ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

www.surgicalneurologyint.com

Surgical Neurology International
Editor-in-Chief: Nancy E. Epstein, MD, NYU Winthrop Hospital, Mineola, NY, USA.
SNI: Unique Case Observations
Editor
S. Ather Enam, MD, PhD
Aga Khan University, Karachi, Sindh, Pakistan

SNI
Open Access

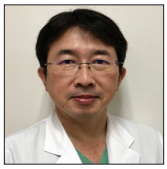
Case Report

Intraoperative use of cone-beam computed tomography for the safe epidural blood patch: Technical case report

Takashi Kawahara[1], Ryuji Awa[2], Masamichi Atsuchi[1], Kazunori Arita[2]

Departments of Neurosurgery, [1]Atsuchi Neurosurgical Hospital, [2]Kagoshima University, Kagoshima City, Kagoshima Prefecture, Japan.

E-mail: *Takashi Kawahara - takashi.kawahara@jifukai.jp; Ryuji Awa - kurikuriawaawa@yahoo.co.jp; Masamichi Atsuchi - atsuchi0824@yahoo.co.jp; Kazunori Arita - karita@m2.kufm.kagoshima-u.ac.jp



***Corresponding author:**
Takashi Kawahara,
Department of Neurosurgery,
Atsuchi Neurosurgical Hospital,
4-13 Higashisengoku-cho,
Kagoshima City, Kagoshima
Prefecture 8900016, Japan.

takashi.kawahara@jifukai.jp

Received : 22 March 19
Accepted : 10 May 19
Published : 19 June 19

DOI
10.25259/SNI-211-2019

Quick Response Code:

ABSTRACT

Background: Epidural blood patch (EBP) is a common method utilized to treat intracranial hypotension, and secondarily, to treat unintentional dural puncture. The authors propose an effective technique for correct epidural needle positioning during EBP using cone-beam computed tomography (CB-CT) images.

Case Description: A 31-year-old female underwent an EBP. Following confirmation of the spinal level of the cerebrospinal fluid leakage, the ideal trajectory for the proposed EBP was assessed from the entry point on the skin to the spinolaminar line under CB-CT imaging. The epidural needle was then gently advanced along the appropriate trajectory. At the 10 mm mark, behind the spinolaminar line, the inner needle was removed. This allowed for slow advancement of the outer needle until its tip reached the epidural space, and its location was confirmed by the "loss of resistance to the saline technique." Using biplane epidurography, the spread of dye within the epidural space for appropriate localization was confirmed. In this case study, the patient's postural headache immediately improved.

Conclusion: Using the CB-CT technique described, a patient successfully underwent EBP without complications.

Keywords: Cone-beam computed tomography, Dural puncture, Epidural blood patch, Spontaneous intracranial hypotension

INTRODUCTION

The first-line treatment for spontaneous intracranial hypotension (SIH) is bed rest and hydration. After the failure of conservative management, the second line of therapy for SIH is the utilization of an epidural blood patch (EBP) that reportedly cures or resolves symptoms in 60%–90% of cases.[2,3] Cerebrospinal fluid (CSF) leakage caused by dural puncture may worsen in patients with SIH. Here, we describe a new method to correctly insert needles into the epidural space, while minimizing the risk of dural puncture using cone-beam computed tomography (CB-CT).

CASE REPORT

A 31-year-old female presented with orthostatic headache and neck pain, exacerbated by standing. The magnetic resonance imaging showed diffuse pachymeningeal enhancement. The CT myelogram revealed a CSF leak at C7-T1 level [Figures 1 and 2]. The target level of the EBP was set to C7–T1. With the patient prone, using CB-CT, the targeted spinal cord

level was confirmed. The trajectory for insertion of the epidural needle was documented on reconstructed CB-CT sagittal images. The distance from the entry point on the skin to the spinolaminar line was measured and the epidural needle was advanced up to 10 mm behind the spinolaminar line [Figures 3 and 4]. Once the inner needle was removed, the outer cannula, attached to a syringe filled with saline, was slowly advanced until one could feel a "loss of resistance" (e.g., within the epidural space, about 4 mm behind the spinolaminar line). The needle position was then confirmed with biplane epidurography (i.e., documenting the spread of contrast dye evenly and symmetrically) [Figure 5]. Next, about 20 cc of autologous blood was gradually injected through the needle. The patient's symptoms of SIH progressively and rapidly improved. Fourteen months later, the patient was asymptomatic.

