CASE REPORT

Delayed subaponeurotic (subgaleal) fluid collection

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SUMMARY

A 14-week-old boy who is known to have a single right kidney presented to our emergency department with history of fever for 1 day. A sepsis work up was performed (complete blood count, blood culture, urine culture and lumbar puncture) in the emergency room. On the second day of admission he developed swelling in the parieto-occipital area. Head CT showed crescent-shaped extra cranial area of homogeneous low attenuation. He remained asymptomatic with a stable haemoglobin and haematocrit. Swelling subsequently resolved within 5 weeks.

BACKGROUND

We are describing extremely rare and poorly understood soft swelling in the scalp which usually develops in infancy beyond the neonatal period. This condition is called delayed subaponeurotic or subgaleal fluid collection. In addition, we review all previously reported cases.

It is important for paediatricians to be aware of this rare condition as it is benign and no investigations or interventions are needed unless there is documented or suspected significant trauma or a questionable child abuse.

CASE PRESENTATION

A 14-week-old boy who is known to have a single right kidney presented to our emergency department with history of fever for 1 day. A sepsis work up was performed (complete blood count, blood culture, urine culture and lumbar puncture) in the emergency room. The patient was admitted for management of presumed pyelonephritis and was begun empiric on ampicillin and cefotaxime. He responded well to the treatment.

On the second day of admission he developed swelling in the parieto-occipital area. The swelling was soft, non-tender and fluctuant (felt like bag of water) under the scalp which shifted with head movement not limited by suture lines. There was no abnormality on palpation of the scalp and there were no signs of bruising or trauma. On questioning by staff and social work, there was no history of trauma. He remained asymptomatic during his hospitalisation with a stable haemoglobin and haematocrit. He was subsequently discharged after completing an intravenous antibiotics course.

The swelling resolved within 5 weeks

His medical history is significant for mother having a prenatal sonogram showing the left kidney considerably smaller than the right kidney. He was a 38-week gestation infant born via caesarean section due to non-reassuring fetal heart sounds and arrest of labour. No fetal scalp electrodes or

instruments were used during labour. The APGAR score was 7/8 (positive pressure ventilation was given for 1 min). Postnatally, a renal scan confirmed single active right kidney.

INVESTIGATIONS

Head CT: 6×5 cm crescent-shaped extra cranial area of homogenous low attenuation. The fluid collections were noted to have Hounsfield units similar to water and no haemorrhage within the subcutaneous soft tissue of the scalp in midline over the parietal calvarium.

The ventricles, cisterns and cerebrospinal fluid (CSF) spaces were normal in size, shape and position. There was no evidence of intracranial haemorrhage (figure 1).

DIFFERENTIAL DIAGNOSIS

Scalp swellings are common in infants and the most common swellings are as below.

Caput succedaneum: This is an area of oedema over the presenting part of the scalp during vertex delivery. The area of oedema is usually associated with bruising and petechiae. It crosses the midline of the skull and suture lines. The bleeding is external to the periosteum¹ (figure 2).

Cephalhematoma: This is caused by bleeding that occurs below the periosteum overlying one cranial bone (usually the parietal bone). There is

Figure 1 CT of the head: 6×5 cm crescent-shaped extra cranial area of homogenous low attenuation.

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Figure 2 The differential diagnosis of extradural fluid collection in infants.

Types of extradural fluid collections seen in newborn infants. (Volpe JJ: *Neurology of the Newborn*, 3rd ed. Philadelphia: WB Saunders, 1995; and based on data from Pape KE *et al*: Haemorrhage, Ischemia and the Perinatal Brach. Philadelphia: JB Lippincott,1979.)[2]

no crossing of the suture line. The overlying scalp is not discoloured¹ (figure 2).
Subgaleal haemorrhage: Is a collection of blood in the soft tissue space under the aponeurosis but above the periosteum of the skull. Diffuse swelling of the soft tissue, often spreading towards the neck and behind the ears, can be seen. Periorbital swelling is also evident. It is an absolute emergency which requires immediate evaluation and management. Associated symptoms include severe blood loss, shock, anaemia, hypotonia, seizures and pallor. Subaponeurotic or subgaleal haemorrhage into this large space is most often associated with vacuum extraction or forceps delivery, but it can occur spontaneously^{1 2} (figure 2).

OUTCOME AND FOLLOW-UP

The patient remained asymptomatic during his hospitalisation with a stable haemoglobin and haematocrit. He was subsequently discharged after completing intravenous antibiotics course.

DISCUSSION

Subaponeurotic fluid collection (SFC) is an extremely rare condition. We searched PubMed for similar published cases. We found that it has been described before but only 18 cases were described in the literature; three of them are reported in the USA and the rest are reported from European countries (table 1).
Hopkins *et al* reported the first seven cases of SFC (6 were infants and the 7th case was a 7-year-old boy who developed fluid collection after a minor trauma to the left eyebrow) six patients were managed conservatively and the one case was managed by needle aspiration of the collection on two occasions when serosanguinous fluid was drained at 6 and 17 days after diagnosis (table 1). The fluid was sterile on microbiological analysis. No biochemical analysis was performed. They postulated that the cause of the swellings were small subaponeurotic bleeds at delivery which were masked by soft tissue swelling and moulding then over the next weeks they underwent gradual liquefaction with further fluid accumulation resulting in increase in size and presentation. They also postulated that birth trauma

