Clinical Reports

Epidural abscess after combined spinal-epidural block

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Purpose: We report the first case of abscess formation after combined spinal-epidural block (CSE). Penetration of the dura in CSE may constitute an additional risk of subarachnoid spread of bacteria when post-puncture epidural infection is present.

Clinical Features: The combination of a spinal and a continuous epidural block (CSE) using a needle through needle technique was used in a 72-yr-old man for reconstructive vascular surgery of the lower limb. On the fourth postoperative day the patient demonstrated back pain, fever, and exudation of pus from the CSE-puncture site. An epidural abscess was diagnosed by magnetic resonance imaging and subsequently an emergency hemilaminectomy was performed. Physical examination and surgery did not show evidence of bacterial spread into the subarachnoid space.

Conclusion: Epidural abscess formation after CSE may increase the risk of bacterial spread into the subarachnoid space. In this case spontaneous exudation and surgical drainage of abscess material may have prevented intrathecal infection. Rapid diagnosis and treatment of an epidural abscess appears particularly essential after CSE to prevent neurological sequelae.

Objectif : Les auteurs rapportent un premier cas d'abcès consécutif à un bloc combiné spinal-épidural (CSE). Avec le CSE, la perforation de la dure-mère peut constituer un facteur additionnel de risque de transmission bactérienne en présence d'une infection épidurale consécutive à la ponction.

Éléments cliniques : Un bloc combiné spinal et rachidien (CSE) était installé avec la technique de la double aiguille chez un homme de 72 ans pour une chirurgie de reconstruction vasculaire du membre inférieur. Quatre jours après l'intervention, il se plaignait de lombalgie, était fébrile et du pus se formait au site de la ponction du CSE. Un diagnostic d'abcès épidural était porté grâce à l'imagerie par résonance magnétique et, par la suite, une hémilaminectomie était réalisée en urgence. L'examen physique et l'exploration chirurgicale n'ont pas montré de transmission bactérienne dans l'espace sous-arachnoïdien.

Conclusion : La formation d'un abcès épidural après un bloc CSE peut augmenter le risque de transmission bactérienne dans l'espace sous-arachnoïdien. Dans le cas présent, l'exsudation spontanée et le drainage chirurgical pourraient avoir évité une infection intrathécale. Pour prévenir les séquelles neurologiques, un diagnostic précoce et un traitement immédiat de l'abcès épidural semblent tout à fait indispensables.

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THE combination of a spinal and a continuous epidural block (CSE) using a needle-through-needle technique is a new trend in regional anaesthesia. Major advantages claimed for the technique are rapid onset, excellent motor blockade and reduced doses of local anaesthetic due to the spinal approach, and the possibility of extending the duration of analgesia via the epidural catheter into the postoperative period. Epidural abscess is a rare complication of epidural anaesthesia. Penetration of the dura in CSE may constitute an additional risk of subarachnoid spread of bacteria in the presence of an epidural abscess.

Clinical Report

A 72-yr-old man 191 cm in height and weighing 98 kg was scheduled for reconstructive vascular surgery of a stenotic right profunda femoral artery. In addition to general peripheral vascular disease, the patient had coronary artery disease with a myocardial infarction three years earlier leading to cardiac aneurysm of the posterior wall and decreased left ventricular function. Type II diabetes mellitus was treated with glibenclamide 3.5 mg twice daily and Hodgkins disease was cured after therapy in 1974. The patient was a heavy smoker. Except for glibenclamide and heparin-sodium 5000 IU *sc* daily during hospitalisation, the patient received no other medication. After the anaesthetist's preoperative visit, CSE was considered the best technique to provide pain relief during the operative and postoperative periods.

The patient was premedicated with 7.5 mg midazolam *po*. Invasive monitoring of blood pressure via the radial artery and central venous access via the basilic vein were established in addition to ECG and pulse oximetry. Oxygen three L·min⁻¹ was supplied via nasal insufflation throughout the procedure.

After placing the patient in the lateral decubitus position, the puncture site was disinfected with an iodine solution three times and, after the last, left to dry. Fenestrated sterile drapes were used to cover the puncture site. The anaesthetist used sterile gloves, gown, facemask and a surgical hood.

