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Case Report

Post-traumatic bilateral synchronous acute extradural hematomas: A case report and review of literature

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ABSTRACT

Introduction: and importance:Bilateral extradural hematomas account for less than 5% of all entities of extradural hematomas. The condition is generally caused by traumatic brain injury, which can form separate hematomas contralaterally or joint bilateral extradural hematomas commonly owing to superior sagittal sinus injury. In light of the above, this is the first case of such a condition to be reported from Sudan in the literature.

Case presentation: A 31-years-old male presented with headache, confusion, and 4 episodes of non-projectile vomiting with a GCS score of 14, after being assaulted by direct blunt head trauma. CT brain showed acute extradural hematoma on the right frontotemporal part compared to a parietal extradural hematoma on the contralateral side. The patient underwent bilateral craniotomy with a wide question mark-like skin flap on the right temporoparietal side followed by 5 burr holes. On the left side, parietal craniotomy was made with an inverted U-shaped skin flap and 4 burr holes on the left parietal side, after that two surgical drains were inserted bilaterally. The patient was discharged on the third postoperative day with a GCS of 15.

Discussion: Although bilateral extradural hematomas are rare and grave conditions, prompt surgical intervention has shown low morbidity and mortality rate with markedly favorable postoperative outcomes.

Conclusion: Bilateral extradural hematomas can be attributed to extended linear fracture caused by superior sagittal sinus injury. CT scan is the gold standard imaging. However, MRI and MRV can be used to demonstrate injury or occlusion of the Superior sagittal sinus.

1. Introduction and importance

Extradural hematoma is a disease characterized by intracranial bleeding collected between the skull and the dura mater. Usually, the bleeding is unilateral and originates from the middle meningeal artery [1]. The causes of Intracranial hemorrhages, particularly extradural hematomas are commonly attributed to traumatic brain injuries, accompanied by a mortality rate of up to 30% [2,3].

Bilateral extradural hematomas are quite rare conditions that account for only less than 5% of all cases of extradural hematomas [2,4]. Bilateral extradural hematomas can be attributed to skull fracture, generally linear fracture, crossing the midline and causing extradural hematomas on both sides of the skull, usually due to superior sagittal sinus injury [1]. Although the first case of bilateral extradural hematoma was reported by Roy in 1884 [5], still there is scanty information regarding this condition. We reported the first case of bilateral extradural hematoma from Sudan in the literature. This case has been reported in line with SCARE guidelines [6].

2. Case presentation

A 31-years-old male was presented to the emergency department, with headache and confusion following trauma with a dull wooden object (stick). The patient showed loss of consciousness for 5 min, including nausea and four episodes of non-projectile vomiting, along with minimal bleeding from the mouth, although there was no fractured tooth. There were no convulsions, abnormal movement, abnormal behavior, weakness, or discharge from ears or nose. The patient is not known to have had hypertension, diabetes, or other medical condition, furthermore he is not taking any types of regular medications or over-

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the-counter medications. From past medical history, no incidence of allergy is known, also no history of admission or surgical operations. He works as a doctor and he was assaulted at work by a co-patient.

At the time of admission, the patient was confused with a GCS of 14 (M = 6, V = 4, E = 4), his vital signs were stable, like the following, BP: 111/71, PR: 82/minute, Spo 2: 99%, RR: 18/minute, temperature: 37.7 and pulse pressure of 40 mmHg. The neurological examinations showed equally reactive pupils bilaterally with no motor or sensory deficit.

His systematic review was insignificant with normal chest, abdominal, and pelvic examination apart from some bruises in the shoulder and trunk.

Laboratory tests (Complete blood picture, random blood sugar, renal function test, urinalysis, and bleeding profile) were within the normal range. In addition, the patient underwent a trauma survey Chest X-ray, Abdominal ultrasound and Cervical X-ray were all unremarkable.

Axial cuts of Non enhanced CT brain revealed an overlying subgaleal hematoma and right Frontotemporal extra-axial hyperdense lesion containing isodense signal that represents acute extradural hematoma (Fig. 1). In addition, many small foci of a hypodense signal represent pneumocephalus, indicating the presence of skull bone Fracture, mostly linear fracture. This hematoma crosses the Right coronal suture and appears treading over the brain convexity in its upper and lower part. There is a mass effect over neighboring sulci. However, there is no mass effect for the ventricular system or midline shift. Furthermore, there is a larger acute extradural hematoma over the upper part of the posterior left parietal area (Fig. 2), likewise exerting mass effect only on neighboring sulci.

