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Vacuum Assisted Delivery Gone Wrong: A Case Report

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ABSTRACT

Vacuum assisted delivery might not be the first-choice route for delivery but remains a viable option when shortening of the second stage of labour is needed. Incorrect placement of the vacuum device, incorrect technique, prolonged use, and multiple attempts often lead to subgaleal haemorrhage, which is a collection of blood in the space underneath the galea aponeurotica. Here we would like to report a case of an infant that was delivered via vacuum assisted delivery after multiple attempts. The unfortunate infant suffered from subgaleal haemorrhage and was promptly assessed and treated. After spending 1 week in our center, he was allowed to be discharged home, with subsequent follow-up showing remarkable improvement. We would like to emphasize on the importance of this case because even though it does not occur very frequently, the consequences can be fatal if the condition is not identified and treated early.

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Introduction

Vacuum assisted delivery is not a first-choice route of delivery beforehand but remains an option when shortening of the second stage of labour is necessary (1). Scottish Professor James Young Simpson was the first person to use a vacuum instrument in obstetrics in 1849. However, he faced some difficulties with his rubber cup, and it was not until a century later that vacuum extraction regained its popularity, albeit with a stainless-steel cup device at the helm (2).

The soft and semi-soft cups were introduced in the 1970s and disposable cups and handheld pumps became popular in the 1980s (3). As of today, there are a variety of cups made from various materials available in the market. For vacuum assisted delivery, the cup must be placed onto the flexion point, which is situated at the centre of the sagittal suture, roughly three centimetres in front of the posterior fontanelle.

Traction is then applied following the pelvic curve concurrently with uterine contraction and maternal pushing effort.

The fetal head usually starts descending with the first traction. However, incorrect placement of the vacuum device contributes significantly to the development of a subgaleal haemorrhage.

A collection of blood in the space underneath the galea aponeurotica leads to the formation of subgaleal haemorrhage. It easily occurs in this area due to a plethora of emissary veins which connect the intradural venous system with superficial scalp veins (4).

The incidence of subgaleal haemorrhage is estimated to be 1 in 2,000 normal vaginal deliveries but increases to 1 in 200 cases of vacuum assisted deliveries (5).

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Case report

A male infant was born after a gestation of 38 weeks with a birth weight of 2860 g, head circumference of 35cm and length of 45cm, as the child of a nulliparous mother. The infant's mother was 29 years old with underlying gestational diabetes mellitus on diet control. Her latest oral glucose tolerance test showed a reading of 9.7mmol/L. Antenatal blood investigations were normal except for a slightly elevated level of white cell count (11.1 x 109/L). Her viral screening for HIV, hepatitis B and syphilis were unremarkable, but her vaginal culture was however positive for group B Beta-haemolytic streptococcus, for which she was adequately treated with antibiotics (Ampicillin). She had also received two doses of ampicillin during intrapartum.

During labour, the infant was delivered via vacuum assisted delivery due to poor maternal effort and fetal distress. 3 attempts were made using a Kiwi Omnicup before successful delivery of the baby. The Kiwi Omnicup dislodged during the first 2 attempts due to difficulty in determining the position of the baby's head. Only during the third attempt, the kiwi cup was successfully placed onto the flexion point. In total, it took more than 10 minutes to complete the procedure.

The baby was born limp, with no cries and no cord around the neck. He had, however, sustained a skin laceration over the mid scalp measuring approximately 8cm x 2cm with mild bulging of the occipital region of the head. The newborn was then immediately taken to the resuscitation room whereby oronasal suctioning was done. In the resuscitation room he responded well to stimuli and had an oxygen saturation of 100% under room air.

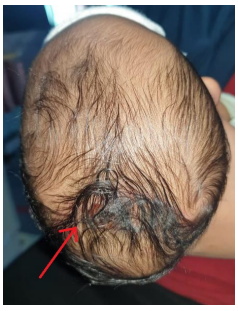

Figure 1: Superficial laceration wound sustained over scalp.

Further examination in the ward demonstrated normal tone with good reflexes, good pulse volume with warm peripheries and a capillary refill time of less than 2 seconds. On top of that, auscultation exhibited good breath sounds with equal air entry bilaterally. Regardless, the baby was given intravenous Benzylpenicillin 280 000 units (100000u/kg/dose) twice a day for 5 days and intravenous Gentamycin 12mg (4mg/kg/dose) daily for 3 days to cover for presumed sepsis. Vitamin K was also administered for 3 days due to increased INR ratio, APTT and prolonged PT. Concurrently, the baby was jaundiced due to an elevated total serum bilirubin, prompting us to start him on phototherapy, with daily monitoring of his total serum bilirubin.

