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The Hidden Hematoma of the Head: Analysis of Vertex EDHs and their Outcome

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Abstract

Context: The skull vertex is an uncommon site for epidural hematoma (EDH) formation. The usual cause of a hematoma is a tear in the sagittal sinus due to trauma or saggital suture diastasis. Vertex EDH, even of small volumes, can cause rapid neurologic deterioration and death. Hence, rapid diagnosis is important to limit morbidity and mortality. There are only few isolated case reports or small series of VEDH in the literature. We analysed all cases of VEDH managed at our trauma centre over the last 10 years. Case records of all traumatic brain injury were analysed.

Aims: To analyze a series of VEDH patients seen in our institute. *Settings and Design:* Retrospective observational study. *Subjects and Methods:* This is an analysis of case records of patients with VEDH during 10 years period from 2008 to 2018. *Statistical Analysis Used:* Nil.

Results: Twenty cases of VEDH were encountered over a period of 10 years, which included 17 males and 3 females. The majority of cases were due to road traffic accidents, and most of these presented with altered sensorium. The diagnosis was made by axial and coronal sections of computerized tomography (CT) scan. 16 patients were operated and 4 managed conservatively. The most common source of bleeding was superior sagittal sinus. One patient expired during treatment.

Conclusions: A high degree of suspicion should be maintained to diagnose vertex EDH as it may be easily missed especially working in a high workload trauma centre. Early diagnosis and judicious decision with regards to surgery and medical management is the key for successful treatment in these cases. This is second largest case series reported so far.

Keywords: Vertex EDH; Traumatic brain injury.

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Introduction

The skull vertex is an uncommon site for epidural hematoma (EDH) formation, and indeed accounts for only 1–8% of all EDHs.[1–4] Due to its location, Vertex EDHs (VEDH) may present with a wide variety of symptoms, ranging from lower-extremity weakness to hydrocephalus and acute intracranial hypertension.[2,5,6] The usual cause of the hematoma is a tear in the sagittal sinus due to trauma, or saggital suture diastasis.[1,2] Vertex EDHs often cause rapid neurologic deterioration and death, martality ranging between 18 % and 50 % in some series.[2,3] Hence, rapid diagnosis with a high index of suspicion is important to limit morbidity and mortality. High axial cuts or direct coronal cuts on CT scan can diagnose this entity; however care has to be taken not to mistake it for an artifact.[7] Magnetic resonance imaging (MRI) is a better diagnostic tool and further helps in confirming the diagnosis. This study was undertaken to analyse

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the varied presentations and outcomes of these patients, and to review the relevant literature.

Materials and Methods

A retrospective analysis of all patients with VEDH, at the apex trauma center of King Georges Medical University, Lucknow, India, over a period of 10 years, from 2008 to 2018 was carried out. The clinical features, radiological findings, management and outcome have been analyzed. Case records and operative details were retrieved from the record section and analysed.

Results

3380 cases of EDHs were seen over a period of 10 years. Out of these there were 20 cases of VEDH were encountered, including 17 males and 3 females. 11 patients (55%) were injured due to road traffic accidents (RTAs). 11 patients (55%) presented with altered sensorium, followed by headache in 9 patients. The diagnosis was made by axial and direct coronal computerized tomography (CT) scan in most of them. 16 patients were managed by surgical intervention. The source of bleeding was found to be mainly from superior sagittal sinus (Table 1 to 6).

Table 1: Summary of EDH and VEDH cases

Total no. of head injury admissions	**12421**
Total no. of patients having EDH	3380
Total no. of operated cases of EDH	2450
Total no. of Vertex EDH patients	20
Male : Female	17:3
Mean age-	28.77 (10–60 years)
Conservative	04
Operated	16

Table 2: Mode of trauma

Mode of trauma	**No. of patients**
Road traffic accidents	11
Fall from height	3
Assault	3
Fall of heavy object	2
Injury by animal	1

Table 3: Presenting complaint of patients

Presenting complaint	**No. of patients**
Altered sensorium	11
headache	9
hemiparesis	2
quadriparesis	2
Lower limb weakness	1

Table 4: Presentation time of patients and associated finding

Presentation time	**No. of patient**	**Mean admission GCS**	**Mean discharge GCS**	**Associated Skull#**	**Source of Bleeding**	**operated / conservative**
<24 hour	13	8.3	13	11(FP#–10 & CD–3)	SSS–12 D–3	12/1
24-72 hours	6	15	15	1 (CD)	SSS–2 D–4	4/2
>72 hours	1	15	15	–	D	conservative

FP#–fronto-parietal fracture, CD-coronal suture diastasis, SSS-superior saggital sinus, D- dural vein

Table 5: Detail of patient presenting within 24 hour

GCS on admission	No. of patients	Operated / conservative	Average blood volume	Associated other brain lesion	GCS on discharge	Average stay in hospital
13–15	2	1-operated 1-conservative	50 ml	absent	15 (10 patients)	6 days
7–12	7	All operated	70 ml	F'contusion- 2, SDH–1 patient, SAH–1 patient	10 (2 patient)	10 days
<7	4	All operated	100 ml	absent	- (1 patient improved to GCS 15 2 improved to GCS 10 1 expired)	14days

Table 6: Glasgow outcome scale

Score	Grade	No. of patients
1	Death	1
2	Vegetative state	-
3	Severe disability	2
4	Moderate disability	1
5	Good recovery	16

Discussion

Guthrie, in 1862, reported the first case of vertex EDH.[8] Ramesh *et al*. reported the largest series of vertex EDH of 29 cases from a retrospective study of over 17 years[9] with an incidence of 0.024% of head injuries and 0.47% of all EDH. Wylen and Nanda reported that VEDH account for 1.3–8.2% of all traumatic intracranial hematomas.[1] We found it to be 0.005% of all EDHs in our series.