After the diagnosis of bilateral extradural hematoma was made while waiting for operation the patient was admitted to ICU for close monitoring and measures to reduce ICP, including Hypertonic saline. Then the patient was transferred to the operation room for an emergency surgical evacuation by bilateral craniotomy.

Firstly, On the right side, a wide question mark-shaped skin flap was done, the operator observed a linear skull fracture extended from the right parietal to the right temporal bone. After a right frontotemporal craniotomy followed by 5 burr holes, bleeding emerged from both the superior sagittal sinus and right middle meningeal artery, which was caused by the linear fracture. However, Most bleeding was from the superior sagittal sinus, eventually, the bleeding was controlled by the combination of dural hitch and surgicel. After that, 40 ml of clot was evacuated, which was markedly larger compared to the CT scan. Although the volume of the right side hematoma was smaller than the left hematoma, the volume may increase rapidly due to the tamponade effect. Therefore, the operator evacuated the right hematoma first.

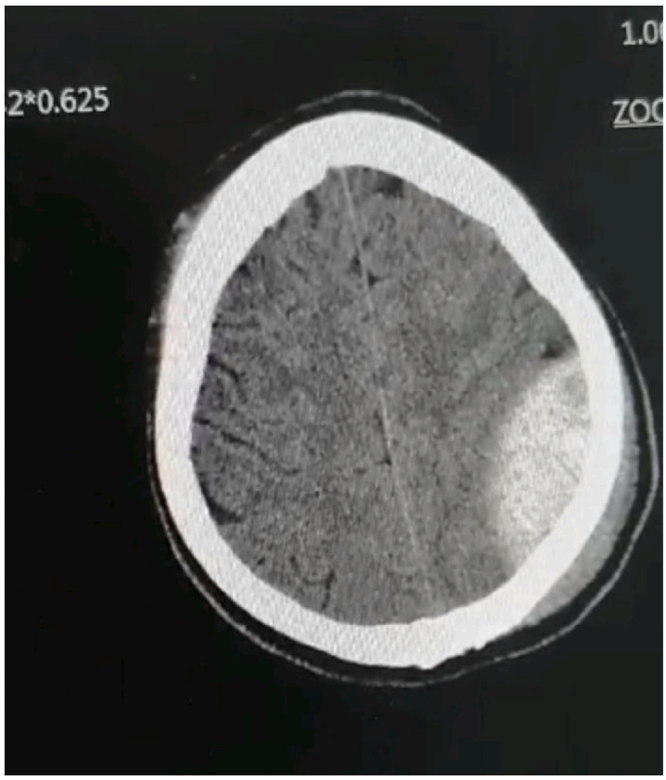

Fig. 2. Axial CT brain revials left parietal extradural hematoma.

Secondly, On the left side, parietal craniotomy was made by an inverted U-shaped skin flap with 4 burr holes. The bleeding was identified from the posterior branch of the middle meningeal artery and 50 ml of blood was evacuated. Finally, two surgical drains were inserted bilaterally. The patient received 2 units of blood intraoperative, the total time of the operation was 6 hours.

Postoperatively, the patient received antibiotics and anticonvulsants, he stayed under observation in the recovery room then transferred to his room. The operation was performed by Dr. Walid Elsalawi, a

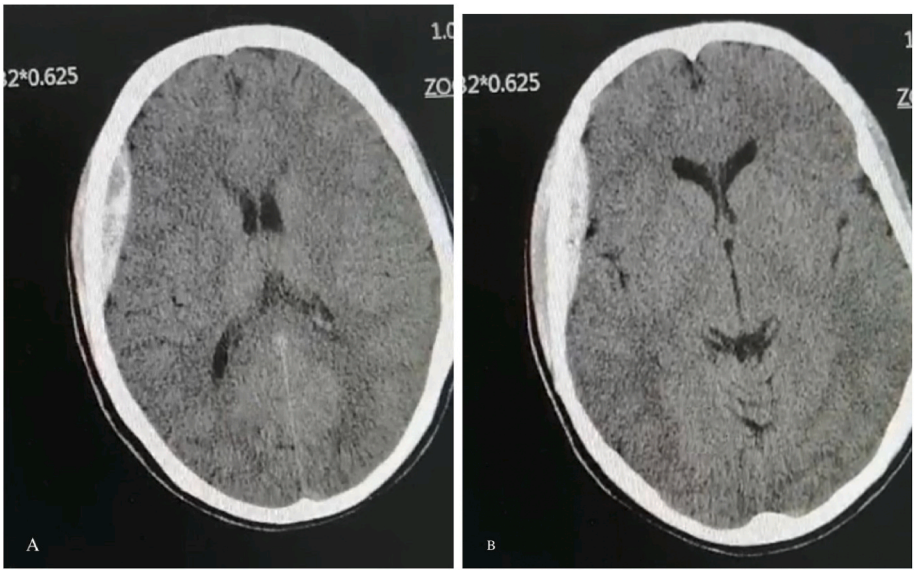

Fig. 1. Axial CT brain shows right Frontotemporal extradural hematoma.

certified neurosurgeon from Sudan Medical Specialization Board.

