Research Article

CT scan Imaging – A Modality of Choice in Patients Having Head Injury

Pawar AR[1], Alone SD[2]

[1]Dr Aruna Ramchandra Pawar, MBBS, MD, Associate Professor, Department of Radiology, Shree Vasantrao Naik Government Medical College Yavatmal, Maharashtra, India. [2]Dr Suhas Dadarao Alone, BVSc & AH, MVSc (Medicine), Assistant Commissioner (AH), Government Vet Minipoliclinic Ghatanji Yavatma, Maharashtra, India.

Address for correspondence: Dr Aruna Pawar, Email: atharvaalone@gmail.com

Abstract

Introduction: Today in world of growing population and increase vehicle use, trauma is the leading cause of death in children, young and adults. Head injury is the major contributor to mortality in over half of these cases. Neuroimaging is fundamental for diagnosis and management of patients with head injury. In this new era of development computed tomography has become the primary modality of choice. The main objective of this study is to assess the utility and importance of CT scan imaging in head injury patients. **Methods:** This is retrospective study of one year. Out of 120 patients males were 96 and females were 24 in number. **Results:** Male predominance is seen in this study. Patients up to the age of 70 years were considered. 6 cases were found up to the age of 15 years. 99 cases were found of age of 16 years to 40 years. 15 cases were found above the age of 40 years. Out of 120 cases 80 patients suffered from skull fractures. Most common lesion indentified in CT was brain contusion in 42 patients followed by epidural collection in 9 cases, subdural haematoma in 19 cases, Intracerebral haematoma in 15 cases, localised brain edema in 23 cases, diffuse brain edema 10 cases and pneumocephalus 2 cases were observed. **Conclusion:** CT scan imaging is a prime important tool in the diagnosis of various pathological abnormalities in the patients suffering from head injury which is important for planning the initial life saving treatment.

Keywords: CT Scan for head injury, Brain Edema, Head Injury, Subdural hematoma, Imaging in head injury

Introduction

Road Traffic accidents are increasing day by day. Head injury is most life threatening complication of road traffic accidents. In accidents head is the most prone part of the body for injury and this trauma is one of the most common cause of death in young adults and children. Neurological trauma accounts for majority of cases [1]. Many references have stated that near about 1.6 million head injuries occurs in America every year resulting in fifty to sixty thousand deaths and more than seventy thousand patients with lifelong neurological deficits [2][3][4]. Present study reveals that males are most commonly involved than the females [2][3][4][5][6][7]. Present study reveals the neurological imaging using CT scan in which different complications of head injury were observed, their prevenlence and frequencies were studied. The observations were correlated with age, sex, presence or absence of associated skull fracture [4][5] intracranial collection, localized and diffuse brain edema. Other modality like MRI is also diagnostic; however CT scan is faster, easily available and comparatively cheaper than MRI. Thus this study shows that neuroimaging with CT scan is the initial and fast modality of choice in patients of head. injury.

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Material and Methods

This is retrospective study of one year. In this study total 120 patients were under consideration. All these patients were having history of head injury and were referred for CT scan imaging. The patients up to the age of 70 years were considered for the study. In one year total 120 cases were reported having head injury. These patients were scanned for head injury and different types of pathological abnormalities were recorded and

analyzed. For this study along with CT findings, age and sex of patients were taken into consideration.

Results

It the present study of 120 patients suspected of head injury male patients were more commonly involved as compared to females. Out of 120 patients males were 96 (80%) and females were 24 (20%) in number. Male predominance is seen in this study. Patients up to the age of 70 years were considered in this study. 6 (5%) cases were found up to the age of 15 years. 99 (83%) cases were found in the age group of 16 years to 40 years. 15 (12%) cases were above the age of 40 years. The above findings are shown in figure 1. Out of 120 cases 80 patients (66.66%) were having skull fractures. In this study the pathological types of intracranial sequelae seen on CT scan imaging were brain contusion 42 cases (35.02%), epidural collection 9 cases (7.5%), subdural hematoma 19 cases (15.83%), intracerebral hematoma 15 cases (12.5%), localised brain edema 23 cases (19.16%), diffuse brain edema 10 cases (8.33%) and pneumocephalus 2 cases (1.66%). These findings of CT scan imaging are demonstrated in figure 2.

Table 1: Incidence of head injury in different age

Sr. No.	Age Group In Years	Number Of Cases	Percentage
1	1 to 15	06	5%
2	16 to 40	99	83%
3	41 and above	15	12%

Table 2: Incidence of post traumatic intracranial sequelae

Sr. No.	Post traumatic intracranial sequelae	Number Of Cases	Percentage
1	Brain contusion	42	35.02%
2	Epidural haematoma	09	07.05%
3	Subdural haematoma	19	15.83%
4	Intacranial haematoma	15	12.50%
5	Localised brain edema	23	19.16%
6	Diffuse brain edema	10	08.33%
7	Pneumocephalus	02	01.66%

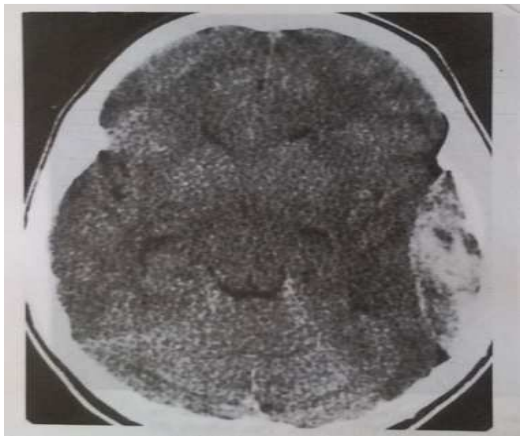

Figure 1: shows heterogenous left temporal convexity suggestive of epidural haematoma

Figure 2: shows multiple hemorrhagic contusions in temporal lobes. Note the small left occipital lobe convexity suggestive of subdural hematoma shown by arrow.

