Asian Journal of Medical Research & Health Sciences, Vol-2, issue-2 ,2024; p47-49, doi: 1107202300027
E-ISSN 2583-7761

Case Report-Radiology

A RARE ANTEPARTUM INTERVENTION FOR GROSS HYDROCEPHALUS – CEPHALOCENTESIS

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Article received on: 13-05-2024 Article accepted on: 23-06-2024 Article Published on:13-07-2024

ABSTRACT

Fetal hydrocephalus detected antenatally presents challenges in management and prognostication, necessitating careful consideration of therapeutic intervention. We report a case of 22 year old primigravida at 35 weeks gestational age with a diagnosis of isolated gross hydrocephalus in a single live intrauterine fetus. Following thorough counselling and consent, the patient underwent fetal cephalocentesis due to maternal contraindications for cesarean section. Under ultrasound guidance and local anesthesia, cerebrospinal fluid was drained. The procedure was well tolerated by both mother and fetus without immediate complications. Post procedure monitoring revealed a reduction in fetal biparietal diameter and alleviation of ventricular distension. This case, underscores the feasibility and potential benefits of fetal cephalocentesis in selected cases of antenatal hydrocephalus, despite the associated neurodevelopment risks and postnatal complications that warrant ongoing monitoring and multidisciplinary care. It also highlights the successful management of isolated gross fetal hydrocephalus through prenatal intervention, emphasizing the multidisciplinary care for maternal and child health care.

Key Words: Fetal hydrocephalus , Cephalocentesis, Ventriculoamniotic shunting

INTRODUCTION

Identification of fetal hydrocephalus is not uncommon in present scenario of use of ultrasound scans of antenatal women. Determining the cause and any associated congenital anomalies through antenatal sonographic scans help in deciding the fetal prognosis

In condition where the antenatal mother prognosis is adverse, radiological intervention to drain excess cerebrospinal fluid which can facilitate the smooth delivery is necessary. Radiological interventions for fetal hydrocephalus include cephalocentesis, ventriculoamniotic shunts andopening lilequist membrane.

Given the technical expertise required and neurodevelopment complications occurring in postnatal life, Fetal cephalocentesis is a technically feasible and potentially beneficial intervention.

CASE REPORT

22 years old primi with 35 weeks of gestational age was referred to our department for herlate third trimester antenatal scan. Her first trimester anomaly scan was unremarkable and no history of any comorbid abnormalities. Review scan at later term showing, Single live intrauterine fetus in cephalic presentation, longitudinal lie is noted. On evaluation, fetal femur and abdomen corresponds to 35 weeks of gestational age. Fetal biparietal diameter and head circumference measures 104 mm and 369 mm respectively corresponding to beyond 40 weeks of gestational age indicating hydro cephalus. No evidence of any other gross congenital anomalies, polyhydramniosandoligohydramniosnoted. A diagnosis of isolated gross hydrocephalus was made.Infectious etiology of hydrocephalus was ruled out on further tests.

The women wascounselled thoroughly about the condition and consent was obtained as mother is anemic and was severe anemic which renders her unfit or cesarean section which makes it necessary for her to undergo cephalocentesis. Under aspectic precautions, local anesthesia was given. An 18 gauge spinal needle connected to catheter was placed transabdominally under ultrasound guidance through anterior fontanelle of fetal head into ventricular cavity. Clear fluid of approximately 250ml was drained resulting in decrease of fetal biparietal diameter from369mm to 330 mm corresponding to 37 weeks appropriate for gestational age indicating decompression of the ventricular system .Fetal heart of 150 bpm was noted postprocedure. The procedure was well tolerated by both the mother and fetus with no immediate complications. The patient was monitored closely post procedure for signs of infection or CSF leak.

After 2 weeks, baby was delivered through vaginal delivery. APGAR score of less than 7 was noted at 1 and 5 min thereby requiring admission of neonate in SICU. Mother and baby were discharged after 15 days after the stabilization of the baby

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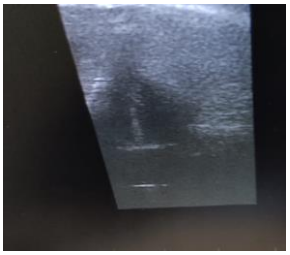
Pic-1,Insertion of 18gauge spinal needle trans abdominally



, Image-1
showing the needle in the fetal Intraventricular cavity

DISCUSSION

Cephalocentesis is anintrauterine procedure in a fetus with gross hydrocephalus for drainage of excess cerebrospinal fluid to promote and simplify the vaginal delivery of fetus.

Fetal hydrocephalus is a complex appearance. Ventriculomegaly can be due to defective absorption of CSF or due to parenchymal atrophy which should be differentiated for further course of treatment. Fetal hydrocephalus that is diagnosed in the last trimester of gestational age usually have better outcome when compared with those that are diagnosed in the first and second trimester of pregnancy(1).

