

CT fluoroscopy-guided percutaneous intervertebral drain insertion for cervical pyogenic spondylodiscitis

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ABSTRACT

A 79-year-old man was admitted to our hospital with C6-C7 pyogenic spondylodiscitis with an epidural abscess. Since the cervical intervertebral space is narrower than the thoracolumbar intervertebral space, drain insertion into the cervical intervertebral space requires a more accurate procedure. Moreover, the specific anatomy of cervical vertebrae, which includes the transverse foramen through which the vertebral artery passes and the uncinat process on the side edges of the top surface of the bodies, makes it impossible to perform computed tomography (CT)-guided percutaneous intervertebral drain insertion through the posterolateral approach. Therefore, CT fluoroscopy-guided percutaneous cervical intervertebral drain insertion using a lateral approach, in which the needle is advanced between the carotid sheath and scalene muscle, and simultaneous intravenous contrast enhancement might be a safe and useful technique. There have been no papers on CT fluoroscopy-guided percutaneous intervertebral drain insertion for cervical pyogenic spondylodiscitis, while successful CT fluoroscopy-guided percutaneous intervertebral drain insertion for thoracolumbar pyogenic spondylodiscitis has been reported. Here, we successfully performed CT fluoroscopy-guided percutaneous intervertebral drain insertion for cervical pyogenic spondylodiscitis.

P yogenic spondylodiscitis can lead to severe complications and death, and the number of patients with this disease is increasing due to various reasons such as advanced age, diabetes mellitus, liver cirrhosis, chronic kidney disease, and malignant tumor (1). Cervical pyogenic spondylodiscitis is uncommon compared with pyogenic spondylodiscitis in other vertebral segments. However, cervical pyogenic spondylodiscitis is associated with a higher incidence of neurological deficits and death compared with pyogenic spondylodiscitis at other sites (2). The administration of antibiotics is the first choice for the treatment of pyogenic spondylodiscitis. Abscesses should be drained if they are large, persist despite antimicrobial therapy, or develop outside the spine (3). Surgical drainage is necessary in case of infection associated with a spinal implant or bone destruction (4). Otherwise, percutaneous drainage is preferred because of the poor general condition of the patient. Computed tomography (CT)-guided drain insertion into the intervertebral space has been reported to be a useful option, as it provides a high culture-positive rate and allows continuous drainage from the source of infection in a single procedure (5). There have been no papers on CT fluoroscopy-guided percutaneous intervertebral drain insertion for cervical pyogenic spondylodiscitis, while the usefulness of CT fluoroscopy-guided percutaneous intervertebral drain insertion for thoracolumbar pyogenic spondylodiscitis has been reported (5). Here, we successfully performed CT fluoroscopy-guided percutaneous intervertebral drain insertion for cervical pyogenic spondylodiscitis.

Technique

A 79-year-old man was admitted to our hospital with a two-week history of worsening neck pain. His medical history included sepsis due to urinary tract infection (UTI) caused by extended-spectrum beta-lactamase (ESBL)-producing *Klebsiella pneumoniae*, diabetes mellitus, and complete atrioventricular block (complete A-V block). A pacemaker had been inserted for complete A-V block. On admission, he was afebrile, and other vital signs were normal. The physical examination showed slight muscle weakness of the right arm.

