Obstetrical and Pediatric Anesthesia

Cesarean section in a patient with syringomyelia

Kenki Murayama MD, Keiko Mamiya MD, Koji Nozaki MD, Koichi Sakurai MD, Kazufumi Sengoku MD, Osamu Takahata MD, Hiroshi Iwasaki MD

Purpose: To describe the anesthetic management of Cesarean section in a patient with syringomyelia.

Clinical features: A 27-yr-old pregnant woman with syringomyelia was scheduled to undergo elective Cesarean section. At the age of 25 yr, she had begun to experience headaches, and at the age of 26 yr, a diagnosis of syringomyelia of the upper spinal cord was made on the basis of magnetic resonance imaging findings. No symptoms other than headache were noted preoperatively.

General anesthesia was used for the Cesarean section. After the administration of 1 mg vecuronium as a priming dose, 5 mg vecuronium were injected. At the onset of clinical muscle weakness, 225 mg thiamylal were promptly administered as the induction agent and the patient was intubated (timing principle with priming method) and pressure on the cricoid cartilage applied to prevent regurgitation of stomach contents. Anesthesia was maintained with oxygen, nitrous oxide and isoflurane at a low concentration. Mild hyperventilation was used throughout the procedure. Anesthesia and surgery proceeded without any problem, response to vecuronium was clinically normal and recovery was uneventful. Neurological status remained normal. .

Conclusion: We report the safe use of general anesthesia for Cesarean section in a patient with syringomyelia. Precautions were taken to avoid increases in intracranial pressure and our patient experienced no untoward neurologic event.

Objectif : *Décrire la démarche anesthésique d'une césarienne chez une patiente qui présente une syringomyélie.*

Éléments cliniques : *Une femme enceinte de 27 ans, atteinte de syringomyélie, devait subir une césarienne planifiée. À 25 ans, elle a commencé à éprouver des céphalées et à 26 ans, on a diagnostiqué une syringomyélie de la moelle épinière supérieure à la suite d'examens de résonance magnétique. Les céphalées étaient le seul symptôme préopératoire.*

L'anesthésie générale a été utilisée pour la césarienne. On a d'abord administré une dose d'amorçage de 1 mg de vécuronium, puis on a en injecté 5 mg. Au début du relâchement musculaire, on a promptement administré 225 mg de thiamylal comme agent inducteur et on a intubé la patiente (synchronisation avec la méthode d'amorçage). On a appliqué une pression sur le cartilage cricoïde afin de prévenir la régurgitation du contenu gastrique. L'anesthésie a été maintenue avec de l'oxygène, du protoxyde d'azote et de l'isoflurane à faible concentration. On a utilisé une hyperventilation modérée tout au long de l'intervention. L'anesthésie et l'opération se sont bien déroulées, la réaction au vécuronium a été cliniquement normale et la récupération sans incident. L'état neurologique est demeuré normal.

Conclusion : *Nous citons l'utilisation sans risque de l'anesthésie générale pour une césarienne chez une patiente atteinte de syringomyélie. Des précautions ont été prises pour éviter l'hypertension intracrânienne et notre patiente n'a subi aucun effet secondaire neurologique.*

SYRINGOMYELIA is a chronic progressive disease characterized by the presence of an expanding cystic cavity within the spinal cord. Cesarean section is usually selected for women in labour who have syringomyelia to avoid possible deterioration of neurological symptoms due to bearing down. We report the successful anesthetic management of Cesarean section in a patient with syringomyelia.

