Is the ventouse responsible for subdural and extra cranial neonatal hemorrhages?

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Introduction: Use of the vacuum extractor in vaginal operative delivery may cause neonatal complications including extra cranial bleeding. Our previous MR imaging study of 111 neonates with no clinical signs of subdural or extra cranial hemorrhage revealed 9 infants with unilateral or bilateral subdural hemorrhage.[1] These appeared to resolve spontaneously within four weeks and did not rebleed. In this study we aimed to a) increase the number of babies scanned, b) to determine if this high number of asymptomatic subdural bleeds was reflected in an increased number of extra cranial bleeds and c) to ascertain if the mode of delivery influenced the occurrence of both or either type of bleed.

Figure 1. Niche MRI scanner

Methods: Term babies were imaged within 48 hours of delivery using a specialised magnetic resonance scanner (InnerVision MRI, London, UK), a permanent magnet system operating at 0.2T (7.2 MHz) using 15 mT/m gradients, installed in a modular screened enclosure within a room on the neonatal intensive care unit (figure 1). T1-weighted axial and coronal and T2-weighted coronal images were obtained with an in-plane resolution of 1 mm and 5 mm slice thickness. No sedation or anaesthesia was used.

Obstetric details were recorded retrospectively from the patient's notes. These included parity, whether onset of labour was spontaneous or induced, mode of delivery and indications for operative delivery. In addition, details of the position and station of the fetal head, degree of caput and moulding, presence of meconium, presence of cord around neck, need for pediatric resuscitation and Apgar scores at 1 min and 5 min were recorded.

A neonatal radiologist (EHW) masked to obstetric details and method of delivery interpreted the MR scans and measured subdural haemorrhage maximum depth in the axial plane. Incidence of subgaleal haemorrhage, cephalohematoma and other extra cranial bleeds were also recorded. Odds ratios were calculated for subdural bleeding and cephalohematoma, for each mode of delivery, using the normal vaginal delivery group as the baseline. As no subgaleal bleeds were found in the normal vaginal delivery group odds ratios could not be calculated.

Results: Analysis of 315 newborns has confirmed our initial findings. 21 (6.8%) newborns had a subdural bleed (figure 2A), these were found in all methods of delivery apart from cesarean sections. However the incidence was higher following ventouse delivery. The majority were located in the posterior fossa. All had resolved by 4 weeks of age (figure 2B), with no rebleeds to date. All were and remained clinically silent. 3.17% had a subgaleal bleed (figure 3) and 1.9% a cephalohematoma. The distribution of extracranial bleeds reflected the distribution of subdural bleeds with respect to the method of delivery but interestingly these were not the same patients. If the patient had an extracranial bleed they did not have a subdural and vice versa. The distribution of subdural and extra cranial bleeds across delivery groups can be seen in tables 1 and 2 below.

Delivery method	n=	Subdural bleed	Risk %	Odds ratio
Normal vaginal delivery	183	9	4.9	1.00
Forceps only	20	2	10	2.15
Ventouse only	36	4	11.1	2.42
Failed ventouse to forceps	22	6	27.3	4.46
Cesarean section - emergency	21	0	0	-
Cesarean section- elective	28	0	0	-
Failed ventouse/forceps to cesariean section	2	0	0	-
Failed forceps to forceps	3	0	0	-

Table 1. Incidence and odds ratio of subdural hemorrhage related to the mode of delivery

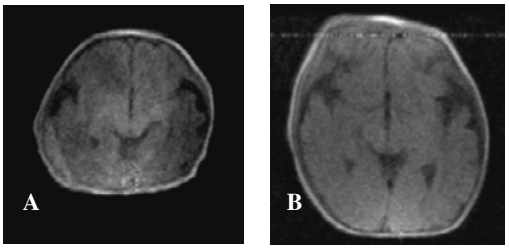

Figure 2. Axial T1-weighted image showing (A) Subdural hemorrhage and (B) subsequent resolution at four weeks of age.

Delivery method	n=	Subgaleal bleed	Cephalohematoma	
Normal vaginal delivery	183	0	1	(1.00)
Forceps only	20	0	0	-
Ventouse only	36	5	2	(11.03)
Failed ventouse to forceps	22	5	3	(28.73)
Cesarean section - emergency	21	0	0	-
Cesarean section- elective	28	0	0	-
Failed ventouse/forceps to ceasarian section	2	0	0	-
Failed forceps to forceps	3	0	0	-

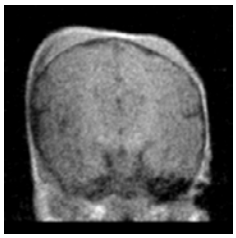

Figure 3. Coronal T1-weighted image showing subgaleal bleed

Table 2. Incidence of extracranial haemorrhage related to the mode of delivery (odds ratio relative to normal vaginal delivery in brackets).

Discussion and Conclusions: These results reveal high numbers of clinically silent subdural and extracranial hemorrhages detected by MR imaging. The subdural bleeds were predominantly located in the posterior fossa. This area is difficult to visualise with ultrasound and many small subdurals have probabaly been missed in the past. Subdural hemorrhages occurred most frequently in instrumental deliveries. Extracranial hemorrhages were associated with vacuum delivery. They appeared to resolve spontaneously without detrimental effects. Symptomatic neonates may have additional pathology to subdural bleeds as all the intracranial bleeds in this study were asymptomatic. Isolated subdural hemorrhages do not appear to rebleed and if they occur in infants over 4 weeks of age are suggestive of non accidental injury rather than birth injury.

Reference: [1]Whitby EH et al. Lancet, 2004 12;363:2001-2.