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His white blood cell count was 4900/mm³, and C-reactive protein level was 3.67 mg/dL. Contrast-enhanced CT showed narrowing of the C6-C7 disc interval, endplate irregularities, and an epidural abscess (Fig. 1). Magnetic resonance imaging (MRI) could not be performed because of pacemaker implantation. Based on the results of the investigation, the diagnosis of C6-C7 pyogenic spondylodiscitis with epidural abscess was made. A neck collar was placed on the patient for cervical spine immobilization. Although surgical treatment, including debridement of infected tissue and drainage of the epidural abscess, is the first choice of treatment for pyogenic spondylodiscitis with epidural abscess, considering the poor general condition of the patient, we planned to perform CT fluoroscopy-guided intervertebral drain insertion. Before drain insertion, preliminary CT scan images (Aquilion ONE, Canon Medical Systems) using a 2 mm thick contiguous axial section through the target region were obtained. Based on the results of preliminary CT, we decided to employ the lateral approach, in which the needle is advanced posterior to the carotid sheath. The procedure was performed under CT fluoroscopic guidance. The CT fluoroscopy-guided drain insertion for cervical pyogenic spondylodiscitis was performed using the intermittent method, except when advancing the needle, to minimize radiation exposure. Only in advancing the needle, the continuous CT fluoroscopic method was used to accurately reach the intervertebral space while avoiding the carotid sheath and vertebral artery. The patient was placed in the supine position. Under local anesthesia, a 64 mm long 18-gauge (G) needle (Surflo, Terumo) was inserted from the lateral side of the neck and advanced between the carotid sheath and scalene muscle until the tip of

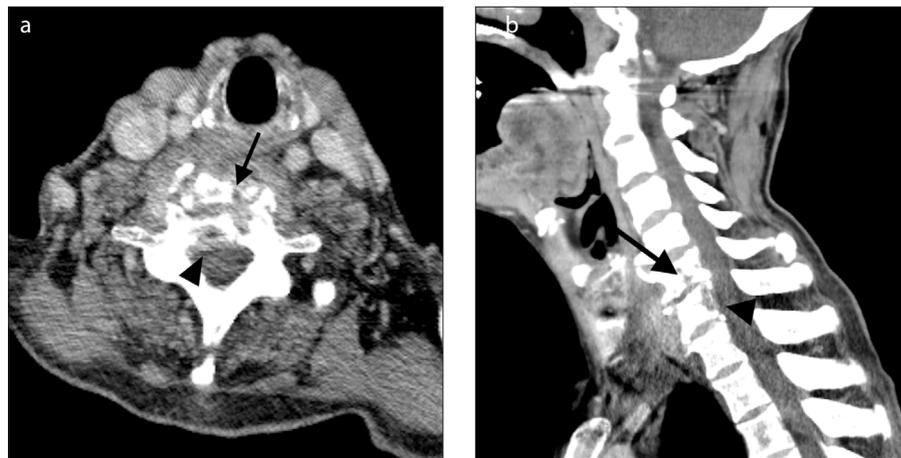


Figure 1. a, b. Pretreatment contrast-enhanced CT demonstrates C6-C7 pyogenic spondylodiscitis with epidural abscess. Axial image (a) shows vertebral body erosion (arrow) and an epidural abscess (arrowhead). Sagittal image (b) shows C6-C7 disc interval narrowing, endplate irregularity (arrow), vertebral body erosion and the epidural abscess (arrowhead).

the needle reached the C6-C7 intervertebral space (Fig. 2a, 2b). When the needle was being advanced, contrast medium (Iohexol, 300 mgI/mL) was simultaneously administered at an injection rate of 1 mL/s, and the total volume of injected contrast medium was 70 mL. A 0.035-inch guidewire (Hanako Medical) was inserted into the C6-C7 intervertebral space through the 18 G needle, and then the needle was removed. After the insertion route was dilated with an 8 French (F) dilator (Merit Medical), an 8 F pigtail drainage catheter (Uresil, Skokie, IL) was inserted over the guidewire, and the tip of the catheter was positioned in the C6-C7 intervertebral space. Finally, we confirmed that the tip of the catheter was precisely placed in the C6-C7 intervertebral space and that there were no complications using volume CT images. The pus aspirated from the drainage catheter was transported to the microbiology laboratory. Then, intravenous administration of meropenem (3.0 g/day) was started immediately after the drain insertion. The choice of antibacterial drug was determined empirically according to the history of infection with ESBL-producing *Klebsiella pneumoniae*. Four days after the procedure, ESBL-producing *Klebsiella pneumoniae* was isolated from the pus, and administration of meropenem was continued for 6 weeks. The amount of pus flowing out of the drain reached 10 mL at the maximum on the fourth day after the drain insertion, and decreased thereafter, while the patient's symptoms and inflammatory signs on blood tests gradually improved. Drainage fluid was no longer aspirated on day 24, and then the drainage catheter was

