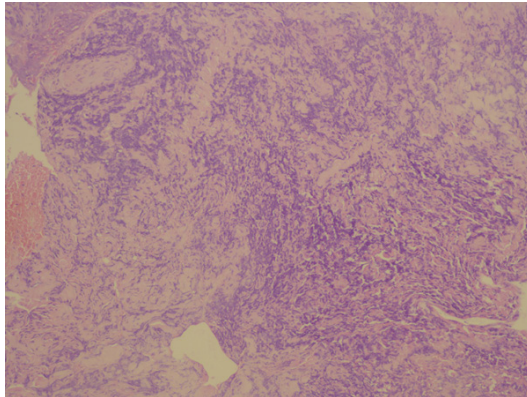


Figure S2. Abscess cavity wall.

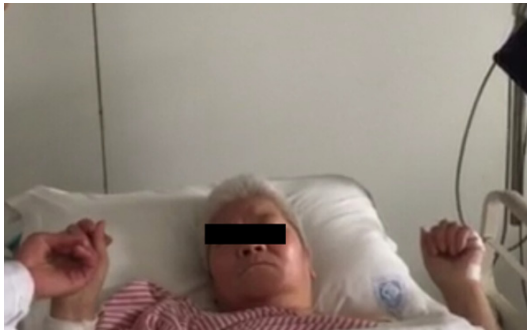


Figure S3. Physical examination prior to discharge.