CASE REPORT

Vitamin K deficiency-related late-onset haemorrhagic disease of a newborn with acute subdural haemorrhage: long-term outcome

Shameem Ahmed (1), Rabin Saikia (2), Surojit Majumdar (3), Puja Banerjee Barua (4), Jagritee Priyadarshinee (5), Siba Prosad Paul (6)

(1) Department of Neurosurgery, Apollo Hospitals, (Unit: International Hospital), Guwahati, India
(2) Department of Radiology, Apollo Hospitals, (Unit: International Hospital), Guwahati, India
(3) Department of General Paediatrics, Hayat Hospital, Guwahati, India
(4) Department of General Paediatrics, Apollo Hospitals, (Unit: International Hospital), Guwahati, India
(5) Department of Physiotherapy, Apollo Hospitals, (Unit: International Hospital), Guwahati, India
(6) Department of General Paediatrics, Yeovil District Hospital, Yeovil, UK

ABSTRACT

Newborn infants who for any reason have not received vitamin K supplementation are at risk of major haemorrhagic complications including intracranial bleeding, due to vitamin K deficiency bleeding (VKDB). We describe a 5-month-old exclusively breastfed infant who presented with subdural haemorrhage following a fall from the mother's lap and was found to have VKDB. The patient was lost to follow-up and was brought back at 8 years of age with global developmental delay, epilepsy and hemiparesis. Computed tomography scan showed left-sided encephalomalacia. Healthcare providers and the public should be aware of this preventable, acquired coagulopathy and its potential sequelae, and encourage the uptake of vitamin K at birth.

KEYWORDS

Vitamin K deficiency bleeding; Subdural haemorrhage; Long-term outcome; Epilepsy; Neuroimaging.

INTRODUCTION

Haemorrhagic disorder of a newborn (HDN), due to vitamin K deficiency bleeding (VKDB), manifests in the first few weeks following delivery. It has been categorised into the following three groups according to the age of onset [1]:

1. Early: Within the first 24 hours of birth; it can also occur *in utero* or during delivery.
2. Classical: First week of neonatal life (day 2-7 of life).
3. Late: From day 8 to up to 6-12 months of life.

VKDB is an acquired coagulopathy caused by the accumulation of inactive vitamin K-dependent coagulation factors, which leads to an increased bleeding tendency [2]. It can be grouped as idiopathic or secondary [2]. Secondary causes result mainly from medication administered to the mother and include anti-tubercular drugs (isoniazid and rifampicin), anti-epileptics

Correspondence to:
Siba Prosad Paul
Yeovil District Hospital, Yeovil, UK
Email: siba@doctors.org.uk
Received: 09 November 2020 | **Accepted:** 29 March 2021

How to cite this article:
Ahmed S, Saikia R, Majumdar S, Banerjee Barua P, Priyadarshinee J, Paul SP. Vitamin K deficiency-related late-onset haemorrhagic disease of a newborn with acute subdural haemorrhage: long-term outcome. Sudan J Paediatr. 2021; 21(2):195–199. https://doi.org/10.24911/SJP.106-1604579538

(phenytoin, barbiturates, and carbamazepine), broad-spectrum antibiotics (cephalosporin) and vitamin K antagonists (warfarin) [1]. This case study describes the long-term outcome of an 8-year-old boy who presented in infancy with acute subdural haemorrhage (SDH) due to VKDB.

CASE REPORT

A 5-month-old male attended a rural healthcare centre in the north-eastern part of India because of deteriorating consciousness and being sleepy. The parents reported that the previous day while the mother was sitting on the chair and breastfeeding she fell asleep; the baby had rolled off her lap onto a wooden floor. The infant was born in the rural healthcare centre and was reported to be fully vaccinated; he was the couple's first child; there was no family history of note and he was exclusively breastfed.

Initial assessment showed a heart rate of 94 per minute, respiratory rate of 27 per minute, and saturation of 93% in room air; his blood pressure was 80/42. The infant was stabilised following airway, breathing, circulation approach, and was urgently intubated and ventilated.

