

Management of Subgaleal Haemorrhage in Neonatal Transport

1. Introduction

Subgaleal haemorrhage is a rare but potentially lethal medical emergency¹. Haemorrhage occurs into the loose connective tissue within the subgaleal space and can cause hypovolaemia. Neonates can lose 50-70% of their circulating blood volume into this space⁵ leading to hypovolemic shock, anaemia, coagulopathy and death. All clinicians involved in newborn care should be familiar with the recognition and management of SGH and be aware that early close monitoring, diagnosis and aggressive treatment is required to prevent and reduce mortality and morbidity from SGH³.

2. Aim

To provide a management pathway for neonates with symptomatic SGH with particular emphasis on the recognition and management of haemorrhagic shock. This guidance includes a focus on SGH in the context of emergency referral and retrieval.

3. Background

Subgaleal haemorrhage occurs most commonly following a vacuum extraction¹ however it can also occur following normal vaginal delivery and caesarean section. There have been recent coronial inquests highlighting the importance of early recognition and intervention in reducing the mortality risk associated with severe SGH. Moderate to severe SGH occur in approximately 1.5 per 10 000 births. Approximately 25% of babies who require intensive care for this condition die⁸. It is recognised however that early close monitoring, diagnosis and aggressive treatment can prevent and reduce the mortality and morbidity from SGH³.

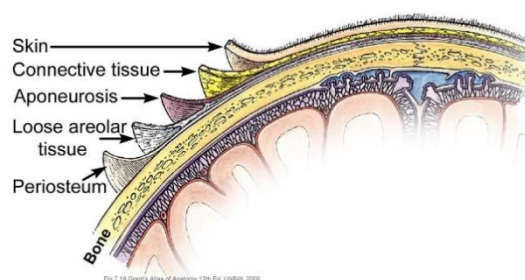
4. Definition of Terms

SGH: Subgaleal Haemorrhage

RANZCOG: Royal Australian and New Zealand College of Obstetricians and Gynaecologists

5. Anatomy

There are 5 layers of tissue forming the scalp: skin, dense connective tissue, a fibrous galea aponeurotica (Galea Aponeurosis), loose connective tissue and the periosteum. The Subgaleal space refers to the area between the fibrous galea aponeurotica and the periosteum³.



6. Differential Diagnosis

Haemorrhage can occur into different layers of the scalp as a result of external forces being applied to the scalp during delivery. It is important to be able to distinguish between the various extra-cranial haemorrhages.

6.1 Caput Succedaneum:

Serosanguinous fluid accumulates in the subcutaneous layer of the scalp⁴, it may extend over the suture lines and cross the midline⁵, causing some confusion with SGH⁶, however it does not extend and usually resolves with 12-18 hours⁴.

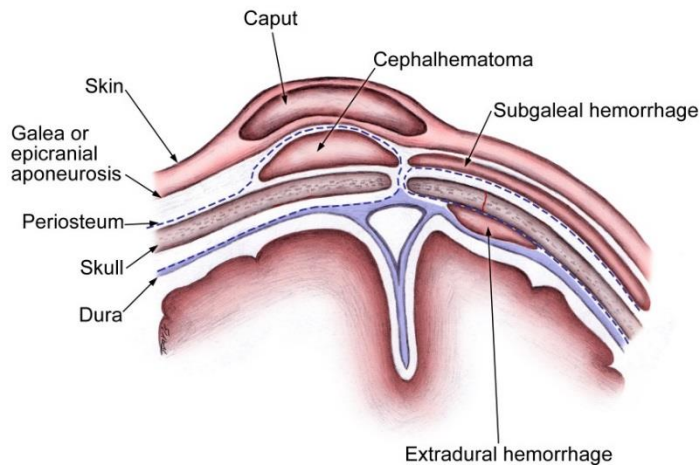
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6.2 Cephalhaematoma:

Rupture of blood vessels between the periosteum and skull causes bleeding into the area beneath the periosteum⁶. The mass cannot extend beyond the suture lines as the bleed is beneath the periosteum. Cephalhaematoma's are usually unilateral and appear as soft, fluctuant swellings which have a well-defined outline⁵.

