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An analysis of frontal extradural hematoma and its radiographic features

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ABSTRACT

Background: The extradural hematoma is the most important expanding lesion due to head injury with high indexes of mortality and morbidity when the correct management is not done. Frontal extradural hematoma (FEH) is considered rare, representing about 10% of the whole extradural hematoma. They are usually unilateral and may present with subacute and chronic evolution in 40% of the cases. **Objective:** The aim is to study fifteen cases of FEH and analyze the causes, clinical findings, and radiographic appearance. **Materials and Methods:** A totsl of 15 patients were studied retrospectively, FEH from the picture archiving and communication system of computed tomography (CT) scanner and magnetic resonance imaging (MRI). 12 cases were male and three female. The age ranged from 10 to 32 years, with a mean of 18 years. **Results:** The main causes were traffic accidents and falls. In two cases, the hematoma was bilateral. Acute collection occurred in 9 cases, subacute in 3, and chronic in 3. The most important clinical findings were headaches, vomiting, and seizures. Skull X-rays detected fracture in 9 cases, and CT was positive in demonstrating the hematoma. **Conclusions:** (1) The FEH is more frequent in young adults, (2) its evolution is slow, usually subacute or chronic, in majority of the cases, (3) the clinical findings of the FEH course with few neurological symptoms during its evolution, and (4) the FEH appears hyperdense in CT images and hypo- to hyper-dense in MRI.

Key words: Computed tomography, extradural hematoma, head injury, magnetic resonance imaging, radiographical features

INTRODUCTION

Extradural hematomas generally have an acute onset and are located in the temporoparietal area.[1] Extradural hematomas, which lie between the inner surface of the skull and the stripped of dural membrane, are nearly always caused by, and located near, a skull fracture.

The collections take several forms in terms of size, location, speed of development, and the effects they exert on patients. Extradural hematomas usually form within a few hours from the time of injury but sometimes run a more chronic course, being detected only days after injury. In some cases, initial computed tomography (CT) scan may be performed too soon in a patient in whom an extradural hematoma is still in the process of forming. In circumstances in which CT scan is obtained within the first 6 h of injury and the patient shows subsequent deterioration, a second CT scan must be obtained. In a small number of instances, repeat CT scan reveals a sizeable extradural hematoma not shown on the first scan.

The main cause of the extradural hematomas is the head injury, and the young adults have more risk to this lesion. However, other causes were described to explain the extradural pathology.[2] Indian roads, which account for the highest fatalities in the world, became yet more dangerous in 2015 with the number of deaths rising nearly 5% to 1.46 lakh. This translates to 400 deaths a day or one life snuffed out every 3.6 min, in what an expert described as a "daily massacre on our roads."

Nowadays, the best examination to diagnostic the extradural hematoma is the CT. In the era before CT, the mortality due to extradural hematoma was 40–80%, and after CT, the mortality is about 10%.[3] The CT scan is appropriated to trauma because is an examination relatively fast with high accuracy. Therefore, the first case of conservative treatment was described by Weaver *et al*.[4] in the CT era. These authors refer that the CT scan created a new group of patients: The patients with extradural hematoma and no symptoms. Pang *et al*.[5] described the evolution of the extradural hematoma by CT and divided it into two groups: Types A and B. Much advances were obtained with CT.

A specific frontal extradural hematoma (FEH) type has been observed in 10% of the cases, and there are few papers about it.[6-8] FEH may present with subacute or chronic evolution in one-third of the cases, and few neurological symptoms are found with a good outcome.

MATERIALS AND METHODS

Fifteen patients were studied retrospectively, FEH from the picture archiving and communication system of CT scanner and

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magnetic resonance imaging (MRI). The patients were studied according to sex, age, etiology of the FEH, clinical findings, and presentation.

Patients were imaged with either one or two imaging modalities, CT, and MRI. All patients of this sample were scanned using a 64 multi-slice CT scan using the protocol of the brain imaging in which the patient was scan in the supine position with the head of the patient is centered and fixed in the gantry of CT scan machine. Brain scan was done under selected exposure factors with slice thickness of 8 mm, and intravenous low-osmolar water-soluble contrast media was injected into the patients. Interpretation of the brain scan was performed by consultant radiologists to conform the diagnosis. Three patients of this study were imaged with 1.5 Tesla MRI using the protocol of imaging of the head by MRI in which the following parameters of imaging were selected; 10 mm slice thickness of the brain, T1 and T2 weighted images were done, and the contrast media that used is intravenous gadolinium (0.1 ml/kg) according to the weight of the patient.