Computed tomography (CT) scan of the brain (Figure 1) showed SDH with a small left posterior parietal parenchymal haematoma, and a large haemorrhagic scalp swelling. Initial blood results showed haemoglobin 4.4 g/ dl and platelets 430 × 10^9/l. His coagulation screen was significantly deranged with prothrombin time of 52 seconds (range: 10.2-14.1) and activated partial thromboplastin time 104 seconds (range: 25.1-36.5).

Further history revealed that as was standard practice in the healthcare centre of his delivery, the infant was never given intramuscular vitamin K at birth. A diagnosis of late-onset VKDB presenting with SDH was made.

A dose of intravenous vitamin K at 1 mg was administered, followed by further intramuscular injection of 1 mg a day later. Intravenous fresh frozen plasma (FFP), 15 ml/kg was also given. Repeat coagulation screening on days 5 and 17 were both reported to be within normal limits.

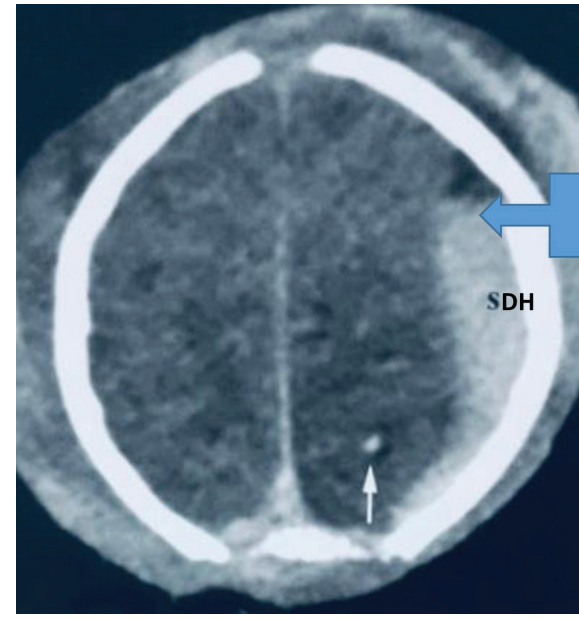

Figure 1. *SDH on left side (blue arrow) and small left posterior parietal parenchymal haematoma (white arrow).*

The haematoma was evacuated through mini-craniotomy procedure and a silicon drain was left in the subdural space until day 6. The infant remained ventilated post-surgery, and was extubated on day 10. As he improved, feeds were gradually established, and anticonvulsant medications started preoperatively was continued.

Safeguarding procedures were initiated to explore concerns regarding the possibility of child abuse. In the absence of a robust multidisciplinary team, enquiry was made with the local police, the Anganwadi worker who provided health visiting support to local families, and the local rural healthcare centre physician, none of whom reported any ongoing health or safeguarding concerns about the family or the infant.

He was discharged from the hospital on day 18, and was advised to continue sodium valproate. Although neurosurgical follow-up was planned, due to the remote location and financial constraints, the family did not attend the appointments.

At 8 years of age the family sought further paediatric review as he was falling behind in school work, struggling to keep pace with activities of daily living and had developed a right-sided weakness. There were also complaints

of intermittent epileptic seizures which were managed by the local physician with oral diazepam on an as required basis and a traditional faith healer. His weight was 18 kg (3rd-10th percentile) and height was 121 cm (10th-25th percentile), and were plotted on the World Health Organisation's (, 2006) and Indian Academy of Paediatrics (, 2015) Combined Boys Charts 0-18 years.

Clinical examination revealed right hemiparesis (Figure 2). His developmental milestones, assessed by a paediatrician at this stage, showed delayed functions of approximately 2-3 years in all developmental milestones.

A CT scan of the brain (Figure 3) showed encephalomalacia involving the territory of left middle cerebral artery to anterior cerebral artery (ACA) without mass effect. There was gliosis in right frontal lobe at ACA territorial distribution with compensatory dilatation of left lateral ventricle to third ventricle. Neurosurgical opinion was that no acute interventions were indicated. The family was advised to resume treatment with sodium valproate and folic acid. Plans were made for yearly follow-up and review sooner if there was deterioration.

Physiotherapy was initiated to improve the functionality of the right side and the family was advised to continue the following exercises at home:

- Stretching exercises - to relax the hypertonicity in the muscles.
- Dynamic-resisted exercises - to strengthen the weaker limb muscles groups.
- Balance and coordination exercises - to improve day-to-day functional activities.

