

## Case Report

# Bilateral Acute Traumatic Epidural Hematoma Due to Coup and Contrecoup Head Injury: a Case Report and Review of the Literature

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### Abstract

**Background:** Traumatic acute epidural hematoma following skull fracture may result from a direct head injury and develops unilaterally at the impact site. Contrecoup injury that occurs in head trauma has rarely been reported to result in a simultaneous contralateral epidural hematoma. When bilateral epidural hematoma does occur, the contralateral hematoma may be missed unless head computed tomographic images are requested.

**Case presentation:** A 25-year-old man was involved in a road traffic accident and was struck on his right temporal region, rendering him unconscious. On admission to hospital, he had a swelling of the right temporal region of the scalp. An initial computed tomography scan demonstrated bilateral acute epidural hematoma of the middle cerebral fossa, with a linear fracture at the right temporoparietal region. Follow-up imaging showed the enlargement of the left-sided hematoma, and urgent hematoma evacuation of the left side was successfully performed; the cause of bleeding was the left middle meningeal artery at the base of the left middle cerebral fossa. A small right-sided hematoma, believed to be due to rupture of the right posterior middle cerebral artery, was treated conservatively. The patient's postoperative course was uneventful, and he was discharged from hospital 30 days following his initial admission, with no residual neurological deficit.

**Conclusions:** Contrecoup epidural hematoma due to skull fracture and detachment of the dura mater from the base of the skull may be associated with rupture of the posterior middle cerebral artery causing a contralateral epidural hematoma. This case demonstrates an interesting mechanism to develop bilateral Epidural Hematoma (EDH).

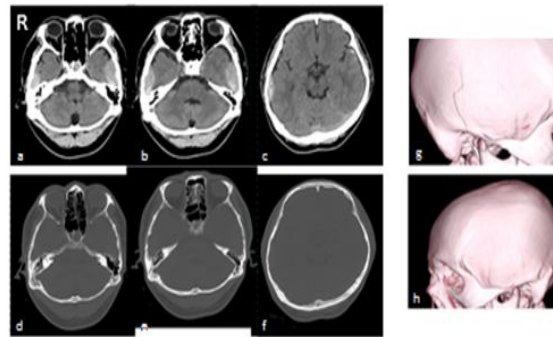
### Introduction

The incidence of Acute Epidural Hematoma (AEDH) is 1-2% among head injured patients. The AEDH is commonly developed unilaterally and caused resulting from coup mechanism with skull fracture in the vicinity of the impact site. We report an uncommon case of bilateral AEDH caused by coup and contrecoup mechanism.

### Case report

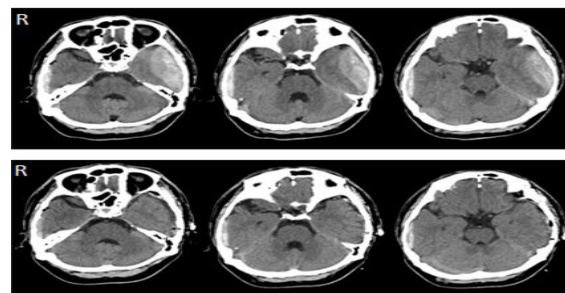
A 25-year-old man was hit by a bike while riding a bicycle, and struck the right temporal region. He immediately became unconscious and was transported to our hospital. He had no specific

past history. On admission, the Glasgow Coma Scale (GCS) was 13 (E3V4M6) with bilateral pupil size of 3.5 mm in diameter. He complained of mild headache, but exhibited no neurological deficits. His temporal region was significantly swollen and had bleeding from the right external auditory canal suggesting skull base fracture. The computed tomography (CT) scan demonstrated traumatic symmetric thin bilateral AEDH (12ml of clot on the right and 13ml on the left side) at the bilateral middle fossa and mild traumatic subarachnoid hemorrhage at the surface at the left temporal lobe. The bone imaging CT revealed a linear fracture at the right parieto-temporal bone to the petrous bone. But, there was no fracture on the left side (Figure 1).



**Figure 1:** Initial skull Computed Tomography (CT) scan on admission showing a high density lesion at the bilateral parieto-temporal region, suggesting acute epidural hematoma (a, b), and traumatic subarachnoid hemorrhage at the left temporal tip (c). Skull CT scan with bone window demonstrating a fracture of parieto-temporal bone and petrous bone on the right side (d-f).

His consciousness was gradually within 1.5 hours after injury. When the CT scan showing the growth of AEDH in the left contrecoup lesion (42ml), but no change of the volume on the right side (Figure 2).



**Figure 2:** a. Initial Skull CT scan of the reconstruction 3D demonstrating a fracture at the right parieto-temporal region and b. no fracture on the left side

An emergency evacuation of hematoma on the left side was then performed. During the operation, the bleeding point was the middle meningeal artery at the left middle fossa base, and successfully coagulated after hematoma evacuation (Figure 2). Postoperative course was uneventful and the right hematoma was conservatively treated. He was discharged at 30 days after injury without neurological deficit.

## Discussion

Traumatic AEDH is commonly caused by coup mechanism with a skull fracture unilaterally. AEDH concomitantly caused by coup and contra coup mechanisms are quite uncommon with an incidence of 0.5-10% in all AEDH [1-10]. In the cases of bilateral AEDH, unilateral hematoma often develops later without finding on the initial CT. The concomitantly developed AEDH caused by coup and / or contra coup mechanisms is quite uncommon. Only eight cases have been reported in literature about AEDH caused by coup and contrecoup mechanisms [11-18]. The clinical features of them are summarized in Table 1.