6.3 Subgaleal Haemorrhage:

Rupture of blood vessels between the galea aponeurosis and periosteum results in haemorrhage into the Subgaleal space. This compartment extends across the entire cranial vault and as there is no anatomical tamponade haemorrhage into this area can be extensive³. The appearance is of a diffuse boggy swelling which crosses the midline and is gravity dependant. The head circumference may increase and in large haemorrhages the eyelids may swell and the ears can be displaced³. A 1 cm increase in depth of the of the Subgaleal space may contain 40-260ml of blood³, the circulating blood volume of a baby is around 90ml/kg³, SGH haemorrhage can cause infants to lose up to 70% of their circulating blood volume, resulting in hypovolemic shock, anaemia, coagulopathy and death⁵.



<https://nursingcrib.com/wp-content/uploads/caput-and-cephal.jpg>

7. Clinical Features of Subgaleal Haemorrhage

The clinical features of SGH are variable, however it is recommended that the diagnosis is considered in a newborn with a 5 minute Apgar score of < 7 and no evidence of asphyxia, especially if the delivery was prolonged or there was a vacuum delivery⁷. The mean time for diagnosis of SGH is 1-6 hours after birth and the RANZCOG have a recommended neonatal surveillance regimen for neonates at risk of SGH⁷. In the at risk but asymptomatic neonate they recommend that cord pH, lactate, haematocrit and platelet count are taken at birth and basic observations taken hourly for the first 2 hours of life and then 2 hourly for a further 6 hours.

Localised signs include:

- Fluctuant scalp swelling
- Ballotable lesion crossing the suture lines
- Pitting oedema extending over the head and in front of the ears
- Fluid shift when the infant is repositioned
- Fluid thrill

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And with extensive haemorrhage:

- Elevation and displacement of the ear lobes
- Peri-orbital oedema
- Irritability

Concerning Features:

Baby appears shocked

HR > 160

Tachypnoea RR >60

CRT > 3 sec

Lactate >3

Low BP: Mean BP < 40 in term infant

A normal BP and HR can be falsely reassuring in a baby who looks sick

Generalised signs include:

- Relatively inactive or irritable baby
- Grunting respirations
- Tachycardia
- Tachypnoea
- Pallor
- Prolonged capillary refill time
- Mild Respiratory Distress – SpO₂ in air may be normal in evolving shock
- Anaemia
- Coagulopathy
- Hypotension
- Acidosis

Early shock may be recognised by tachycardia, reduced spontaneous activity, pallor, poor capillary refill time and mild respiratory distress³. **The absence of tachycardia does not preclude a diagnosis of haemorrhagic shock in the newborn.** Poor end organ tissue perfusion results in low urine output, hypotonia, lethargy, cyanosis and seizures. A rising lactate and worsening base deficit may accompany deranged LFTs, and renal function. If the haemorrhage is large volume and persisting the patient is at risk of disseminated intravascular coagulopathy³.

8. PIPER Response

PIPER encourages the most senior clinician (unless they are involved in a resuscitation) to refer these patients. It can sometimes be a challenge to gauge the severity of SGH in the early stages. There are a number of babies with mild SGH who do not require intervention and emergency transfer.

If a PIPER transfer is required the PIPER Consultant will work with the available resources to ensure a team is dispatched as soon as possible. Emergency stabilisation advice will be provided at referral and thereafter as needed while the team is en route.

PIPER will assess blood product availability at the referring hospital to determine if RCH Blood bank needs to be contacted to provide emergency blood products to take with the retrieval team.

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9. Clinical Management Principles

If a baby with suspected SGH acutely deteriorates and has haemorrhagic shock a designated doctor or nurse should call the hospital blood bank and ask for uncrossed matched O negative blood to be available at the bedside within 15 minutes.

