Extensive Sensory Block Caused by Accidental Subdural Catheterization during Epidural Labor Analgesia

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A 32-year-old parturient requested epidural analgesia for labor. A lumbar epidural block was performed at the L1-2 interspace. Thirty minutes after the loading dose of the local anesthetic mixture, she suffered numbness in both arms and high sensory block up to the C6 dermatome without significant motor blockade. The retained epidural catheter was later confirmed radiologically to be in the subdural space. Accidental subdural catheterization is a rare complication of epidural block. Due to the smaller potential space, a subdural injection usually produces a high level block disproportional to the volume injected. Thus, patients receiving epidural block should be closely monitored following injection of local anesthetics regardless of the concentration or volume administered. *(Chang Gung Med J 2006;29:607-11)*

Key words: subdural catheterization, epidural labor analgesia.

The subdural space lies between the arachnoid and the dura. There is potential for accidental injection or catheterization of the subdural space during performance of a neuroaxial block.[1-3] Although a recognized complication, accidental subdural catheterization occurs rarely and few practitioners are familiar with its clinical presentation. We report a case of unexpected high sensory block during labor epidural analgesia. Radiologic contrast study confirmed that the catheter was in the subdural space.

CASE REPORT

A 32-year-old primigravid woman at 41 weeks gestation was admitted to the hospital for induction of labor. She requested an epidural block for pain relief. Before the procedure, an intravenous infusion of lactated Ringer's solution 500 ml was given. With the patient in a left lateral decubitus position, the L1-2 epidural space was easily identified using the loss-of-resistance to air technique with an 18-gauge Tuohy needle with the bevel oriented cephalad. An epidural catheter with an open end and three lateral eyes (Portex Minipack, Hythe, UK) was threaded through the needle with minimal resistance without eliciting paresthesia or other discomfort. An estimated 5 cm was left in the presumed epidural space and aspiration revealed no blood or cerebrospinal fluid (CSF). A test dose of 3 ml of 0.67% lidocaine and fentanyl 3 μg/ml with 1:300,000 epinephrine was injected and the epidural catheter was secured. The test dose produced no detectable sensory or motor changes after 3 minutes and subsequently 12 ml of the same mixture was given by slow incremental injection over 8 minutes after the patient turned to the supine position. Fifteen minutes after loading dose was given, the parturient felt that contraction pains were much improved without any motor block-

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ade. Maternal vital signs and the fetal heart beat recording were within the normal ranges.

Thirty minutes later, the patient began to notice numbness in both arms. Testing of sensation to cold revealed sensory block from T10 to C6. No significant motor weakness was found. The conjunctiva were injected, and she complained of a stuffy nose. However, neither ptosis nor miosis was noted. There was no loss of consciousness or impairment of respiration and speech. Vital signs and fetal heart rate remained stable. Over the next 60 minutes the block slowly regressed and labor pains ensued. The obstetrician then decided to perform a cesarean section due to failure of labor progression. Because of the unusual block pattern, the anesthesiologist decided to perform spinal anesthesia at a lower level with enough space for betadine skin cleansing. The catheter was retained to facilitate further investigation. After placing the patient in the right lateral position, a lumbar puncture was performed via the paramedian approach at the L3-4 level using a 26-gauge Greene spinal needle with the bevel aligned parallel to the long axis of the meninges. When free flow of CSF was confirmed, 0.5% heavy bupivacaine solution 2.2 ml was slowly injected without barbotage. A dense lower extremity motor block was obtained and the patient reported sensory block up to the C6 level without ventilatory impairment. The operation proceeded smoothly and a vigorous male baby, body weight 3660 g, was delivered.

On the second postoperative day, with the patient's permission and consent, 10 ml of nonionic contrast medium, iotrolan, was injected through the catheter to investigate the catheter position. The spread of the dye was shown to extend exclusively in the cephalic direction with some delineation of the roots which is characteristic of subdural injection (Fig. 1). Subsequent computed tomographic (CT) scanning confirmed the dye was within the subdural space (Fig. 2). The patient had an uneventful recovery after the cesarean section and was discharged with no neurological deficits.

Fig. 1 Anterior-posterior view of the thoraco-lumbar spine shows contrast medium extending exclusively in the cephalic direction with some delineation of the nerve roots (arrows), which is characteristic of subdural injection.

DISCUSSION

Epidural nerve blocks occasionally exhibit an atypical pattern of spread. This may be caused by accidental injection into the subarachnoid or subdural space. Subarachnoid injection is characterized by abrupt onset of dense motor block and profound hemodynamic compromise, which can include respiratory arrest when the block extends to the brain stem level. The subdural space lies between the dura and arachnoid matter which is relatively narrow in the spine. Although it has been reported, accidental subdural injection during performance of an epidural block is rare and not every practitioner is familiar with its clinical presentation. The features of a subdural block are a delayed onset of an extensive sensory block with little or no motor block and mild effects on vital signs.[4,5] This occurs because the sub-

Fig. 2 Computed tomography performed after contrast medium injection demonstrates unequivocally that the catheter is in the subdural space (arrow). The dense collection of contrast medium is confined to the posterior aspect of the spinal canal with some delineation of the nerve roots.

dural compartment has more potential space posterior and laterally, so there is partial sparing of the anterior roots which transmit the motor and sympathetic fibers[6-8] (Fig. 2). The slow onset and relative sparing of motor and sympathetic block differentiates it from unintentional subarachnoid injection which also results in extensive block.[2,9]

There have been several reports of accidental subdural catheterization during performance of epidural block, most of which were proved by clinical presentation and indirect radiographic evidence of the distribution of contrast medium on plain radiographs. Our case is valuable because axial CT scanning demonstrated more clearly the distribution of the subdural injection. The dense collection of contrast medium in the subdural space was confined to the posterior aspect of the spinal canal, with a small amount extending laterally, delineating the nerve roots (Fig. 2). This picture differs greatly from that of epidural injection where contrast medium disperses outside the spinal canal.[10]

Most of the reported cases, including ours, occurred in obstetric patients, especially those receiving labor analgesia.[1,4-8] A possible explanation may be that the positive epidural pressure recorded in parturients makes identification of the epidural space difficult, leading to dural piercing and subsequent unintentional subdural catheterization.[11] Anesthesiologists should take precautions during practice of epidural block for this group of patients and observe for any unusual block pattern.

