SUBAPONEUROTIC HAEMORRHAGE IN MALAYSIAN NEONATES

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ABSTRACT

In a 30-month prospective study, between January 1987 and June 1989, 101 of 64,424 Malaysian neonates (1.6 per 1000 livebirths) born in the Maternity Hospital, Kuala Lumpur were found to have subaponeurotic haemorrhage shortly after delivery.

The incidence was highest in neonates weighing 4000 gm or more. There was no significant difference in incidence of this condition in neonates of different ethnic origins. Hypoprothrombinemia was present in only 5/101 (5.0%) of the affected neonates.

Sixty seven (66.3%) of the neonates with subaponeurotic haemorrhage had history of trial of vacuum extraction. The incidence of subaponeurotic haemorrhage was significantly higher in neonates delivered by vacuum extraction than by other modes of delivery in this hospital (41.4 per 1000 livebirths in neonates delivered by vacuum extraction versus 1.0 per 1000 livebirths in neonates delivered by other modes). Those neonates who developed subaponeurotic haemorrhage without trial of vacuum extraction had a history of either prolonged labour or difficult delivery.

Thirty-three (32.7%) of the neonates with subaponeurotic haemorrhage developed anaemia which required blood transfusion and 3/33 (9.1%) were in shock. Fifty seven (56.4%) of the neonates with subaponeurotic haemorrhage developed hyperbilirubinemia due to the haemorrhage. Four (7.0%) of them had severe unconjugated hyperbilirubinemia which required exchange transfusion.

The results of this study suggest that subaponeurotic haemorrhage in Malaysian neonates was commonly associated with vacuum extraction and was not a benign condition.

Keywords: Subaponeurotic haemorrhage, Malaysian neonates, vacuum extraction.

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INTRODUCTION

Subaponeurotic or subgaleal haemorrhage is defined as bleeding beneath the galea aponeurosis covering the scalp. As the galea aponeurotica layer of the scalp is continuous across the scalp, bleeding in this layer may extend across the entire cranium. Thus, this type of bleeding can be extensive and life threatening (1). Clinically, this condition presents as a fluctuant mass that crosses the suture lines in the scalp.

In Caucasian infants, subaponeurotic haemorrhage was not a common condition and was reported in neonates who were delivered by vacuum extraction in the 1960's (2-4). Some authors reported this condition to be more common in infants of African origin (5-7) and suggested an underlying bleeding tendency as the primary cause for the higher incidence. There was, however, no data to support this hypothesis.

In the Maternity Hospital, Kuala Lumpur, subaponeurotic haemorrhage was seen fairly commonly. A prospective observational study was carried out over a 30-month period between January 1987 and June 1989 to determine the incidence of and factors associated with subaponeurotic haemorrhage in Malaysian neonates born in this hospital.

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PATIENTS AND METHODS

In the Maternity Hospital, Kuala Lumpur, Paediatric doctors attended deliveries of almost all of the instrumental births and high risk pregnancies. Vitamin K 1 mg was given intramuscularly routinely at birth to all babies delivered in this hospital. Screening examinations of neonates were carried out in the postnatal wards by the doctors before the babies were discharged home. Any neonate diagnosed to have subaponeurotic haemorrhage after delivery was admitted to the Special Care Nursery (SCN) for close observation and treatment. The diagnosis was made mainly clinically based on the presence of a soft fluctuant mass in the scalp which crossed the suture lines of the skull. Depending on its size, this fluctuant swelling usually resolved over a period of a few days or weeks.