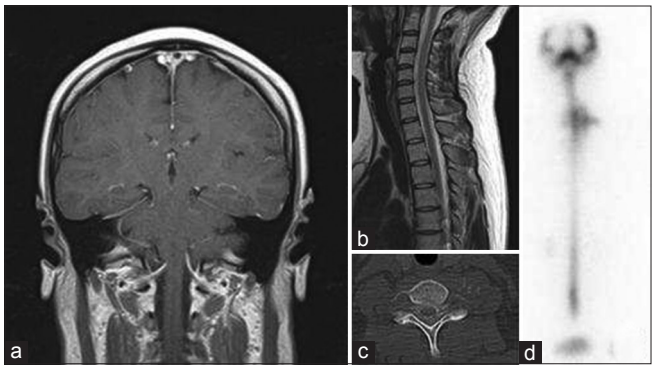


Figure 1: (a) Contrast-enhanced coronal magnetic resonance image showing minimal thickness and contrast enhancing in the bilateral dura. (b) Spinal T2-weighted magnetic resonance image showed the fluid collection in the posterior cervicothoracic level. (c) Myelography with computed tomography (myelography) showed double ring sign at the cervicothoracic junction. (d) Radioisotope cisternography 1 h after injection of tracer revealed apparent leakage of tracer from cervicothoracic junction.

Figure 2: Patient was placed in prone position between the arms of cone-beam computed tomography machine.

DISCUSSION

Clinical presentation and treatment of spontaneous intracranial hypotension

Patients with SIH typically present with orthostatic headache, neck pain, vertigo, tinnitus, visual disturbances, and cognitive dysfunction. Prompt treatment generally produces excellent results, while delayed diagnoses and interventions can lead to serious morbidity. After initial treatment with bed rest and rehydration, EBP provides a high rate of cure/improvement in SIH symptoms/signs.[6]

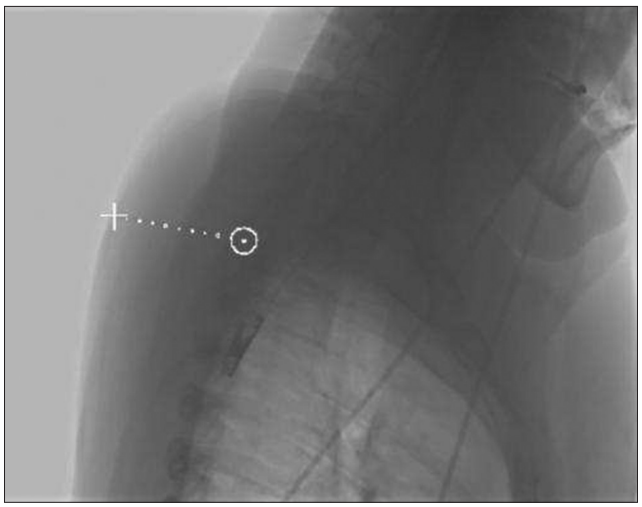


Figure 3: Costal, blade bones, bulky soft tissue, and air around the thin neck disturb correct interpretation of position of epidural needle under radiographic observation.

