Usefulness of intrapartum magnetic resonance imaging for a parturient with neurofibromatosis type 1 during induction of labor for preeclampsia

Jacqueline M. Galvan, MD^a, and Michael P. Hofkamp, MD^b

^aDepartment of Anesthesiology, University of Illinois at Chicago, Chicago, Illinois; ^bDepartment of Anesthesiology, Scott & White Medical Center–Temple, Temple, Texas

ABSTRACT

A 22-year-old woman, G3P0 at 31 weeks, 1 day gestational age, was admitted to the labor and delivery unit for induction of labor (IOL) due to preeclampsia with severe features. Her medical history included neurofibromatosis type 1 (NF-1) and systemic lupus erythematosus with pericarditis and pericardial effusion. When labor analgesia was considered, the concern for an undiagnosed spinal neurofibroma and attendant sequelae was deliberated. After a multidisciplinary discussion, the IOL was halted during the cervical ripening phase to allow timely magnetic resonance imaging (MRI) of the spine. The MRI was negative for spinal lesions and the patient subsequently received labor analgesia via a combined spinal-epidural catheter.

KEYWORDS Magnetic resonance imaging; neurofibromatosis type 1; obstetric anesthesia; preeclampsia

Neurofibromatosis type 1 (NF-1) is a rare neurocutaneous disorder that can have widespread effects on various organ systems, including the spine. Antenatal radiologic exclusion of spinal lesions in pregnant patients with NF-1 may facilitate safe neuraxial placement, but it is not always available before presentation for labor. Obtaining real-time, intrapartum spinal imaging may also pose clinical and logistical challenges to the obstetric care team. We present a patient with NF-1 who was admitted for induction of labor (IOL) due to preeclampsia with severe features who ultimately received neuraxial labor analgesia after intrapartum magnetic resonance imaging (MRI) of the spine.

CASE DESCRIPTION

A 22-year-old woman, G3P0 at 31 weeks, 1 day gestational age, was admitted to the labor and delivery unit for IOL secondary to preeclampsia with severe features. The diagnosis of preeclampsia with severe features was made based on sustained blood pressure of >160/105 mm Hg for >15 minutes along with thrombocytopenia criteria. Her medical history included NF-1 and systemic lupus erythematosus with pericarditis and pericardial effusion during her pregnancy that required 1 L of percutaneous drainage. The patient did not have neurologic complaints or deficits at the time of presentation and had no recent imaging of her spine.

The obstetric anesthesia service was consulted for labor epidural catheter placement. A focused anesthesia assessment

revealed a body mass index of 23 kg/m², Mallampati score 2, normal heart and lung exam, and no peripheral edema. Cutaneous neurofibromas and skin discoloration consistent with café-au-lait spots were observed. Blood pressure was in goal range after initiation of antihypertensive and intravenous magnesium therapy.

After a multidisciplinary discussion and shared decision making with the patient, it was agreed that an MRI would be obtained to facilitate neuraxial labor analgesia. The risks, benefits, and logistics of suspending external fetal monitoring during an MRI were discussed because the equipment is not MRI compatible. Institutional guidelines allow for suspension of external fetal monitoring for a finite period if the risks outweigh the benefits and the fetus has a category 1 tracing for 30 minutes following a cycle of the cervical ripening agent. The patient was in the cervical ripening phase of the IOL and, once she met these parameters, she was accompanied by the labor and delivery nurse for her lumbar spine MRI, which had an anticipated duration of 1 hour.

The patient was highly motivated and cooperative in completing the MRI; therefore, no sedation was needed. The patient was positioned with a slight left uterine displacement using a hip wedge. Maternal comfort was confirmed before initiating the scan. Upon completion of the MRI, the patient was transported back to her labor room. Maternal and fetal statuses were reassuring, and IOL was resumed with the next cycle of cervical ripening agent.

