

# Pregnancy, Delivery and Postpartum Care of Women with Ventriculo-Peritoneal Shunted Hydrocephalus: a case series

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## Abstract

Since the introduction of cerebrospinal fluid (CSF) -shunt implantation in 1971 at the University Hospital of Innsbruck, the number of hydrocephalus patients reaching reproductive age has increased in recent years. In the last few years we were confronted with the fact that three of our patients became pregnant. Our main aim was to attend these patients throughout pregnancy, delivery and maternity. These patients have been in our care from the beginning of their disease to adulthood and we have reviewed their development with other reported patients in literature. Indications for shunt placement were in two cases postmeningitis hydrocephalus and in one case congenital hydrocephalus of undetermined origin during childhood. Because of the mental impairment of our patients, intensive follow-up and medical consultation as well as special antenatal, peripartur and postnatal circumstances had to be considered in order to ensure the optimal quality of care, like social welfare work and vocational guidance. With our multidisciplinary management of these patients, we did not experience any complications regarding maternal shunt dependency contrary to literature. All these patients are now "mother patients" and well integrated in society and their families. We suggest that proper care of these patients can lead to normal pregnancies, deliveries and maternity.

## INTRODUCTION

As a result of the introduction of silicone indwelling cerebrospinal fluid (CSF) shunts in the 1960s., prognosis of hydrocephalus has become better and therefore the number of hydrocephalic patients reaching reproductive age have increased in recent years. Because of the introduction of CSF shunts in 1971 at our hospital we are now confronted with maternal shunt dependence and resulting various problems. On the basis of selected review of larger published series in literature we have been keen to advance our understanding of the coherence of multifarious maternal shunt problems and to improve medical care. We report on the pregnancies outcomes of three patients with ventriculo-peritoneal (VP) shunts with four deliveries at our hospital during the period from 2000- 2007.

Since the first report on maternal shunt dependency in 1979 by Monfared et al.[1] other series addressing various shunt problems during pregnancy and delivery have been published in literature [2-5].

Based on these findings Bradley et al. [2], Wisoff et al. [4],

Kleinman et al. [6], Soava et al. [7], Samuels et al.[8] reported shunt related complications in VP placed shunts during pregnancy and in the postpartum period. We specially focussed on the question of analgesia, the method of anaesthesia applied during delivery and special aspects after delivery as well as intensive follow-up. In our three patients, neither acute shunt malfunctions nor shunt revision during pregnancy appeared. As regards prenatal testing, monthly routine prenatal investigations including ultrasonics were performed. At the end of pregnancy the exact position of intraperitoneal catheter drainage was determined using ultrasound assisted marking in case an emergency caesarean section would have been required.

## CASE PRESENTATIONS

In Case 1 (22-year-old woman) the first delivery was a vaginal birth. The delivery was complicated by the posterior position (face up/ head down) of the baby and therefore prolonged course of labour. Observing cardiotocography (CTG) we noticed foetal distress and therefore vacuum extraction and episiotomy under local anaesthesia was

necessary. A healthy baby weighing 3420 g with APGAR 9/10/10 was delivered.

Because of psychological reasons the same patient refused vaginal delivery for her second baby. In this case a primary low transverse caesarean section had to be performed. After having received detailed information the patient preferred regional anaesthesia to general anaesthesia and spinal anaesthesia was applied. A pencil point needle was used for the single puncture to inject 9.5 mg hyperbaric bupivacaine 0.5% (1.9 ml) and Fentanyl 15µg (0.3 ml) at the lumbar vertebral interspace 3/4. Caesarean section proceeded without complications and 17 minutes later a healthy baby weighing 2980 g APGAR 9/10/10 was delivered.

In Case 2 (24-year-old woman) the delivery was complicated due to the high longitudinal position of the baby at the first stage of labour. Despite induction with an oxytocic, labour progress was arrested and caesarean section under general anaesthesia had to be performed. A healthy baby weighing 4050 g APGAR 9/9/10 was delivered.

In Case 3 (29-year-old woman) the delivery was an uneventful vaginal delivery of a healthy baby weighing 2860 g APGAR 9/9/10.

Postpartum clinical observation of the development of motherhood and the health condition of the child had to be intensified because of different correlated mentally impairment of all mother patients.

In Case 1, the woman was married after the first birth to the father of her babies. She neither had postpartum shunt problems nor problems in upbringing and educating her children. During lactation period she was primarily attended by a nurse on a regular basis. The development and health of the babies was observed by a paediatrician at the child-welfare centre every 6-8 weeks during the first year of life. At the last follow-up in our outpatient department both children (aged 1 ½ years and 3 years) were in a good general state of health. At the moment the patient receives supplementary benefit money from an Austrian social welfare institute.

