J Anesth (2006) 20:223–226
DOI 10.1007/s00540-006-0405-x

Journal of
Anesthesia

Spinal anesthesia using a continuous spinal catheter for cesarean section in a parturient with prior surgical correction of scoliosis

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Abstract
This case report demonstrates the successful anesthetic management of cesarean section for a 29-year-old primiparous parturient with a past history of a scoliosis operation at 13 years of age. An Isola hook and screw-rod system had been implanted as posterior spinal instrumentation at the level of T3-L3. We titrated hyperbaric bupivacaine 7 mg combined with fentanyl 15 μg through a continuous spinal catheter, placed with a catheter-over-needle technique in order to avoid unintentional wide spread of anesthetic agents. The anesthetic level was T4 at the start of the operation. Her surgery was carried out without any problems. Headache, as a dural tap-related complication, was not observed. Spinal anesthesia with the titration of anesthetic agents for cesarean section is considered to be one of the choices for a parturient who has had spinal instrumentation.

Key words Continuous intrathecal analgesia · Cesarean section · Over-the-needle-catheter · Scoliosis

Introduction

Idiopathic scoliosis is a rotational deformity of the spine. In order to prevent the natural progression of cardio-respiratory and ambulatory impairment, it usually needs surgical intervention. For the correction of the spine deformity, a metal rod, such as Harrington instrumentation, has been used for the past few decades.

Because congenital scoliosis is more frequent in females than in males [1] and because the cesarean delivery rate is greater in women with corrected scoliosis [2], a strategy for obstetric anesthesia in parturients with prior spinal surgery is required. Epidural anesthesia is usually preferred over spinal anesthesia for these patients, because, with single-shot spinal anesthesia it is impossible to titrate the anesthetic agent, resulting in an unexpected spread of the analgesic effect. However, reports have concluded that epidural anesthesia for cesarean section is safe but not always successful in a parturient with prior spinal surgery [3–5]. Therefore, continuous spinal anesthesia with the titration of the anesthetic is expected to provide a new strategy for the patient in whom epidural anesthesia may be difficult.

We describe successful analgesia with a continuous spinal catheter for a parturient who had had a spinal operation, with the implantation of an Isola hook and screw-rod system instrumentation.

Case report

A 29-year-old primiparous parturient, who was 154 cm tall and weighed 59 kg, and who had spinal instrumentation, was transferred to our institution at 30 weeks' gestation. At age 13 years, she had undergone an operation for scoliosis, with the implantation of an Isola hook and screw-rod system as posterior spinal instrumentation (Robert Reid, Tokyo, Japan). Prior to the spinal operation, her spine had had a thoracolumbar curve of 36° (Cobb angle) and lumbar curve in the opposite direction, of 29° (Cobb angle). The instrumentation amended these frontal scoliotic curvatures (Figs. 1, 2), although the angels of thoracic kyphosis and lumbar lordosis, as sagittal curvature, were reduced (Figs. 3, 4) compared with those in a healthy adult.

Her antepartum course was without any obstetric complications, except for having a breech presentation. Her previous obstetrician had declared that it was impossible to deliver her baby under regional anesthesia. However, we judged from her radiographs that an approach to an epidural or intrathecal space was feasible. Due to the breech presentation remaining at 38 weeks' gestation, an elective cesarean section, at 39 weeks' ges-

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Received: December 20, 2005 / Accepted: April 8, 2006

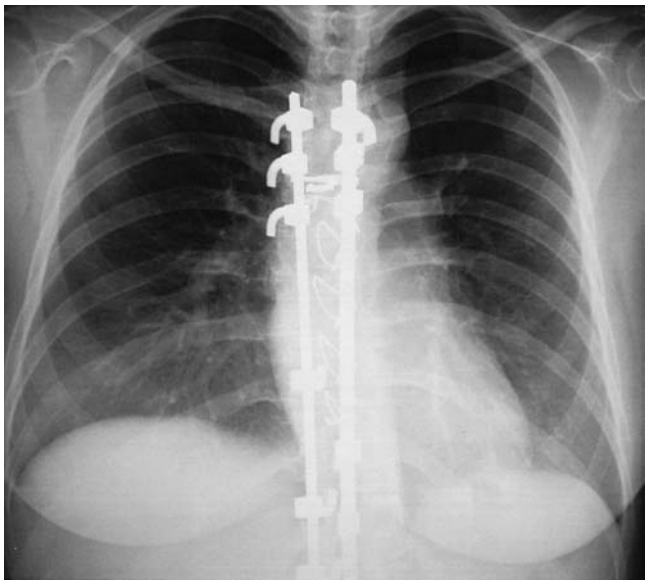

Fig. 1. Thoracic anteroposterior (AP) radiograph obtained 8 days prior to the operation. Idiopathic scoliosis had been treated with Isola hook and screw-rod system instrumentation. The cephalad end of the instrument was at the third thoracic vertebra