When performing an epidural block, negative aspiration of CSF and administration of a test dose are recommended as a safeguard to avoid extensive spinal block. Nevertheless, it is possible that there will be no return of CSF when inadvertent subdural entry occurs.[9] Consequently, negative aspiration during the test dose plus delayed onset of sensory block sometimes may lead the practitioner to overlook subdural catheterization.[12] There is no strategy that has been proven effective to prevent subdural catheterization. Although a poorly performed procedure with excessive manipulation and dural trauma has been suggested as a predisposing factor, most of the reported cases had uncomplicated catheter placements.[13] In view of that, patients having epidural block should be closely monitored following injection of local anesthetics, regardless of the concentration or volume administered.

Once subdural block occurs, there are no clear guidelines for subsequent management. Many authors suggest applying the “if in doubt, take it out” maxim and proceeding with relocating epidural anesthesia to another space or shifting to a subarachnoid block.[14] However, as depicted from the CT scan in our case, cephalad spread of local anesthetics after subarachnoid injection could be enhanced due to decreases in CSF volume caused by a space-occupying effect after subdural injection. General anesthesia may as well be employed, but it should be kept in mind that intravenous succinylcholine may induce severe bradycardia in the presence of a high sympathetic block.[14]

In conclusion, accidental subdural placement is possible during performance of epidural catheterization. It is thus mandatory to keep close observation for any atypical block pattern after epidural administration of anesthetics, regardless of the dosage. Anesthesiologists should be able to readily recognize this complication to prevent any further devastating catastrophe.[15] Once in doubt, relocate another catheter to another space or switch to another technique. A definite diagnosis of the site of catheter misplacement can be obtained from radiological examination by injection of contrast medium through the catheter.

REFERENCES

1. Manchanda VN, Murad SH, Shilyansky G, Mehringer M. Unusual clinical course of accidental subdural local anesthetic injection. Anesth Analg 1983;62:1124-6.
2. McMenemin IM, Sissons GR, Brownridge P. Accidental subdural catheterization: radiological evidence of a possible mechanism for spinal cord damage. Br J Anaesth 1992;69:417-9.
3. Stevens RA, Stanton-Hicks MD. Subdural injection of local anesthetic: a complication of epidural anesthesia. Anesthesiology 1985;63:323-6.
4. Smith GB, Barton FL, Watt JH. Extensive spread of local anaesthetic solution following subdural insertion of an epidural catheter during labour. Anaesthesia 1984;39:355-8.
5. Boys JE, Norman PF. Accidental subdural analgesia: A case report, possible clinical implications and relevance to “massive extradurals”. Br J Anaesth 1975;47:1111-3.
6. Collier CB, Gatt SP, Lockley SM. A continuous subdural block. Br J Anaesth 1993;70:462-5.
7. Lee A, Dodd KW. Accidental subdural catheterisation. Anaesthesia 1986;41:847-9.
8. Collier CB. Accidental subdural block: four more cases and a radiographic review. Anaesth Intensive Care1992;20:215-25.
9. Orbegozo M, Sheikh T, Slogoff S. Subdural cannulation and local anesthetic injection as a complication of an intended epidural anesthetic. J Clin Anesth 1999;11:129-31.
10. Savolaine ER, Pandya JB, Greenblatt SH, Conover SR. Anatomy of the human lumbar epidural space: new insights using CT-epidurography. Anesthesiology 1988;68:217-20.
11. Messih MN. Epidural space pressures during pregnancy. Anaesthesia. 1981;36:775-82.
12. Crosby ET, Halpern S. Failure of a lidocaine test dose to identify subdural placement of an epidural catheter. Can J Anaesth 1989;36:445-7.
13. Lena P, Martin R. Subdural placement of an epidural catheter detected by nerve stimulation. Can J Anaesth 2005;52:618-21.
14. Rowbottom SJ. Continuous subdural block. Br J Anaesth 1993;71:607.
15. Mizuyama K, Dohi S. An accidental subdural injection of a local anaesthetic resulting in respiratory depression. Can J Anaesth 1993;40:83-4.

硬脊膜外無痛分娩時導管意外置入硬脊膜下腔導致高位脊椎感覺神經阻斷

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一位 32 歲孕婦要求施行無痛分娩，我們在腰椎第一、二節間順利放置硬脊膜外導管。三十分鐘後病患抱怨雙手會麻，理學檢查發現感覺神經阻斷到達頸椎第六神經節。並沒有明顯的運動神經遲鈍而生命徵象也維持穩定。保留的硬脊膜外導管，後來經 X 光檢查發現確認意外置入硬脊膜下腔。在執行硬脊膜外神經阻斷時，在罕見的情況下會意外將導管置入硬脊膜下腔。由於其潛在空間較窄，硬脊膜下腔注射藥物常會分布延伸很廣，造成與注入劑量不成比例的高位脊椎神經阻斷。我們報告此例罕見的併發症來提醒相關工作者在執行硬脊膜外注射時，無論注射藥物多寡都應仔細觀察病患的表現，以避免嚴重的後遺症發生。(長庚醫誌 2006;29:607-11)

關鍵字：硬脊膜下腔導管，硬脊膜外分娩止痛。

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