Case No.	Author & Year	Age & Sex	Accident	Consciousness	Injury site	Coup injury	Contrecoup injury	Site of contrecoup EDH	Operation for contrecoup EDH	Origin of bleeding	Outcom
1	Okamoto <sup>16)</sup> , 1983	51 F	Fall	Alert	Occipital	-		Frontal	+	unknown	GR
2	Balasubramaniam <sup>11)</sup> , 1991	21 M	Fall	Confusion	Parietal	EDH		Frontal	+	Small vessels of dura	GR

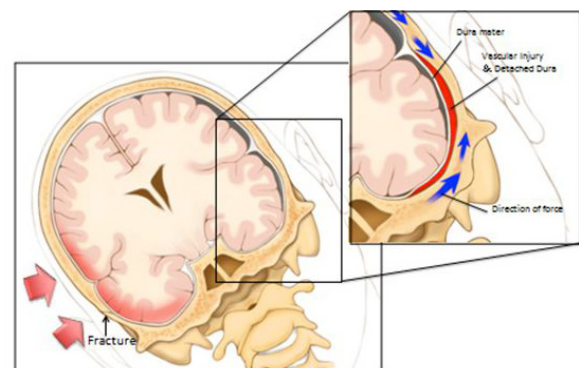
3	Miyazaki <sup>14)</sup> , 1995	52 F	TA	Alert	Occipital	SDH	SAH	Frontal	+	Small vessels of dura	GR
							ASDH				
4	Motohashi <sup>15)</sup> , 2000	59 F	Stumble	Alert	Occipital	-		Frontal	-	-	GR
5	Mishra <sup>12)</sup> , 2001	50 M	Axe	GCS 3	Fronto-parietal	contusion		Fronto-parietal	+	Unkown	GR
6	Mitsuyama <sup>13)</sup> , 2004	50 F	TA	Alert	Parietal	EDH		Frontal	-	-	GR
7	Sato <sup>17)</sup> , 2009	68 F	TA	GCS 13	Occipital	EDH		Frontal	-	-	GR
8	Takeuchi <sup>20)</sup> , 2010	60 F	TA	Alert	Occipital	EDH		Frontal	-	-	GR
9	Present case	25 M	TA	GCS 13	Temporal	EDH		Temporal	+	MMA	GR

**Table 1:** Clinical features of acute epidural hematoma caused by coup and contrecoup mechanisms

The six women and two men were mean aged of 48.4 years old (21 to 68). Many cases had skull fracture at the impact side, except for Case 1, but the intracranial lesions and patient's condition is quite various. Neurological states of the patient on admission were generally good[11-19].

Patients with contrecoup mechanism AEDH had initial GCS of better than GCS 13 points except for Case 6. And, 4 cases (Case 1, 2, 3, 5) underwent craniotomy (Table 1). The mechanism about the frontal AEDH caused by blow to the posterior region (Case 1, 3, 4, 7, 8) has been comprehensively considered that the dura mater of lateral frontal region is easily detached from the inner table of the skull, the skull is deformed and intracranial negative pressure arise, small vessels of the superficial dura mater or meningeal artery are injured by impact at the time of injury [13-16, 18].

Kuwayama[20] has described the first case of spontaneous bilateral AEDH, but bilateral and concomitantly developed traumatic AEDH is quite uncommon. Although, in the present case, there was no skull base and convexity fracture on the left side and the bleeding vessel was the posterior middle meningeal artery. We guess that the negative pressure was caused, recovering the deformation of skull due to deflection, as a result, detachment from the dura mater and injury of vascular occurred (Figure 3).



**Figure 3:** Skull CT scan, taken one hour and half later, showing enlargement of the left hematoma.

In the past report of pediatric AEDH without skull fracture[21]. In the children, the skull is easily deformed at the time of impact, so that detachment of dura matter.

In our case, the curvature of parieto-temporal bone and middle cranial fossa may involve detachment of dura mater. The review of the literatures[11-22] of bilateral epidural hematoma show the high incidence of young people (adolescence) and high energy accident. Whose have loose adhesion between the dural surface

and the inner table of the skull and fibrous skull sutures with relatively soft skull easily deform by the impact. These anatomical characteristics will be the risk of bilateral development of hematoma. The head-injured patient with some hemorrhagic tendency and/or hematological diseases has also the high risk of such hematoma development.

Bleeding source of AEDH is commonly injury of artery, veins or sinus. On the other hand, previous report indicated that injury of small vessels from dura mater, which was detached from the inner table of the skull, causes AEDH. Only oozing from small dural vessels was recognized in four cases (Case. 1, 2, 3, 5), which underwent craniotomy.

Our case was recognized injury of middle meningeal artery and active bleeding from it. There was no evidence on CT scan or subsequently at operation that a fracture was associated with AEDH. We considered that injury of middle meningeal artery was caused by detachment of dura mater in contre' coup injury.

The bilateral hematoma may develop simultaneously after the trauma and delayed development after evacuation of the hematoma. During the operation, the careful observation of the dural tense after clot removal is mandatory if the patients have high risks. If the effect of decompression seems to be not enough with strong dural tense, an emergency Echo-encephalogram or CT scan will necessary for the detection of the enlargement of contralateral hematoma or newly developed hematoma. The delayed detection of the second hematoma is quite important to improve the final outcome of the patients.

## Conclusion

We report that traumatic bilateral symmetric AEDHs, contrecoup epidural hematoma due to skull fracture and detachment of the dura mater from the base of the skull may be associated with rupture of the posterior middle cerebral artery causing a contralateral epidural hematoma. This case demonstrates the importance of brain imaging after operation in cases of coup and contrecoup traumatic head injury.

After the diagnosis of bilateral AEDH, immediate surgery is necessary. Unlike our case of asymmetric AEDH a simultaneous approach should be first considered since it promotes a quicker treatment and functional recovery even in patients under critical neurological conditions.

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