



Patterns of traumatic intracranial hemorrhage on Non-contrast computed tomography - A study on a hospital-based population

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Abstract

Background: Traumatic intracranial hemorrhage is a potentially life-threatening consequence of head injury. Noncontrast computed tomography (NCCT) is the investigation of choice for evaluation of traumatic intracranial hemorrhage.

Objectives: To know the frequency, types, and patterns of traumatic intracranial hemorrhage (ICH) on NCCT Brain in a hospital-based population.

Materials and Methods: A cross-sectional retrospective and descriptive study for one year done at GEMS&H, a tertiary care hospital in Srikakulam district. All patients of head injury referred to the department of Radiodiagnosis for NCCT brain were recruited into the study, and patients with only intracranial hemorrhage were evaluated.

Results: Out of 341 patients with head injury, 107 (33.1%) patients had traumatic intracranial hemorrhage (ICH) on NCCT scan. 99 out of 107 patients (92.5%) had extra-axial hemorrhage, and 83 out of 107 patients (77.57%) showed intra-axial hemorrhage. 75 patients (70.1%) were males. 42 patients (39%) were from the age group of 30-45 years. Out of 107 patients, hemorrhagic contusion (HC) was seen in 81 patients (75.7%), subdural hemorrhage (SDH) in 60 out of 107 patients (56%), subarachnoid hemorrhage (SAH) in 33 patients (30.8%), extradural hemorrhage (EDH) in 21 patients (19.6%), intraventricular hemorrhage in 7 patients (6.54%) and intraparenchymal hemorrhage (IPH) in 5 patients (4.67%). 60 patients (56%) had calvarial fractures.

Conclusion: Hemorrhagic contusion & subdural hemorrhage were the most frequent types of intra-axial & extra-axial hemorrhage seen both independently and in combination. A careful search for co-existent subdural hemorrhage in patients with hemorrhagic contusion may be needed to prevent possible complications from expanding SDH.

Keywords: Hemorrhagic contusion, Traumatic intracranial hemorrhage, Non-contrast computed tomography.

Introduction

Head trauma is one of the most common causes of death and disability in adults and children worldwide. The World Health Organization

estimated that by the year 2020, traumatic head injuries from Road Traffic accidents alone would be the 3rd leading burden of diseases in developing countries. Stein and Ross found the

frequency of intracranial hemorrhage to be 4.2% among traumatic head injuries.

Traumatic intracranial hemorrhage includes intra-axial hemorrhage (hemorrhagic contusion & intraparenchymal hematoma), extra-axial hemorrhage (subdural, subarachnoid and extradural hemorrhage) and intraventricular hemorrhage. Etiological factors for head trauma include road traffic accidents, falls, violence, and sports injuries.

Noncontrast computed tomography (NCCT) is the investigation of choice for evaluation of traumatic intracranial hemorrhage. This study aims to evaluate the frequency, types, and patterns of traumatic intracranial hemorrhage (ICH) on NCCT brain in a hospital-based population in Srikakulam district, Andhra Pradesh, India for one year.

Material & Methods

This is a cross-sectional retrospective and descriptive study for one year done between April 2018 and March 2019. Out of all patients in one year with a history of head trauma referred to GEMS&H, Srikakulam for Noncontrast Computed Tomography (NCCT Brain), only

patients with intracranial hemorrhage on NCCT were included in the study.

NCCT brain was performed using a GE 16 Slice CT scanner, slice thickness 5mm, and matrix size 256x256. Only the initial NCCT scan was considered.

A datasheet was compiled with patients' UMR number, age, sex, and Computed Tomography findings, etc. Data analysis was done using Microsoft Excel. The percentage was calculated for all categorical and qualitative variables, i.e., age, sex, intracranial hemorrhage, calvarial fractures, etc.