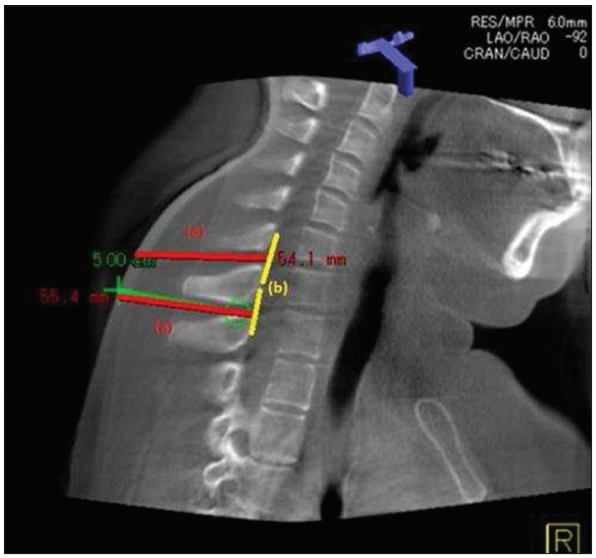


Figure 4: Cone-beam computed tomography scanning was done and the distance (a) from the entry point on the skin to the spinolaminar line (b) was measured on the sagittal reconstruction image.

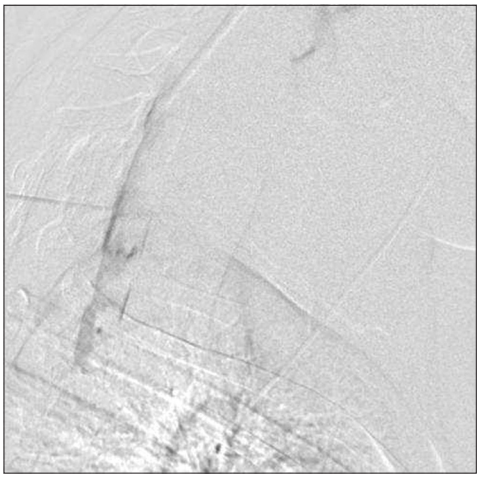


Figure 5: Digital subtraction epidural imaging confirmed that the epidural needle was punctured correctly.

Magnetic resonance/computed tomography findings

With intracranial hypotension, one typically sees on MR/CT studies, downward shift of the intracranial structures including the cerebellar tonsils. Further leakage of the CSF due to an unintentional dural puncture may, therefore, result in serious sequelae, including mortality. Inadvertent dural puncture should be prevented in the first place by correctly utilizing radiographic imaging/ultrasound to perform epidural anesthesia.[1,4]

Cone-beam computed tomography for epidural blood patch

Recently, CB-CT has become an essential tool in dentistry, otolaryngology, orthopedics, and interventional radiology.[5] Due to its small size, low tube power device, moderate costs, and easy handling, CB-CT is an effective alternative treatment modality for the safe insertion of a needle into the epidural space when performing EBP. In addition, it minimizes the risk of inadvertent dural puncture.

CONCLUSION

Using the CB-CT technique described, a patient successfully underwent EBP without complications.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Cho KI, Moon HS, Jeon HJ, Park K, Kong DS. Spontaneous intracranial hypotension: Efficacy of radiologic targeting vs blind blood patch. Neurology 2011;76:1139-44.
2. Feltracco P, Galligioni H, Barbieri S, Ori C. Thoracic epidural blood patches in the treatment of spontaneous intracranial hypotension: A Retrospective case series. Pain Physician 2015; 18:343-8.
3. Franzini A, Messina G, Nazzi V, Mea E, Leone M, Chiapparini L, *et al.* Spontaneous intracranial hypotension syndrome: A novel speculative physiopathological hypothesis and a novel patch method in a series of 28 consecutive patients. J Neurosurg 2010;112:300-6.
4. Seinfeld J, Sawyer M, Rabb CH. Successful treatment of paradoxical cerebral herniation by lumbar epidural blood patch placement: Technical case report. Neurosurgery 2007;61:E175.
5. Stratemann SA, Huang JC, Maki K, Miller AJ, Hatcher DC. Comparison of cone beam computed tomography imaging with physical measures. Dentomaxillofac Radiol 2008;37:80-93.
6. Yoon SH, Chung YS, Yoon BW, Kim JE, Paek SH, Kim DG, *et al.* Clinical experiences with spontaneous intracranial hypotension: A proposal of a diagnostic approach and treatment. Clin Neurol Neurosurg 2011;113:373-9.

How to cite this article: Kawahara T, Awa R, Atsuchi M, Arita K. Intraoperative use of cone-beam computed tomography for the safe epidural blood patch: Technical case report. Surg Neurol Int 2019;10:110.