Journal of Anesthesia & Clinical Research

Kayhan et al., J Anesth Clin Res 2016, 7:8
DOI: 10.4172/2155-6148.1000649

Case Report Open Access

Successful Management of Ultrasound-Guided Combined Spinal-Epidural Anesthesia for Cesarean Section in a Patient with Achondroplasia

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Received date: May 28, 2016; **Accepted date:** July 21, 2016; **Published date:** July 27, 2016

Abstract

Anesthetic management of the pregnant achondroplastic patient for cesarean section poses significant challenges for anesthetists when coupled with anesthetic risks encountered during the third trimester of pregnancy. We report the case of a 25-year-old, 107 cm in height, and 37-week woman with achondroplasia who underwent neuraxial anesthesia for an elective cesarean section. Due to lumbar hyperlordosis and tissue edema, spinous processes could not be palpated and ultrasound probe was used to identify the vertebral interspace and also, the distance to the ligamentum flavum was measured. Accompanied by combined spinal-epidural (CSE) set, epidural space was located and a spinal needle was placed to the subarachnoid space. After 5 mg 0.5% hyperbaric bupivacaine with 10 μg fentanyl (total volume 1.2 mL) was injected to the subarachnoid space, the epidural catheter was advanced. A bilateral T5 sensory block level to pinprick was obtained after 5 min and the operation was allowed. A baby girl weighing 2460 gr was delivered 7 min after skin incision. The patient felt pain and discomfort during the elevation of the uterus and 3 mL 2% lidocaine was injected twice at 5 min intervals via the epidural catheter. The patient had no complications related to her delivery or anesthetic and was discharged home on the second postoperative day. CSE anesthesia with low spinal dose and ability to increase the level of the block via epidural route when needed, in combination with ultrasound guidance, provided successful and safe anesthesia.

Keywords: Achondroplasia; Cesarean; Anesthesia

Introduction

Dwarfism is defined as a failure to reach a high of 148 cm in adulthood [1,2]. Achondroplasia is the commonest form of short-limbed dwarfism, and occurring in 0.5-1.5 per 10,000 live births [3]. Patients have a genetic bone metabolism disorder, and there are several craniofacial and spinal abnormalities in addition to disproportional dwarfism. There might be also central nervous system, respiratory, and cardiac problems [1,4]. Some characteristic features as large head, large mandibula, macroglossia, hypertrophic tonsil, hypoplasic larynx, atlanto-axial instability, and limited neck extension may lead to difficult airway management during general anesthesia. Anatomic alterations like lumbar hyperlordosis, kyphoscoliosis, and spinal stenosis make neuraxial anesthesia technically difficult with neurological complications [1,2,5].

Moreover, anesthetic risks encountered during the third trimester of pregnancy as airway edema, aspiration of stomach contents, decreased functional residual capacity and hypoxia, supine hypotension present major challenges to the anesthetists [1,4].

Various success rates have been reported in a small number of case reports about neuraxial anesthesia for cesarean delivery in patients with achondroplasia. The aim of this report is to present the successful management of ultrasound-guided combined spinal-epidural (CSE) anesthesia in a 37-week pregnant woman with achondroplasia, and to discuss the controversies in anesthetic management of this complicated patient. The patient reviewed the case and she gave written consent for us to publish the report.

Case Report

A 25-year-old woman (gravida 1, para 0) with achondroplasia was admitted to high-risk pregnancy outpatient clinic for routine obstetric care. She was consulted to department of obstetrics anesthesia for pre-assessment at 28 weeks of gestation due to possibility of unscheduled urgent delivery. Her medical history was unremarkable. On physical examination, the height of the patient was 107 cm, weight was 51 kg, and she had short limbs, a large head, and lumbar hyperlordosis that are characteristic to achondroplasia. She had no severe kyphoscoliotic deformity. The Mallampati classification was II and the neck extension was normal. After counseling about the potential risks and benefits of the anesthetic techniques, the patient decided to be awake during the operation and requested a neuraxial technique.

The patient was scheduled for elective cesarean delivery due to cephalopelvic disproportion at 37 weeks of gestation. The laboratory tests were repeated before the surgery (Hemoglobin: 9.5 g/dL; Hematocrit: 31.5%; WBC: 13000/μL; Thrombocyte: 249000/μL; INR: 0.9; BUN: 5 mg/dL; Creatinin: 0.4 mg/dL; Glucose: 87 mg/dL; AST: 23 U/L; ALT: 10U/L; Na: 134 mmol/L; Cl: 107 mmol/L; K: 3.76 mmol/L). She was given 10 mg metoclopramide and 50 mg ranitidine one hour before the anesthesia, and was taken to the operation room. Standard monitoring was established, and the first measured values were as follows BP: 156/74 mmHg, HR: 131/min, and SpO_2: 97%. Due to difficulty in vascular access, 20-gauge intravenous cannula was placed only and 500 mL colloid infusion was started. Equipment for difficult airway management (endotracheal tubes in various sizes, supraglottic airways, video-laryngoscope and flexible bronchoscopy device) was prepared for the possibility of failure of neuraxial block.

CSE anesthesia was planned for the patient and she placed in sitting position. However, due to lumbar hyperlordosis and tissue edema, spinous processes could not be palpated. Then, the convex ultrasound probe (Esaote® MyLab 5, Genova, Italy) was used to identify the L3-L4 vertebral interspace by scanning in transverse and parasagittal view from the sacrum to cephalad direction, and also, the distance to the ligamentum flavum was measured.