On the first day following the operation GCS improved to 15/15, Headache subsided and there was no motor or sensory deficit. The patient was discharged on the third postoperative day with a GCS of 15/15, no complications or complaints were reported, then the patient came to follow-up 14 days later for stitches removal. After that, he returned to his work.

3. Clinical discussion

Bilateral extradural hematoma is a rare and grave condition that accounts for only less than 5% of all cases of extradural hematoma [2]. However, although it's extremely rare in the pediatric population, the incidence increased steadily up to 20% [7]. Generally, extradural hematomas are caused by direct head trauma that leads to accumulation of acute blood clots in the space between dura mater and the skull. Source of bleeding is usually arterial in origin from the middle meningeal artery [1]. However, Nonarterial extradural hematoma can be attributed to injury of dural sinuses, arachnoid villi, or emissary veins [8]. In addition, a bilateral extradural hematoma can occur due to skull fracture, mostly linear fracture, extending the midline and causing extradural hematomas on both sides of the skull [1].

Similarly, in our case, there was a linear fracture extended from the right parietal bone to the right temporal bone.This fracture caused venous bleeding from the end of the anterior one-third of the superior sagittal sinus without causing dural detachment. The fracture also caused arterial bleeding from the right middle meningeal artery. Moreover, there was arterial bleeding on the left side due to injury of the posterior branch of the meningeal artery. The additional intracranial volume caused by accumulated extradural hematoma was initially compensated by intracranial compliance. However, with the active bleeding, the brain failed to compensate and the patient developed symptoms of increased intracranial pressure.

Bilateral extradural hematoma can be differentiated into two categories according to the time of bleeding, the majority can occur synchronously similar to our case. The other category is sequential extradural hematoma when a delayed hematoma is identified by postoperative CT scan on the contralateral side after the evacuation of the initial hematoma such a case was reported by Fricia M et al. [9]. CT scan is the gold standard investigation to diagnose bilateral extradural hematoma. However, if there is uncertainty regarding the origin of the bleeding, further imaging modalities such as brain MRI and MRV can be ordered to roll out injury or occlusion of the superior sagittal sinus, which can cause single bilateral frontoparietal extradural hematoma particularly when the injury is located in the anterior one-third of the superior sagittal sinus [8]. CTV can be used in acute sitting instead of time-consuming MRV.

After a narrative review of the literature in the last 20 years, we found 10 studies describing bilateral extradural hematoma (Table 1). This Rarity can be eclipsed by the scarce or uncommon reporting of such cases from African countries, we found only 4 cases of bilateral extradural hematomas from Africa reported by Udoh DO et al. [10], same countries where even high incidence - typical-traumatic brain injuries go unrecorded in the medical literature [11]. Our case is the first case of its kind to be reported from Sudan, detailing the circumstances and subsequent management.

The reported literature has approximately 18 patients with GCS scores of 13–15, 25 patients falling between 8 and 12, and the majority 28 from 3 to 7. Our reported case belongs to the more scarce first group with a GCS of 14 (M = 6, V = 4, E = 4). Furthermore, only 5 cases in the literature have been diagnosed in more than 6 hours of the initiation of the hematoma [2,10], our reported case belonging to the majority of cases diagnosed within only 6 hours. More female cases have been reported, 18 in total [2,3,6] in comparison to the overwhelming number of male cases, shedding light on male force work hazards.

The majority of cases of bilateral extradural hematoma were treated surgically in spite of various surgical techniques used in different centers. However, only two cases were treated conservatively [2,8]. Görgülü A et al., reported a patient (GCS = 15) of bifrontal extradural hematoma with a sickness of 15 mm, CT scan showed reabsorption of the hematoma after 17 days of conservative management [2]. Early surgical evacuation of bilateral extradural hematoma revealed favorable postoperative outcomes and GOS of 5 [2,12,13].

