

**A COMPARATIVE STUDY OF CT SCAN FINDING AND AUTOPSY FINDING IN HEAD INJURY CASES****Muhammad Tausif Arafat Hazarika<sup>1</sup> and Aditya Madhab Baruah\*<sup>2</sup>**

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**ABSTRACT**

Head injury is a leading cause of death and is a common finding in medico legal practice. The most common radiological tool in evaluation of such cases is CT scan. The study attempts to make a comparison in results of the CT scan with the subsequent autopsy findings. 41.17% of contusions of scalp were missed on CT findings. 40% of fissured fractures were missed. Subdural and sub arachnoid hemorrhages were also missed. As such an effort must be made by all the doctors involved starting from the radiologist to the autopsy surgeon to better correlate their results to avoid future litigations.

**KEYWORDS:** Head injury, CT scan, contusions, radiology, litigations.**INTRODUCTION**

A head injury is any trauma that leads to injury of the scalp, skull or brain. The injuries can range from a minor swelling on the scalp to serious brain injuries. Head injuries are classified into two categories.

1. Primary head injuries: damage directly related to a traumatic event such as fractures, lacerations or haematomas.
2. Secondary head injuries: damage incurred as a result of subsequent ischaemia, oedema or inflammation. Secondary injury contributes greatly to overall morbidity and mortality in traumatic brain injury.<sup>[1]</sup>

Head injuries provide the major contribution to deaths in assaults, falls and transportation accidents. Of all regional injuries, those of head and neck are the most common and most important in forensic practice.

Computed tomography scanning (CT Scan) is the most popular investigation in case of head injury among the neurosurgeons. It conveys much more information about the intracranial contents than any previous technique. CT scanning may show a fracture of the skull and may be particularly useful in demonstrating basal or occipital fractures, yet its major contribution is in the demonstration of haematomas. Its major importance lies in detecting clots in atypical positions which are always missed in other investigations<sup>[2]</sup> It can separate those patients with compressing haematomas that require immediate surgery from those in whom craniotomy might be of no benefit or even harmful. Patient with severe head injury has a mortality rate of 50% and those who survive are often left with severe neurological deficits.

However quite often there can be differences in the CT finding with that of the forensic surgeon, which can lead to a vagary of results leading to a lot of questions in the mind of the affected families. Also genuineness of the reports of both the radiologist and the forensic expert can be questioned in case of a major discrepancy.

As such an attempt has been made with this study to find a comparison with the same.

**AIMS AND OBJECTIVES**

- 1 To determine the injuries which CT scan fails to detect but are encountered during autopsy.
- 2 To determine the sites where injury, if present, remains undetected in CT scan.

A cross sectional study has been carried out in the Department of Forensic Medicine, Gauhati Medical College and Hospital, Guwahati. The cases on which autopsies were done were brought by the police from within the district administrative area of Kamrup of the state of Assam and few referral cases from the neighbouring districts. The study period extended from 1<sup>st</sup> August, 2015 to the 31<sup>st</sup> July, 2016.

**CRITERIA FOR CASE SELECTION  
INCLUSION CRITERIA**

All cases of death due to head injury in whom CT scan were done before death and the CT scan report is available, will be included in the present study.

**EXCLUSION CRITERIA**

1. Cases with time of interval between death and the autopsy greater than 24 hours will be excluded from the present study.
2. Post-operative cases will be excluded from the study.

**RESULTS**

A total of 3039 medico-legal autopsies were conducted during the study period and out of these deaths, 43 cases of head injury were selected for the study taking into account the inclusion and exclusion criteria.

After thorough analysis of the data, it was found that the age of the victims ranged from 7 years to 80 years. Majority of the cases were males, 40 out of 43(93.02%) and only 3 out of 43 cases (6.98%) were females.

**Scalp findings: CT scan findings vs Autopsy findings**

On analyzing the scalp findings, it was found that in all cases, oedema and lacerations that were detected on CT scan were also detected on autopsy. However, contusions that were found on autopsy were missed on CT scan. In 20 out of 34 cases, contusions were detected while in the rest 14 cases out of 34 cases (41.17% cases), contusions were not detected on CT scan.

**Table: 1 Showing the number and percentage of cases where scalp findings were missed on CT scan**

|              | Scalp findings | Detected on CT Scan           | Detected on Autopsy | No. of cases where findings were missed on CT | Percentage of cases where findings were missed on CT |        |
|--------------|----------------|-------------------------------|---------------------|---|--|--------|
| No. of cases | Oedema         | 14                            | 14                  | 0   | 0%   |        |
|              | Injuries       | Only Contusion                | 20                  | 34  | 14   | 41.17% |
|              |                | Only Laceration               | 1                   | 1   | 0  | 0%     |
|              |                | Both contusion and laceration | 3                   | 3   | 0  | 0%     |

**Skull fractures: CT scan findings vs Autopsy findings**

On analyzing the data on skull findings it was observed that out of 43 cases, skull fractures were detected in 11 cases on CT scan however during autopsy skull fractures

were detected in a total of 17 cases. Out of these 17 cases, 15 were fissured fractures and 2 were sutural fractures. In 6 cases (40% cases), fissured fractures remained undetected on CT scan.