The boy was reviewed by a dietician and his weight and height percentiles were considered appropriate for his age. The assessment of his dietary intake revealed that it predominantly consisted of locally sourced food items and were found to provide a nutritionally balanced diet. No special nutritional management was considered necessary.

DISCUSSION

This case demonstrates the importance of considering medical causes of acute intracranial bleeding while bearing in mind the possibility of child abuse. The left-sided encephalomalacia, leading to loss of brain tissue, is likely to explain the boy's quality of life which is

Figure 2. *Hemiparesis (right) at 8 years of age.*

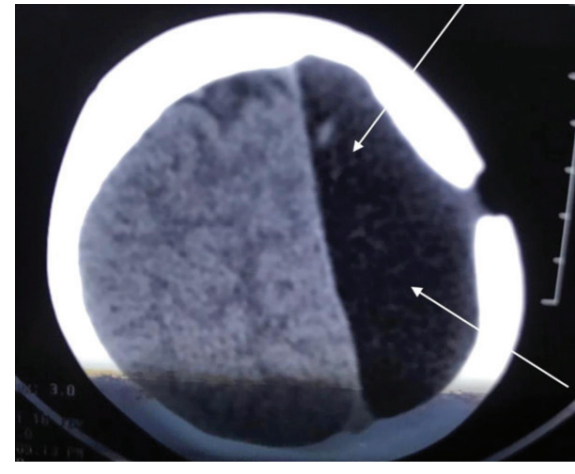

Figure 3. *Encephalomalacia noted on left side (white arrows).*

compromised due to epilepsy and significant developmental delay. It also highlights the importance of the need for long-term follow-up and consideration for neuroimaging in cases where evidence of neurological compromise including global developmental delay, epilepsy, or neurodevelopmental regressions develop as this may provide an explanation for the family.

Administration of prophylactic intramuscular/oral vitamin K at birth is becoming a universal practice. Late-onset VKDB in young infants occurs mostly from omission or refusal of vitamin K prophylaxis at birth, and has significant morbidity and mortality [2]. A case series from the USA reported seven infants, none of whom received vitamin K at birth, presenting with VKDB over an 8 months period; mean age was 10.3 weeks (range: 7-20 weeks) [2]. Manifestations at presentation included overt bleeding, vomiting, poor feeding, and lethargy. All infants had profound derangement of coagulation parameters, which corrected rapidly with administration of intravenous or intramuscular vitamin K injection. Four of the seven infants had intracranial haemorrhage (ICH) at presentation; two of them required urgent neurosurgical intervention [2].

A 25-year (1993-2017) study using the information available from the Australian Paediatric Surveillance Unit included 58 infants with VKDB aged <6 months being reported by paediatricians: 5/58 (9%) were early, 11/58 (19%) classic and 42/58 (72%) late; 53/58 (91%) were exclusively breast fed [3]. Oral vitamin K prophylaxis was used in 7/58 (12%) infants, and majority (86%) had not received all three recommended doses. Parental refusal accounted for 33/58 (57%) infants not being administered vitamin K. Six deaths were reported, and all were due to ICH; and three out of six deaths were associated with home delivery and vitamin K refusal by parents [3].

An Indian study identified 42 infants over a 4-year period (1998-2001) with late-onset HDN associated especially with ICH; 76% were aged between 1 and 3 months, all born at term and exclusively breastfed, and none received vitamin K at birth. Of the 42 infants, three died [4]. A case report from Eastern India described a case of late-onset VKDB in a 2-month-old infant presenting with extensive acute SDH and impending brain herniation who was treated with infusion of FFP, followed by intravenous vitamin K administration [5]. Emergency neurosurgical drainage of SDH under mannitol cover was required. Another case from Eastern India described a month-old infant with unilateral sub-periosteal haemorrhage of the cheek who subsequently developed life-threatening intracerebral haemorrhage and was managed with vitamin K supplementation and FFP [6]. Both cases needed neuroprotective ventilation and effective seizure control, with prolonged periods of hospitalisation [5,6]. Both cases reportedly did well during the short-term follow-up period.