For the CSE a disposable sterile set (Becton Dickinson, Heidelberg, Germany) was used. An 18 Gauge Tuohy Weiss needle was introduced into the epidural space via the L3-4 interspace on the first attempt using the loss of resistance to saline technique. On aspiration, no blood or cerebrospinal fluid could be drawn. A long length 27 Gauge Whitacre needle was passed through this needle and the dura mater was punctured. Reflux of cerebro-spinal fluid was observed. After injection of 3.0 ml hyperbaric bupivacaine 0.5%

(15 mg) the spinal needle was withdrawn from the Tuohy Weiss needle and an epidural catheter was introduced 4 cm cephalad into the epidural space without difficulty. The Tuohy Weiss needle was removed, a sterile sponge was placed on the puncture site and the catheter was covered with tape. Anaesthesia rapidly reached L1/L2. A bolus of 100 µg fentanyl and 10 ml isobaric bupivacaine 0.5% were given through the epidural catheter to provide sufficient anaesthesia up to a sensory level of T9 according to surgical needs. Two hours later an additional injection of 7 ml bupivacaine 0.25% was given. A bacterial filter (0.22 µM) was used for all injections through the epidural catheter. There were no apparent surgical or anaesthetic complications in the operative and early postoperative periods. The epidural catheter was removed eight hours postoperatively on the ward. The unremarkable puncture site was covered with a sterile Band Aid. Beginning the next day the leucocyte count increased to a maximum of $17.8 \times 10^9 \cdot l^{-1}$ on the fourth day after surgery. On this day the patient complained of backache and a temperature spike of 38.2°C was observed. On examination, the CSE-puncture site was found to be erythematous and indurated. Furthermore, spontaneous exudation of pus was observed. Physical examination did not reveal any neurological signs with the exception of slight nuchal rigidity. With a diagnosis of local abscess broad spectrum antibiotic therapy with cefmenoxim 1 g twice daily, cefotaxim 2 g twice daily and tobramycin 80 mg three times a day was initiated. On the same day, magnetic resonance imaging (MRI) showed a mass at the level of the L 3-4 interspace, involving the paravertebral tissue. With gadolinium-DTPA contrast peripheral enhancement of the mass was demonstrated consistent with the diagnosis of an epidural abscess (Figures 1, 2). Immediately thereafter, emergency hemilaminectomy was performed. About 4 ml pus, most of it located in the epidural space, were drained. The dura was found to be penetrated at one spot, consistent with the CSE technique. The arachnoid, however, appeared to be intact and there was no evidence of bacterial spread into the subarachnoid space. After intraoperative lavage, suction drainage was established and the drain was rinsed with a neomycin solution (32,500 IU in 10 ml saline) twice daily for the following three days. The pus taken during the operation grew staphylococcus aureus in the microbiological culture at $36 \pm 1^\circ\text{C}$ after 48 hr. According to susceptibility testing, antibiotic therapy was altered to a combination of imipenem/cilastin and rifampicin. Sixteen days after neurosurgery, recovery of the patient was complicated by formation of a spinal fluid fistula where the suction drainage was located. After treatment, the patient recovered completely without neurological sequelae.

FIGURE 1 Sagittal (600/12) gadolinium-enhanced T1-weighted MR image showing the puncture site (arrow) and the intraspinal but extradural abscess (arrowhead), with peripheral contrast enhancement.

FIGURE 2 Axial (810/12) gadolinium-enhanced T1-weighted MR image showing the puncture site (arrow) and the intraspinal but extradural abscess (arrowhead), with peripheral contrast enhancement. The paravertebral abscess is demonstrated along the spinous process.

Discussion

Abscess formation associated with epidural catheterization is rare.^{1,2} Scott *et al.* reported one case of epidural abscess in 506,000 patients after epidural anaesthesia for delivery.³ Epidural abscess, in general, was diagnosed in less than two cases per 10,000 hospital admissions.⁴ Reports addressing the complications of epidural analgesia showed a much higher incidence of epidural abscess formation.^{5,6} In the general hospital population risk factors associated with epidural abscess formation were found to be malignancy, poor state of general health, generalized infection and localized infection in the proximity of the puncture site, degenerative joint disease, *iv* drug abuse, diabetes mellitus and immune deficiency.⁷

Possible routes of infection include direct inoculation of bacteria in the subcutaneous tissue at the time of catheter placement. Other potential causes are haematogenous seeding of bacteria from a remote septic focus or by insertion of central venous and arterial lines, contamination of the injectate or infection by migration of bacteria from the exit site of the catheter downwards.

