

**Original article:**

## **Application of Canadian CT head rule on patients with head trauma coming to the Emergency Room(ER)**

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### **Abstract:**

**Introduction:** Road Traffic Accident accounts for a total of 4-5% of India's GDP every year and out of which head trauma is the major cause of impalement. Traumatic Brain Injury (TBI) can be any head trauma as trivial as head bump against the wall to a serious one causing massive blood loss with increased mortality, all of these ends up coming to the ER (Emergency Room) every day.

**Methods and materials:** Anyone above 16 years with head injury coming to the ER within 24 hours of trauma were included in study. A detailed accidental and clinical history, vital parameters, systemic examination, especially neurological examination of all patients will be taken as per the Proforma on presentation in the emergency department

**Results:** Subjects fulfil CANADIAN CT Head Rule (CCHR). Out of 62 subjects who had shown fulfilment of CCHR criteria 46 (74.1%) were having normal CT scan findings and 16 had either haemorrhage (12) contusion (4) and (1) nasal bone fracture. Subjects who didn't fulfil CCHR 39(100%) had normal CT scan findings. CCHR is 100% sensitive to help in finding significant TBIs in patients

**Conclusion:** CCHR is 100% sensitive to help in finding significant TBIs in patients.

**Keywords:** CANADIAN CT Head Rule, Emergency Room

### **Introduction:**

Head injury is defined as any kind of insult over the head which can range from a small bump to massive traumatic intra cranial haemorrhage. Non-communicable diseases like injuries have become the main causes of mortality and morbidity across the world [1] Road Traffic Accident accounts for a total of 4-5% of India's GDP every year and out of which head trauma is the major cause of impalement. Traumatic Brain Injury (TBI) can be any head trauma as trivial as head bump against the wall to a serious one causing massive blood loss with increased mortality, all of these ends up coming to the ER (Emergency Room) every day. At the same time with increase in the life expectancy as old people are more prone to head injury more and more head trauma patients make their way to the ER. The standard classification of head injury classifies head injury into minor, moderate and major on the basis of GCS with minor head injury with GCS with 14or15, moderate head injury with 9-13 and severe with GCS score of 3-8. Among the clinical decision rules, the Canadian CT Head Rule is one of the available tools which sets the standard to guide clinicians in determining which adult patient (>16 Years of age) with minor head injury would need computed tomography (CT) imaging and thus helps us in our decision making.[3]

CT scans are a burden on the pocket of the patient and a hassle for the hospital which will have to spend more on unnecessary electricity and maintenance with the overuse of this important investigation. This study would be of importance and effective in curtailing the expenditure of the patient, considering that majority

of the population are below poverty line. It will also cut down on the wastage of electricity which is another crisis for a developing country like India and reduce the unnecessary radiation exposure which is unaccounted for and poses a risk for causing malignant changes in participating patients.

**Methods and materials:**

This was an observational type of study. It is based on the history of head trauma patients presenting in the ER. Study will be conducted on the patients in the Department of Emergency Medicine at Dr. D.Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune, with sample size as 101.

Written and Informed Consent was obtained from all patients. The patients were informed regarding the purpose, procedures, risks and benefits of the study.

**INCLUSION CRITERIA**

Any head injury above 16 years coming to the ER within 24 hours of trauma.

**EXCLUSION CRITERIA:**

Patients less than 16 years of age.

Any head injury coming to the ER after more than 24 hours of injury.

**METHODS OF STUDY:**

1. Assessment of patient: All patients presenting to the ER within 24 hours following a HEAD INJURY. A detailed accidental and clinical history, vital parameters, systemic examination, especially neurological examination of all patients will be taken as per the Proforma on presentation in the emergency room.
2. Application of Canadian CT head rule criteria on the basis of patient's age and type of type of trauma.
3. Observation and neurological examination and monitoring with special consideration to Glasgow coma scale. We strive to study a prospective convenience sample of patients with head injury who received head CTs as part of their evaluations in the emergency room.

Participants will be enrolled as they enter the ER and fit the inclusion criteria after which, but before the physician received the imaging results. Final patient disposition will be recorded as and when it becomes available. Patients with positive CT findings will have their medical records reviewed for specific disposition, admission length of stay, ICU stay, and any operative, procedural or medical interventions [3]

Data was entered into Microsoft Excel and analysed using SPSS (Statistical Package for Social Sciences) Software 20. Categorical variable were expressed in terms of frequency and percentage and continuous were expressed in terms of mean and SD. Data was expressed in chart & pie diagram.

## Results

Table 1 : Age distribution among study subjects

Age Group	Frequency	Percent
17-20yrs	11	11
21-30yrs	43	42.6
31-40yrs	16	15.8
41-50yrs	14	13.8
51-60yrs	9	8.9
>60yrs	8	7.9
Total	101	100

In our study , maximum (42.6%) subjects were in age group of 21-30yrs, 15.8% were in 31-40yrs, very few (7.9%) were above age of 60yrs. Maximum (69.3%) were male. M:F was 1.93:1. Male patients show predominance to head trauma. Most common mode was RTA (48.4%) followed by fall (35.5%) and assault (16.1%)

Table 2 : Gender distribution of study subjects

Gender	Frequency	Percent
Female	31	30.7
Male	70	69.3
Total	101	100

Table shows gender distribution of study subjects. Maximum (64.5%) were male. M:F was 1.93:1. Male patients show predominance to head trauma.