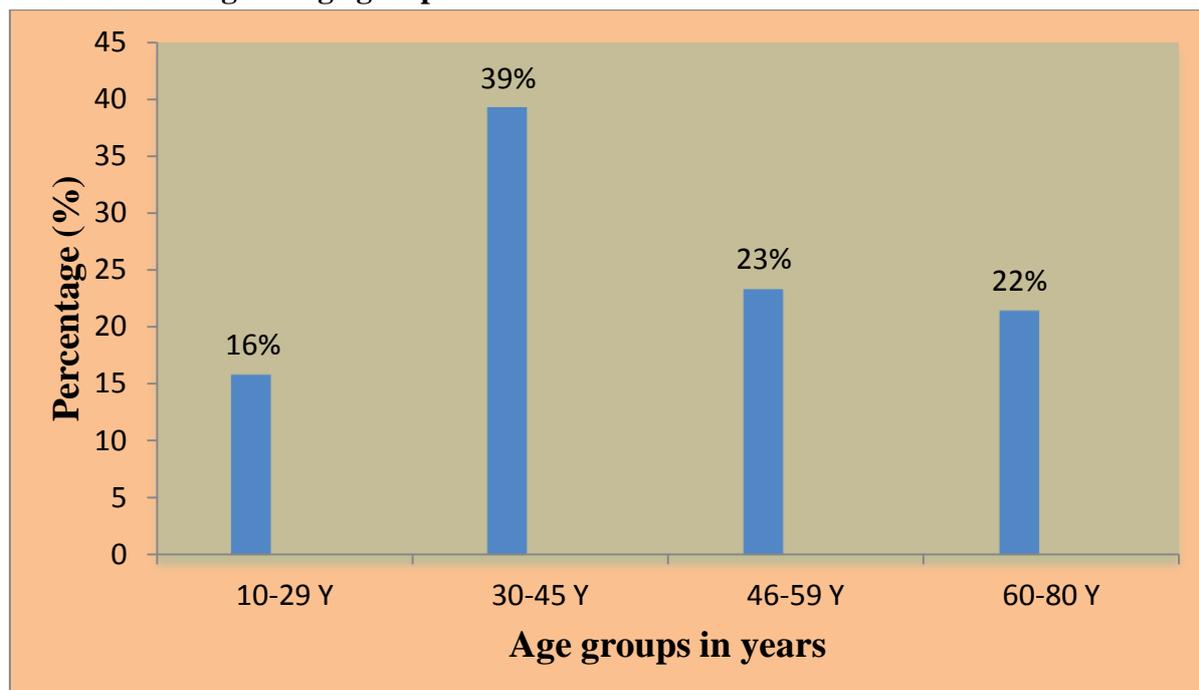
Results

Out of 341 patients with a head injury, 107 (33.1%) patients showed traumatic intracranial hemorrhage on NCCT scan.

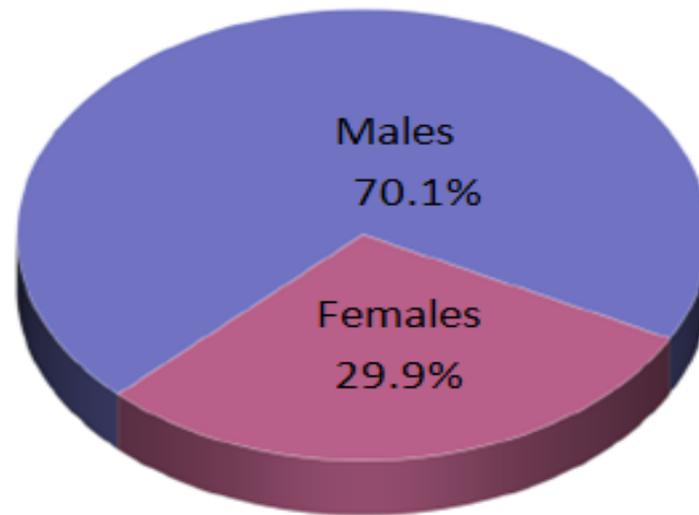
75 patients (70.1%) were males and 32 patients(29.9%) were females.

42 patients(39%) were from the age group of 30-45 years, 25 patients (23%) belonged to 46-59 years age group, 23 patients(22%) were from 60-80 years age group, and 17 patients(16%) belonged to 10-29 years age group.

