

Intrapartum Cephalocentesis: Case Report and Review

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Abstract

Introduction: Cephalocentesis is a procedure that can be utilized to drain excessive Cerebrospinal Fluid (CSF) from a fetus with hydrocephalus along with severe associated abnormalities incompatible with survival or in a nonviable fetus with hydrocephalus in order to facilitate normal vaginal delivery and avoid maternal morbidity due to Cesarean delivery.

Case Presentation: We present a case of a 36-year-old primigravida who had a fetus with severe hydrocephalus complicated by intrauterine fetal demise at 36 weeks of gestation, requiring cephalocentesis to facilitate vaginal delivery.

Conclusion: Cephalocentesis can be a valuable procedure in avoiding cesarean delivery and related morbidity in situations where there is a nonviable fetus or fetus with very poor prognosis of survival after birth with hydrocephalus causing obstructed labor. Cephalocentesis, though not routinely used, is a destructive procedure that still has an essential role in modern obstetrics.

Introduction

Cephalocentesis is a procedure that can be utilized to drain excessive Cerebrospinal Fluid (CSF) in a fetus with hydrocephalus in order to facilitate normal vaginal delivery. The purpose of the procedure is to avoid maternal morbidity due to Cesarean delivery. There are no fetal benefits of the procedure as cephalocentesis almost always results in perinatal death due to intracranial bleeding Chervenak et al. [1] performed cephalocentesis in eleven patients with hydrocephalus to promote vaginal birth, and ten out of these eleven had perinatal deaths due to intracranial bleeding. Fetal hydrocephalus with severe associated abnormalities is incompatible with survival, but it also makes spontaneous vaginal delivery impossible due to large fetal head circumference. Early vaginal delivery is desirable, but fetal head decompression is necessary to avoid obstructed labor and Cesarean delivery. The procedure can be done transabdominally or transvaginally with a large needle, plastic catheter, trocar, cannula, or with scissors under ultrasound guidance to promote drainage of the cerebrospinal spinal which will collapse the fetal cranium to facilitate vaginal delivery [2].

In some cases, cephalocentesis has been performed with a modified Smellie's perforator, but the availability in every hospital is a challenge [3-8]. Ventriculo-amniotic shunting is another procedure reported in the literature to decompress the enlarging ventricles, but this procedure is associated with significant procedure-related fetal death and a high rate of neurological morbidity in survivors [9]. In this report, we describe a case of intrapartum cephalocentesis which resulted in vaginal delivery in a setting with limited resources.

Case Report

We present here a case of 36-year-old primigravida, who had a fetus with severe hydrocephalus complicated by intrauterine fetal demise at

36 weeks of gestation, requiring cephalocentesis to facilitate vaginal delivery. She initially presented to our clinic for prenatal care at twelve weeks of gestation. She had presentational diabetes, chronic hypertension and morbid obesity with a BMI of 40 kg/m². Her HbA1c was 12.9% at her initial visit. She was immediately started on insulin as well as labetalol for chronic hypertension. Maternal-fetal medicine consultation was utilized for management of her comorbid conditions. Her first-trimester sonogram showed normal anatomical survey and cell-free fetal DNA testing revealed no genetic abnormalities. Genetic counseling was also provided due to the patient's advanced maternal age. Her second-trimester ultrasound at 19 weeks gestation revealed oligohydramnios and mild pyelectasis. The patient denied leakage of fluid. A repeat sonogram two weeks later confirmed anhydramnios, bilateral ventriculomegaly, right multicystic kidney and left renal dysplasia. Further genetic counseling was provided. We followed her very closely with serial growth scans which subsequently showed enlarging hydrocephalus. The patient was counseled several times about the nature of the anatomical abnormalities of the fetus as well as the poor prognosis of the fetus. She desired to carry the pregnancy and do everything possible to save the neonate after birth. The patient's autonomy was respected and the pregnancy was continued. The maternal-fetal medicine specialist followed her weekly to manage her diabetes and hypertension.

In the third trimester, at 36 weeks of gestation, the patient, unfortunately, had an intrauterine fetal demise. Sonogram confirmed fetal demise with hydrocephalus with a head circumference of 398.6 mm, anhydramnios, and an estimated fetal weight of 3984 gm. She and her family were thoroughly counseled and labor was induced with vaginal misoprostol. She received two doses of 25 micrograms of vaginal misoprostol and her cervix dilated to 3 cm. We performed amniotomy and started oxytocin for augmentation of labor. She received epidural analgesia for pain management in labor. When her

cervix was dilated to 8 cm, she experienced an arrest of dilation because of the severe hydrocephalus.

