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■ Case Report ■
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Unilateral sudden sensorineural hearing loss after combined spinal-epidural anesthesia for emergency cesarean section -A case report-

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A 30-year-old primigravida with gestational age of 25 weeks and 4 days was admitted for emergency cesarean section. She was diagnosed as pre-eclampsia with fetal distress. We anesthetized the patient through the combined spinal-epidural anesthetic technique, and there was no specific event throughout the surgical procedures and in post anesthetic care unit. Subsequently, she complained of unilateral hearing difficulty in the ward and an otolaryngology consultation was obtained. She was diagnosed with left sudden sensorineural hearing loss in full frequency range after an acoustic examination. She received intravenous and local steroid treatments for 4 weeks. She showed 32 dB on pure tone audiometry after 5 months. However, we could not continue follow-up testing on the patient because she stopped visiting the hospital since the last examination. We reported a case of uncommon unilateral sudden sensorineural hearing loss after a combined spinal-epidural anesthesia for emergency cesarean section. **(Anesth Pain Med 2016; 11: 359-361)**

Key Words: Cesarean section, Combined spinal-epidural anesthesia, Hearing loss.

Combined spinal-epidural anesthesia (CSE) has the benefits of both spinal anesthesia and epidural anesthesia and analgesia. Spinal anesthesia has advantages of rapid onset and effective blockade. With an indwelling epidural catheter, anesthesia can be flexibly maintained, and can also provide a route for postoperative patient controlled analgesia [1]. When cesarean section is performed, spinal anesthesia or CSE is generally used as the anesthesia of choice. Complications of neuroaxial blocks include urinary retention, high or total spinal anesthesia, cardiac arrest, anterior spinal artery syndrome, Horner's syndrome, backache, postdural puncture headache (PDPH), neural injury, bleeding, subdural block, inflammation, infection, and epidural abscess. In this case report, we presented an uncommon case with the complication of unilateral sudden sensorineural hearing loss (SSNHL) after CSE for an emergency cesarean section and discuss the relevant literature.

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CASE REPORT

A 30-year-old woman, primigravida with gestational age of 25 weeks and 4 days with pre-eclampsia and intra-uterine growth retardation (IUGR) was admitted into the emergency room of our hospital after fetal distress signs were observed at a local clinic. For an emergency cesarean section, CSE was performed. While crystalloid fluid (lactated Ringer's solution) was infused at the maximum rate, the patient was placed in the left lateral decubitus position for skin preparation with betadine and then local infiltration was performed using 2% lidocaine. An 18-gauge Tuohy needle was used for the epidural catheter placement. It was inserted 4 cm cephalad into the epidural space at L3-4 by the midline approach. Then 3 ml of 1% lidocaine and 1 : 200,000 epinephrine was injected to rule out the intrathecal or intravascular placement of catheter. After confirmation of proper catheter placement, 0.5% bupivacaine 7 mg and fentanyl 10 μg was injected with a 25-gauge spinal needle (Quincke) on the first try at L4-5. Sensory block level was T6. On arriving in the operating room, blood pressure was 165/86 mmHg, and heart rate was

115 bpm. After anesthetization, the patient's vital sign was gradually stabilized by the start of the surgery (blood pressure 120/60 mmHg and HR 75 bpm). The cesarean section was started, delivery was made in 5 minutes, and immediately carbetocin 100 μg was administered intravenously. When blood pressure was 85/40 mmHg and HR 65 bpm, 10 mg of ephedrine was given intravenously followed by additional ephedrine 5 mg. Blood pressure reached 130/75 mmHg and was maintained within normal range. Ten minutes before the end of operation, patient controlled epidural analgesia (total volume; 230 ml, 0.75% levobupivacaine 225 mg and fentanyl 800 μg in normal saline) was applied with 6 ml of initial starting bolus. Total fluid intake was 1,350 ml, and urine output was 100 ml. The patient was moved to the post anesthetic care unit, and without any specific events, the patient was moved to the ward in an hour. The day after surgery, she complained of left unilateral hearing loss and the otolaryngology consultation was obtained. Four days after surgery, pure tone audiometry results showed complete deafness in full frequency range and left sudden SSNHL was suspected. Her hearing was not improved, so steroids were administered both intravenously and directly into the ear. The patient was later discharged and the patient's progress was observed in the outpatient clinic. Gradually her symptoms were improved (acoustic examination, post-operative day [POD] 4: 77 dB [the pure-tone average threshold at 250, 500, and 1,000 Hz]/12% [speech discrimination score], POD 12: 45 dB/12%, POD 34: 37 dB/20%, POD 62: 37 dB/40%, POD 146: 32 dB/52%). So the administration of steroids was slowly tapered and finally stopped. There was still some hearing deficit after 5 months of surgery, but the patient discontinued outpatient visits and the patient's progress could no longer be observed.