Case report

The patient was a 27-yr-old woman, 148 cm in height and weighting 56 kg. She had complained of headaches at the age of 25 yr, and, at the age of 26,

From the Department of Anesthesiology and Critical Care Medicine, Asahikawa Medical College, Asahikawa, Japan.
Address correspondence to: Dr. Kenki Murayama, Department of Anesthesiology, Asahikawa Medical College, 2-1-1-1 Midorigaoka-higashi, Asahikawa 078-8510, Japan. Fax: 0166-68-2589; E-mail: kenki906@d4.dion.ne.jp
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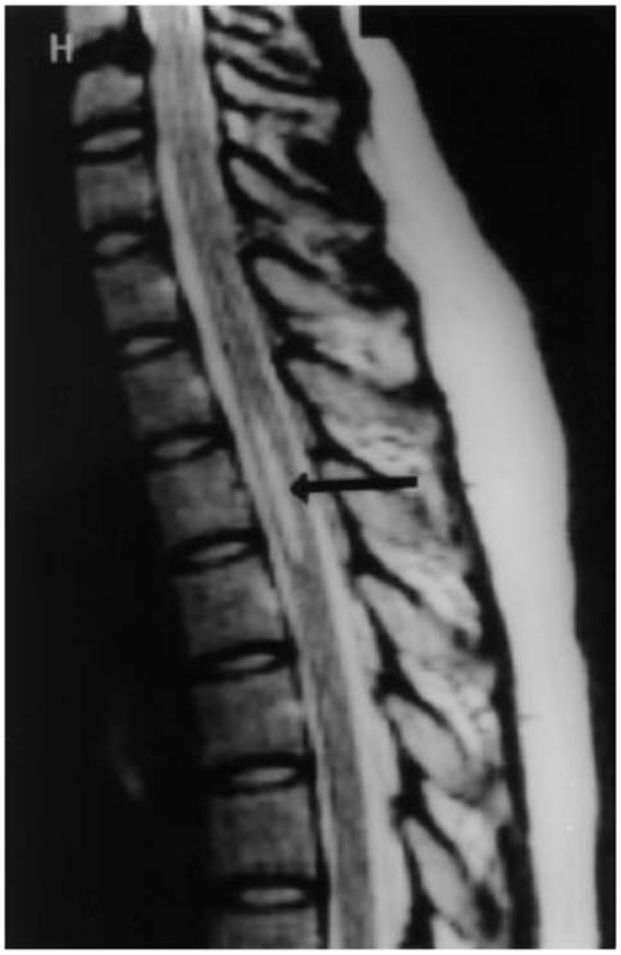

FIGURE T2-weighted sagittal magnetic resonance imaging (MRI) of the upper spinal cord. This picture showed a high-intensity signal at the T3 level of the spinal cord indicating the presence of a cavity.

syringomyelia of the upper spinal cord was diagnosed. Magnetic resonance imaging (MRI) showed a high-intensity signal at the T3 level of the spinal cord indicating the presence of a cavity (Figure). The MRI was repeated several times during follow-up, but no changes in size or shape were seen after the time of diagnosis. There was no progression of the lesions, and no symptoms other than headache were noted. She became pregnant at the age of 27 yr, and Cesarean section was scheduled for the 38th week of gestation.

At the time of admission, there were no signs of autonomic nervous dysfunction and the results of physical examination and blood tests showed no abnormalities. On arrival in the operating room, a 20-gauge *iv* cannula was inserted and the patient given lactated Ringer's solution 1000 ml as a volume preload. Monitoring by pulse oximetry, ECG and non-invasive automated arterial pressure were initiated. Since the patient had no evidence of neurologic dysfunction, a neuromuscular blockade monitor was attached to the left wrist. No oral premedication was administered. Initially, systolic blood pressure was 142 mmHg, diastolic pressure 73 mmHg and pulse rate 99 beats·min^{-1}. The patient was pre-oxygenated via face mask. One milligram vecuronium was administered as a priming dose, followed by vecuronium 5 mg four minutes later. At the onset of clinical weakness, as judged by decreased respiratory effort, 225 mg thiamylal was promptly given as the induction agent, and pressure on the cricoid cartilage applied to prevent aspiration of gastric contents. Sixty seconds after injection of thiamylal, the patient was intubated (timing principle[1] with priming[2]). Anesthesia was initially maintained with O_2 33%: N_2O 67% and, after delivery, with O_2 50%: N_2O 50%: isoflurane 1–2% with mild hyperventilation. The patient's hemodynamic condition during the operation remained stable and no decrease of SpO_2 was observed. Duration of surgery and anesthesia were 45 min and 80 min, respectively.