The collected data in the study were analyzed using the SPSS software program. The study contains both qualitative and quantitative variable. The quantitative was described using numbers, percentage, and tables (Tables 1-4).

Table 1: Gender of the patients (*n*=15)

Gender	Number of respondent (%)
Male	12 (80)
Female	3 (20)

Table 2: Age group of the patients (*n*=15)

Age (years)	Number of respondent (%)
<10	0 (0)
10–15	3 (20.0)
16–20	8 (53.3)
21–25	2 (13.3)
26–30	1 (6.7)
31–35	1 (6.7)
More than 35	0 (0)

Table 3: Clinical presentation of the patient (*n*=15)

Clinical presentation	Number of respondent (%)
Acute	9 (60)
Subacute	3 (20)
Chronic	3 (20)

Table 4: Mode of injury (*n*=15)

Causes	Number of respondent (%)
Road traffic accident	6 (40)
Sports injury	3 (20)
Beating	3 (20)
Fall	2 (13.3)
Unknown	1 (6.7)

RESULTS

In all, 15 cases were analyzed in the study, consisting of 12 male and 3 female.

The age of the patients ranged from 10 to 35 years. 8 cases are reported in the range of 16–20 years which has 53.3%. In the range 26–30 years and 31–35 years, there was only one patient.

The clinical presentation had an acute (first 24 h) evolution in 9 (60%) cases, subacute (48-72 h) in 3 (20%) cases, and chronic (more than 72 h) in 3 (20%) cases.

The principal causes of the FEH were as follows: Road traffic accidents in 6 (40%) patients, sports injury in 3 (20%), beating in 3 (20%), falls in 2 (13.3%), and unknown in 1 (6.7%) patients. Main symptoms were headaches, vomiting, and seizures. Fracture was detected in skull X-rays in 9 patients. CT scan was very important for a demonstration of size and the location of the hematomas: Two patients had bilateral FEH and one patient presented calcifications in the hematoma.

DISCUSSION

Extradural hematomas may affect any part of the skull, although it is more common in some areas. Temporal and temporoparietal areas are involved in 70% of the cases. Approximately 10% occur at the frontal area, 10% at the parietooccipital, and 10% at the infratentorial area, being less frequent in the vertex and in the clivus.[1]

The FEH represents 10% of all cases of extradural hematomas, being generally unilateral. In this study, I found two bilateral frontal cases. Tatagiba *et al*.[9] reported a higher incidence of subacute and chronic evolution and had lower morbimortality. According to Zucarrello *et al*.,[10] the FEH presents a subacute or chronic evolution because the brain can easily tolerate an anterior and postlateral compression rather than a lateral compression or in the posterior fossa. Some authors found a little predominance of extradural hematoma with chronic evolution when it occurs in the frontal and the parietooccipital areas.[11,12] We studied three patients with subacute evolution and three patients with chronic evolution. The lower incidence of calcification in these hematomas[1] has been reported, even though in this work there was one chronic patient with calcification.

In some cases, the only symptom found in patients with FEH was headache and occasional irritability.[13] Many authors reported that pupillary abnormalities are rare in cases of extradural hematoma in the frontal area.[11,14]

Radiographic Features of FEH

CT

In almost all cases, extradural hematomas are seen on CT scans of the brain. They are typically bi-convex (or lentiform) in shape, and most frequently beneath the squamous part of the temporal bone. EDHs are hyperdense, somewhat heterogeneous, and sharply demarcated. Depending on their size, secondary features of mass effect (e.g., midline shift, subfalcine herniation, and uncal herniation) may be present.

When acute bleeding is occurring at the time of CT scanning, the non-clotted fresh blood is typically less hyperdense, and a swirl sign may be evident one. Postcontrast extravasation may be seen rarely in case of acute EDH and peripheral enhancement due to granulation and neovascularization can be seen in chronic EDH.

MRI

MRI can clearly demonstrate the displaced dura that appears as a hypointense line on T1 and T2 sequences which is helpful in distinguishing it from a subdural hematoma.