The clinical presentation may be immediately post trauma or later and are nonspecific. In our case series, 19 patients (95%) presented in acute phase (<72 hour), of which 55% (11 patients) presented in altered sensorium, headache in 45% (9 patients) while quadriparesis & hemiparesis occured in 10% (2 patient) each, unilateral lower limb weakness in 5% (1 patient). Only 1 patient presented in later phase with mild to moderate headache being his only complaint. Severe headache was the major presenting feature as seen the case series of Columella *et al*.[10] *and V.G.* Ramesh *et al*.[9] with a majority present in the acute phase. None of our patients presented with cranial nerve involvement or papilloedema as reported in the case series by Alexander and others.[5]

After initial stabilization of patient, NCCT head with axial cuts parallel to th occiput-mandibular line is the primary mode of investigation. All cases suspected to have vertex EDH also underwent coronal and sagittal section of NCCT head. The suspicion should arise when patients have vertex bone fracture, paraparesis without cervical trauma, unexplained poor GCS patients, doubtful cases and those with artifact defects in high parietal cuts. Coronal imaging would help to confirm the diagnosis, delineate the extent and amount of bleed and degree of compression of the underlying brain. In a separate study by Messori *et al*. and by Harbury *et al*. the authors showed that VEDH may be missed as an artifact in axial CT and diagnosis to be confirmed with direct coronal CT.[11,12] Ramesh and Sivakumar reported the first case of VEDH diagnosed with MRI[13] as it is multiplanar and without bony artifact. The additional findings like frontal contusion were found in 2 patients, and SDH and SAH in 1 patient each.

Two of our patients who presented with quadriparesis also underwent CT and MRI cervical spine to rule out cervical spinal cord injury which was found to be normal. The compression of the motor homunculus where upper and lower limbs lie in proximity may have caused the hemiparesis or lower limb weakness. The bilateral extension of vertex EDH, associated with frontal contusion may be the cause of quadriparesis.

In our series of 20 patients, 16 patients (80%) were operated and 4 patients (20%) were managed conservatively. Surgery was done by either bilateral or unilateral fronto-parietal craniotomy, bicornonal craniotomy or trephine craniotomy. The average volume of EDH was found to be 70 to 80 ml. The source of bleeding were found to be superior

sagittal sinus in 14 patients (70%), from fracture line in 12 patient (60%), and dural stripping from skull in 8 (40%). In literature patients with pagets disease of bone, bleeding disorder and spontaneous vertex EDH have also been reported.

The management of VEDH was considered on a case to case basis.[10,14] The size of VEDH, the rapidity of evolution, clinical presentation, GCS of the patients, mass effect on brain are the factors which determine the management of VEDH.[5,10,14] The smaller hematomas were likely to resolve spontaneously. The pathophysiology of vertex hematoma is entirely different from the EDH on other sites, so is the associated deficit. Hence, even a small amount of clot may need surgery.[10] In the series of 29 patients of VG Ramesh *et al*. 24 patients were manged conservatively.

Though a rare entity, vertex EDH diagnosis required high index of suspicion, prompt diagnosis, close monitoring and surgical intervention when required, leading to a good outcome in VED.[7,8] Intraoperative precautions are required to prevent complications due to its unusual location and proximity to the major venous sinus. The complications encountered were bleeding from superior sagittal sinus and risk of venous air embolism. The bleeding was controlled by surgicel or gelfoam, repair of venous sinuses, adequate amount of blood units were kept ready, prevention or control of bleeding from bone margins, keeping operative field irrigated and measures to prevent and prompt management of venous air embolism. Out of 16 operative patients one patient died in the early postoperative period. The remaining 19 patients showed improvement with mean hospital stay of 8.5 days.

A summary of the studies of VEDH[13] reported so far are shown in Table 7.

Table 7: Summary of the studies of VEDH

Author	No. of cases	Diagnostic investigation
Columella *et al*., 1959	5	CA/PEG
Alexander, 1961	4	CA
Da Pian *et al*., 1963	4	CA
Borzone *et al*., 1979	14	CT
Kunz *et al*., 1969	8	CT
VG Ramesh *et al*., 2013	29	CT/MRI
Present study,2018	20	CT

CA—carotid angiography, CT—Computerized tomography, PEG—Pneumoencephalography, MRI-Magnetic Resonance imaging

Conclusion

Vertex EDH is an uncommon entity encountered by the neurosurgeon. Vertex EDH has nonspecific presentations, hence a high index of suspicion is required for diagnosis and early management to limit morbidity and mortality. Adequate blood arrangement is required intra operatively to facilitate a safe surgical outcome, as are the safety precautions to prevent excessive blood loss and venous air embolism.

Traumatic paraparesis, in the absence of spinal cord injury, should prompt a diligent search for Vertex EDH.

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