In Case 2 the woman has a well structured family with concerned parents living in the same village and neighbourhood. In the postpartum period, she did not suffer any shunt problems. She manages upbringing and education of her child as well as possible. She receives help from community providers, social welfare services and her parents

especially from her mother. At the last follow-up in our outpatient department we established that the 6 year old child is in a good general state of health and its psychogenic development is age-appropriate.

In Case 3 the woman is still living together with her parents. They play an important role in the upbringing and education of their grandchild and care about continuity concerning the follow up of mother and child. The mother did not have postpartum shunt problems. The baby is now 4 months old and in a good state of health.

## **DISCUSSION**

In the literature, there have been published various shunt problems during pregnancy and delivery [2-5]. According to literature [3, 5] all three patients in our series with VP shunts had no shunt-related complications during their four pregnancies.

Nevertheless we were aware of these circumstances and each patient was closely monitored by an interdisciplinary team of specialists. Especially close follow-up of function and position of the peritoneal catheter was performed with ultrasound of the abdomen in order to recognise a shunt occlusion caused by kinking, deviation, omentofixation or cerebrospinal fluid cyst formation. To determine the final position of the peritoneal catheter ultrasound assisted marking was performed at the end of pregnancy in case of an unexpected emergency caesarean section.

(Fig. 1) Exact position of intraperitoneal catheter drainage. Black line: intraperitoneal course. Black slashed line: subcutaneous course

**Figure 1**

Figure 1



As the literature review indicates the presence of shunted hydrocephalus itself does not influence the decision of vaginal delivery or caesarean section [2, 3]. Caesarean section should be limited to those indicated for delivery caused by shunt malfunction or obstetrical reasons [7, 9]. There is evidence that epidural/peridural and spinal analgesia as well as anaesthesia can be used deliberately but with caution [2, 10-12]. It is well known that postural post-puncture headache rates after obstetrical peridural anaesthesia occur up to 60% according to anaesthesiological experience. Postural headache in shunted hydrocephalic patients might also be a sign of shunt malfunction according to “slit ventricle syndrome”. Postpartum differentiation of these symptoms could be difficult to distinguish. Thus we recommend a highly experienced anaesthetist carrying out the obstetrical peridural anaesthesia (if necessary combined with blood patch method to seal the leakage after accidental puncture of the dura) in these shunted hydrocephalic patients. Spinal anaesthesia for caesarean section is commonly used in our European territory. This method of anaesthesia bears a minimal risk of postural headache as well as cerebro-spinal leakage syndrome because it is standard proceeding to use a pencil point needle (“Sprottenadel”) [25] gauch. Nevertheless shunt malfunction syndrome might be pretended, caused by cerebro-spinal fluid loss during anaesthetic procedure and following low intracranial pressure period. Ventricular enlargement is presented in computer tomography (CT) scan, because CSF is unable to drain either through subarachnoideal space or the shunt especially in patients with obstructive or aqueduct stenosis induced hydrocephalus. Symptoms are supposed to

resolve with a period of recumbency, CT scan findings return to baseline and shunt revision or external ventricular drainage is not necessary [10]. We propose that anaesthetists and neurosurgeons should be aware of this potential complication.

The increase of intracranial pressure in patients with functioning shunt systems is minimized during spinal anaesthesia because total volume of Bubivacain hyperbar respectively Ropivacain injected does not exceed the critical amount of five ml [12].

Furthermore we recommend to intensify aseptic method of working during the whole procedure comparable to an operative situation in order to avoid contamination of the CSF. We do not recommend prophylactic antibiotic therapy because only very few antibiotics are crossing into the CSF combined with unknown or high toxic side effects to the unborn child.

According to the literature about interdisciplinary team work, patient outcome and long-term prognosis seem to be highly related to team collaboration [13]. Because of different correlated mental impairment of our patients we established a multidisciplinary team to intensify special measures during pregnancy, delivery and postpartum follow-up. To ensure a high quality of care, concerning medical consultation, educational measures for the baby, social welfare work, vocational guidance and vocational training to improve their independence, our transdisciplinary team is directly responsible for the patient and the continuous exchange of information between specialists. Furthermore it is mandatory to provide genetic consultation for these patients. Evidence suggests that the inheritance of hydrocephalus in the LEW/Jms rat strain to a locus on a sex chromosome with additional influences from one or more autosomal loci [14].

## CONCLUSION

Being medical specialists we “literally create” these patients and enable them to enter all stages of adult life including childbearing age. Therefore we have the responsibility to improve their treatment and lives. As a result they should obtain more attention in our society.

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