SWISS SOCIETY OF NEONATOLOGY

Unexpected intrapartum coagulopathy

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Title figure:
Frank breech, by William Smellie (1792)
Source: www.wikipedia.org

The normal ranges of coagulation parameters in both term and preterm neonates differ considerably from values later in life. Functional levels of most coagulation proteins increase gradually during gestation and after birth, reaching adult levels at around 6 months of age or even later. In healthy neonates, concentrations of most pro- and antithrombotic coagulation proteins are lower than in children and adults (1).

However, the coagulation system of the newborn provides an adequate protection from bleeding or thrombosis in most situations, although there is an increased risk of both entities in the perinatal period. Therefore, clinical presentation and understanding of the age-related developing hemostatic system are essential to assess and treat neonates with hemorrhage.

We present two preterm babies with suspected coagulopathy due to venous stasis following complicated deliveries. This phenomenon has rarely been described in the literature and is possibly underreported because it usually does not cause severe hemorrhage.

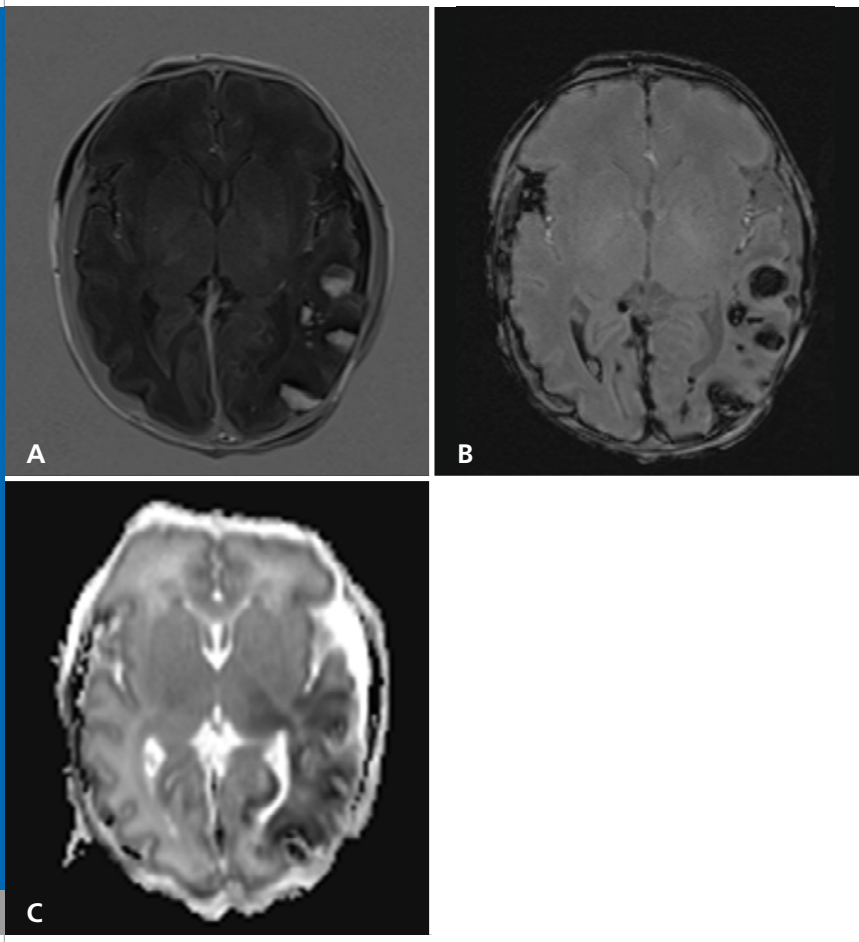

Fig. 1

MRI (case report 1): A) T1-ir (T1 inversion sequence): multiple hemorrhages in the left parieto-occipital region and extensive subdural hematomas; B) SWI sequence (susceptibility weighted imaging): additional blood accumulation in the sulci and ventricular system; C) ADC mapping (apparent diffusion coefficients):cortical and subcortical zones of ischemia.

