Med & Health Dec 2021; 16(2): 274-279 https://doi.org/10.17576/MH.2021.1602.21

CASE REPORT

Subaponeurotic Fluid Collection (SFC) in an Infant

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ABSTRAK

Pengumpulan cairan subaponeurotik ialah pembengkakkan di bawah kulit kepala yang jarang berlaku dalam kalangan bayi. Kami melaporkan seorang bayi lelaki berusia 10 minggu yang mempunyai pembengkakkan kulit kepala selama lima hari tanpa mengalami sebarang kecederaan di kepala. Terdapat pembengkakkan yang lembut, boleh digerakan, tidak sakit apabila ditekan, bertransiluminasi, berfluktuasi di bahagian parieto-oksipital posterior dan tidak dibatasi oleh garisan sutura. Ultrasonografi kranial menunjukkan pengumpulan subaponeurotik di bahagian parieto-oksipital posterior tanpa berkomunikasi langsung dengan ruang intrakranial atau parenkim otak. Bayi ini dirawat secara konservatif. Pembengkakkan ini pulih secara spontan selepas 4 minggu. Kekurangan kesedaran sebahagian doktor di Jabatan Kecemasan tentang keadaan ini akan menyebabkan siasatan, kemasukkan wad dan intervensi yang tidak diperlukan. Diharapkan laporan kes ini dapat memberikan keyakinan kepada para doktor di Jabatan Kecemasan untuk membuat diagnosa secara tepat dan merawat kes pengumpulan cairan subaponeurotik ini dengan optimal.

Kata kunci: bayi, kulit kepala, subaponeurotik, subgaleal

ABSTRACT

Subaponeurotic fluid collection is an infrequent cause of scalp swelling in infants. We report a 10-week-old male who had a scalp swelling for five days without any recent history of head injury. There was a soft, mobile, non-tender, transilluminating, fluctuant swelling over posterior parieto-occipital area and it was not limited by suture lines. Cranial ultrasonography showed a subaponeurotic collection at the posterior parieto-occipital area without definite communication with the intracranial space or the brain parenchyma. This infant was treated

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conservatively. The swelling resolved spontaneously after 4 weeks. The lack of awareness of some doctors in the Emergency Department about this condition may lead to unnecessary investigations, ward admission and intervention. It is hoped that this case report will provide emergency health care professionals the confidence to make accurate diagnosis and treat patient with subaponeurotic fluid collection optimally.

Keywords: infant, scalp, subaponeurotic, subgaleal

INTRODUCTION

The human scalp consists of five layers i.e. skin, connective tissue, epicranial aponeurosis (galea apnoneurotica), loose areolar tissue and periosteum. The subaponeurotic space, also known as the subgaleal space, is a potential space between the epicranial aponeurosis and periosteum, extending from the supraorbital ridge to the nape of the neck.

The most common causes of scalp swelling in newborn infants are cephalhaematoma and caput succedaneum (Williams 2008) with the former occuring in up to 2.5 % of all births and 1.8-33.6 % of all vaginal deliveries for the latter (Harbert & Pardo 2017). These usually present immediately after a traumatic delivery and are easily recognised by medical personnel.

Another rare cause of scalp swelling in infants is subaponeurotic fluid collection (SFC), also known as subgaleal fluid collection. The exact incidence of this condition in Malaysia is unknown with limited reports of SFC from other countries (Hopkins et al. 2002; Schoberer et al. 2008; Aries et al. 2009; Petraglia et al. 2010; Vaibhav et al. 2010; Medows & Mohammad Nijres 2014; Roy & Magdum 2014; Smith et al. 2016; Wang et al. 2016; Munjal & Kumar 2017; Lee & Wenger 2018; Cullas Ilarslan et al. 2019; Stephan et al. 2019). However, many health care professionals (HCP) in the Emergency Department and primary care are unaware of this benign condition, leading to unnecessary investigations.

CASE REPORT

A 10-week-old male infant was brought in by parents as they noticed soft scalp swelling for 5 days with no other symptoms with the baby tolerating feeding well. There was no recent history of trauma or injury. On presentation to hospital, there was a soft, mobile, non-tender, transilluminating swelling over the posterior parieto-occipital region, measuring 8 cm x 6 cm, not limited by suture lines (Figure 1). There was no discolouration or bruising of the overlying skin. There was no other sign that suggests the possibility of non-accidental injury (NAI). Other clinical examination was unremarkable. He was born at 38 weeks gestation via vacuum-assisted delivery for a prolonged second stage