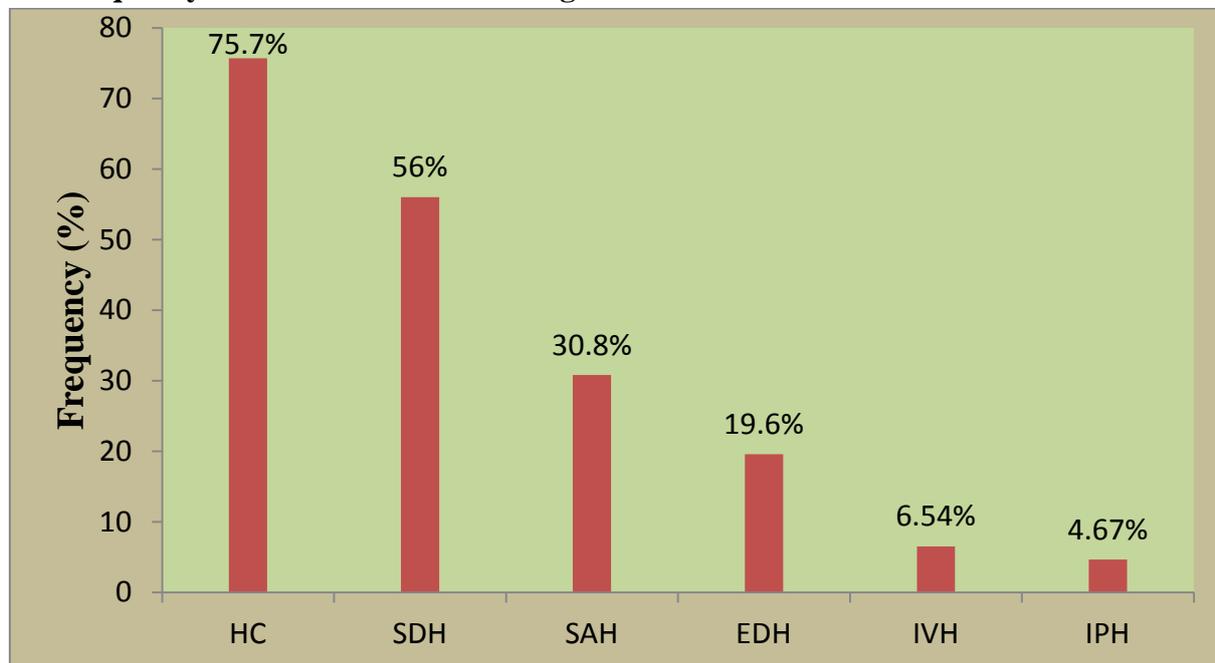
Intracranial hemorrhage in Age groups



Gender distribution in Intracranial hemorrhage



Types and frequency of Intracranial hemorrhage



HC- Hemorrhagic contusion, SDH- Subdural hemorrhage, SAH- Subarachnoid hemorrhage, EDH- Extradural hemorrhage, IVH- Intraventricular hemorrhage, IPH- Intraparenchymal hematoma.

83 out of 107(77.57%) patients suffered intra-axial hemorrhage, and 99 out of 107(92.5%) patients also suffered extra-axial hemorrhage. Collectively, 81 out of 107 patients(75.7%) showed hemorrhagic contusion, 60 out of 107 patients had (56%) subdural hemorrhage (SDH), 33 (30.8%) had subarachnoid hemorrhage (SAH), 21 showed(19.6%) extradural hemorrhage (EDH), 7 patients (6.54%) with intraventricular hemorrhage and 05 patients (4.67%) showed

intraparenchymal hemorrhage (IPH). 23 out of 107 patients (21.4%) showed combined hemorrhagic contusion and subdural hemorrhage exclusive of other types of intracranial hemorrhage.

Sixty patients (56%) showed calvarial fractures. Sixty-seven patients (62.6%) had a history of a road traffic accident, 39 patients(36.4%) with a history of falls and one patient(0.93%) with a history of violence.

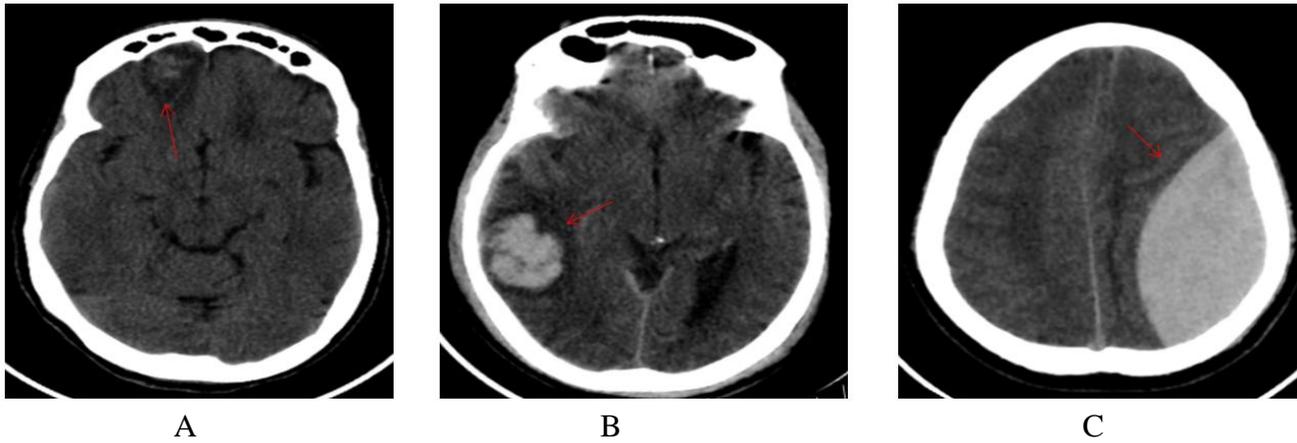


Fig 1. Axial NCCT images showing isolated A) hemorrhagic contusion, B) intraparenchymal hemorrhage & C) extradural hemorrhage.