On admission, the affected neonates were closely monitored for signs of shock, anaemia and hypoprothrombinemia. The blood pressure and heart rate were measured continuously with the use of neonatal non-invasive blood pressure monitor (Ohio 2000) at 15-minute intervals during the first 48 hours of life. A term neonate was diagnosed to be in shock when the systolic

blood pressure was less than 55 mm Hg. For the preterm neonate, shock was diagnosed when the systolic blood pressure was less than the lower limit for the respective gestational age and birthweight (8). Hypoprothrombinemia was diagnosed to be present when prothrombin time was greater than 15.3 seconds. Specimens of venous blood were collected from the patients for measurement of haemoglobin level (and or packed cell volume) and prothrombin time before treatment. Fresh frozen plasma was given to the patients for volume replacement while awaiting blood to be cross-matched. Blood transfusion was given when the patient was anaemic (haemoglobin <14 gm/100 ml or packed cell volume <40%) or developed signs of shock despite plasma transfusion. An additional dose of vitamin K was given if hypoprothrombinemia was present. Once repeated plasma prothrombin time performed 24 hours later was normal, no further dose of vitamin K was given.

When jaundice was clinically detected in the patients, their venous serum bilirubin levels (total, direct and indirect serum bilirubin) were monitored daily. Their cord blood glucose-6-phosphate dehydrogenase results were reviewed and a full blood picture was done. Phototherapy was commenced when hyperbilirubinemia was mainly unconjugated. Any neonate with indirect hyperbilirubinemia of 340 micromols/L or above was given exchange transfusion. The following investigations were carried out on each patient just prior to exchange transfusion: full blood picture, glucose-6-phospate dehydrogenase screening, liver function test, renal profile, and hepatitis B antigen screening. Full septic work-up (blood culture; cerebral spinal fluid study: culture, cytological and biochemical examination; chest X rays and urine cultures) was carried out whenever septicaemia was suspected clinically. TORCHES (Toxoplasma, Rubella, Cytomegalovirus, Herpes simplex, Syphilis) antibodies study was performed when intrauterine infection was suspected from maternal history or from clinical features. Jaundice was considered to be physiological in nature when hyperbilirubinemia occurred from the third day of life, was mainly unconjugated, the peaked total serum bilirubin was 250 micromol/L or less, the glucose-6-phosphate dehydrogenase screening was normal and the jaundice resolved by seventh day of life. Unconjugated hyperbilirubinemia was diagnosed to be due mainly to subaponeurotic haemorrhage when the peaked total serum bilirubin exceeded 250 micromol/L, the above mentioned investigations were negative, and the blood groups of mother and neonate did not suggest incompatibility. Phototherapy was stopped when hyperbilirubinemia decreased to below 200 micromol/L.

During the study period, all neonates with subaponeurotic haemorrhage were included. Their case notes were reviewed at the time of discharge or death.

The overall hospital data were obtained from the perinatal census.

Chi-square test was used for statistical test. P value of less than 0.05 was considered significant.

RESULTS

There were 64,424 livebirths delivered in this hospital during the 30 month period. 101 neonates (1.6 per 1000 livebirths) were found to have subaponeurotic haemorrhage after birth. All neonates with subaponeurotic haemorrhage, except one, were admitted directly to the SCN from the labour rooms shortly after birth either because of the presence of subaponeurotic haemorrhage at birth, or severe birth asphyxia and/or other birth injuries. One neonate was admitted to the postnatal ward and developed subaponeutic haemorrhage which was detected at 12 hours after delivery during screening examination. None of these 101 neonates had clinical evidence of congenital malformations. Ninety-four (93%) were term neonates with gestation of between 37 to less than 42 completed weeks. Only one neonate (1%) was preterm with gestation of 36 weeks. Six neonates (5.9%) were posterm with gestation of 42 completed weeks or more. The birthweights of all affected babies were above 2000 gm (Table I). The smallest affected baby weighed 2174 gm. The incidence of subaponeurotic haemorrhage was significantly high in neonates weighing 4000 gm or more (X^2 = 25.9975, df=5, p<0.001). There was no significant difference in incidence among the Malay, Chinese and Indian babies (X^2 = 4.3133, df=3, p=0.22) although the Indian babies had a higher incidence than other races. The male:female ratio was 2.1:1 (Table II).

Table I
Birthweight-specific incidence of Subaponeurotic Haemorrhage in Malaysian neonates born in the Maternity Hospital, Kuala Lumpur, between January 1987 and June 1989.

