

Pediatric dural venous sinus thrombosis following closed head injury: an easily overlooked diagnosis with devastating consequences

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ABSTRACT

Dural venous sinus thrombosis (DVST) is an uncommon finding after traumatic brain injury. The diagnosis can often be initially missed, particularly if not associated with an overlying fracture. Pediatric DVST following closed head injury and without an overlying fracture is very rare, with only 20 cases reported in the literature to date. Here we present the case of a 19-month-old boy who presented with a history of trivial fall and an episode of fever. On presentation, the pediatric Glasgow Coma Scale (pGCS) score was E3V4M6, and initial brain computed tomography (CT) was normal. He was initially conservatively managed. However, subsequent CT, taken following an episode of seizure, revealed right tentorial subarachnoid hemorrhage and falx hematoma. Conservative management was continued till he started developing recurrent seizures with a decrease in pGCS scores. Repeat CT revealed sinus thrombosis that involved the posterior aspect of the superior sagittal sinus with a massive brain edema. The coagulation profile was normal, and no fracture overlying the sinus was observed. Although he underwent emergency bifrontal decompressive craniotomy, he did not recover. This study emphasizes on the importance of not missing the diagnosis of sinus thrombosis and the devastating consequences that can occur if it is overlooked.

Keywords: Child; closed head injuries; cranial venous sinus thrombosis; decompressive craniectomy; early post-traumatic seizures.

INTRODUCTION

Although dural venous sinus thrombosis (DVST) is observed in 4% of patients following penetrating head injury, it is rare following closed head injury.^[1] In closed head injuries, DVST is usually associated with a fracture overlying the sinus. The occurrence of DVST without an overlying fracture is quite unique, particularly in the pediatric population, with only 20 cases reported in the literature to date.^[2,3] Management guidelines are not clearly defined for such cases because of the rarity of the condition. Thus, if not carefully considered, the diagnosis of DVST can often be missed.

CASE REPORT

A 19-month-old boy who was born at full-term via normal de-

livery and had normal developmental mile stones presented to our emergency room (ER) following a 4-h history of fall from one stair height. He was referred from a secondary care hospital, where he had an episode of fever. There was no history of loss of consciousness, vomiting, seizures, nasal bleed, earache, or ear discharge. He did not have any previous illness or hospital admissions. On reaching the ER, his pediatric Glasgow Coma Scale (pGCS) score (Table 1) was E3V4M6, and his pupils were bilaterally equal and reacted to light. There was no asymmetry of limb movements. He did not have any external injury, and no features of chest or abdominal injury was observed. He underwent brain computed tomography (CT) at the previous hospital, which was reported as normal. Hence, he was managed by the Department of Pediatrics and was examined to rule out infective causes of fever and altered sensorium. Almost 15 h after the trauma, he started

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Table 1. Pediatric Glasgow Coma Scale (pGCS) score^[10]

	>1 year		<1 year		
Eye opening	4	Spontaneously	Spontaneously		
	3	To verbal command	To shout		
	2	To pain	To pain		
	1	No response	No response		
Best motor response	6	Obeys	Spontaneous movements		
	5	Localizes pain	Localizes pain		
	4	Flexion-withdrawal	Flexion-withdrawal		
	3	Abnormal flexion	Abnormal flexion		
	2	Abnormal extension	Abnormal extension		
	1	No response	No response		
	>5 years	2–5 years	0–23 months		
Best verbal response	5	Oriented and converses	Appropriate words and phrases	Coos and smiles appropriately	
	4	Disoriented and converses	Inappropriate words	Cries	
	3	Inappropriate words	Cries and/or screams	Inappropriate crying and/or screaming	
	2	Incomprehensible sounds	Grunts	Grunts	
	1	No response	No response	No response	

developing generalized tonic–clonic seizures, refractory to phenytoin. Hence, he was transferred to the Neurosurgery Intensive Care Unit. Repeat brain CT (Fig. 1) revealed right-sided tentorial subarachnoid hemorrhage (SAH) and falx hematoma. Parenteral sodium valproate was initiated, and his seizures were controlled. On the next day, his pGCS score was E2V3M6, and breast feeding was initiated. He was active

till the third post-trauma day, when he developed another episode of right-sided focal seizures. Midazolam was initiated as an add-on anticonvulsant, following which the seizures were controlled. Repeat plain brain CT (Fig. 2a) revealed a massive cerebral edema with diffuse hypoxic injury. Contrast-enhanced CT brain (Fig. 2b) showed a sinus thrombosis that involved the posterior aspect of the superior sagittal sinus.