There is a lack of data in literature from the African continent describing the mode of trauma, subsequent skull fracture, and bleeders, this can be attributed to underreporting from this side of the globe, in contrast, comparison to the succulent reports from other countries, both-and the known rareness of the case; leaving us with scant data to glean from. Our reported case has two bleeders, right side hematoma is a direct result of a linear fracture caused injury to the right middle meningeal artery and superior sagittal sinus, while the left hematoma upon exploration was revealed to be a consequence of bleeding from the

Table 1
Summary of studies of Bilateral Extradural Hematoma in the last 20 years.

Study	Number Of Patients	Gender	GCS on Admission	Time of Diagnosis	Management	Skull Fracture	GOS
Görgülü A et al., 2000 [2]	19	15 Pts M 4 Pts F	5 Pts 13 to 15 6 Pts 8 to 12 5 Pst 3 to 7	16 Pts < 6h 3 Pts > 6h	18 Pt surgical 1 pt conservative	19 Pts yes	15 Pts 5 1 Pts 3 3 Pts 1
Huda et al. [3], 2004	46	33 Pts M 13 Pts F	9 Pts 13 to 15 16 Pts 9 to 12 21 Pts 3 to 8	Not Mentioned	46 Pts Surgical	Not Mentioned	16 Pts 0 30 Pts Not Mentioned
Agrawal A et al., 2011 [14]	1	F	9	<6h	Surgical	No	Not Mentioned
Udoh DO et al., 2012 [10]	4	4 Pts M	7,8,11,15	2 Pts > 6h 2 Pts < 6h	4 Pts surgical	4 Pts yes	Not Mentioned
Bimpis A et al., 2015 [15]	1	M	3	Not Mentioned	Surgical	Yes	5
Giannakaki V et al., 2016 [8]	1	M	14	Not Mentioned	Conservative	yes	5
Hou B et al., 2017 [12]	1	M	15	<6h	Surgical	Yes	5
Abbas M et al., 2018 [13]	1	M	15	<6h	Surgical	Yes	5
Fricia M et al., 2019 [9]	1	M	7	Not Mentioned	Surgical	Yes	5
Montemurro N et al., 2020 [16]	1	F	7	Not Mentioned	Surgical	No	0

GCS = Glasgow Coma Score, Pts = Patients, GOS = Glasgow outcome score.

left posterior meningeal artery.

4. Conclusion

Bilateral extradural hematomas are extremely rare conditions with serious complications. Mostly, the hematoma can be attributed to extended linear fracture caused by superior sagittal sinus injury. CT scan is the gold standard imaging.MRV can be used to demonstrate injury or occlusion of the Superior sagittal sinus. However, in The emergency sitting, CTV can be used because it's widely available and affordable. Prompt surgical evacuation showed excellent postoperative outcomes despite the surgical challenges.

Declaration of interest

The authors report no conflict of interest of any kind.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Source of funding

None.

Ethical aproval

This study was exempted from ethical approval.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contributions

Tarig Fadalla: Involved in study design, data acquisition, drafting the article, revising it critically and finally approved the manuscript. Basil Jalaledeen: Involved in study design, data acquisition, drafting the article, revising it critically and finally approved the manuscript. Mazin Suliman: Involved in conception of the study design, drafting the article and finally approved the manuscript. Mohamedzain Elsayed: Involved in conception of the study design, drafting the article and finally approved the manuscript. Muhab Elmahdi: Involved in the design of the study, revising it criti-cally and finally approved the manuscript. Walid Elsalawi: Involved in the design of the study, revising it critically and finally approved the manuscript.

Research registry

N/A.

Guarantor

Tarig Fadalla.

Conflicts of interest

The authors report no conflict of interest of any kind.

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None.

Ethical approval

This case report was exempt from ethical approval.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in- Chief of this journal on request.

Author contributions

Tarig Fadalla: Involved in study design, data acquisition, drafting the article, revising it critically and finally approved the manuscript. Basil Jalaledeen: Involved in study design, data acquisition, drafting the article, revising it critically and finally approved the manuscript. Mazin Suliman: Involved in conception of the study design, drafting the article and finally approved the manuscript. Mohamedzain Elsayed: Involved in conception of the study design, drafting the article and finally approved the manuscript. Muhab Elmahdi: Involved in the design of the study, revising it criti-cally and finally approved the manuscript. Walid Elsalawi: Involved in the design of the study, revising it critically and finally approved the manuscript.

Registration of research studies

Not Applicable.

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Declaration of competing interest

All authors declare no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.103377.

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