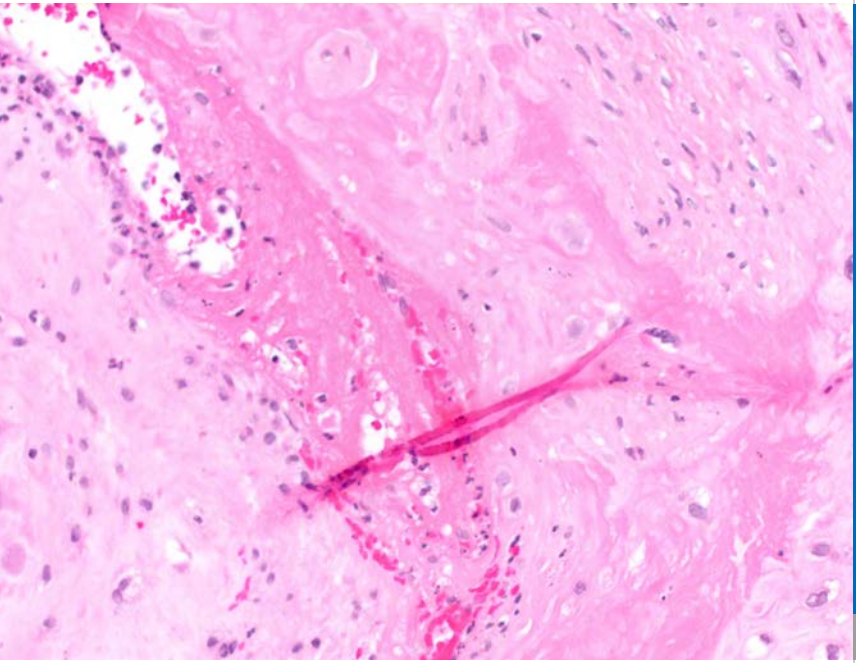

Fig. 2

Histology of the placenta (case report 1): acute atherosis in the basal plate with luminal thrombosis and partial fibrinoid necrosis of the vessel wall (H&E stain).

CASE REPORT 1

The first patient is a preterm girl, born at a gestational age (GA) of 34 0/7 weeks. Pregnancy had been uneventful until 33 0/7 weeks, when intrauterine growth restriction (IUGR) and signs of fetal hypoxia on Doppler ultrasound examination of the umbilical artery were detected.

Cesarean was performed one week later because of IUGR and non-reassuring fetal heart rate tracing on cardiotocography (CTG). Extraction was difficult and lasted more than 15 minutes because the head was stuck in the birth canal and had to be pushed back up. The girl was floppy, cyanotic and required immediate positive pressure ventilation after birth. Her skin had a striking appearance with massively dilated superficial veins in a reticular pattern. Even with SpO_2 values above 90%, the skin appeared grey and multiple hematomas were noted.

Respiratory support was necessary in the first 30 minutes after birth. An umbilical venous catheter (UVC) was inserted and a coagulation profile was ordered. The blood showed no coagulation capacity at all, fibrinogen concentration was below measurable levels and the platelet count was 62 G/l. While ruling out pre-analytic problems, intravenous vitamin K, fresh frozen plasma (FFP) and fibrinogen were administered and coagulation normalized within the next 12 hours (Table 1). Neurological examination was remarkable for hyperexcitation but no focal deficits. The venous

congestion resolved within the first hour of life and no new hematomas appeared.

Shortly after admission to the neonatal intensive care unit (NICU), cerebral ultrasound examination revealed multiple intracerebral and subdural lesions, which were confirmed by magnetic resonance imaging (MRI) on day of life (DOL) 3 (Fig. 1). Histological examination of the small placenta showed venous congestion, as well as both old and new thrombi with signs of impaired circulation (Fig. 2).

The further course was favorable and the patient was discharged on DOL 40 at a corrected GA of 39 5/7 weeks. Neurological exam at discharge was remarkable for increased muscle tone in the lower extremities, but was otherwise unremarkable. At 2 years of age, there were no obvious neurological deficits, but further follow-up was recommended.

