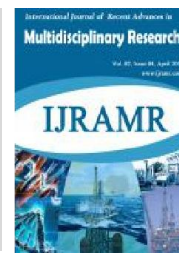


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Research Article

HEAD TRAUMA AND POST TRAUMATIC EPILEPSY – A RADIOLOGICAL STUDY

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ABSTRACT

Introduction: India went through a phase of massive urbanization, industrialization and motorization. In relation to motorization one of the problems is head injury. Imaging tests help in determining the diagnosis and prognosis of a traumatic brain injury patient. One of the common sequelae of head trauma is seizures. About 25% of patients with brain contusions or hematomas and about 50% of patients with penetrating head injuries will develop seizures. These seizures occur within first 24 hours of head injury.

Material, Method and Observation: An attempt is being made to correlate the CT appearances with epilepsy. We study about 1000 cases of head injury and separate the cases of post traumatic epilepsy for further study. This study was a prospective hospital based study and was carried out from August 2009 to July 2011.

Result and conclusion: Seizure is a known complication in patients of head injury with incidence of seizure in our series was 7% & most common clinical presentation in post traumatic seizure patients is headache which was seen in our series. Plain X- ray had a limited role in evaluation of post traumatic head injury because negative or positive plain X-ray needs further investigation in the form of CT. CT is the sensitive imaging modality to pick up the injuries of skull bones, subdural and epidural hematomas and contusions. MRI is the modality of choice for evaluation of post traumatic epilepsy because it can reveal all the lesions detected on CT in addition to diffuse axonal injury and gliosis. In our series, because of financial constraints, we could do MRI in a limited number of cases.

INTRODUCTION

India went through a phase of massive urbanization, industrialization and motorization. With technology getting more and more advanced, the working and living concept of the people changed drastically. Consequently several new problems and challenges emerged. In relation to motorization one of the problems is head injury. Half of all traumatic brain injuries are due to automobiles, motorcycles, bicycles and pedestrian. Imaging tests help in determining the diagnosis and prognosis of a traumatic brain injury patient. One of the common sequelae of head trauma is seizures. About 25% of patients with brain contusions or hematomas and about 50% of patients with penetrating head injuries will develop seizures. These seizures occur within first 24 hours of head injury.

Aims and Objectives

- To know the incidence of epilepsy following trauma in Acharya Vinoba Bhave Rural Hospital (AVBRH)
- To assess the symptoms in post traumatic epilepsy

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- To know the utility of plain x ray skull if any in cases of head injury
- To study the CT appearances in post traumatic epilepsy patients
- To compare role of MRI and its advantage over CT in cases of head injury wherever it is possible

MATERIALS AND METHODS

Due to availability of such high number of cases of head injury and their subsequent follow up, we thought of studying the common complication of head injury i.e. seizures. We have tried to follow these cases for evidence of delayed epilepsy also. An attempt is being made to correlate the CT appearances with epilepsy. We propose to study about 1000 cases of head injury and separate the cases of post traumatic epilepsy for further study. All patients clinically suspected of having post traumatic epilepsy and presenting at neurosurgery/ casualty/ surgery outpatient/inpatient, were evaluated. This study was a prospective hospital based study and was carried out from August 2009 to July 2011.

EQUIPMENTS USED: PHILIPS BRILLIANT multislice CT scan machine, 800ma X-ray machine and Signa Profile GE 0.2 Tesla MR Unit in some cases.

Radiological Investigation

- Plain X-Ray skull-anteroposterior and lateral view. Various points noted on plain radiograph were: Soft tissue over calvaria, Linear fracture, Depressed fracture, Facial bone fractures, Comminuted fracture, Pneumocephalus.
- CT scan protocols: Plain scan was taken in axial section which also included bone window. Reformatting was done in coronal and sagittal section. On CT SCAN following points were noted: Soft tissue, Fractures, Extradural hematoma, Subdural, hematoma, Subarachnoid (intraventricular) bleed, Brain Contusions, Hypodense areas in brain, Diffuse Axonal injury in white matter, Herniations, Oedema of brain, Midline shift, Atrophic changes, prominence of sulcogyral spaces and sylvian fissure and rounding of the ventricular system, Gliosis.
- MRI and Protocol in MRI brain: Images were taken in the following sequences and wherever neurological deficits were obvious Diffusion Weighted Imaging was done to rule out small infarcts. TIWI, T2WI, GRE (Gradient resonance echo) and FLAIR (Fluid attenuated inversion recovery) was noted. Location of bleed and its duration, Shearing type / white matter injury was observed.