Birthweight in grams	Total No of livebirths	Neonates with Subaponeurotic haemorrhage No.	(per 1000 livebirths)*
<2000	1904	0	(0.0)
2000-2499	5111	4	(0.8)
2500-2999	19818	30	(1.5)
3000-3499	26039	39	(1.5)
3500-3999	9774	18	(1.8)
4000 and above	1778	10	(5.6)
Total	64424	99	(1.5)

X^2 = 25.9975 df=5 p < 0.001

* Incidence in each birthweight category

Subaponeurotic haemorrhage was significantly more common in neonates delivered by vacuum extraction than in neonates delivered by other methods (X^2=10253, df=4, p<0.001). The incidence was 41.4 per 1000 livebirths in neonates delivered by vacuum extraction and 1.0 per 1000 livebirths in neonates delivered by other modes (Table III).

Among the 23 neonates with subaponeurotic haemorrhage who were delivered by forceps (Table III), 13/23 (56.5%) of them had failed vacuum extraction before delivery. The remainder 10/23 (43.5%) had history of either prolonged second stage and/or shoulder dystocia. Similarly, among the 24 neonates with subaponeurotic haemorrhage who were subsequently

Table II
Incidence of Subaponeurotic Haemorrhage according to Ethnic Origins in the Maternity Hospital, Kuala Lumpur, between January 1987 and June 1989.

Ethnic origin	Total No. of livebirths	Neonates with Subaponeurotic Haemorrhage Male	Female	Total No.	Incidence* per 1000 livebirths
Malay	37,143	39	14	53	1.4
Chinese	14,680	15	6	21	1.4
Indian	9,126	12	9	21	2.1
Others	3,475	2	4	6	1.7
Total	64,424	68	33	101	1.6

Table III
Incidence of Subaponeurotic Haemorrhage according to modes of delivery in the Maternity Hospital, Kuala Lumpur, between January 1987 and June 1989.

Mode of delivery	Total No. of livebirths	Neonates with Subaponeurotic Haemorrhage No.	(per 1000 livebirths)*
SVD	54,387	17	(0.03)
Breech delivery	1,597	0	(0.0)
Forceps delivery	1,761	23	(13.1)
Vacuum extraction	894	37	(41.4)
LSCS	5,797	24	(4.1)

$X^2 = 10253$ df=4 $p < 0.001$

SVD = spontaneous vertex delivery
LSCS = lower segment Caesarean section
*Incidence according to each mode of delivery

delivered by lower segment Caesarean section (LSCS), 17/24 (70.8%) of them had failed vacuum extraction. In fact, three of these 17 neonates had both failed vacuum extraction and failed forceps delivery before LSCS was undertaken. For the remainder 7/24 neonates (29.2%) who had no history of trial of vacuum extraction before LSCS, one neonate had failed forceps delivery, and the remainder 6/24 had history of prolonged second stage before LSCS. Even among those neonates with subaponeurotic haemorrhage who were delivered by vacuum extraction, 6/37 (16.2%) of them had failed vacuum extraction at least once before delivery. One of these six babies had four trials of vacuum extraction before birth. Vacuum extraction was therefore attempted successfully or unsuccessfully in 67/101 (66.3%) of all neonates with subaponeurotic haemorrhage irrespective of their final modes of delivery.

Table IV
Modes of delivery of neonates with Subaponeurotic Haemorrhage who developed Anaemia requiring blood transfusion.

Mode of delivery	Neonates with Subaponeurotic Haemorrhage Total No.	With anaemia No.	(%)
SVD	17	3	(17.5)
Forceps delivery	23	9	(39.1)
Vacuum extraction	37	18	(48.6)
LSCS	24	3	(12.5)
Total	101	33	(32.7)

SVD = spontaneous vertex delivery
LSCS = lower segment Caesarean section

In the 17 neonates who were delivered by spontaneous vertex delivery, one of them had history of failed forceps delivery, while the remainder 16 neonates had history of either prolonged second stage or shoulder dystocia.