Fig. 2. Lumbar AP radiograph obtained 8 days prior to the operation. The caudal end of the instrument was at the third lumbar vertebra

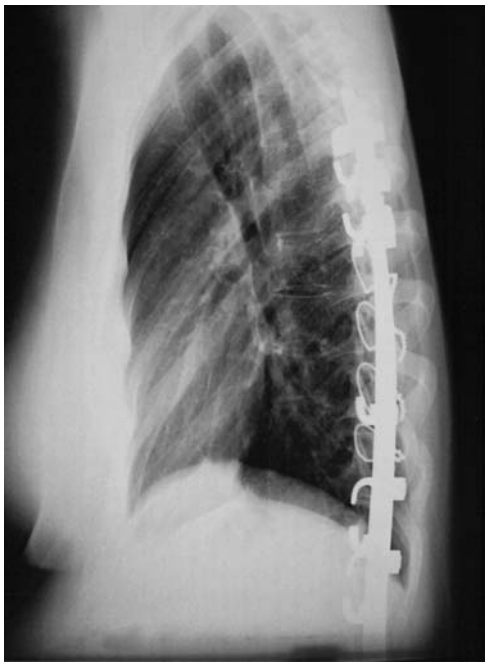

Fig. 3. Lateral view of thoracic radiograph obtained 8 days prior to the operation

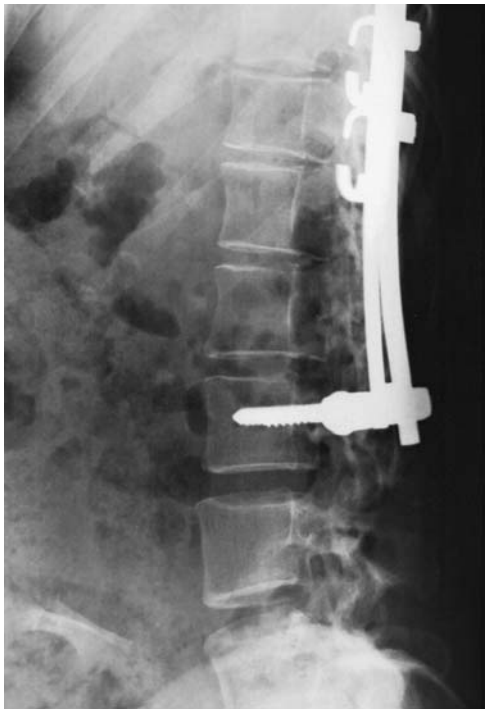

Fig. 4. Lateral view of lumbar radiograph obtained 8 days prior to the operation. The radiograph shows that the lumbar lordosis was blunted

tation, was planned. Prior to the induction of anesthesia, her arterial blood pressure was 104/64 mmHg, heart rate was 66 beats/min, and peripheral oxygen saturation (Sp_{O_2}) was 99% on room air. After intravenous hydration with 500 ml of acetated Ringer's solution, she was placed in the sitting position and her back was prepared aseptically. A continuous spinal catheter (22-gauge Spinocath; B. Braun, Melsungen, Germany) was placed 3-cm into the subarachnoid space, using an over-the-

needle (27-gauge) technique at the L3-4 intervertebral space. Spinal anesthesia was initiated with 5 mg of hyperbaric bupivacaine and 15 μg of fentanyl while she was in the supine position with left uterine displacement to minimize aortocaval compression. Her arterial blood pressure decreased to 88/50 mmHg. However, the blood pressure was easily controlled to the baseline values with intravenous ephedrine 5 mg, given three times. The cephalad level of sensory blockade to cold was T10, 12 min after the intrathecal administration of the anesthetic agents, and so another 2 mg of hyperbaric bupivacaine was administered in order to provide sufficient anesthesia. Her sensory block level increased to T4, 5 min after this additional bupivacaine.

During the operation (47 min) she received 500 ml of 6% hydroxylethylstarch solution and 220 ml of acetated Ringer's solution. Intraoperative blood loss was 500 ml. At the end of surgery, the cephalad level of sensory blockade to cold remained at T4. Her hemodynamic variables were stable throughout the surgery. The neonate weighed 3072 g, with an Apgar score of 8 at both 1 and 5 min. Although the spinal catheter was removed 1 h after the end of the operation, the patient did not note a headache thereafter.

Discussion

Scoliosis is usually idiopathic, and most patients need surgical intervention in order to prevent the functional impairment that occurs with the natural progression of the disease. Scoliosis occurs seven times more frequently in females than in males [1]. Therefore, pregnancy and delivery in parturients with prior surgical correction of scoliosis is not unusual. Generally, patients with corrected scoliosis tolerate pregnancy, labor, and delivery well. However, studies have demonstrated that the rates of cesarean section in these patients are two to three times higher than those in healthy parturients [2].