Inclusion Criteria

Patients presenting with epilepsy within and after 24hours of head injury.

Exclusion Criteria

Patients with previous history of neurologic deficit, seizure, bleeding disorders, consumption of oral anticoagulants, febrile seizures, children with history of birth asphyxia, instrumental history, maternal illness, or drug intake, previous history of operative intervention in head, stroke, any operative intervention in brain, trauma. All cases of head injury were followed for evidence of seizures. 70 cases were selected who had a head injury followed by seizures.

RESULTS

Observations and results of our study are as follows-

Table 1. Incidence of Seizures

IMMEDIATE (within 24 hrs)	DELAYED (within first wk)	LATE (greater than 1 wk)
24	33	13

Table 2. Age in patients of Post traumatic epilepsy

0-10	10-20	20-30	30-40	40-50	50-60	60+
9	6	17	19	5	4	10

Clinical Presentation in Post Traumatic Period

Table 3. Clinical presentation in the post traumatic period

Clinical presentation	No. of Patients
Headache	55
Dizziness	30
Vomiting	15
Depression	8
Memory deficits	6
Cognitive impairment	5

Table 4. Showing CT findings in patients of post traumatic epilepsy

CT Findings	No. of Patients
Skull Fracture	38
Brain Swelling	34
Extra Dural Haemorrhage	14
Sub Dural Haemorrhage	34
Sub Arachnoid Haemorrhage	28
Focal Hypodensity	15
Contusions	39
Diffuse Axonal injury	5

Table 5. Showing Skull radiographic finding in 70 patients of post traumatic epilepsy

Radiographic findings	No. of patients
Skull fractures	14
Pneumocephalus	4
Extracalvareal hematoma	8

Table 6. showing MRI findings in patients of post traumatic epilepsy

MRI findings	No. of Patients
Only Diffuse Axonal Injury	3
Parenchymal Contusion	1
Only Extradural Hematoma	1
Only Atrophy	1
Only Encephalomalacia	1
Diffuse Axonal Injury + Subdural Hematoma	2
Gliosis + Brain Infarction	1
Total Number Of Patients	10

Table 7. MRI versus CT in patients of post traumatic epilepsy

Finding in brain	MRI showing positive finding(no of pt)	CT showing positive finding(no of pt)
Diffuse axonal injury	5	-
Small subdural hematoma (with parenchymal contusion)	3(subdural hematoma detected)	Subdural hematoma was missed but parenchymal contusions were detected)
Extradural hematoma	1	1
Gliosis of brain tissue	1	1
Atrophy of brain	1	1
Encephalomalacia	1	1
Brain infarction	1	1

Table 8. Total number of cases studied: 70

1.Headache	55
2.Dizziness	30
3.Vomiting	15
4.Depression	8
5.Memory deficits	6
6.Cognitive impairment	5
7.Csf rhinorrhoea	7

EARLY SYMPTOMS	LATE SYMPTOMS
1.Headache-78.6%	1.Depression-11.4%
2.Dizziness-42.9%	2.Memory deficits-8.6%
3.vomitting-21.4%	3.Cognitive impairment-7.1%

DISCUSSION

Epilepsy that develops after traumatic brain injury has a number of features that makes it a subject of study. Firstly, it is the most common form of acquired epilepsy. Secondly, it can be difficult to treat medically and surgically. Last but not the least the likelihood of developing seizures in severe head injury can be as high as 40-50 % (1).