Hypoprothrombinemia was present in only 5/101 (5.0%) of the neonates. This was corrected after fresh frozen plasma transfusion and a second dose of vitamin K injection.

In addition to fresh frozen plasma transfusion, 33/101 (32.6%) of the neonates with subaponeurotic haemorrhage required blood transfusion because of anaemia. Anaemia was most common in neonates delivered by vacuum extraction (Table IV). In the neonates delivered by forceps delivery, 7/9 of the neonates who developed anaemia had failed trial of vacuum extraction. All three neonates delivered by LSCS who developed anaemia also had history of failed vacuum extraction. Shock developed in 3/33 (9%) of the anaemic neonates. All 33 neonates survived.

Eighty one neonates (80.2%) developed unconjugated hyperbilirubinemia. Three of the 81 neonates had evidence of maternal-fetal blood group incompatibilities, one neonate had proven septicaemia while another one had glucose-6-phosphate dehydrogenase deficiency. In the remaining 76 neonates with hyperbilirubinemia, no other cause of jaundice was detected. However, 19/76 of these neonates had such mild hyperbilirubinemia that physiological jaundice could be the most likely underlying cause. In the remainder 57 neonates, based on the criteria defined in this study, hyperbilirubinemia was thought to be due mainly to subaponeurotic haemorrhage. In 4/57 (7.0%) of these neonates, exchange blood transfusion was performed because the unconjugated hyperbilirubinemia exceeded 340 umol/L. None of these 4 neonates manifested clinical evidence of kernicterus.

DISCUSSION

There was no difficulty in making the diagnosis of subaponeurotic haemorrhage in the neonates during this study. Unlike the cephalhematoma which was confined by the suture lines, the fluctuant mass of subaponeurotic haemorrhage crossed suture lines and in severe cases tended to be very massive and commonly situated over the occipital region of the skull in the supine child. Moreover, when called to attend difficult deliveries, the neonatal doctors in this hospital anticipated subaponeurotic haemorrhage as one of the common complications based on our past experience.

The results in this study showed that the incidence of subaponeurotic haemorrhage in this hospital was high when compared with those reported elsewhere (1-7). The association of this condition mainly with neonates weighing more than 2500 gm in the presence of low incidence of hypoprothrombinemia, and high incidence of application of vacuum extraction in the affected neonates suggested that subaponeurotic haemorrhage in the Malaysian neonates was primarily the result of birth trauma. The high incidence of failed trial of vacuum extraction and difficult delivery in the affected neonates also suggested possible under-diagnosis of cephalo-pelvic disproportion and/or wrong technique in the application of vacuum extraction as the principal underlying factors contributing to the large number of neonates afflicted with subaponeurotic haemorrhage in this hospital. Both Malmstrom cup and silastic cup were used in this hospital. During the study, the obstetric doctors were not interviewed after delivery of the babies with regard to the type of cup they used. Furthermore, documentation of type of cup used in the obstetric case record was not a routine practice. It was, therefore, not certain to what extent the incidence of subaponeurotic haemorrhage in this hospital was influenced by the type of vcacuum extractor cup used. Information on the type of cup used would be useful because studies had shown that vacuum extraction with the silastic cup produced less trauma to the babies (9).

The high incidence of morbidity in the affected babies showed that subaponeurotic haemorrhage was not a benign condition.

Vacuum extraction has been thought to be a very safe method of delivery if all the indications and contraindications for its application were strictly adhered to (10,11). Many workers reported low incidence of complications in neonates delivered by this method (9,11-16). Because of its apparent safety, this mode of delivery had been recommended for use in the developing countries (10). However, the results of this study showed that this was not so. In view of the high morbidity associated with subaponeurotic haemorrhage which occurred most commonly following vacuum extraction, there is an urgent need for Obstetricians to review the application of this mode of delivery to ensure safety to the neonates.

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