CASE REPORT 2

The second patient was a boy born by Cesarean section at 34 5/7 weeks due to breech presentation with prolapsed feet and pathological CTG. His birth weight was 2310 g. When he was found to be stuck in the birth canal, vaginal delivery was attempted but unsuccessful, and he had to be pushed upwards. After delivery, he needed mask ventilation and CPAP for a short while but recovered within 2 hours. Multiple hematomas covered the lower part of the body (Fig. 3). Based on the experience with the first case described above, a coagulation profile was ordered and revealed aPTT of 47 s and a fibrinogen concentration of 0.66 g/l, but no thrombocytopenia. After the administration of FFP and fibrinogen, follow-up laboratory values were normal (Table 1). There were no neurological abnormalities and a cerebral ultrasound examination was unremarkable. Histological examination of the placenta showed lymphohistiocytic villitis but no signs of coagulopathies.

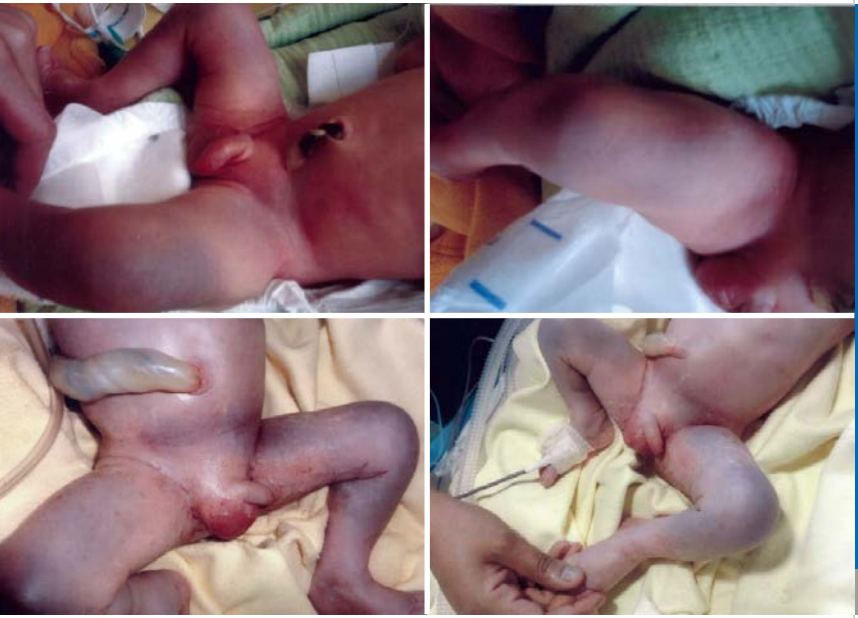

Fig. 3

Clinical appearance of the second patient with extensive hematomas on the lower extremities.

DISCUSSION

In both cases, the infants were trapped in the birth canal, the first one in a cephalic, the second one in a breech presentation. After birth, the first patient presented with generalized dilatation of the veins and severe consumption coagulopathy (Table 1) (2). Imaging revealed an intracranial hemorrhage. In the second patient, hematomas were restricted to the lower part of the body, there was only mild coagulopathy and no further complications.

Prolapse of limbs with consecutive hematomas are a well-known obstetric problem. However, they generally are not associated with coagulopathies. In the presented patients, congenital coagulopathies were excluded, raising the question whether the coagulation abnormalities were related to the complicated deliveries. We suggest that the extensive hematomas resulted in the consumption of platelets and coagulation factors, particularly fibrinogen mimicking disseminated intravascular coagulation (DIC).

This interpretation was shared by the hematologists, arguing that generalized venous stasis might cause contact between platelets and subendothelial structures resulting in activation of the coagulation cascade leading to an excess of thrombin formation and eventually consumption coagulopathy.