Although regional anesthesia is not always a contraindication for cesarean section, it is possible that the operation scar could interfere with the insertion of a spinal or epidural needle, because adhesion of the ligamentum flavum obliterates the epidural space, and structural degeneration of the epidural space results in difficulty with the insertion of an epidural catheter or modifies the spread of local anesthetics administered into the subarachnoid or epidural space. Schachner and Abram [6] reported a patchy epidural block in patients with previous back trauma or injury. They suggested that this may have been due to epidural adhesions and scarring during the process of healing from a disc injury. In fact, when they performed epidurography with metrizamide at their Pain Clinic, they demonstrated the failure of contrast material to pass the level of an injured disc; the material had leaked out of the foramina just below the level of the abnormal disc.

Compared with anterior rod implants, such as anterior multisegmental spinal instrumentation with the Kaneda device (Robert Reid, Tokyo, Japan) which has been used recently, posterior spinal instrumentation with the Isola hook and screw-rod system (Robert Reid, Tokyo, Japan) as well as Harrington rod instrumentation, provides less correction of lordosis as sagittal curvature. Furthermore, tissue damage to the spinal canal may be greater during this operation with posterior spinal instrumentation. Therefore in patients with such instrumentation, one shot of a local anesthetic agent into the subarachnoid space could induce induce unexpected cephalad spread of the block height due to blunted thoracic kyphosis and lumbar lordosis. These anatomical changes may also affect the success rate of epidural anesthesia. In previous reports, the rates of successful epidural anesthesia in patients with prior spinal surgery varied from 42% to 94% [3–5]. However, in the patients described in these studies, multiple attempts in various interspaces were required. Even if the epidural space is found, this does not always mean that epidural anesthesia will be successful. Dayley et al. [5] reported that 58% of patients with Harrington instrumentation had either increased local anesthetic requirements or patchy epidural blocks.

Considering the unreliability of conventional spinal or lumbar epidural anesthesia in patients with spinal instrumentation as described above, we felt that the choice of continuous subarachnoid anesthesia could offer the following possible advantages over epidural anesthesia. Fusion for idiopathic scoliosis usually stops at L4. In fact, the caudal end of the rod was at L3 in our patient. Therefore, the intrathecal space seemed to be intact, and thus a successful approach to the intrathecal space could be anticipated. One might suggest that spinal anesthesia could be chosen if epidural anesthesia was not successful. Some authors have demonstrated successful spinal anesthesia after an inadequate epidural block [7–9]. If spinal anesthesia is performed after the epidural administration of anesthetic, it is possible that the solution administered into the epidural space squeezes the dura mater and cerebrospinal fluid (CFS), resulting in the excessive cephalad spread of the intrathecal anesthetic agent [10]. Previous articles reported that the unexpectedly rapid cephalad spread of a spinal block necessitated respiratory support under tracheal intubation [11,12]. Therefore, we felt that the first choice for the patient with spinal instrumentation was titrated spinal anesthesia, to avoid this unexpected cephalad spread. Kardash et al. [8] recommended spinal anesthesia at the L5-S1 interspace [8]. Considering that the apex of the lumbar lordosis in pregnant supine

women is L4-5 [13], it is perhaps not necessary to employ a tilting table to ensure adequate cephalad spread when injecting at the L4-5 level. Thus, L4-5 seems to be superior to the L5-S1 level.

One may be concerned about the risk of postdural puncture headache (PDPH) after the use of large-gauge catheters, whereas microcatheters have been associated with technical difficulties and neurologic side effects. However, the over-the-needle- catheter used in our patient minimized the risk of PDPH, due to the low potential for the leakage of CSF around the catheter because the outer diameter of the catheter was larger than the diameter of the spinal needle, and this would plug the hole. Based on the results available to date in 125 patients in a multinational study, the rate of PDPH was 1.6% (2 patients) [14]. Gosch et al. [15] indicated significantly shorter duration and lower intensity of PDPH after the use of an over-the-needle-catheter, compared with a catheter-through-needle (mircrocatheter), even after intermittent CSF sampling (17×0.5 ml over 4 h).

In conclusion, we have demonstrated successful spinal anesthesia in a cesarean section for a 29-year-old primiparous parturient with history of a scoliosis operation at the level of T3-L3. Anesthetic was titrated with fractionated bupivacaine 7 mg, combined with fentanyl 15 µg, to avoid unintentional wide spread of anesthetic agents, using a continuous spinal catheter. Headache as a dural tap-related complication was not observed.

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