At 4 hours of life, there was an increase in the head circumference of the baby to 37cm with a prominent swelling extending from the left temporo-parietal area to the occipital area. The swelling was soft, tender and boggy. The baby had also vomited 4 times in his first 16 hours of life.

Hence, he was kept fasted for the next several hours before resuming feeding. 2 plain x-rays (anteroposterior skull and lateral skull) were also taken in view of the swelling at the occipital region. The images showed no linear cortical lucency of the skull vault, intact facial bones and no lytic or sclerotic bony lesion.

It did however show opacities exterior to the skull at the parieto-occipital region. Therefore, an urgent ultrasound of the cranium was requested, and the findings are as follows: thick subgaleal anechoic collection at left parieto-occipital region with a maximum thickness of 1.7cm crossing the suture line, left parietal cephalohematoma measuring 1.3cm, normal and symmetrical ventricles with no hydrocephalus.

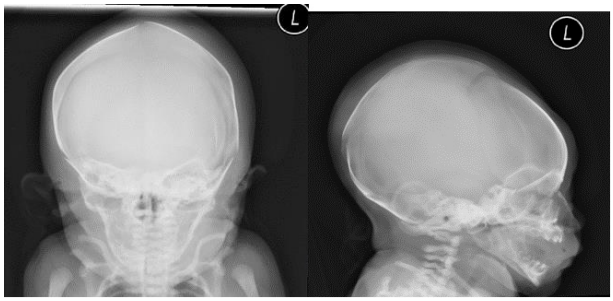

Figure 2: Anteroposterior skull and lateral skull x-rays showing opacities exterior to the skull at the parieto-occipital region

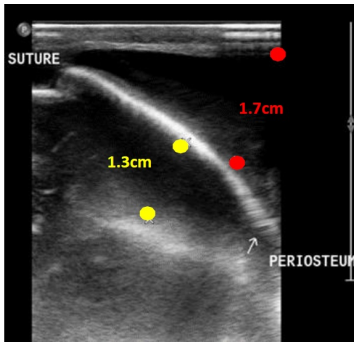

Figure 3: Ultrasound cranium showing left subgaleal hematoma (indicated by red dots) andleft parietal cephalohematoma (indicated by yellow dots)

The plan by the Paediatrics team was for conservative management of the swelling, with close monitoring of the baby and to look out for any neurological deficits or seizure.

This was followed by a referral to the ophthalmology team in view of possible presence of retinal haemorrhage. Their examination revealed normal lids, white conjunctiva with no chemosis, clear cornea, deep anterior chamber, pupils 2mm, round and reactive.

The pupils were then pharmacologically dilated 5mm. Subsequently fundoscopy was performed, exhibiting bilateral cup to disc ratio of 0.3, well defined margins, flat retina, normal macula, no vitreous haemorrhage, no salt and pepper appearance and no roth spots bilaterally.

Unfortunately, the right eye sustained blot hemorrhage below the disc measuring less than ½ of disc diameter in size, whereas the left eye sustained blot hemorrhage superotemporally along the supero temporal vessel measuring 1 disc diameter in size.

The management adopted by the ophthalmology team however was conservative, with an outpatient appointment given 1 week later for reassessment.

The baby was continuously monitored throughout his stay. By day 7 of life, his total serum bilirubin was well below photo level and his head circumference was 33cm with no more scalp swelling. Therefore, he was allowed to be discharged home.

He was however scheduled for a repeat of the ultrasound of the cranium prior to his next visit to the Paediatrics and Ophthalmology clinic.1 week later during his outpatient fundoscopic appointment in the ophthalmology clinic, there was no more retinal haemorrhage with normal vessels appearance, prompting them to discharge him. Upon examination in the Paediatrics clinic, the baby was active, well perfused and pink.

He also had no seizure episodes at home and was tolerating mixed feeding well. He however still had a small swelling over the left parietal area, which was much smaller compared to the initial swelling.

His latest ultrasound of the cranium demonstrated the following findings: smaller subgaleal hematoma at left parietal region measuring 0.4cm and a smaller left parietal cephalohematoma measuring 0.9cm not crossing the suture line.

From the latest ultrasound findings, the baby is on the right track to recovery with a vast reduction in the size of his scalp collection. Thus, we planned to periodically monitor him until the condition fully resolves.

Figure 4: Prominent swelling at occipital region at 4 hours of life.

Figure 5: Resolving swelling at occipital region on day 7 of life.

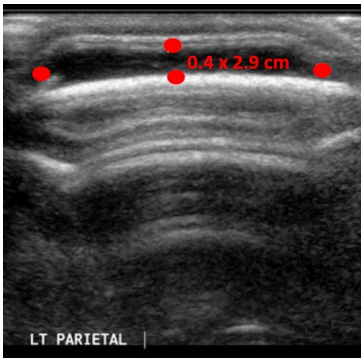

Figure 6: Ultrasound cranium/brain showing reduced left subgaleal hematoma.