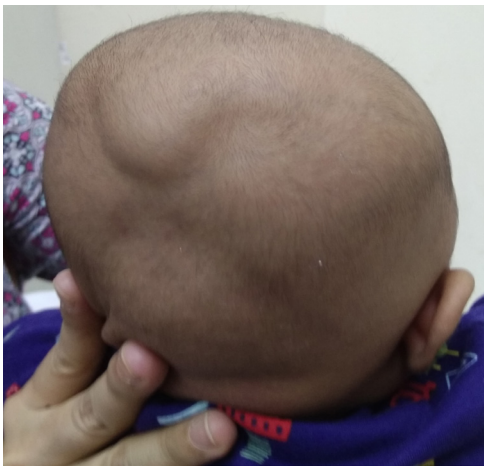

Figure 1: A soft, mobile, non-tender swelling region over the posterior parieto-occipital region, not limited by suture lines. There was no discolouration or bruising of the overlying skin.

of labour. He weighed 2.99 kg and there was caput succedaneum at the right temporoparietal region measuring 3 cm x 3 cm at the time of birth but had resolved by the following day.

Cranial ultrasound was performed and it showed subaponeurotic collection at the posterior parieto-occipital region with no definite communication with the intracranial space or brain parenchyma (Figure 2). This case was referred to the Paediatric Surgery Department and was treated conservatively. A follow-up appointment in the paediatric surgery clinic was arranged. The swelling resolved spontaneously by 14 weeks of age.

DISCUSSION

SFC is a benign cause of scalp swelling in infants which is not readily recognised by medical personnel. A literature search was done using PubMed with the term "subaponeurotic collection". The search found 13 related articles describing 51 infants with this condition, ranging from 2 to 18 weeks of age (Hopkins et al. 2002; Schoberer et al. 2008; Aries et al. 2009; Petraglia et al. 2010; Vaibhav et al. 2010; Medows & Mohammad Nijres 2014; Roy & Magdum 2014; Smith et al. 2016; Wang et al. 2016; Munjal & Kumar 2017; Lee & Wenger 2018; Cullas Ilarslan et al. 2019; Stephan et al. 2019). All published cases were

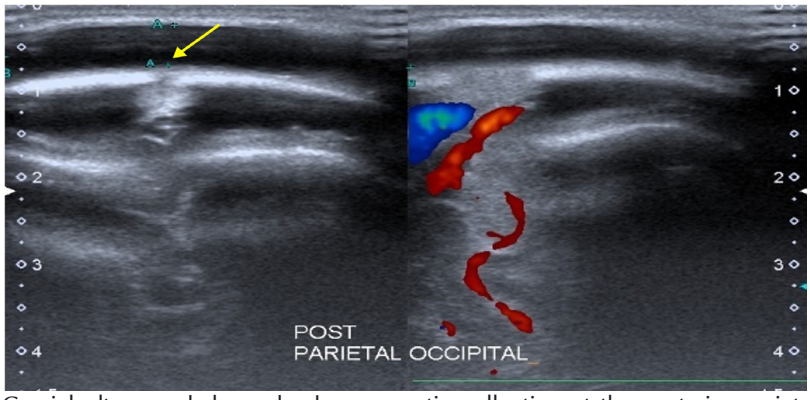

Figure 2: Cranial ultrasound showed subaponeurotic collection at the posterior parieto-occipital region with no definite communication with the intracranial space or brain parenchymal. The ultrasound image demonstrated the hypoechoic fluid collection is crossing over the suture line (yellow arrow).

reported from non-Asian countries except a case reported in India by Munjal & Kumar (2017).

Unlike birth-related scalp injuries (cephalhaematoma, caput succedaneum and subaponeurotic haemorrhage) which present at birth, SFC has a delayed onset, usually develops spontaneously weeks to months after the birth with no recent history of trauma or injury to the head. SFC usually presents as a soft, mobile, non-tender, transilluminating swelling on the scalp, crossing the suture line, with no discolouration of the overlying skin. The most common associated factors for the development of SFC are the use of instruments during delivery (forceps or ventouse suction cup) [32 cases] (Hopkins et al. 2002; Schoberer et al. 2008; Petraglia et al. 2010; Vaibhav et al. 2010, Roy & Magdum 2014; Smith et al. 2016; Wang et al. 2016; Munjal & Kumar 2017; Lee & Wenger 2018; Cullas Ilarslan et al. 2019), caesarean section [18 cases] (Hopkins et al. 2002; Schoberer et al. 2008; Petraglia et al. 2010; Vaibhav et al. 2010; Medows & Mohammad Nijres 2014; Roy & Magdum 2014; Smith et al. 2016; Wang et al. 2016; Munjal & Kumar 2017; Lee & Wenger 2018; Cullas Ilarslan et al. 2019), and use of fetal scalp electrode (FSE) [4 cases] (Petraglia et al. 2010; Roy & Magdum 2014). However, 5 infants, who had SFC, were born via normal vaginal delivery (Hopkins et al. 2002; Wang et al. 2016; Cullas Ilarslan et al. 2019). Medows & Mohammad Nijres (2014) reported a case of a 14-week-old infant who developed SFC after spinal tap as part of the septic screen.