The association of fetal hydrocephalus with congenital infection or chromosomal anomalies contraindicates intrauterine therapeutic procedure (1).

Larger head circumference could also necessitate a classical uterine incision during the time of cesarean which would preclude future vaginal deliveries(2).

Neonate with gross hydrocephalus have poor postnatal outcome necessitating the intervention procedure for maternal health benefits.

Radiological interventions for fetal hydrocephalusis a multidisciplinary team approach includescephalocentesis , ventriculoamniotic shunts and ventriculostomy.

Cephalocentesis is a procedure done transabdominally or transvaginally with a needle, plastic catheter, trocar andcannula under ultrasound guidance to promote drainage of cerebrospinal fluid which will collapse the fetal cranium to facilitate vaginal delivery.

INDICATION:

1. For CSF drainage: to relieve hydrocephalus
2. To relieve elevated intracranial pressure.
3. CSF analysis for diagnostic evaluation of neurological conditions
4. To assess CSF protein, glucose levels and other biochemical properties

CONTRAINDICATION:

- Absolute contraindication:
    1. Hemodynamically unstable or patient in severe shock
    2. Coagulopathy or bleeding disorders
    3. Presence of local infection at puncture site in case of transabdominal cephalocentesis.
- Relative contraindication:
    1. Ventricular anatomy variations
    2. Patient refusal
    3. Expertise

Procedure specific considerations:

a. Imaging guidance for accurate placement of needle and reduce the risk of complications
b. Sterility: Strict adherence to aspectic technique to prevent introduction of infection into CSF.
c. Monitoring: continuous monitoring of vital signs , neurological status and CSF pressure during and after the procedure.

Ventriculoamniotic shunt provides a fast drainage in volume of ventricular cavity with normalization of ventricular diameter. Its primary purpose is to treat hydrocephalus in fetus by placing a shunt, thereby potentially mitigating the risks associated with severe hydrocephalus during fetal development.

Procedure:

The procedure is usually performed by placing a shunt during the second trimester of pregnancy.This shunt is a thin, flexible tube that helps in diverting excess fluid from the brain's ventricles into the amniotic fluid surrounding the fetus in the womb. The shunt typically consists of a catheter that is placed into the ventricle of the brain and a valve system to regulate the flow of fluid.

Like any surgical procedure, the risks involved include infection, shunt malfunction, shunt dislocation, and injury to surrounding tissues.

Important complications of this procedure are brain hemorrhage and preterm rupture of membranes. Regular monitoring of the fetus and the shunt function is essential throughout the remainder of the pregnancy.

In Litwinska(3)et al was a retrospective study evaluated the outcomes of 44 fetus who underwent ventriculoamniotic shunting for ventriculomegaly. The procedure successfully reduced ventricular size initially, it is associated with a significant risk of shunt

dislocation. There were 3 fetal deaths shortly after the procedure and 3 neonatal deaths due to prematurity. Among the 41 live births, ventriculomegaly was isolated in 73.2% and associated with other defects in 26.8%. neurodevelopmental evaluation at two years of postprocedure infants showed that isolated ventriculomegaly was generally associated with better outcomes (70.4% normal or mild delay), whereas non isolated ventriculomegaly had poorer outcomes (81.8% moderate or severe delay)

Fetal neuroendoscopyprocedures such as third ventriculostomy and aqueductoplasty with stenting can be done as alternative to treat obstructive hydrocephalus. In third ventriculostomy a defect is created in the floor of third ventricle under general anesthesia. It provides a route for CSF to flow into surrounding spaces of brain, where it can be absorbed which uses the natural ability of brain to absorb the CSF.

In acqueductoplasty without stenting higher reclosure rate is observed requiring third ventriculostomy later[(4)]. Thusa study done by Fleck and Schroeder, no longer considered aqueductoplasty to be indicated in cases of hydrocephalus caused by aqueduct stenosis

Lifelong follow up is mandatory for all endoscopically treated patients.

High level technical expertise is required in all intervention procedure. Cephalocentesis has a comparatively easier curve of learning and expertise compared to ventriculoamniotic shunting and ventriculostomy.

The beneficence based obligation of the physician and the pregnant woman to sustain the life of the fetus or prevent further neurologic injury are minimal and offering cephalocentesis is appropriate [(5)]

In this case, considering the risk-benefit ratio and the future pregnancies of this primi women, the decision of decreasing the head circumference of fetus was made to facilitating the smoother vaginal delivery.

CONCLUSION

Considering the maternal health importance and poor fetal prognosis, antepartum interventions should be considered whenever it is feasible.

The cephalocentesis makes it easier for women to have vaginal delivery as cesarean delivery would be trivial to both mother and neonate health in such scenario. It would also avoid the morbidity associated with cesarean deliveryand classic uterine incision requiring the delivery of large head delivery. It also aids in prevention of future compulsory cesarean.

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