removed on day 29, under x-ray fluoroscopy. The patient was transferred to a rehabilitation hospital on day 49. No recurrence was observed during the 4-year follow-up period (Fig. 2c), and the patient died of an unrelated cause.

Discussion

A CT fluoroscopy system has been developed to overcome the lack of real-time display using conventional CT images. CT fluoroscopic guidance, which allows real-time imaging of puncture, insertion of a guidewire, and insertion of the drainage catheter positioned precisely within the intervertebral space, is known to be useful for the treatment of thoracolumbar pyogenic spondylodiscitis (5). Since the cervical spine has a narrower intervertebral space than the other vertebral segments and the vertebral artery runs nearby, drain insertion into the cervical intervertebral space requires a more accurate procedure than drain insertion into the thoracolumbar intervertebral space. Therefore, the CT fluoroscopy-guided procedure plays an essential part in performing drain insertion for cervical pyogenic spondylodiscitis.

The cervical intervertebral space is impossible to reach using the same puncture route used at the thoracolumbar spine. This may be one of the reasons for the lack of reports about CT fluoroscopy-guided percutaneous intervertebral drain insertion in the cervical spine. The cervical spine, which has different anatomical features from the thoracolumbar spine, has wide articular processes, the transverse foramen through which the vertebral artery passes, and the uncinat

Main points

- Cervical pyogenic spondylodiscitis is rare, but is more likely to be severe than pyogenic spondylodiscitis in other vertebral segments.
- The CT fluoroscopy-guided procedure plays an essential part in performing drain insertion for cervical pyogenic spondylodiscitis.
- CT fluoroscopy-guided percutaneous cervical intervertebral drainage insertion using a lateral approach and simultaneous intravenous contrast enhancement might be a safe and useful technique.

