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Analysis of CT Brain referred from emergency department in tertiary care hospital

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Abstract

Context: Computed Tomography of brain is commonly prescribed investigation in the emergency department. CT brain is essential to diagnose multiple life threatening and high morbidity emergency conditions like stroke and hemorrhage.
However unnecessary CT brain investigations can lead to increase load on hospital resources, financial burden to patients and hospital as well as radiation exposure to patients.

Aims: To evaluate the indications of CT brain done in emergency, its findings and methods to justify its use

Methods and Material: Retrospective analysis of CT brain which were referred from emergency department of our institute was done. CT findings were correlated with relevant history, indication, neurological examination (GCS score) of the patient.

Results: Most common indication of CT brain in our institute was head trauma (RTA/ assault) followed by non-traumatic neurological deficit. The maximum prevalance of positive cases was found in cases with neurological deficit followed by traumatic etiology. There is a clear correlation of positive CT brain cases and Glasgow coma score of the patients.

Conclusions: Emergency CT brain is very essential and lifesaving investigation. However, there is a trend to overuse the investigation without proper justification and without following proper guidelines for the same.

Keywords: CT brain, computed tomography, emergency department, indications, justification

Introduction

Brain related pathologies are one of the most common causes of visits to emergency department. Computed Tomography (CT) scan of head is widely used and primary radiological diagnostic modality for pathologies of brain. CT is used because of its quick, sensitivity, specificity and relatively cheaper and wider availability as compared to magnetic resonance imaging (MRI). CT scan is an ionizing modality and significant radiation exposure to patient is a downside. A single non contrast CT brain has radiation dose of 2 mSv which is equivalent to 8 months of background radiation [1].

2. Materials and Methods

Retrospective study was conducted in Department of Radio-diagnosis in Gujarat Adani Institute of Medical Sciences, Bhuj from 1st September to 31st December 2019. All CT scan of brain which were referred from emergency department during out of routine hours were included in study.

Non contrast enhanced helical CT scan from base of skull to vertex were performed using 16 slice Siemens Somatoson system. 1.5 mm slice thickness reconstruction was done in brain and bony window. The reporting was done using Osirix MD software by residents of the department which were reviewed later on by senior consultants.

Exclusion Criteria:

- Elective scans done after routine hours.
- Follow up scans of known positive cases.
- Patients referred from out of hospital
- Patients whose history and/or neurological examinations were not available A total of 706 scans were included in the study.

Indication of the scan, patient's relevant neurological Examination, GCS score and CT findings were recorded. Positive cases were separated and analysed.

For the purpose of study, cases with only extracalverial findings, post-traumatic soft tissue changes, facial injuries and other incidental findings like atrophic and gliotic changes not relevant in emergency settings were considered negative for the study. Patients with skull fracture along with haemorrhage were included in group of intra cranial haemorrhage (ICH).

3. Results

In our study out of 706 scans included, only 210 scans were positive (29.75%). There were total of 449 male and 257 female with male to female ratio of 1.74.

Trauma accounted for more than half of scan performed (386) (54.6%). Most of them were medicolegal cases.

Among non-traumatic indications, Neurological deficit and altered sensorium were most common indications. Maximum positive cases were found in cases that presented with complain of altered sensorium and neurological deficit. If skull fracture were excluded (considered negative), positive cases lowers to 177 (25.0%)

Table 1: Indication and CT findings

Indication	Total	Normal	%	Positive	%
Overall Total	*706*	*496*	*70.25%*	*210*	*29.75%*
Trauma	386	276	71.50%	110	28.50%
Non-Traumatic	320	220	68.75%	100	31.25%
Neurological Deficit	130	82	63.08%	48	36.92%
Altered sensorium	85	45	52.94%	40	47.06%
Convulsion	43	35	81.40%	8	18.60%
Vertigo/ Dizzines	31	31	100.00%	0	0.00%
Headache	27	23	85.19%	4	14.81%
Diplopia/ Vision	4	4	100.00%	0	0.00%

Table 2: Correlation between GCS and Positive cases

GCS	Cases	Positive	%
15	417	58	13.91%
<15	289	152	52.60%
12 to 14	212	80	37.74%
<12	77	72	93.51%
Total	706	210	29.75%

Table 3: Positive findings

Indication	Total	Normal	Fracture	ICH	Infarct	Others	Positive	%
Trauma	386	276	33	77	0	0	110	28.5%
Neurological Deficit	130	82	0	7	41	0	48	36.9%
Altered sensorium	85	45	0	12	24	4	40	47.0%
Convulsion	43	35	0	2	1	5	8	18.6%
Headache	27	23	0	1	0	3	4	14.8%
Vertigo/ Dizziness	31	31	0	0	0	0	0	0%
Diplopia/ Vision	4	4	0	0	0	0	0	0%
Total	706	496	33	99	66	12	210	29.7%

4. Discussion

CT brain is one of most referred radiological investigation from emergency. There is increasing trend in prescription of CT scan [2].

There are guidelines on use of CT brain, however they are not effectively implemented in emergency settings due to varied reasons.

Emergency doctors tend to become over dependent on CT scan and other radiological investigations and are becoming less reliant on clinical examination

NICE guidelines recommends CT scan if GCS is '≤13 at any time' or '<15 two hours after admission [3].

In our study, it is clear that number of positive cases has correlation with GCS of patient. Positivity rate for GCS 15/15 was 14% while for GCS <12 was around 94%.

If the guidelines would have been implemented correctly, there would have been significant reduction in number of scans performed [4].

CT is also associated with inherent risk like increased risk of malignancy due to radiation. In one study, excess lifetime risks(ELR) of CT head ranged from 0.3 to 1.0 in paediatric population [5]. Due to such unwarranted scans, there is also increase in duration of hospital stay of such patients which causes strain on limited hospital capacity, health care workers and increased occupancy rate and less than optimal health care. It also increases chances of nosocomial infections and economic burden to family and society as a whole. Conversely one of the factors for unindicated scans is also lack of doctors in emergency health care. Due to overwhelming patient load and responsibility on limited number of emergency room doctor, they may not get adequate time for every patient and hence transfer the burden of diagnosis on investigations and spare more time for already known critical patients.

In our study maximum number of scans were done due to history of trauma followed by neurological deficit. There were some scans which were performed because of medicolegal status and due patient's insistence. The positivity rate of such cases were very low. The practice of defensive medicine should be discouraged.

In our study there was no positive case in patients with complain of vertigo and diplopia. Although CT may be helpful for some of this patients, MRI should have been preferred investigation for them [6].

5. Conclusion

CT scan is prescribed overzealously in emergency department without proper clinical examination and any regards for guidelines. It is necessary to establish proper protocols for prescribing such scans in order to decrease load on scarce hospital resources, improve patient management and avoid unwarranted radiation exposure.

6. References

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