The effect of the muscle relaxant was not prolonged. The patient was extubated after administration of 1 mg atropine and 2 mg neostigmine to reverse neuromuscular blockade. After extubation, the systolic and diastolic blood pressures were 134 mmHg and 73 mmHg, respectively. The pulse rate and SpO2 were 104 beats·min^{-1} and 97%, respectively. There were no neurological changes after the operation.

Discussion

We report the safe use of general anesthesia for Cesarean section in a patient with syringomyelia. There have been only a few reports on pregnancies complicated with syringomyelia, and the optimal anesthetic management of such cases has not yet been established. One of the most important points in the anesthetic management of syringomyelia is the avoidance of an increase in intracranial pressure.

The term syringomyelia, derived from the Greek, was introduced by Ollivier d'Angers in 1827 to describe a tubular cavitation in the spinal cord. Pathologically, the area around a hydromyelic or developmental syringomyelic cavity demonstrates reactive gliosis. The pathogenesis of syringomyelia has been the subject of controversy; however, conceptually and from a practical standpoint, these cysts may be divided into two general groups, those that communicate with the cerebrospinal fluid (CSF) pathways (communicating syringomyelia) and those that do not (non-communicating syringomyelia). Type I Chiari malformations are also

commonly associated with syringomyelia. Currently, it is suggested that a disturbance to the passage of CSF in the subarachnoid space is one of the major causes of enlargement and progression of a cyst. Well-recognized symptoms include a suspended and dissociated sensory loss, cervical and occipital pain, lower motor neuron weakness of the hands and arms, and neurologic arthropathies (Charcot's joints).[3] In the past, diagnosis of syringomyelia was difficult, but recently, as in our case, this difficulty has been eliminated by MRI.[4]

General anesthesia is usually used for patients with syringomyelia for neurosurgical procedures. However, great care should be taken to avoid the following possible problems that can arise during anesthetic management: 1) the risk of permanent damage to the spinal cord as a result of an increase in intracranial pressure caused by coughing or vomiting; 2) abnormalities of the autonomic nervous system such as Horner's syndrome and excessive sweating; 3) ventilation-perfusion abnormalities due to complications such as deformities of the vertebral column or vocal cord paralysis; and 4) abnormal reaction to a muscle relaxant in patients who have myopathic atrophy.[5]

There have been few reports of pregnancies complicated with syringomyelia,[5–8] and only two of these deal with anesthetic management.[5,6]

Roelofse *et al.*[5] chose general anesthesia for their patient with syringomyelia and reported the following anesthetic management: *iv* injection of 8 mg gallamine three minutes before induction, followed by a crash induction with 4 $mg \cdot kg^{-1}$ thiopentone *iv* and intubation after *iv* injection of 1.5 $mg \cdot kg^{-1}$ suxamethonium. Anesthesia was maintained with 40% N_2O: 60% O_2: 0.5% halothane. Hemodynamic parameters remained stable throughout anesthesia. The authors recommend general anesthesia for medico-legal reasons, rather than a spinal or epidural anesthesia.

In another case, Nel *et al.*[6] established epidural anesthesia with 0.5% bupivacaine injected slowly in 3–4 ml boluses at five-minute intervals. The advantages of epidural anesthesia are avoidance of potential hazards in securing the airway, less compromise of respiratory function, and better preservation of the existing craniospinal CSF pressure relationship. Moreover, gradual onset of epidural anesthesia may prevent acute reductions in blood pressure and deterioration of autonomic neuropathy.

Whichever anesthetic management is chosen, prevention of a rise in CSF pressure is the most important precaution to follow.