Table 3 : Mode of injury

Mode of injury	Frequency	Percent
Assault	18	17.8
Fall	23	22.7
RTA	60	59.4
Total	101	100

In our study, CT scan finding among study subjects. Irrespective of severity of injury all subjects were underwent CT scan and majority (85.6%) were having normal findings, 11.8% showed hemorrhage, 3.9% showed contusion and 1 case had nasal bone fracture

Adult subjects 61.4% were full filling CANADIAN CT HEAD RULE.

Table 4 : Emergency Intervention

Emergency Intervention	Frequency	Percent
Admitted in EM for observation and management	101	100
Emergency airway management by intubating by EM physician	7	6.9
Conservative+Suturing of CLW	25	24.7
Mannitol +Anti epileptic	17	16.8

Table shows emergency intervention from emergency department among study subjects. Maximum (100%) were kept under observation, 24.7% received conservative treatment suturing of CLW, 16.8% were on mannitol and anti-epileptics.

Table 5 : Disposal and Follow-up

Disposal and Follow up	Frequency	Percent
Diseased	1	1
Admitted In SICU	12	11.9
LAMA after 12 hours of stay in the EM	23	22.8
Stable and Discharged	65	64.3
Total	101	100

Table 6 : Fulfils CANADIAN CT head rule and CT scan findings

Fulfil CANADIAN CT head rule	CT scan lesion		Total	Sensitivity	Specificity
	No	Yes			
Yes	46(74.1%)	16(26.7%)	62	100%	45.8%
No	39(100%)	0	39		
Total	85	16	101		

Table shows CT scan findings among subjects fulfil CANADIAN CT head rule. Out of 62 subjects who had shown fulfilment of CANADIAN CT head rule criteria 46 (74.1%) were having normal CT scan findings and 16 had either haemorrhage (12) contusion (4) and nasal bone fracture (1). Subjects who didn't fulfil CANADIAN CT head rule 39(100%) had normal CT scan findings.

CANADIAN CT head rule is 100% sensitive to help in finding significant TBIs in patients.

## Discussion

Road traffic accident has shown to be the major cause of TBI in the population with 41 of the 101 adult candidates associated with motorized two wheeler accidents and out of these 41, none seem to have been wearing helmets and 19.5% of these patients were involved with significant NCCT findings on their CT scan signifying the importance of wearing a helmet.

CT scan finding among study subjects. Irrespective of severity of injury all subjects underwent CT scan and majority (84.2%) were having normal findings, 11.8% showed hemorrhage, 3.9% showed contusion and 1 case had nasal bone fracture as a finding on CT scan.<sup>6</sup> Among adult subjects 61.3% were full filling CANADIAN CT HEAD RULE. Though only 62 patients of the 101 fell into the criteria of getting NCCT scans for the patients with TBI, in spite of not full filling the CCHR criteria all subjects underwent CT scan after head trauma despite not fulfilling the criteria, and even though the criteria was not met and that by applying CCHR unnecessary NCCT could have been avoided in 39 of the 101 patients. Emergency intervention from emergency department among study subjects. Maximum (100%) were kept under observation, 24.7% received conservative treatment suturing of CLW, 16.8% were on mannitol and anti-epileptics.

CT scan findings among subjects fulfil CANADIAN CT head rule. Out of 62 subjects who had shown fulfilment of CANADIAN CT head rule criteria 46(74.1%) were having normal CT scan findings and 16 had either hemorrhage(12)contusion(4)or nasal bone fracture (1). Subjects who didn't fulfil CANADIAN CT head rule 39 (100%) had normal CT scan findings. CANADIAN CT head rule is 100% sensitive to help in finding significant TBIs in patients GCS alone is not a tool enough to decide the need for NCCT scans in a case of TBI, all factors of the CCHR criteria need to be taken into account as well. In various other studies done in the Indian population there are a very few done on the topics of CCHR criteria , one such study was done in 2012 where Efficacy of Canadian computed tomography head rule in predicting the need for a computed-axial tomography scans among patients with suspected head injuries was done in the department of Surgical Emergency where a small sample size of 50 patients were taken and they came to the conclusion that CCHR was 97% sensitive and 70% specific in helping as a tool for detecting significant findings on a NCCT<sup>[4]</sup> Another study done in 2009 in the ER of Sri Ramchandra Medical College & Research Institute, Chennai with a sample size of 136 which took CCHR and New Orleans Criteria as different tools to find need for NCCT in adult head trauma cases also found CCHR was 100% Sensitive and 71.10% specific in identifying need for neurosurgical intervention.<sup>[5]</sup>

## Conclusion:

CANADIAN CT head rule is 100% sensitive to help in finding significant TBIs in patients.

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