Discussion

In this new era of development, road accidents both by two wheelers, four wheelers is the commonest cause of trauma of which head injury is most commonly involved and is the major contributory factor to mortality in half of the cases [1]. In present study 96 cases (80%) were males. Age group mostly involved in our study was 16 years to 40 years, this is because of male dominance society & they have more socioeconomic life [2]. Thus teenagers and young adults are most commonly involved in trauma [5][6]. Pediatric age group contributed to 53% and 39% [7]. The various types of intracranial sequelae seen on CT scan imaging that are observed in this study of 120 cases of head injury were as follows.

1. Brain Contusion: The lesions are characterized pathologically as areas of hemorrhage, necrosis and edema. The mechanism contusion production is complex and dependent on many factors, with lesions occurring at the site of impact as well as at sites remote from impact. These are reffered to as coup and countercoup lesions respectively [8]. Contusions are the most commonly encountered lesions occurring as a result of head trauma [9]. On plain CT scan contusions appear as hypodense areas if hemorrhage is absent and hyperdense if hemorrhage is present which is shown in figure 2. CT scan is more sensitive in detecting blood clots in the acute stage of head injury as compared to MRI as clot signals appear same as that of brain parenchyma [10]. In this study of 120 patients total cases reported of brain contusion were 42 (35.02%) slightly higher as compared to the study mentioned in another studies[2][3][6]. In another study the incidence shown was 13% [7].

2. Epidural Hematoma: Epidural hematomas are characteristically biconvex or lentiform [11] which is shown in figure 3. Uncommonly epidural hematomas may be bilenticular, crescentic, or irregular [12]. This shape is determined by the dura, which is firmly adherent to the inner table of the skull. Fracture of the adjacent bone is however common [13]. Most commonly bleeding is from an injured middle meningeal artery near to inner table, from a fracture of the adjacent bony cranium with shift of ventricles [7][14][15][16]. In this study of 120 patients, epidural hematoma was observed in 9 patients (7.5%).

3. Subdural Haematoma: Subdural hematoma are most commonly caused by shearing forces that result in the tearing of the bridging veins present in the subdural space [17]. Laceration of cortical arteries and parenchymal contusions are other causes of subdural hematomas. Rarely the subdural hematomas may be caused by rupture of aneurysm or arteriorvenous malformations [18]. In our study subdural hematomas were found in 19 cases (15.83%). Other studies have shown the incidence of 9%, 12%, 16% and 19% [7]. Subdural hygroma is seen as extraaxial, semilunar, peripheral collection of CSF density. It has convex outer border and concave inner border. It is difficult to distinguish it from chronic subdural hematoma on CT scan, on the other hand it can be fatal and may have the same clinical significance as subdural hematoma [7][15][16].

4. Intracerebral Hematoma: Intracerebral hematomas are differentiated from hemorrhagic contusions in that the former are homogeneously hyperdense, sharply marginated, and surrounded by a ring of decreased density [19]. Considerable mass effect may be present, depending on the size of the lesion. The most frequent sites of involvement are the frontal and temporal lobes [19][20]. In our study intracerebral hematoma was observed in 15 cases (12.5%), however slightly higher incidence was observed in previous study [7].

5. Localised Brain Edema: Brain swelling and edema occurred commonly in patients with head trauma. Brain swelling is observed more frequently in children than in adults [21]. Minor episodes of trauma may result in brain swelling. Localized brain edema is seen as illdefined hypodense area with shift of midline structures to the contralateral side which may be the only presenting feature [9][16][22]. Its high incidence can be explained by it being usually accompanied with other sequelae. In our study the incidence of localized brain edema were noted in 23 cases (19.16%]

6. Diffuse Brain Edema: Diffuse brain edema occurs when there is loss of cerebral autoregulation which results in increased blood flow and blood volume forcing CSF out of the ventricles and subarachnoid spaces, which causes compressions of cisterns spaces and ventricles which presents as mild increased density of white matter[4][8][10][23][24][25]. It is observed that diffuse brain edema is more common among children following head injury because of various reasons like due to unossified sutures there is flexibility, myelination is poor, they don't sustain injury in the same way as adults and the response to trauma is rapid in the form of hyperemia and vasodialatation [4][6]. In

our study diffuse brain edema was found in 10 cases (8.33%).

7. Pneumocephalus: Air locules in extracerbral spaces usually indicate traumatic air entry resulting from fracture of a paranasal sinus or mastoid air cells abuting the dura. When associated with dural tear they may be complicated by CSF leakage, empyema, meningitis or brain abscess. Most post-traumatic CSF leaks cease spontaneously, and the responsible fractures may never be visualized [7][14]. In our study only two cases (1.66%) of pneumocephalus was observed.

Conclusion

CT scan imaging is a prime important tool in the diagnosis of various pathological abnormalities in the patients suffering from head injury. It helps in assessing the severity of brain trauma which is important for planning the initial life saving treatment. CT scan plays a role of light house in the long term management of the patients suffering from head injury.

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