Table 1 Summary of the all reporting cases in literature including our case²⁻⁵

Study name/number of cases	Age at presentation Range/mean (weeks)	Gestation Range/mean (weeks)	Delivery type Fetal scalp electrodes (Y/N)	Presentation	Scalp appearance	Treatment	Resolution Range/mean (weeks)
Woodhull Hospital, ¹	14	38	Em CS/N	Cephalic	Normal	Conservative	5
Vaibhav <i>et al</i> (2010), ⁴	4–14/7.5	36–41/39	All of them Em CS (1 case failed forceps/ventouse)	3 Cephalic 1 Face	3 Normal 1 Face and scalp bruising	Conservative	3–8/7.25
Hopkins <i>et al</i> (2002), ⁶	3–18/8.5	38–41/39.7	2 NVD 1 Ventouse 1 Low forceps (failed ventouse) 1 Em CS; failed (ventouse/forceps) 1 Ventouse	All Cephalic	3 Normal 1 Cephalhematoma 1 Large caput	5 Conservative 1 Aspiration×2	2–24/9.2
Petraglia <i>et al</i> (2010), ³	5–9/7.6	39–40/39.3	1 Ventouse/Y 2 CS/Y			Conservative	5–9/6.7
Schoberer <i>et al</i> (2008), ⁵	7–8/7.8		4 Ventouse 1 Em CS	4 Cephalic 1 Breech		2 Conservative 2 Aspiration×1 1 Aspiration×2	

Presentation: Face: 1; Breech: 1; Cephalic: 14.
Type of delivery: C section: 7, Vaginal delivery: 9.
Instrumental use (fetal scalp electrodes, ventouse/forceps): 12.
CS, caesarean section; Em CS, emergency cesarean section; NVD, normal vaginal delivery.

may lead to disruption of scalp lymphatic drainage with resultant accumulation of fluids over several weeks. The swellings in all cases resolved between 2 and 24 weeks.³

By reviewing the previous cases, we notice that instruments use is the most observed factor associated with the development of SFC which might indicate the possible role of perinatal trauma as a most consistent risk factor.

In our case there is no history of traumatic delivery, instrument use or scalp swelling at birth. The unique feature in our patient is that he is the only reported case who developed SFC after having a spinal tap—all previously reported cases did not undergo spinal tap—and we think the swelling may be related to the spinal tap. We believe that the aspiration of CSF might decrease CSF pressure inside the ventricles which might lead to relative shrinking in the brain and that might lead to attraction to one of the subarachnoid granulations and lead to rupture and because of the pressure in the CSF is overcomes the venous pressure we postulate that will lead to backflow of the CSF and disruption of emissary or diploic veins that connect intracranial venous sinuses with superficial veins of the scalp and resultant of collection of subaponeurotic fluid. In Grant *et al* study they concluded that total intracranial CSF volume is almost always reduced following lumbar puncture. This loss of intracranial CSF leads to low-intracranial pressure. This may explain why subdural haematomas can occur as a complication of lumbar puncture.⁶ This study further supports our postulation that lumbar puncture changes the dynamics and the pressure of the intracranial CSF which may lead to developing of subgaleal fluid collection.

The diagnosis is made on a clinical basis. Imaging studies are not indicated unless there is concern of head injury (abuse or clear history of trauma). In such instances, a skull X-ray should be ordered first to rule out any evident fracture. An ultrasound is safe and is a simple method to confirm subgaleal fluid collection. It however cannot give information regarding the nature of the fluid. To further delineate the nature of the fluid, MRI is considered the best modality. It is best to avoid a head CT due to unnecessary radiation in this age group.

Conservative management is the treatment of preference. That is mostly to decrease the risk of infection. In addition, more invasive modalities have shown redevelopment of fluid. In

two out of the four cases who underwent fluid aspiration, they redeveloped significant fluid accumulations which needed second aspiration. In all cases which were managed conservatively, the swelling resolved within few weeks to few months without any documented sequelae.

Learning points

- ▶ Subaponeurotic fluid collection (SFC) is an extremely rare condition.
- ▶ The aetiology of SFC is still poorly understood. By analysis of previously reported 18 cases in infancy, it seems to be related to minor trauma during the delivery.
- ▶ We suspect that the patient's lumbar puncture may be a causative or contributing factor, but with the current data many questions still need to be answered regarding the exact aetiology and pathology.
- ▶ We hope the future will bring these answers.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Gomella T, Cunningham M, Eyal F, *et al*. *Neonatology: management, procedures, on-call problems, diseases, and drugs*. 6th edn. New York: McGraw-Hill, 2009.
- 2 Vaibhav A, Smith R, Millman G, *et al*. Subaponeurotic or subgaleal fluid collections in infancy: an unusual but distinct cause of scalp swelling in infancy. *BMJ Case Rep* 2010;2010:pil:bcr0420102915.
- 3 Hopkins RE, Inward C, Chambers T, *et al*. Sub-aponeurotic fluid collections in infancy. *Clin Radiol* 2002;57:114–16.
- 4 Petraglia AL, Moravan MJ, Marky AH, *et al*. Delayed sub-aponeurotic fluid collections in infancy: three cases and a review of the literature. *Surg Neurol Int* 2010;1:34.
- 5 Schoberer A, Yagmur E, Boltshauser E, *et al*. Sub-aponeurotic fluid collections: a delayed-onset self-limiting cerebrospinal fluid fistula in young infants. *Eur J Paediatr Neurol* 2008;12:401–3.
- 6 Grant R, Condon B, Hart I, *et al*. Changes in intracranial CSF volume after lumbar puncture and their relationship to post-LP headache. *J Neurol Neurosurg Psychiatry* 1991;54:440–2.

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