**Table: 2 Showing percentage of cases where fractures were missed on CT scan**

| Skull fracture | Detected on CT | Detected on Autopsy | Not detected on CT | Percentage of cases where fracture missed on CT |
|----------------|----------------|---------------------|--------------------|---|
| Fissured       | 9              | 15                  | 6                  | 40%   |
| Sutural        | 2              | 2                   | 0                  | 0%  |

**Membrane findings: CT scan findings vs Autopsy findings**

**Table 3 showing membrane tears that were detected on autopsy but remained undetected on CT scan**

| Membrane tears | CT scan | Autopsy | Difference |
|----------------|---------|---------|------------|
| Present        | 3       | 5       | 2          |
| Absent         | 40      | 38      | 2          |

The data on membrane findings was thoroughly analyzed and it was observed that out of 43 cases, 3 cases were detected both on CT scan and on autopsy. However, a

total of 5 cases were detected on autopsy. Additional 2 cases (40% cases) remained undetected on CT scan.

**Intracranial haemorrhages: CT scan findings vs Autopsy findings**

**Table: 4 Showing cases with intracranial haemorrhages which were detected on autopsy but not on CT scan and vice-versa.**

| Intracranial haemorrhage | CT scan  |              | Autopsy  |              |
|--------------------------|----------|--------------|----------|--------------|
|                          | Detected | Not Detected | Detected | Not Detected |
| EDH                      | 4        | 0            | 4        | 0            |
| SDH                      | 26       | 8            | 34       | 0            |
| SAH                      | 21       | 8            | 29       | 0            |

|     |   |   |   |   |
|-----|---|---|---|---|
| ICH | 4 | 1 | 3 | 2 |
| IVH | 9 | 1 | 8 | 2 |

Out of 43 cases, 4 cases of extradural haemorrhage (EDH) were found which were detected both on CT scan and on autopsy. In case of subdural haemorrhage (SDH), a total of 34 cases were detected on autopsy while CT scan detected only 26 cases and 8 cases remained undetected. Similarly in case of subarachnoid haemorrhage (SAH), out of 43 cases, 29 cases with SAH were detected on autopsy while CT scan could detect only 21 cases and 8 cases remained undetected. Intracerebral haemorrhages (ICH) were detected both on CT scan and on autopsy but not all cases which were detected on CT scan were detected on autopsy and vice-versa. On CT scan 1 case remained undetected, which was detected on autopsy. While, out of 4 cases which were detected on CT scan, 2 cases were detected and 2 cases were not found during autopsy. Intraventricular haemorrhage (IVH) showed a different result. Here, 9 cases were detected on CT scan while on autopsy, IVH was found in 8 cases only. On the other hand in 1 case where IVH was not found in CT scan was subsequently detected on autopsy.

## DISCUSSION

The present study findings are in accordance to previous studies regarding age and sex distribution.

In the present study it was found that out of 43 cases, skull fractures were detected in 11 cases on CT scan however during autopsy skull fractures were detected in a total of 17 cases. Out of these 17 cases, 15 were fissured fractures and 2 were sutural fractures. In 6 cases (40% cases), fissured fractures remained undetected on CT scan.

The skull findings of the present study is in accordance with the findings of the studies done by Goyal MK et al<sup>[3]</sup>, Reddy PS et al (2012)<sup>[4]</sup>, Pathak A et al (2006)<sup>[5]</sup> and Sharma R et al (2006)<sup>[6]</sup> and in variance with the findings of the study done by Chawla H et al (2015).<sup>[7]</sup>

Fissured fractures, also known as linear fractures, are undisplaced fractures involving one or both the tables of the skull and the distance between the two fractured fragments is not more than the breadth of a hair, hence may be missed while reporting a CT film which is just an interpretation of an image.

In case of subdural haemorrhage (SDH), a total of 34 cases were detected on autopsy while CT scan detected only 26 cases and 8 cases remained undetected. This is in accordance with findings of the studies done by Priyatha P et al (2016)<sup>[8]</sup> and Pathak A et al (2006)<sup>[5]</sup> while it is not in accordance with findings of studies done by Sharma R et al (2006)<sup>[6]</sup>

In the present study, in case of subarachnoid haemorrhage (SAH), out of 43 cases, 29 cases with SAH

were detected on autopsy while CT scan could detect only 21 cases and 8 cases remained undetected. This is in accordance with findings of studies done by Priyatha P et al (2016)<sup>[8]</sup>, Pathak A et al (2006)<sup>[5]</sup> and Sharma R et al (2006).<sup>[6]</sup>

Failure of detection of subarachnoid haemorrhage on CT scan may be either due to minimal bleeding at the time of scanning or due to heavy onset of bleeding or rebleeding post scanning which was eventually detected on autopsy.

## CONCLUSION

This study brings to relevance the disparity which arises out of radiological imaging and subsequent physical findings. While raising authenticity claims about the findings is beyond the scope of the authors, there may arise many medicolegal litigations and counter accusations from aggrieved parties if such findings are taken to the court of law. As such a holistic approach is to be taken and autopsy surgeons must make the effort to consult the immediate treating surgeon and the radiologist to better make a substantial autopsy report.

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