Discussion

The American College of Obstetricians and Gynecologists (ACOG) stipulated 3 main criteria in which vacuum delivery is indicated, and they are fetal indication, prolonged second stage of labour and maternal indication (6). Our case fitted 2 out of the 3 criteria mentioned, hence justifying why vacuum delivery had to be applied despite its risks and complications.

The patient was also informed regarding possible complications that can arise from vacuum assisted delivery including scalp injuries, retinal haemorrhage, extracranial haemorrhage such as cephalohematoma and subgaleal haemorrhage, intracranial bleeding, brachial plexus palsy and non-haemolytic neonatal hyperbilirubinemia (1).

One of the most common complications of instrumental deliveries is extracranial haemorrhage. However, it can occur in all modes of delivery, even in utero prior to the onset of labourBased on scalp anatomy and clinical presentation, haemorrhages deep in the scalp and outside the calvarium are categorized into subgaleal haemorrhage, cephalhematoma and caput succedaneum. Table 1 below summarizes several features of these conditions to aid in establishing a diagnosis.

Table 1: Comparison of different neonatal extracerebral fluid collections

Attributes	Subgaleal haemorrhage	Cephalhematoma	Caput succedaneum
Location	Below epicranial aponeurosis, can cross suture lines and may even spread to orbit and nape of neck	Frequently occurs over parietal bones and does not cross suture lines	Occurs at point of contact and can cross suture lines
Features	Firm to fluctuant, ill-defined borders, possible crepitus	Usually unilateral, distinct borders, initially firm but becomes fluctuant after 48 hours	Soft, pitting and superficial edema, ecchymosis over injured area
Blood loss	Can be massive and is often associated with coagulopathy	Rarely severe	Minimal
Prognosis	Mortality rate of 25%	Resolves in 2 to 3 weeks	Excellent, resolves within 72 hours

When shearing forces are applied to the scalp, large emissary veins in the subgaleal space rupture, leading to blood accumulation. As the galea aponeurotica covers the entire cranial vault, the subgaleal space poses a huge potential risk for haemorrhage, from the orbits of the eyes to the nape of the neck and laterally to the temporal fascia. If the haemorrhage is massive, it can even displace the ears anteriorly. Massive haemorrhage can occur because there are no anatomic barriers, such as sutures in this space (8).

Positioning the vacuum device is crucial as incorrect traction may result in descent of only the scalp and not of the infant's entire head. Multiple dislodgments of the suction cup, applications exceeding ten minutes, increased number of pulls, and incorrect manipulation of the vacuum-assisted device also causes subgaleal haemorrhage (9).

Hence, prompt initial identification and assessment of subgaleal haemorrhage by an experienced staff, paediatrician, or neonatologist is of utmost importance. Treatment may include replacing blood volume when needed to maintain adequate organ perfusion, treating neurologic disturbances if present, and managing coagulation disorders to arrest bleeding.

The swelling gradually resolves over several days to weeks once bleeding is controlled. Even though the prognosis is good, it is prudent to have follow-up and monitor the patient closely during the first year of life to detect any residual neurologic deficits (10).

Despite its frequent occurrence, there haven't been many case reports discussing subgaleal haemorrhage and vacuum assisted delivery per se. The main limitation in our case report however is the short duration of follow-up for this patient.

Even though he recovered uneventfully, the risk of developing neurological disorders later in life cannot be disregarded. While this case may only be an isolated case and does not necessarily reflect an entire population, we hope that it will be an eye opener and provide some insight into how things can go wrong when utilizing devices for assistance during delivery.

Conclusion

Neonatal subgaleal haemorrhage is an uncommon but potentially fatal condition that is often linked to vacuum extraction. More similar cases are being encountered with the increase in usage of vacuum extractors for assisted vaginal delivery.

As the saying goes, prevention is better than cure. Hence, measures should be taken to prevent this condition from occurring, such as correct placement of the cup onto the flexion point, maintaining a steady traction in the direction of the birth canal and avoiding rocking movements.

Those involved with the delivery should also be well versed with the vacuum device used and adherently follow the manufacturer's instructions.

However, if this condition does occur, early recognition and appropriate timely management is essential to improve the clinical and neurological outcome, thus decreasing the mortality rate.

Ethics Approval and Consent to Participate

While ethics approval is not applicable in this case report, the principles outlined in the Declaration of Helsinki were strictly followed throughout the entire process to ensure that the authors acted in the patient's best interest when providing medical care while adhering to the ethical guidelines.

Written informed consent for patient information and images to be published was provided by the patient's mother.

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Conflict of Interest

The authors declare no conflict of interest

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