Contrecoup Epidural Haematoma-a Rare Phenomenon: an Autopsy Case Report

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Background: Contrecoup extradural haemorrhage (CCEDH) is reported very rarely in literature, 13 to be exact. All these cases have been documented based on clinical, radiological and intraoperative findings.

Case Report: Here we report a rare entity of CCEDH with autopsy findings in a 48-year old male with an alleged history of falling. The clinical and the radiological findings recorded in the hospital files as well as information supplied by the investigating officer has been considered.

Conclusion: Various mechanisms of CCEDH hypothesised by the previous authors have been discussed.

►*Implication for health policy/practice/research/medical education:* Contrecoup Epidural Haematoma

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1. Introduction:

Epidural haemorrhage (EDH), also known as extradural haemorrhage is a collection of blood between the inner surface of the skull and the dura mater, often associated with local impact loading (1). Most of the EDHs are unilateral and commonly located at the parieto-temporal region. It usually results from the fracture of temporal bone with an injury to underlying middle meningeal artery (2). Contrecoup EDH (CCEDH) is extremely rare with only a few cases being reported in the literature (3-15). Moreover, these cases are based on radiological and clinical findings only. The present report deals with a case of traumatic CCEDH documented by standard autopsy procedures. A brief comparison with the previously documented CCEDH cases with respect to different demographic profile and the mechanisms involved are discussed in this case report.

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2. Case Report:

A 48-year-old male, with an alleged history of fall while de-boarding a bus was rushed to the emergency room in an unconscious state with a history of ENT bleed and vomiting. On examination Glasgow coma score (GCS) was E1VTM1 with pupils dilated, fixed and non-reactive to light. The blood coagulation profile was within normal limits. Non-Contrast Computed Tomography of the head revealed left frontal lobe contusion, brain stem contusion, intra-ventricular and intracerebellar haemorrhage with a midline

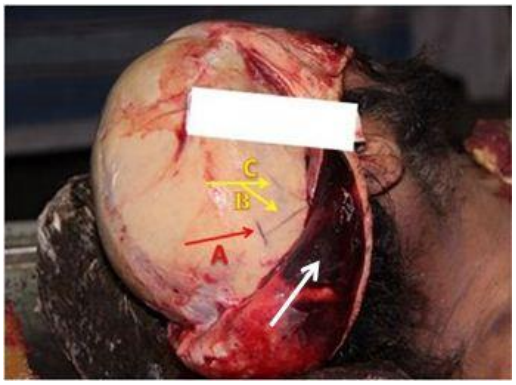

Fig. 1. Haemorrhage in the scalp layers (white arrow) and fissure fractures (red and yellow arrows) over the right temporo-parietal region.

Fig. 2. CCEDH over the left frontal region. Also note the absence of scalp injuries (white arrows) over the same area.

shift of brain towards the right side. The patient was managed conservatively, and few hours later the patient suddenly went into cardio-respiratory arrest and died on the same day of admission.

Autopsy findings

The nostrils and right external auditory canal showed the presence of dried blood clots. The right parieto-temporal region of the scalp showed few abrasions and contusions along with fissure fractures of the underlying bones (Figure 1) which radiated into the right middle and posterior cranial fossa. On the opening of the calvaria, a thick layer of EDH (7cm × 4cm × 1.3cm) was observed over the left frontal region (Figure 2). A diffuse thin layer of subdural haemorrhage (SDH) and patchy areas of subarachnoid haemorrhage (SAH) were seen over the left fronto- parieto- temporal convexities. The brain was grossly edematous with grooving of uncus and cerebellar tonsils. Multiple contusions and lacerations were observed over both the frontal poles (left > right) and parasagittal region of the right frontal lobe. Intraventricular haemorrhage was seen in the occipital horn of right lateral ventricle along with brainstem and right intracerebellar haemorrhage. The cause of death, in this case, was given as cranio-cerebral damage consequent to blunt trauma to head.

3. Discussion:

EDH is most often a coup injury occurring at the site of primary impact (1). CCEDH is a very rare event, and some authors firmly believe that EDH does not present as a contrecoup injury (2). Most EDHs result from the fracture of squamous temporal bone with an injury to the underlying middle meningeal artery. The source of bleeding in EDH can be venous or even of mixed nature (16-18). EDHs have also been reported in the absence of the fracture of the skull bone (19, 20) though its incidence being 20% higher when associated with skull fractures (21). In another study, it was noted that only about 1% of EDH were not associated with fractures (22).