Acute EDH appears isointense on T1 and shows variable intensities from hypo- to hyper-intense on a T2 sequence. Early subacute EDH appears hypointense on T2, while late subacute and chronic EDHs are hyperintense on both T1 and T2 sequences. Intravenous contrast may demonstrate displaced or occluded venous sinus in case of the venous origin of EDH.

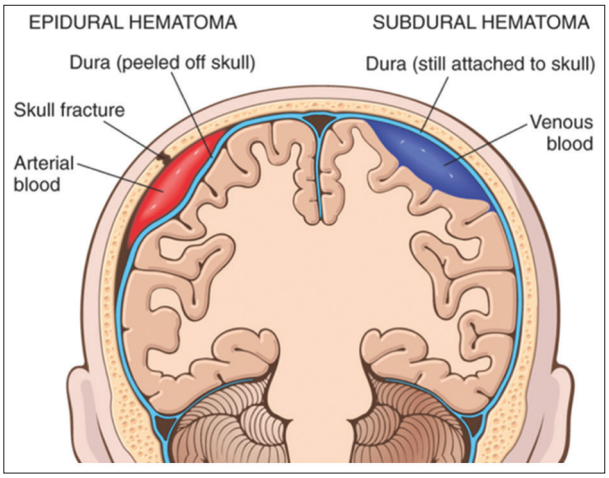

Figure 1: Various regions of hematoma

Figure 2: Bilateral frontal hematoma of 25 years male with road traffic accident. In this image, frontal extradural hematomas are seen, of maximum thickness about 5 cm on the right side and 3.5 cm on the left side. An associated brain edema with marked mass effect in the form of effacement of cerebral sulci, compression of the third and lateral ventricles with possible uncal herniation. Hemorrhagic foci seen at the right frontal gray-white matter junction and right temporal region

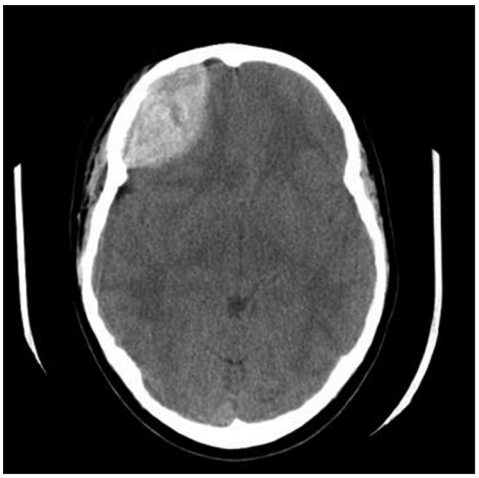

Figure 3: An extradural hematoma overlies the right frontal lobe with right-to-left subfalcine herniation of approximately 7 mm. Areas of low attenuation in the hematoma are again seen. These indicate continued hemorrhage at the time of the examination. Overlying soft-tissue swelling is present in the right frontal aspect of the scalp

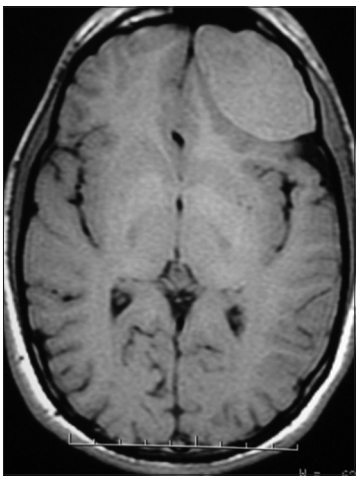

Figure 4: T2-weighted magnetic resonance imaging image showing extradural hematoma in the left frontal region

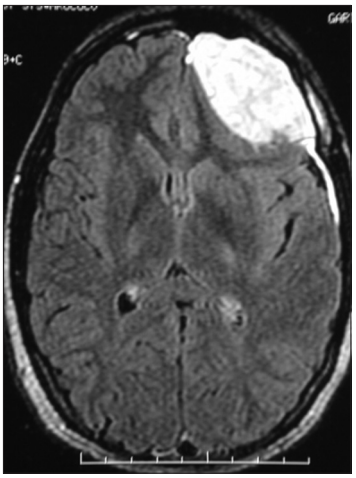

Figure 5: T2-weighted magnetic resonance imaging image showing left frontal extradural hematoma

Although highly sensitive is in the evaluation of spinal EDH, MRI is infrequently the initial modality of choice for assessing intracranial EDH because of the acuteness and severity of EDH. Motion artifact in obtunded patients and the lack of readily available MRI units outside of urban areas also limit its usefulness.