Corresponding author: Jacqueline M. Galvan, MD, Department of Anesthesiology, University of Illinois at Chicago, Chicago, IL (e-mail: jackiemgalvan@gmail.com)

No spinal lesions were noted on MRI and the patient received labor analgesia via a combined spinal-epidural catheter. Her IOL continued uneventfully and resulted in a normal spontaneous vaginal delivery.

DISCUSSION

NF-1 has a reported incidence of 1:3000 live births and can affect 75,000 people in the United States each year.^{1,2} It is an autosomal-dominant disorder with 100% penetrance; those with the diagnosis will exhibit one of the phenotypic traits at some point in their lifetime. Classic manifestations are widespread and include central nervous, respiratory, cardiovascular, musculoskeletal, and gastrointestinal and genitourinary system lesions. The varying degrees of severity and disease burden can complicate anesthetic management in the perioperative period.

The interaction between pregnancy and NF-1 presents a challenge to the obstetric anesthesiologist. Existing neurofibromas may increase in size during pregnancy, and pelvic or genital neurofibromas may cause preterm labor or complicate delivery.² Because of the associated maternal and fetal morbidity, the American College of Obstetrics and Gynecology has recently added neurofibromatosis as a maternal condition that warrants predelivery assessment by an anesthesiologist.³

Neuraxial placement in patients with NF-1 may be precluded by existing spinal neurofibromas. Epidural hematoma due to unintentional puncture of a spinal neurofibroma during labor epidural catheter placement has been described in case reports.^{4,5} Clinical suspicion may not suffice either, because the incidence of asymptomatic spinal neurofibromas in patients with NF-1 may be 5% to 9%.^{6,7}

We determined that our patient would benefit from epidural labor analgesia; her diagnosis of preeclampsia with severe features would present difficulties during an urgent cesarean

delivery that might be mitigated by a well-functioning labor epidural. Airway edema, pulmonary edema, increased oxygen consumption, and an exaggerated cardiovascular response to laryngoscopy could have complicated general anesthesia. Additionally, labor analgesia could possibly attenuate the exaggerated catecholamine response seen in preeclampsia and could improve blood flow to vital organs and to the fetal-placental unit.

The obstacle to optimal anesthetic management in this patient was the unknown status of spinal neurofibromas. This case demonstrates that select laboring parturient women with NF-1 can obtain real-time intrapartum imaging that can potentially optimize anesthetic care.

1. Terry AR, Barker FG, Leffert L, Bateman BT, Souter I, Plotkin SR. Neurofibromatosis type 1 and pregnancy complications: a population-based study. *Am J Obstet Gynecol*. 2013;209:46.e1–8. doi:10.1016/j.ajog.2013.03.029.
2. Fox CJ, Tomajian S, Kaye AJ, Russo S, Abadie JV, Kaye AD. Perioperative management of neurofibromatosis type 1. *Ochsner J*. 2012;12(2):111–121.
3. Committee on Practice Bulletins – Obstetrics. Practice bulletin no. 177: obstetric analgesia and anesthesia. *Obstet Gynecol*. 2017;129(4):e73–e89. doi:10.1097/AOG.0000000000002018.
4. Youngs P, Human M. Epidural haematoma in a parturient with neurofibromatosis. *Br J Anaesth*. 2002;88(5):745.
5. Esler MD, Durbridge J, Kirby S. Epidural haematoma after dural puncture in a parturient with neurofibromatosis. *Br J Anaesth*. 2001;87:932–934. doi:10.1093/bja/87.6.932.
6. Thakkar SD, Feigen U, Mautner VF. Spinal tumours in neurofibromatosis type 1: an MRI study of frequency, multiplicity and variety. *Neuroradiology*. 1999;41:625–629. doi:10.1007/s002340050814.
7. Dounas M, Mercier FJ, Lhuissier C, Benhamou D. Epidural analgesia for labour in a parturient with neurofibromatosis. *Can J Anaesth*. 1995;42(Pt 1):420–422; discussion 422–424. doi:10.1007/BF03015490.