Incidence of post Traumatic Seizures

John Annegers *et al.*, (1998) conducted a study on 4541 patients of traumatic brain injury in Olmsted County at Minnesota. The incidence of post traumatic seizures was around 12%. Englander *et al.*, (2003) studied 647 patients done at Chang Gung Memorial Hospital (Taiwan), the incidence of early seizures was 3% and late seizure was 10.2%. Lee *et al.*, (1995) studied 2574 cases of head injury; the incidence of seizures was 5.9%. A study done at SGPGI Lucknow (Rajesh kumar *et al.*, 2003) demonstrated the incidence of post traumatic epilepsy to be 30%. In our series of 1000 patients, 70 patients showed the evidence of seizures. They were further classified into immediate (within 24 hours), early (within 1 week), and late epilepsy (up to 1 year). In our series the incidence on late epilepsy was around 18%. This figure does not correlate with other studies as we could get a limited follow up for duration of up to one year. In published studies they have followed the cases up to 15 years period. This discrepancy in follow up period can explain the relative low incidence of late epilepsy. In our series of 70 patients, we have done plane x rays- anteroposterior and lateral. Positive findings were recorded in 20 cases. These cases had clinical signs and symptoms s/o amnesia, neurological deficits, CSF rhinorrhoea and penetrating scalp injuries. We have noted that in all these cases where x ray findings were positive, we had to proceed with a CT scan to evaluate injury/damage to brain. Hence the utility of plain x ray as a preliminary investigative modality for traumatic brain injury is limited. In places where CT scan is not available, it will be useful as a screening modality. In our study a series of 70 patients with traumatic brain head injury followed by seizures were studied. It was found that most common clinical symptom occurring post trauma (Table 8) was headache followed by dizziness and emesis. The other presentations were depression, which was seen in patients over the time along with short term memory deficits and cognitive impairment.

Is Mri More Informative than CT in post Traumatic Epilepsy?

In our study we also tried to evaluate and correlate the post traumatic epilepsy patient by MRI scan to find out the cause of neurological deficit in patient even after normal CT scan imaging. We followed 10 patients out of our study population using 0.2 tesla MRI setup of our hospital for further evaluation. Out of the 10 patients, 5 patients who were showing normal CT scan showed diffuse axonal injury (50%) on MRI evaluation. 3 patients showing parenchymal contusion which was diagnosed on CT scan also had very small subdural hematoma (30%) which was well appreciated on T2- weighted sequences. However the rest of the findings showing 1 patient with extradural hematoma (10%), 1 with Gliosis (10%), 1 having atrophy (10%), 1 encephalomalacia (10%) and 1 brain infarction (10%) were showing similarity with the CT scan finding. In our study also the shearing injury showed to be the commonest with finding of diffuse axonal injury in 50 % of patients in similarity to one study quoted in our reference (Turkish Neurosurgery (6). Diffuse axonal injuries were well appreciated using Diffusion Weighted Imaging as also quoted by Gomori *et al.*, (1985). T2 weighted GE sequences and T2 weighted Flair were more sensitive for detection of gliosis and hemosiderin containing lesion. (Anna Messori *et al.*, 2005). The study also showed that shearing injury, cortical contusion, sub cortical gray matter injury and brain stem lesion along with

the staging of parenchymal hemorrhage and acute, subacute hemorrhagic and non hemorrhagic lesion can be well appreciated on MRI (Turkish Neurosurgery (8). Hence we can conclude by saying that majority of severe craniocerebral injury cases without appreciable lesion on CT may have positive MRI findings. MRI is not only useful in identifying subtle brain lesions but also provides some prognostic information to the clinicians.

Conclusion

- Seizure is a known complication in patients of head injury.
- The incidence of seizure in our series was 7%.
- The most common clinical presentation in post traumatic seizure patients is headache which was seen in our series.
- Plain X- ray had a limited role in evaluation of post traumatic head injury because negative or positive plain X- ray needs further investigation in the form of CT.
- CT is the sensitive imaging modality to pick up the injuries of skull bones, subdural and epidural hematomas and contusions.
- The role of CT in detecting diffuse axonal injury is limited.
- MRI is the modality of choice for evaluation of post traumatic epilepsy because it can reveal all the lesions detected on CT in addition to diffuse axonal injury and gliosis.
- In our series, because of financial constraints, we could do MRI in a limited number of cases.
- Even though our number is less (10), MRI revealed its superiority over CT.

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