After cleaning the skin and aseptic precautions, the marked space was infiltrated with 1% prilocaine. Accompanied by 16-gauge Tuohy needle of the CSE set (Egemen, İzmir), the epidural space was located at a depth of 7 cm using a loss-of-resistance technique with saline. A 26-gauge Whitacre spinal needle was placed in the subarachnoid space, and 5 mg 0.5% hyperbaric bupivacaine with 10 µg fentanyl (total volume 1.2 mL) was injected slowly after cerebrospinal fluid flow was observed. The epidural catheter was advanced, and 4 cm of catheter was left within the epidural space after the negative aspiration test for blood and cerebrospinal fluid. The patient was placed supine with 15o left lateral tilt, and supplemental oxygen was given via mask. A bilateral T5 sensory block level to pinprick was obtained after 5 min and the operation was allowed. A baby girl weighing 2460 gr was delivered 7 min after skin incision. The 1st and 5th min Apgar score of the baby was 9 and 10, respectively. After the placenta was removed, oxytocin 3 IU was given slowly, and 15 IU oxytocin/1000 mL ringer lactate infusion was started. The patient felt pain and discomfort during the elevation of the uterus and 3 mL 2% lidocaine was injected twice at 5 min intervals via the epidural catheter. Also, sedation with midazolam 2 mg was administered for anxiety. The lowest systolic blood pressure measured during the operation was 124 mmHg, so there was no need for vasopressor. Surgery proceeded uneventfully and took 40 min. The patient had no complications related to her delivery or anesthetic and was discharged home on the second postoperative day.

Discussion

In cases with achondroplasia, delivery is almost always performed through cesarean section due to cephalopelvic disproportion and the possible anatomic disorders of the baby [2]. General anesthesia has traditionally been considered the technique of choice though there are no definite methods in the management of anesthesia for a patient with achondroplasia [6]. On the other hand, the changes, related to achondroplasia and pregnancy increase the risk of difficult airway management. Huang et al. reported a case in which they applied awake-intubation with fiberoptic bronchoscopy following the failure of an attempt with video-laryngoscope [4]. Whichever method is chosen, difficult airway preparations should be done for the possibility of general anesthesia. In addition, respiratory problems, due to narrow chest, kyphoscoliosis and extreme abdominal pressure, make the general anesthesia applications and postoperative care more complicated [1]. Postoperative intensive care conditions should be available in cases of general anesthesia.

Because of the patient's demand and apparent lack of kyphoscoliosis, we were initially decided to perform neuraxial anesthesia. Because of the risk of failure in single-shot spinal anesthesia, the CSE method was preferred to ensure sufficient block by having the ability to administer additional doses to the epidural space as needed.

Also, significant structural defects complicate the performance of neuraxial anesthesia techniques. Different methods and various success rates have been reported in the literature [4,6-9]. The difficulties in single-shot spinal anesthesia are the risks of unpredictable local anesthetic (LA) spread, inadequate or a dangerously high block, and extreme hypotension due to short stature and the aortocaval compression [1,4,7,8]. DeRenzo et al. reported inadequate block at the forward period of surgery with single-shot spinal anesthesia during urgent cesarean delivery. The authors recommended using epidural, CSE or continuous spinal methods with little LA applications and incremental doses [7]. On the other hand, difficulties in placing the epidural catheter and inadvertent dural puncture are common complications in epidural anesthesia [1]. In addition, this method is time-consuming that may be a disadvantage for patients undergoing urgent cesarean [10].

Although there is no consensus on spinal or epidural LA doses, the general approach is decreasing the dose of LA and combining it with opioids [2,5]. Ravenscroft et al. reported that they decreased the LA dose by 30% and achieved a successful block [11]. We also decreased the spinal LA doses and added opioid because of the possibility of unpredictable spread and high block.

We had difficulty in manual palpation of the intervertebral space. The space was found with ease by ultrasound, and a successful intervention was achieved in the first attempt. The depth of the epidural space was longer than we expected. So, the predetermination of the distance with ultrasound will be enormously beneficial during the epidural needle insertion. In addition, the neuraxial procedures may be performed real-time by ultrasound. Similarly to our case, Weight and Rudoz used ultrasound to determine the intervertebral space and to measure the epidural distance, and they succeeded [5,6].

No pre-assessment was made in terms of spinal stenosis in our patient and we did not have any problems in placing the catheter and spread of LA. However, magnetic resonance imaging for determining the spinal deformities before the operation might be helpful in the anesthesia management of these patients [1].

As a conclusion, both neuraxial and general anesthesia methods in pregnant women with achondroplasia have significant challenges for anesthetists. A multidisciplinary approach, careful preoperative assessment, and preparation are essential in such cases. The management of anesthesia should be considered on individual basis. We think that CSE anesthesia is an appropriate method in terms of providing rapid onset with low dose spinal anesthesia and the ability to increase the level of block if necessary, except for very urgent cesarean deliveries (category 1). Meanwhile, we assert that ultrasound guidance is beneficial for overcoming anatomic difficulties, increasing success of performing neuraxial anesthesia, and decreasing neurological complications.

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