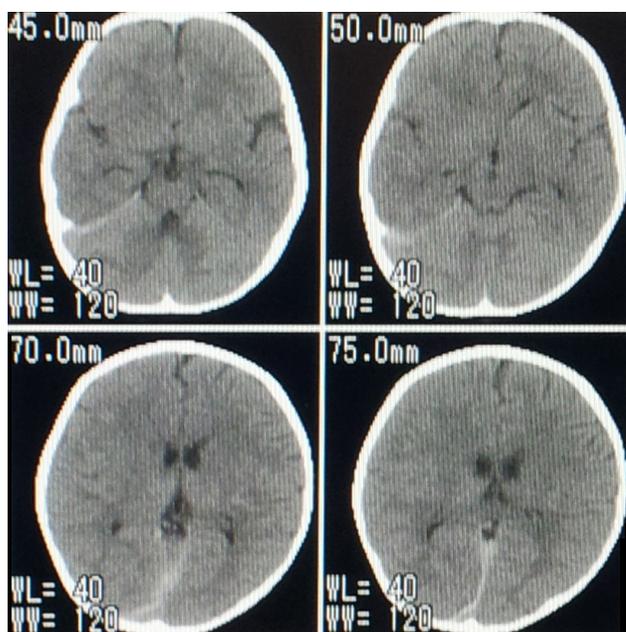


Figure 1. Non-contrast axial computed tomography (CT) of the brain showing right-sided tentorial subarachnoid hemorrhage and falx hematoma.

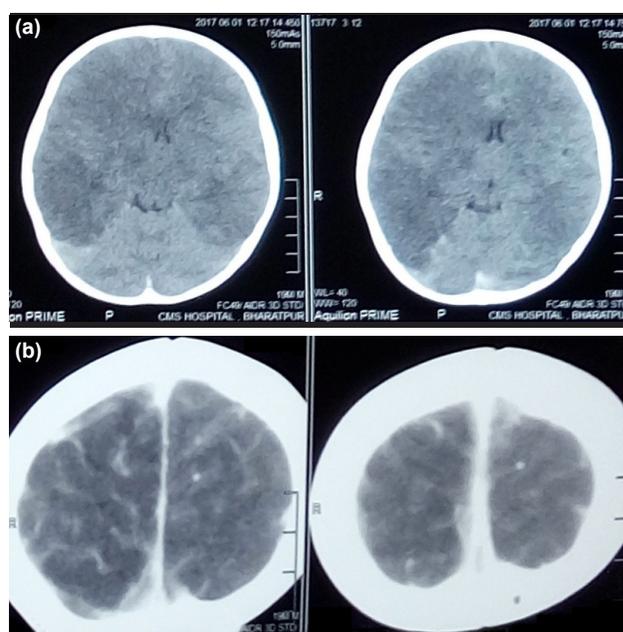


Figure 2. (a) Non-contrast axial CT of the brain showing diffuse brain edema and effacement of ventricles. (b) Contrast-enhanced axial CT of the brain showing the thrombosed superior sagittal sinus.

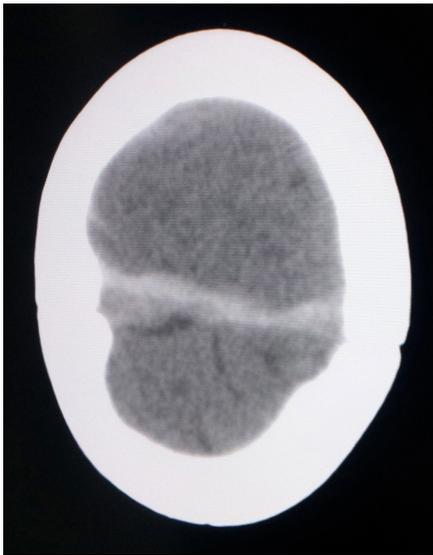


Figure 3. Retrospective analysis of initial non-contrast CT of the brain showing hyperdense superior sagittal sinus.