The reason we decided to use general anesthesia for our patient was that: 1) general anesthesia has been used for almost all cases of syringomyelia, and there is only one report on the use of epidural anesthesia; 2) in an epidural block, there is the risk of fluctuation in CSF pressure due to dural puncture as well as the risk of subarachnoid or lumbar puncture;[9] and 3) since syringomyelia is a progressive disease, it is difficult to identify the cause of neurologic symptoms that appear following epidural anesthesia. We agree epidural anesthesia may be used in these patients. However, they must be fully informed of the risks associated with subarachnoid or lumbar puncure, and of the possible evolution of their disease condition.

A non-depolarizing muscle relaxant was used in our patient in order to avoid the CSF pressure rise and hyperkalemia[10] which may occur with succinylcholine. Moreover, since it has been demonstrated that patients with syringomyelia have an increased sensitivity to non-depolarizing neuromuscular blocking agents,[11,12] we administered the agent in minimum doses guided by a neuromuscular blockade monitor.

Although the end-tidal CO_2 was not recorded in this patient, mild hyperventilation during anesthesia was maintained to avoid increases in intracranial pressure. End-tidal CO_2 should be monitored in patients with syringomyelia throughout anesthesia.

In our case, the effect of muscle relaxants was clinicaly normal, the operation proceeded without any problems, and there was no deterioration of the patient's neurologic condition after the operation. Further, patients with syringomyelia require close postoperative observation, at the time when sudden apnea or cardiac arrest may occur because of the autonomic disturbance associated with the disease.

Conclusion

We report the safe use of general anesthesia for Cesarean section in a patient with syringomyelia. Precautions were taken to avoid increases in intracranial pressure and our patient experienced no untoward neurologic event.

References

1 *Silverman SM, Culling RD, Middaugh RE.* Rapid-sequence orotracheal intubation: a comparison of three techniques. Anesthesiology 1990; 73: 244–8.

2 *Koyama K, Ishizuka I, Miyao H, Kawasaki J, Kawazoe T.* Evaluation of the timing principle with small priming doses of vecuronium. Masui 1992; 41: 1585–9.

3 *Oakes WJ.* Chiari malformations, hydoromyelia, syringomyelia. *In*: Wilkins RH, Rengachary SS (Eds.). Neurosurgery. New York: McGraw-Hill Book Com., 1985: 2102–24.

4 *Arai S, Ohtsuka Y, Moriya H, Kitahara H, Minami S.* Scoliosis associated with syringomyelia. Spine 1993; 18: 1591–2.

5 *Roelofse JA, Shipton EA, Nell AC.* Anaesthesia for caesarean section in a patient with syringomyelia. SA Med J 1984; 65: 736–7.
6 *Nel MR, Robson V, Robinson PN.* Extradural anaesthesia for caesarean section in a patient with syringomyelia and Chiari type I anomaly. Br J Anaesth 1998; 80: 512–5.
7 *Castello C, Fiaccavento M, Vergano R, Bottino G* Syringomyelia and pregnancy. Report of a clinical case and review of the literature. Minerva Ginecol 1996; 48: 253–7.
8 *Cantu Esquivel MG, Benavides de Anda L, Benavides de la Garza L.* Syringomyelia and pregnancy. Report of a case (Mexicain). Ginec Obst Mcx 1994; 62: 302–3.
9 *Semple DA, McClure JH, Wallace EM.* Arnold-Chiari malformation in pregnancy. Anaesthesia 1996; 51: 580–2.
10 *Cooperman LH.* Succinylcholine-induced hyperkalemia in neuromuscular disease. JAMA 1970; 213: 1867–71.
11 *Fiacchino F, Gemma M, Bricchi M, Giombini S, Regi B.* Sensitivity to curare in patients with upper and lower motor neurone dysfunction Anaesthesia 1991; 46: 980–2.
12 *Rosenbaum KJ, Neigh JL, Strobel GE.* Sensitivity to nondepolarizing muscle relaxants in amyothrophic lateral sclerosis: report of two cases. Anesthesiology 1971; 35: 638–41.