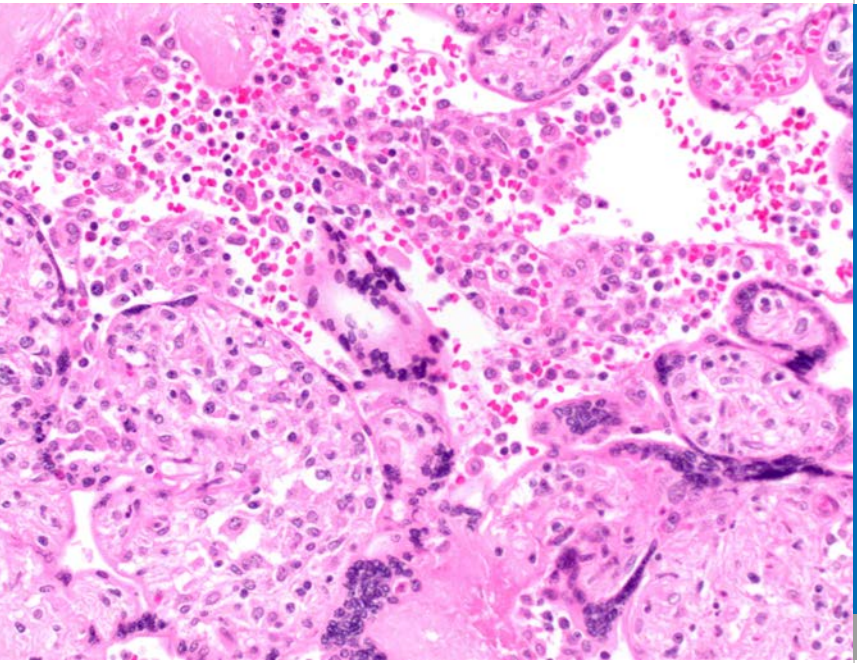

Fig. 4

Histology of the placenta (case report 2): mild villous and intervillous placentitis with histiocytes and a few lymphocytes (H&E stain).

Value	Adult reference values	Patient 1 initial value	Patient 1 after therapy	Patient 2 initial value	Patient 2 after therapy
Platelets (G/l)	140 – 400	62	87	189	168
Fibrinogen (g/L)	2.0 – 4.5	prolonged, not measureable	2.04	0.66	1.67
INR	0.8 – 1.3	prolonged, not measureable	0.9	1.5	1.3
aPTT (sec.)	25 – 38	prolonged, not measureable	25	47	36

Table 1. *Platelet values and coagulation test results of the presented patients.*

Value	Adult reference values	Neonatal reference values	Preterm infants (GA 33.7±2.8 weeks)	BW (g) 500 – 749	BW (g) 750 – 999	BW (g) 1000 – 1249	BW (g) 1250 – 1499	GA (weeks) < 28	GA (weeks) > 28
Platelets (G/l)	140 – 400	normal or increased		150 ± 68	191 ± 66	202 ± 54	227 ± 70		
vWF	0.5 – 1.5	+153%							
Platelet closure time (sec.)	< 180	shortend							
Fibrinogen (g/l)	2.0 – 4.5	normal or decreased fetal fibrinogen may be present	183 ± 80	101 (55 – 245)	105 (69 – 339)	134 (81 – 215)	161 (96 – 331)	1.4 (0.7 – 3.8)	1.3 (0.8 – 4.0)
INR	0.8 – 1.3		1.32 ± 0.20	2.0. ± 0.7	1.7 ± 0.4	1.7 ± 0.3	1.6 ± 0.3		
aPTT (sec.)	25 – 38	prolonged	51 ± 12	61.1 ± 20.7	54.3 ± 16.5	52.6 ± 15.8	48.9 ± 11.1	87.2 (53.7–139.3)	72.6 (43.6– 101.1)
Reference	(4)	(8)	(5)	(1)	(3)	(3)	(3)	(6)	(6)

Table 2. *Age-specific normal values of platelet count and various coagulation tests.*

CONCLUSIONS

Physiological values of coagulation parameters in preterm infants differ significantly from those in term infants and older children. Particularly, coagulation inhibitors show very low activity, while others, like factor VIII and von Willebrand factor, may even exceed adult values (Table 2) (3 – 6, 8). This might compensate for both the low levels of coagulation proteins as well as physiologically hypofunctional platelets, and thus explain the relatively low risk of bleeding in healthy neonates. Clotting tests are of little value in predicting risk of bleeding, and evaluation of a newborn with bleeding (or thrombosis) must take into account age-related differences in clotting factor concentrations.

In the case of obstructed labour with an infant stuck in the birth canal, the possibility of an acquired coagulopathy should be considered. In case of severe bleeding, fibrinogen should be given, particularly when fibrinogen levels are less than 1 g/l. The decision to substitute other coagulation factors and platelets should be based on the clinical presentation and the laboratory results.

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