We could not wait for magnetic resonance imaging (MRI) of the brain. His platelet count, prothrombin time–International Normalized Ratio, bleeding time, and clotting time were all normal. He underwent emergency bifrontal decompressive craniotomy with falx duraplasty. The brain was full and pulsatile. The patient was postoperatively ventilated. However, before we could perform postoperative CT, he suffered a cardiac arrest at 6 h after the surgery and he could not be resuscitated. On subsequent retrospective analysis of the second CT (Fig. 3) in the console, we noticed that the superior sagittal sinus was completely thrombosed. Usually in CT images, the top-most axial cuts are not included; hence, the diagnosis can be missed because the superior sagittal sinus may sometimes be clearly observed in such cuts only.

DISCUSSION

Although the exact incidence of DVST following head injury remains unknown, it is believed to occur in up to 4% of patients with penetrating head injuries. DVST is rare following closed head injuries, particularly injuries that are mild. The exact cause of sinus thrombosis after a closed head injury is unknown. However, the following factors may be responsible.^[4]

1. Injury to the wall of the dural sinus
2. Inward extension of the thrombosis from injured emissary veins
3. Intramural hemorrhage with subsequent injury to the lining endothelium

DVST is rare in children, with an incidence of 0.07 in 100,000. Antithrombin defects, protein C and S defects, and factor V gene defect (associated with activated protein C resistance) are common predisposing factors for DVST in the pediatric population. Polycythemia and congenital heart diseases can also predispose to DVST.^[5]

Posttraumatic DVST is a rare condition that is associated with high morbidity and mortality. The sinus thrombosis is often missed in plain brain CT images. However, careful study of non-contrast-enhanced CT images may often reveal hyperdensity of the sinus,^[6] as in this case, although we initially missed it. The diagnosis is quite often revealed on retrospective and careful analysis of the situation.^[7] This needs to be confirmed with contrast-enhanced CT or MRI.

We propose that DVST should be suspected in a patient with a head injury when one or more of the following red flag signs are observed.

1. Persistent focal seizures refractory to usual anticonvulsants
2. Brain CT showing features of tentorial and falx SAH
3. GCS that does not improve in a patient with tentorial or falx SAH
4. Fever occurs within 12 h of head injury
5. Persistent giddiness or vomiting^[8]
6. Late deterioration in a patient's clinical condition^[9]

This study underscores the importance of interpreting brain CT in patients with traumatic head injury, particularly those with the red flag signs as mentioned above. DVST, if left alone, can lead to morbidity and mortality owing to an increased intracranial pressure secondary to venous infarct.

Conflict of interest: None declared.

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OLGU SUNUMU - ÖZET

Kapalı kafa travması sonrası pediatrik dural venöz sinüs trombozu: Kötü sonuçları olan ve kolayca atlanan bir tanı

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Travmatik beyin yaralanması sonrası dural venöz sinüs trombozu (DVST) sık görülmeyen bir bulgudur. Başlangıçta tanı özellikle üstünde bir kırık yoksa sıklıkla atlanabilir. Üstünde kırık olmayan pediatrik DVST çok ender olup literatürde bu tarihe kadar yalnızca 20 olgu bildirilmiştir. Burada önemsiz bir düşme ve bir febril epizot öyküsü olan 19 aylık bir erkek çocuğu sunuyoruz. Bize geldiğinde Glasgow Koma Skalası skoru (pGKS) E3V4M6 olduğu gibi beyin bilgisayarlı tomografi (BT) taraması normaldi. Başlangıçta konservatif tedavi edildi. Ancak bir nöbet sonrası çekilen müteakip BT taraması tentoriyumda subaraknoid kanama ve falks hematomunu gösterdi. pGKS'de düşüşle birlikte yinelenen nöbetleri gelişmeye başlayana kadar konservatif tedaviye devam edildi. Yinelenen BT taraması masif beyin ödemiyle birlikte süperiyor sagittal sinüsün arka yüzünü etkileyen sinüs trombozunu açığa çıkardı. Koagülasyon profili normaldi ve sinüsün üzerinde kırık yoktu. Acil bifrontal dekompressif kraniyektomi uygulanmasına rağmen hasta kurtarılamadı. Bu olgu sunumu, sinüs tanısını atlamamanın ve atlandığı takdirde yıkıcı sonuçlara yol açabilen bu patolojinin önemini vurgulamaktadır.

Anahtar sözcükler: Çocuk; dekompressif kraniyektomi; erken posttravmatik nöbetler; kapalı kafa travması; kraniyal venöz sinüs trombozu.

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