Back pain and nuchal rigidity are reported to be early symptoms of epidural abscess. Signs of inflammation at the catheter exit site may be indicative of local infection. General symptoms e.g., fever, chills or an elevated leucocyte count may be further signs of infection. If not treated aggressively symptoms can progress to root pain, paraesthesia and urinary retention. Among the late symptoms are muscle weakness and loss of sphincter function followed by irreversible paraplegia.^{8,9}

The onset of signs and symptoms of an epidural abscess can vary from 48 hr to one month after epidural or spinal anaesthesia.^{10,11} In our case, the first symptoms occurred on the fourth postoperative day. The location of the abscess at the puncture site, penetration into the paravertebral tissue and culture of *Staph. aureus* from the intraoperative swab may indicate inoculation of this organism during insertion of the catheter. Haematogenous spread facilitated by haematoma during epidural catheter insertion or removal could be another cause of epidural abscess formation. In our patient, invasive haemodynamic monitoring may have been a source of bacteraemia. Haematogenous spread is thought to be responsible for 26–50 % of all epidural abscesses.⁷ Our patient also suffered from diabetes mellitus (type II), a known risk factor present in 34% of patients with epidural abscess.⁷ Contamination of the injectate and secondary infection by migration of organisms along the catheter have been discussed as a cause of abscess formation. However, this seems unlikely in

this case because of the use of a bacterial filter (0.22 µm) and the short duration of epidural catheterisation, respectively.

Cord compression with subsequent ischaemia is believed to be the major mechanism leading to neurological sequelae in epidural abscess formation.¹² Spinal vein thrombophlebitis and thrombosis due to an inflammatory stimulus have been considered less important factors for spinal damage because the dura seems to act as a barrier withholding the inflammatory thrombotic effects of the abscess on the spinal vessels.¹² In CSE, however, this mechanism might be of greater relevance, because the dura is penetrated just before the epidural catheter is placed. Cases of bacterial meningitis after CSE have been described.^{13,14}

However, in the patient presented here, clinically and according to the neurosurgical findings the infection seemed to be confined to the epidural space. One possible explanation is that, although the dura was damaged by the 27 gauge Whitacre needle during the CSE procedure, the small puncture was closed by the arachnoid before bacterial invasion could take place. The arachnoid was probably the last barrier against the bacterial invasion into the subarachnoid space.

The origin of the spinal fluid fistula 16 days after neurosurgery is not clear. A persisting hole caused by the CSE procedure would have allowed bacterial spread into the subarachnoid space, which did not take place. Neurosurgical intervention with extensive drainage and rinsing of the abscess could have also caused reopening of the puncture.

All authors stress the importance of rapid diagnosis and treatment once epidural abscess formation is suspected because neurological sequelae may develop quickly.^{3,4,7} This seems to be of particular importance with the CSE technique because the dura, as a natural barrier, is violated. If epidural abscess is suspected, MRI for confirmation of the diagnosis should be performed immediately. Nonsurgical therapy of epidural abscess has been advocated for cases of a localized abscess with the absence of neurological deficit and identification of the causative organism.¹⁵ However, abscess progression despite appropriate antibiotic therapy has been described.^{4,16} In the case presented here the threat of an increasing abscess following a decreased path of resistance into the subarachnoid space favours surgical decompression in addition to broad spectrum antibiotic therapy until the antimicrobiogram allows for more specific treatment.

Perioperative epidural catheters should be removed as soon as possible because the epidural analgesia provided through the catheter may disguise the onset of signs and symptoms of abscess formation. Furthermore,

the incidence of infection related to epidural catheters appears to be higher after catheterisation for longer than two days.^{5,6,17,18} Daily inspection of the CSE puncture site could allow for early detection of local signs of inflammation. The need for aseptic precautions throughout the CSE-procedure must be emphasized.

Conclusion

Rapid onset and reduction of local anaesthetic requirement are the major advantages of CSE. Compared with epidural anaesthesia alone, penetration of the dura in CSE may constitute an additional risk of subarachnoid spread of bacteria when post-puncture epidural infection is present.

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