Out of the 13 reported cases of CCEDH, the females have accounted for 8 cases (5, 6, 8-12, 14). Interestingly in these cases the CCEDH predominantly occurred in the frontal region. Most of the cases have sustained these injuries in the third to fifth decades of their life. History of Road traffic injuries, fall from height/ground level falls and assaults (hit by an axe) were noted in 6, 5 and 2 cases respectively. A brief summary of the previously reported cases of CCEDH in comparison with the present case is tabulated below (Table 1).

Different authors have hypothesised various mechanisms for the occurrence of CCEDH. According to Balasubramanium *et al* (4)"buckling effect" of the calvarium opposite the impact site and the "release effect" produced by the surgical evacuation of a coup EDH were hypothesised to explain the evolution of CCEDH. Mishra S *et al* (7) and Miyazaki et al. (9) suggested that dural separation due to distortion of the cranium brought on by the force of impact was responsible for the formation of CCEDH. Few authors are of the belief that the dura mater of the lateral frontal region can be

Table 1: Summary of cases of CCEDH (M-Male, F-Female, RSA – Roadside accident, EDH – Extradural haemorrhage, SDH – Subdural haemorrhage)

S. No	Cases	Age (yrs)	Sex	Cause	Impact site	Fracture	Coup injury	Contrecoup injury (EDH)
1.	Okamoto et al (1983) (11)	51	F	Fall	Occipital region	–	–	Left Frontal region
2.	Shigemori (1985) (13)	43	M	RSA	Right Fronto-temporal region	+	–	Right Occipital region
3.	Hamasaki *et al* (1987) (6)	58	F	RSA	Occipital region	+	Cerebellar contusion	Frontal region
4.	Abe et al. (1988) (3)	36	M	Fall	Right frontal region	+	–	Left occipital region
5.	Balasubramaniam and Ramesh (1991) (4)	21	M	Fall	Right parietal region	+	EDH	Left frontal region
6.	Miyazaki *et al* (1995) (9)	52	F	RSA	Left Occipital region	+	SDH	Right frontal region
7.	Motohashi *et al* (2000) (10)	59	F	Fall	Occipital region	+	–	Left frontal region
8.	Mishra and Mohanty (2001) (7)	50	M	Hit by Axe	Left frontal region	+	Cerebral contusion	Right Parietal Region
9.	Mitsuyama *et al* (2004) (8)	50	F	RSA	Left parietal region	+	EDH	Right frontal region
10.	Sato *et al* (2009) (12)	68	F	RSA	Occipital region	+	Occipital EDH & Cerebellar contusion	Frontal region
11.	Zeynep Cakir *et al* (2009) (15)	56	M	Hit by Axe	Left Frontotemporal region	+	–	Right Parieto-temporal region
12.	Satoru Takeuchi *et al* (2010) (14)	68	F	RSA	Occipital region	+	Left cerebellar haematoma	Right frontal region
13.	Huanmin Gao (2010) (5)	32	F	Fall	Left occipital region	–	–	Right frontal region
14.	Present case (Autopsy)	48	M	Fall	Right Parietotemporal region	+	Right Intracerebellar haematoma & brainstem contusion	Left frontal region

easily detached from the inner table. Further, a transient negative pressure is thought to be created at the contrecoup site as a result of the inertia of the brain (8, 12).

The autopsy findings in the present case clearly show that the right parietotemporal region with skull fractures corresponding to scalp haematoma is the primary site of impact (coup site). It was accompanied by contralateral SDH, SAH, frontal EDH and extensive frontal lobe contusions. The EDH is purely a contrecoup lesion that is justified by the absence of injuries to the scalp or the skull over left frontal region. The direct impact on the right side of the skull along with herniation of the brain could have individually or collectively resulted in the brainstem and cerebellar haemorrhage in this case.

In the present case, the authors believe that there were two impacts in the coup region. The first impact should have resulted in a small fracture line (A), near the right parietal eminence which intersects almost perpendicular to the upper end of the posterior most linear fracture (B) of the skull

vault (Figure 1). The two linear fractures (B and C) running upwards should have originated from an area of peripheral out bending of the second impact. The order of occurrence of these fractures can be deduced by applying the Puppe's rule. However, the influence of the sequence and the number of impacts at the coup site in the causation of CCEDH needs to be studied.

Because of the rarity of the event, CCEDHs are often not suspected and diagnosed when there is a concurrent occurrence of contrecoup SDH and extensive brain injury at the same location. For the same reason, in this case also a definite diagnosis of EDH was not made out even after post-mortem review of the CT scan. However, the missed CCEDH, in this case, would have had little impact on the prognosis since there were many concurrent severe brain injuries. Thus, this paper stresses medical fraternity to be aware of the occurrence of CCEDH concurrently with other contrecoup injuries.

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