The aetiology and pathophysiology of SFC are still unknown, with different authors have postulated multiple theories. As the majority of cases were associated with a traumatic labour, Hopkins et al. (2002) proposed that in infants with SFC, there was a small subaponeurotic haematoma at birth which liquified with further exudation to cause the scalp swelling. They also postulated that birth trauma may disrupt the scalp lymphatic drainage, leading to accumulation of fluid in the subaponeurotic space. Schoberer et al. (2008) suspected that there might have been microfractures undetectable by neuroimaging. Petraglia et al. (2010) and Roy & Magdum (2014) suggested that the use of FSE can cause a small puncture wound, allowing a slow gradual leakage of cerebrospinal fluid (CSF) into the subaponeurotic space. Medows & Mohammad Nijres (2014) postulated that SFC was due to a change of CSF dynamic after spinal tapping, resulting in a collection of subaponeurotic fluid.

Neither imaging nor laboratory investigation is required to diagnose SFC. However, if the diagnosis of SFC is uncertain, imaging is helpful to differentiate it from other causes of scalp swelling. Skull x-ray can be done if there is a concern of skull fracture following a head injury. Cranial ultrasound helps to confirm the location of the fluid collection in the subaponeurotic space by demonstrating the anechoic fluid collection between the aponeurosis and the cranium, and by confirming the fluid is crossing the suture line (Hopkins et al. 2002; Vaibhav et al.

2010; Wang et al. 2016; Cullas Ilarslan et al. 2019). In the computed tomography (CT) scans of the brain of infants with SFC, the fluid collections were noted to be a homogenous hypodense fluid with Hounsfield units similar to water, different to that of blood (Petraglia et al. 2010; Medows & Mohammad Nijres 2014; Wang et al. 2016). Magnetic resonance imaging (MRI) of the brain is a superior modality to that of CT, as it does not involve radiation and will provide information about the nature of the fluid (Vaibhav et al. 2010). In the case series reported by Wang et al. (2016) MRI of an 11-month-old infant revealed the presence of hemosiderin staining and blood products in the fluid collection, supporting the hypothesis that trauma is implicated in the formation of SFC.

In all the 9 cases reported by Wang et al. (2016), a complete coagulopathy screen (Factor VIII, Factor VIII inhibitor, von Willebrand factor, Factor XIII, Factor XIII activity) were performed and the results were all within the normal range. The coagulation profiles of the 5 cases reported by Cullas Ilarslan et al. (2019) were also normal.

The majority of the cases were managed conservatively. There were 6 cases where aspiration of fluid was performed (Hopkins et al. 2002; Schoberer et al. 2008; Roy & Magdum 2014; Munjal & Kumar 2017), but the fluid reaccumulated after aspiration with the procedure not shortening time for SFC to resolve. In all the cases no complications were reported and the swelling resolved spontaneously after 2-24 weeks. In the case series reported by Hopkins et al. (2002), the fluid aspirated from a patient was clear and sterile, but the fluid aspirated from patients reported by Schoberer et al. (2008) and Munjal & Kumar (2017) had a serosanguineous appearance which supports the traumatic mechanism of SFC. In the 3 patients reported by Schoberer et al. (2008), for whom aspiration was performed, microbiological studies of the aspirate were normal; the CSF markers β-trace protein (βTP) and β2-transferrin were found, confirming the presence of CSF in the fluid collection in SFC, but the origin of the CSF is uncertain.

To avoid unnecessary investigation or intervention in the emergency department, we recommend a simple management principle of infant with scalp swelling. The HCP should focus on the history of presenting condition and identification of clinical features of SFC during physical examination. No imaging or blood investigation is required in patients who are clinically well with typical characteristics of SFC without history of trauma or suspicion of NAI. A quick checklist to rule out NAI can be developed to assist the HCP when managing infant with scalp swelling. For any uncertainty in the diagnosis, non-invasive imaging without radiation such as cranial ultrasound should be the first choice of investigation. In the event of inconclusive ultrasound findings, the next choice of imaging should be MRI of brain. The patient can be discharged and parents are advised to bring the patient back to the clinic or hospital if the swelling is getting larger. A follow-up in the nearest clinic should be arranged to ensure the swelling is

resolved later.

CONCLUSION

SFC is a rare cause of scalp swelling in infancy with a delayed onset after birth. There are distinctive characteristic features which differentiate it from other causes of scalp swelling. Although the aetiology of this condition remains undetermined, it is generally benign and no further investigation or imaging is required unless there is a diagnostic dilemma or a suspicion of NAI. SFC will resolve spontaneously over time without intervention. Needle aspiration does not hasten the resolution of the swelling and carries the risk of infection.

ACKNOWLEDGEMENT

The authors would like to thank Dr Bethany Moos from Hedena Health, Oxford, England for this article language review and revision.

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Received: 22 Nov 2019
Accepted: 10 Jul 2020