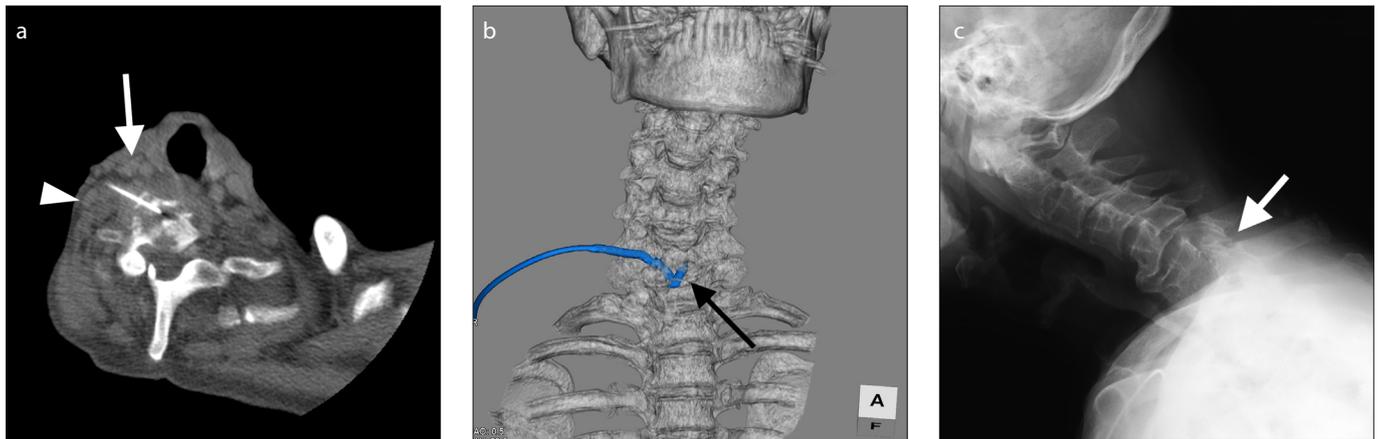


Figure 2. a–c. CT fluoroscopy-guided percutaneous intervertebral drain insertion. CT fluoroscopic image (a) shows that an 18 G needle has been inserted into the intervertebral space through the space between the carotid sheath (*arrow*) and the scalene muscle (*arrowhead*). CT volume rendering image (b) shows that the tip of an 8 F pigtail catheter has been inserted into the C6–C7 intervertebral space (*arrow*). Follow-up radiograph taken 16 months after the drainage (c) shows that there is no progression of vertebral body destruction and a narrowing of the C6–C7 intervertebral space remains (*arrow*).

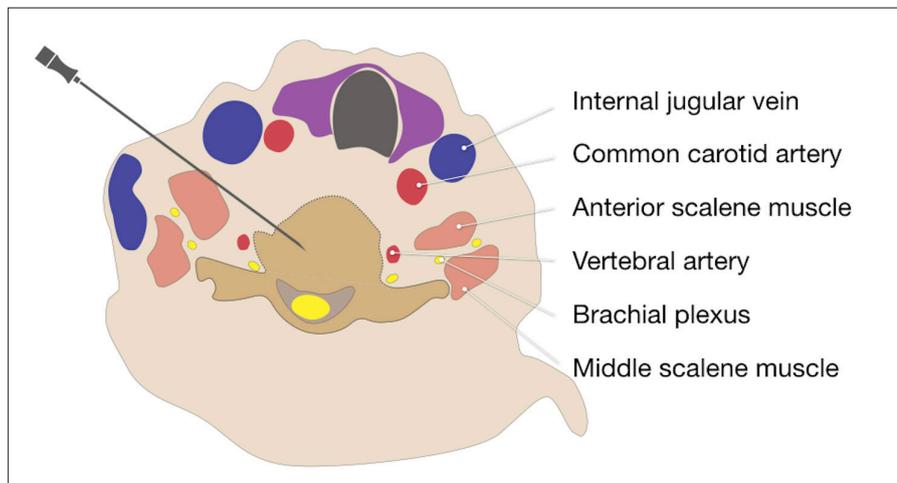


Figure 3. Schematic of the lateral approach at the level of the C6–C7 intervertebral space. The patient is placed in the supine position. The needle is inserted from the lateral side of the neck and is advanced between the carotid sheath and scalene muscle until the tip of the needle reaches the C6–C7 intervertebral space.

process on the side edges of the top surface of the body. Since these anatomical structures would be encountered on the puncture route in the posterior approach, the posterior approach cannot be used in the cervical spine and the vertebral artery is the structure with the highest risk of injury in the posterolateral approach. Therefore, we employed a lateral approach (Fig. 3), which is an approach route that has been used in obtaining a biopsy specimen from the lower cervical spine region and whose details are described elsewhere (6, 7). Moreover, we employed simultaneous intravenous contrast enhancement to fur-

ther reduce the potential risk of vascular injury during the procedure (8).

Immobilization is recommended for the treatment of pyogenic spondylodiscitis (3), and the neck collar was used in the present case as well. The cervical spine is a highly mobile part compared to other parts of the spine. Therefore, immobilization is considered to be important in the treatment of cervical pyogenic spondylodiscitis. In the present case, the catheter was not damaged or dislocated from the intervertebral space. A further study on the safety of placing a catheter in the cervical intervertebral space should be conducted.

In conclusion, we successfully performed CT fluoroscopy-guided percutaneous intervertebral drain insertion for cervical pyogenic spondylodiscitis.

Conflict of interest disclosure

The authors declared no conflicts of interest.

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