At this time, we offered cephalocentesis to decompress the hydrocephalus to facilitate vaginal delivery as the patient had other comorbidities and desired to avoid cesarean delivery. We thoroughly counseled the patient about the cephalocentesis procedure, including the consequences, advantages, risks, and alternatives. The patient and her family opted to proceed with cephalocentesis.

A thorough pelvic exam was performed. The fetal head, suture lines, and the anterior fontanelle were felt which confirmed the position as occiput anterior. A speculum was inserted into the vagina and the head of the fetus was visualized. An 18-gauge Tuohy spinal needle attached to a syringe was placed transvaginally through the anterior fontanel of the fetal head into the ventricular cavity under direct visualization. Approximately 500 mL of clear fluid was drained. At the end of the procedure, the Biparietal Diameter (BPD) decreased significantly. The bones of the calvarium collapsed and head and rest of the body were delivered without any difficulty.

Indications of Cephalocentesis

Cephalocentesis should be considered when there is hydrocephalus with severe associated abnormalities that are incompatible with survival (e.g. thanatophoric dysplasia), are compatible with survival but results in the potential absence of cognitive function, or are associated with severe neurological abnormalities (e.g. Edwards' syndrome (Trisomy 18), lobar holoprosencephaly or Dandy-Walker malformation [4] or if there is an intrauterine fetal demise.

Isolated hydrocephalus, which is usually caused by stenosis of the aqueduct of Sylvius, is treated in the neonatal period by diverting the flow of CSF from the blocked aqueduct with ventriculoperitoneal shunting. Though these children are at a higher risk for neurologic abnormalities or death, normal or even superior intelligence is possible in some cases.

The neurodevelopmental outcome of survivors with isolated hydrocephalus showed significant neurological morbidity in 50% of the cases, mild morbidity in 40% and a normal outcome in only 10% of the cases [7].

The choice to offer cephalocentesis in hydrocephalic fetuses with other severe associated abnormalities is based on the physician's beneficence-based responsibility to the pregnant woman to allow her to avoid Cesarean delivery, which would be of little value to the fetus. A large head circumference could also necessitate a classical uterine incision during the time of cesarean which would preclude future vaginal deliveries. To avoid short- and long-term morbidity from Cesarean delivery to the mother, the physician can commence interventions for the maternal advantage.

Procedure

There are many ways to perform cephalocentesis which can be determined by the route chosen, position of the fetal head, physician's skill, and the accessibility of resources. Generally, it is performed by making an incision at the base of the skull with a sharp instrument (e.g., curved Mayo scissors), or by inserting a cannula or a needle through the anterior or posterior fontanelle, as described in this case report, or by using Smellie perforator as described by B. Chanrachakul et al. [3] These procedures can be performed both under direct visualization of the fetal head transvaginally or under ultrasound

guidance. It should be noted that breech presentation necessitates ultrasound guidance. After entering the ventricular cavity, the cerebrospinal fluid is drained, leading a reduction in the biparietal diameter and overall fetal head circumference. Additional suction and drainage can be done if there is still difficulty in the delivery of the head. While transabdominal cephalocentesis under ultrasound guidance is also an effective substitute to decompress the fetal head before induction, it is not widely used as it requires an obstetrician who is highly trained in the procedure due to its invasive and painful nature [3]. The transvaginal approach can be performed by any obstetrician as it is not as technically difficult or invasive.

Discussion and Conclusion

In summary, cephalocentesis though not routinely used, is a destructive procedure that still has an important role in modern obstetrics. Cephalocentesis can be a valuable procedure in avoiding cesarean delivery and related morbidity in situations where there is a nonviable fetus or fetus with very poor prognosis of survival after birth causing obstructed labor [5].

When fetal hydrocephalus is isolated or associated with anomalies with a good outcome, Cesarean section should be performed. For fetal hydrocephalus with severe associated abnormalities (those incompatible with postnatal survival) or intrauterine death as described in this case report, cephalocentesis followed by vaginal delivery is indicated [8].

Cephalocentesis can be performed transvaginally during labor by making an incision at the base of the skull with a sharp instrument (e.g., curved Mayo scissors), or by inserting a cannula or a needle through the anterior or posterior fontanelle. It can also be performed by Smellie perforator. Transabdominal cephalocentesis is another substitute procedure to decompress the fetal head before induction, but, not widely used as it requires a skilled obstetrician and it is invasive and more painful. The transvaginal approach requires few resources and limited skill and can be more easily utilized. Overall, the route of cephalocentesis is chosen depending on obstetrician skill, fetal head position, cervical dilation and availability of resources.

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