If severe compromise suspected on clinical grounds you can commence blood and FFP without doing ANY blood tests

9.1 Initial Action:

- Apply Cardio-respiratory monitoring and pulse oximetry
- Secure IV access (rapid UV cannulation recommended if peripheral cannulation anticipated to be difficult) and take bloods (where feasible) for:
 - FBE, Group and X match, UEC, LFT, Coagulation, NSBT
 - Blood gas including lactate and glucose
- Measure head circumference
- Blood Pressure
- Assess perfusion
- Consider elective intubation
- Consult PIPER Consultant and plan interventions (including timeline);
PIPER Consultant briefs RCH Clinical Haematology if blood products are anticipated to be needed

9.2 Resuscitation:

If concerns of Hypovolaemia:

- Shocked appearance
 - Tachycardia (HR > 160)
 - Poor Peripheral Perfusion (CRT > 3 sec)
 - Hypotension (MBP < 40 in a term baby)
 - Metabolic Acidosis
1. Give 20ml/kg 0.9% Saline as rapid push if blood not immediately (5min) available
 2. If severe compromise suspected on **clinical** grounds (do not absolutely require **ANY** blood tests) - request immediate uncrossed O-ve blood (nominate a specific staff member to get the blood) and Fresh Frozen Plasma (FFP, Group AB). Ensure Vit K has been administered.
 3. As a guide, by 30 mins after pushing the saline, aim to have 20ml/kg uncrossed O negative blood pushed in and be commencing 20ml/kg FFP. By 1 hour after diagnosis of decompensated haemorrhagic shock the baby has ideally received a saline bolus and 20mls/kg of both uncrossed O neg blood and Group AB FFP.
 4. Order crossed matched blood and group appropriate FFP from the blood bank when the acute emergency is under control
 5. Continue fluid resuscitation as required with O-ve blood and FFP (or 0.9% saline until these are available)
 6. Discuss with PIPER Consultant at 30 minutes after initial consult.
 7. PIPER Consultant will have briefed the RCH Clinical Haematologist who will facilitate blood product management including liaison with referring hospital blood bank as appropriate.
 8. RCH Clinical haematologist will advise re the use of Recombinant Factor VIIa and/or tranexamic acid 15mg/kg.
 9. The PIPER Consultant, PIPER team and senior referring unit clinical staff will continually review the

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overall situation to determine if expediting transfer with ongoing product support is prioritised over further stabilisation at the referring unit.

NB:

- If there is a strong **clinical suspicion** of haemorrhagic shock or coagulation studies are abnormal give 20ml/kg FFP (Grp AB) and repeat coagulation study afterwards
- If continued bleeding or Fibrinogen < 1.5g/l then consider Cryoprecipitate 5ml/kg,
- If thrombocytopenic (platelets < 80) give Platelet transfusion if available.
- Consider the use of Recombinant Factor VIIa (discuss with on call haematologist)
- The PIPER Consultant works closely with the RCH Clinical Haematologist and referring hospital Haematology/Blood bank team to manage blood product use including activating massive transfusion protocols where applicable.

10. References

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11. Disclaimer

The Paediatric, Infant Perinatal Emergency Retrieval (PIPER) Neonatal and Paediatric guidelines were developed by PIPER clinicians for the sole use within the PIPER service at The Royal Children's Hospital Melbourne.

The authors of these guidelines have made considerable effort to ensure the information upon which they are based is accurate and up to date. Users of these guidelines are strongly recommended to confirm that the information contained within them especially drug doses is correct by way of independent resources. The authors accept no responsibility for any inaccuracies or information perceived as misleading.

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12. Appendix 1 - Subgaleal Haemorrhage Fluid Resuscitation Pathway

- For a shocked baby the aim to is to reach commencement of FFP within 30 minutes of diagnosis
- Do not wait for laboratory results to guide initial use of blood products if there is a strong clinical suspicion of haemorrhagic shock.