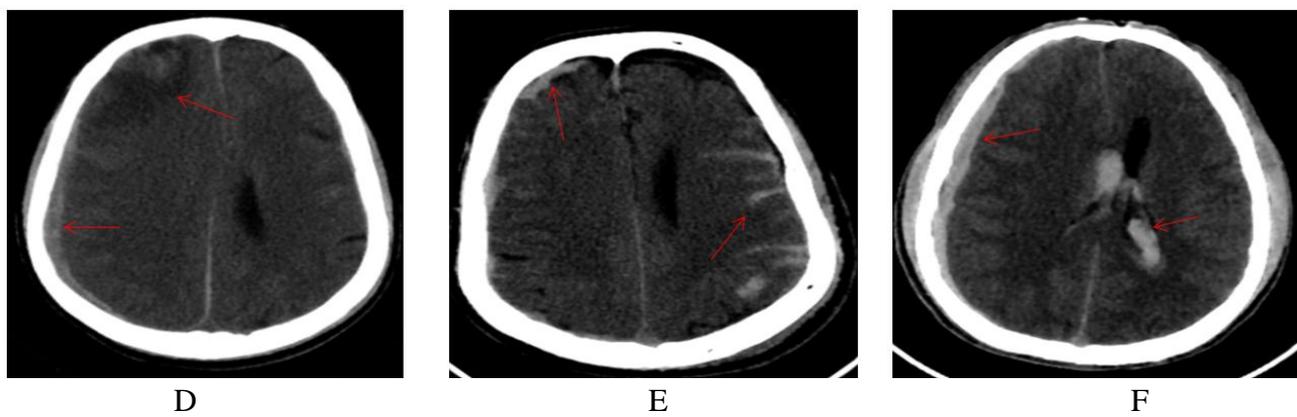


Fig 2. Axial NCCT images showing combinations of D) hemorrhagic contusion & subduralhemorrhage E) Subdural & subarachnoid hemorrhage & F) Subdural & intraventricular hemorrhage in included sections.

Discussion

Head injury is a significant cause of mortality and morbidity worldwide. Road traffic accidents are mainly responsible for mortality and morbidity in cases of head injury. The frequencies of intracranial hemorrhage in studies conducted by Racadio et al. and Adekanmi et al. were 15.3%, 46%, and 65% respectively. In our study, out of 341 patients with a head injury, 107 patients (33.1%) patients showed intracranial hemorrhage. Hemorrhagic contusion (75.7%) was the most common type of intracranial hemorrhage in our study, followed by subdural hemorrhage (56%). The frequency of hemorrhagic contusion is higher compared to the research by Adekanmi et al. in which it was 50.9%. Compared to multiple studies, the frequency of subdural hemorrhage (56%) is also higher. Studies by Ummara Siddique and Ravindran et al. showed 35% and

20% of patients with subdural hemorrhage, respectively, which is lower compared to our research. Ashaleye et al. also documented subdural hemorrhage (80%) as the most common finding. Hemorrhagic contusion combined with subdural hemorrhage alone is seen in 107 patients (21.4%) which is the most frequent pattern of combined intra-axial and extra-axial hemorrhage in head trauma patients.

Calvarial fractures were seen in 60 out of 107 patients (56%), which is higher compared to 17.42% in the study by Adekanmi, et al. and 17% in the study by Ummara Siddique.

Conclusion

- Intracranial hemorrhage (ICH) was seen in 33.1% of patients with a traumatic head injury on NCCT scan predominantly in males and 30-45 year age group.

- Hemorrhagic contusion (HC) was the most common type of intra-axial hemorrhage, and intraparenchymal hemorrhage (IPH) was the least common.
 - Subdural hemorrhage (SDH) was the most frequent extra-axial hemorrhage, and extradural hemorrhage was the least common.
 - Hemorrhagic contusion, together with subdural hemorrhage, was the commonest occurring combined intra-axial & extra-axial hemorrhage.
 - Intracranial hemorrhage was more frequently associated with calvarial fractures and road traffic accidents.
 - A careful search for co-existent subdural hemorrhage in patients with hemorrhagic contusion may be needed to prevent possible complications from expanding subdural hemorrhage.
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