DISCUSSION

For cesarean sections, spinal anesthesia or CSE are usually performed. Although many kinds of complications could occur after neuroaxial blocks, hearing loss is one of the relatively uncommon complications. The diagnosis and management of SSNHL is still controversial. But the definition given by Wilson et al. [2] is most widely accepted, i.e., hearing loss of at least 30 dB in 3 contiguous frequencies in the standard pure-tone audiogram occurring over a period of < 3 days. Various studies have reported a 0.2%-40% occurrence rate for post-spinal anesthesia hearing loss [3-6]. Post-spinal anesthesia hearing loss is temporary, hearing returns to normal in 5-15 days after the occurrence, and hearing loss occurs usually in low frequency range (125-1,000 Hz) with high numbers [3,4]. Also, it happens within 2 days of the spinal anesthesia [3]. Although usually temporary, many articles reported cases of hearing loss lasting 7 months to 2 years [3]. Moreover, complaints of hearing loss are usually in low frequency range, but also occur in full frequency range [5].

Post-spinal anesthesia hearing loss has no clear known etiology. However, cerebrospinal fluid (CSF) leakage due to the dural puncture in spinal anesthesia, same as in PDPH, is considered as the cause [3,5]. CSF leakage due to the dural puncture makes the cerebrospinal fluid pressure drop. The change in CSF pressure is delivered through the cochlear duct to the inner ear, and an endolymphatic hydrops occurs, causing the inner ear's basal membrane's hair cells to change locations and cause an abnormality in the vestibular-cochlear nerve [3,5]. Some medical procedures such as shunt operations for hydrocephalus, myelography, and lumbar punctures in cerebrospinal tests were reported to be associated with hearing loss, supportive of the above mentioned hypothesis [3]. In addition, as PDPH is also caused by CSF leakage, it can be accompanied by SSNHL. However, PDPH and SSNHL do not always emerge simultaneously. Because a small leakage of CSF that is adequate to induce hearing loss may not be sufficient to induce PDPH. Other studies that support the CSF leakage as the cause have reported that hearing loss symptoms were improved by changing the patients' position from sitting to supine [7].

Some reported factors are assumed to contribute to SSHNL.

Firstly, age is a known factor in post-spinal anesthesia hearing loss. This is because the patency of the cochlear duct, which controls the pressure of the inner ear, diminishes with age [3]. Therefore, the pressure change is better delivered through the cochlear duct in younger people than in the elderly. Hence, younger people more commonly experience post-spinal anesthesia hearing loss [3,5]. One article reported that the frequency of post-spinal anesthesia hearing loss is higher in patients < 30 than > 60 years of age [8].

Second, the amount of blood loss during surgery and fluid replaced for deficit could be the cause of hearing loss [3]. Sudden changes in blood volume, intracranial pressure, and osmosis concentration can be factors for hearing loss not only in spinal anesthesia but also in general anesthesia [4,9]. Therefore, adequate blood replacement could increase blood flow to the cochlear duct and prevent post-spinal anesthesia hearing loss [3].

Third, the diameter and the shape of the spinal needles are known to affect the incidence rate of hearing loss. The

incidence of hearing loss is proportional to the diameter of the spinal needles. And Quincke needles (cutting needles) are more apt to lead to hearing loss than Whitacre needles (blunt-tipped needles) [5,10-12]. In one study, 22-gauge spinal needles resulted in 92% hearing loss; whereas, 26-gauge spinal needles resulted in a 29% hearing loss [12].

Last, types of local anesthetics may also play a role. Its characteristics, such as density, concentration, temperature and volume can vary depending on the anesthetic situations. When the local anesthetic is introduced into the subarachnoid space, CSF pressure may be affected. Because they have different osmotic pressure or specific gravity, as a result, the incidence of hearing loss can be different depending upon the type of local anesthetic used [13].

There is also the hypothesis that post-spinal anesthesia hearing loss occurs because of the increase in CSF flowing through the cochlear duct due to an anatomical functional abnormality. However, this hypothesis is not very convincing because the cochlear duct patency reduces with age, and cochlear ducts functionally close in > 50% of healthy adults [5].

One study revealed no demonstrable hearing loss after neuroaxial blocks, including spinal anesthesia or epidural analgesia, in the obstetric population [6]. On the other hand, Michel and Brusis [14] have suggested that the individual risk of hearing loss after dural puncture is not predictable.

In this case, the patient was 30 years old and had peri-operative low blood pressure, which are factors that increase the incidence rate of hearing loss. Also, she received epidural analgesia, which might increase CSF pressure by the bolus injection. Transient but altered CSF pressure might have had another effect on cochlear hair cell function [6].

This was a rare case of a patient from the obstetric population; in addition, the hearing loss was in full frequency range rather than the commonly reported low frequency range. Even though the patient in the present case consulted with the otolaryngology department immediately after her symptoms emerged, hearing loss persisted even until 5 months after operation. Currently, there is no gold standard treatment for post-spinal anesthesia hearing loss. Hearing recovers naturally with no special treatment except symptomatic treatment like steroid therapy, which was used in the present patient. If symptoms are severe, using an epidural blood patch with autologous blood as in PDPH treatment is reportedly effective [5]; but it was not used in this patient. Method for complete prevention of hearing loss is a challenge to the anesthesiologists. Hearing loss has a low incidence rate, is not an emergency life threatening situation, and is a complication that usually recovers naturally. However, it is still an alarming experience for the patient and anesthesiologist. Therefore, anesthesiologists should be aware that post-spinal anesthesia hearing loss could occur in patients with above mentioned risk factors. Informing patients about the possible complications in advance would help in patients care. Also, when hearing loss occurs, consultation with other department faculties and expert treatment should be considered.

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