MRI demonstrates a biconvex mass separated from the overlying dura by a thin rim of extruded serum lying between the clot and the dura. This stripe is hyperintense on both T1- and T2-weighted images.

Acute EDH is isointense to minimally hypointense on T1-weighted images and markedly hypointense on T2-weighted images; this appearance corresponds to the deoxyhemoglobin phase. Subacute EDH is hyperintense on T1-weighted images because deoxyhemoglobin is converted to methemoglobin. On T1-weighted images, the dura may be seen as a thin, hypointense stripe that the hematoma displaces inwardly.

The appearance of an EDH may evolve over time similar to a parenchymal hematoma. An acutely formed blood clot is hypointense on a T2-weighted MRI due to the presence of deoxyhemoglobin. During subsequent weeks, deoxyhemoglobin degrades to methemoglobin, which appears bright on both T1- and T2-weighted MRIs. After several, with only hemosiderin deposits remaining, the blood clot becomes hypointense on the T1-weighted MRI (Figures 1-5).

CONCLUSIONS

These data suggest that:

- The FEDH is more frequent in young adults;
- The FEH is more in male (80%) compared to female (20%);
- Its evolution is slow, usually subacute or chronic, in majority of the cases;
- In CT, the FEH appears hyperdense;
- In MRI, the acute FEDH appears isointense on T1 and shows variable intensities from hypo- to hyper-intense on a T2 sequence. Early subacute EDH appears hypointense on T2, while late subacute and chronic EDHs are hyperintense on both T1 and T2 sequences.

REFERENCES

1. Reale F, Delfini R, Mencantini G. Extradural hematomas. J Neurosurg Sci 1984;28:9-16.
2. Marks SM, Shaw MD. Spontaneous intracranial extradural hematoma. Case report. J Neurosurg 1982;57:708-9.
3. Lee EJ, Hung YC, Wang LC, Chung KC, Chen HH. Factors influencing the functional outcome of patients with acute extradural hematomas: Analysis of 200 patients undergoing surgery. J Trauma 1998;45:946-52.
4. Weaver D, Pobereskin L, Jane JA. Spontaneous resolution of Extradural hematomas. Report of two cases. J Neurosurg 1981;54:248-51.
5. Pang D, Horton JA, Herron JM, Wilberger JE Jr., Vries JK. Nonsurgical management of extradural hematomas in children. J Neurosurg 1983;59:958-71.
6. Gruskiewicz J, Doron Y, Peyser E. Frontal extradural hematomas. Surg Neurol 1976;5:122-8.
7. Lecuire J, Lapras C, Goutelle A, Gacon G, Dechamme JP. Extradural prefrontal hematomas: A propos of 18 cases. Neurochirurgie 1967;13:431-3.
8. Miyazaki Y, Isojima A, Takekawa M, Abe S, Sakai H, Abe T, *et al.* Frontal acute extradural hematoma due to contrecoup injury: A case report. No Shinkei Geka 1995;23:917-20.
9. Tatagiba M, Sepehrnia A, el Azm M, Samii M. Chronic epidural hematoma--report on eight cases and review of the literature. Surg Neurol 1989;32:453-8.
10. Zuccarello M, Fiore DL, Pardatscher K, Trincia G, Andrioli GC. Chronic extradural hematoma. Acta Neurochir (Wien) 1983;67:57-66.
11. Jamieson KG, Yelland JD. Extradural hematoma. Report of 167 cases. J Neurosurg 1968;29:13-23.
12. McLaurin RL, Ford LE. Extradural hematoma. Statistical survey of 47 cases. J Neurosurg 1964;21:364-71.
13. Grevsten S, Pellettieri L. Surgical decision in the treatment of extradural hematoma. Acta Chir Scand 1982;148:97-102.
14. Hooper R. Observations on extradural haemorrhage. Br J Surg 1959;47:71-87.

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