A report from the United Kingdom described five cases of late-onset HDN who presented with acute spontaneous ICH secondary to an inherited coagulopathy (n = 3), vitamin K deficiency in α-1-antitrypsin deficiency (n = 1) and liver disease due to Alagille syndrome (n = 1) [7]. The authors highlighted that the cases of spontaneous ICH due to a significant inherited coagulopathy usually vary in their bleeding pattern and can be differentiated from ICH secondary to non-abusive head trauma (AHT). All five infants made a good neurological recovery and the authors suggested that the neurodevelopment outcome appears to be better in cases of ICH secondary to inherited coagulopathy than in AHT [7].

Our case is possibly the first in the literature with a long-term follow-up, following intracranial bleed secondary to late-onset VKDB, where neuroimaging showed absence of brain matter on left side. As the patient was lost to follow-up for >7 years and with no follow-up neuroimaging being done in the interim period, we hypothesise that the left-sided encephalomalacia may have been related to some intracranial bleeding or ischaemia related to the original episode which had remained unidentified. The appearance seen in CT scan at the age of 8 years does not reflect the typical appearances of long-term outcome which is seen after acute SDH.

CONCLUSION

The patient we report had clinical features and laboratory parameters suggestive of a late-onset

VKDB, presenting with acute SDH necessitating urgent neurosurgical evacuation. Neuroimaging was undertaken almost 8 years after the initial event showed absence of left hemisphere of the brain, which helped in providing an explanation to the family regarding the boy's developmental delay and epilepsy. The case study also reflects the unexpected diagnostic challenges that may be faced by clinicians working in resource-limited settings where advanced radiological imaging such as CT or magnetic resonance imaging scan may not be available in smaller centres with the risk of children being lost to follow-up. There is need for ongoing surveillance and educational campaigns for healthcare professionals and parents to prevent VKDB.

ACKNOWLEDGEMENT

The authors thank Dr Paul Heaton, Consultant Paediatrician, Yeovil District Hospital, for his great support and valuable input to the paper and editing the manuscript. Thanks are also due to the parents for kindly allowing us to use the case study and the radiological pictures.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING

None.

ETHICAL APPROVAL

Signed informed consent for participation and publication of medical details and photography was obtained from the parents of this child. Ethics clearance and approval to publish the case report was obtained from the Ethics Committee and Additional Director of Medical Education, Apollo Hospitals, Guwahati.

REFERENCES

1. Kher P, Verma RP. Hemorrhagic disease of newborn. Treasure Island, FL: StatPearls; 2020. [cited 2021 Jan]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK558994/
2. Schulte R, Jordan LC, Morad A, Naftel RP, Wellons JC 3rd, Sidonio R. Rise in late onset vitamin K deficiency bleeding in young infants because of omission or refusal of prophylaxis at birth. Pediatr Neurol. 2014;50(6):564–8. https://doi.org/10.1016/j.pediatrneurol.2014.02.013
3. Zurynski Y, Grover CJ, Jalaludin B, Elliott EJ. Vitamin K deficiency bleeding in Australian infants 1993-2017: an Australian Paediatric Surveillance Unit study. Arch Dis Child. 2020;105(5):433–8. https://doi.org/10.1136/archdischild-2018-316424
4. Pooni PA, Singh D, Singh H, Jain BK. Intracranial hemorrhage in late hemorrhagic disease of the newborn. Indian Pediatr. 2003;40(3):243–8.
5. Gopakumar H, Sivji R, Rajiv PK. Vitamin K deficiency bleeding presenting as impending brain herniation. J Pediatr Neurosci. 2010;5(1):55–8. https://doi.org/10.4103/1817-1745.66681
6. Ghosh A, Rana R. Sinister presentation of a neglected case of late onset hemorrhagic disease of newborn. Curr Pediatr Res. 2017;21(3):389–91.
7. Vorstman EB, Anslow P, Keeling DM, Haythornthwaite G, Bilolikar H, McShane MT. Brain haemorrhage in five infants with coagulopathy. Arch Dis Child. 2003;88(12):1119–21. https://doi.org/10.1136/adc.88.12.1119