

Prevalence of Normal Brain CT Scan in Head Injury Patients

Dr. Hashmatullah Rahimi and Dr. Homayun Tawhid
Lecturers at Kabul University of Medical Science, Neurosurgery Department

Abstract

➤ Introduction:

Compound Tomography is one of the most sophisticated modalities used to contribute for assessment of various body deficits. Compound Tomography scan imaging shows, shape and structure of body tissues can be assessed and with the information about the potential diseases and lesions (Shaker, Said Husain; Qanbari, Hamed Reza et al. : 2012). Head trauma is one the leading causes of morbidities and in this regard Head CT scan is the modality of choice (Waganekar, Archana; Sadasivan, Jagadish et al. : 2018). Sometimes in presence of clinical evidence of Head injury with its cause, the brain CT scan has been reported normal or unmarkabal (Pirzad.: 2018).

➤ Objective:

Finding out the rate and percentage of normal CT scan in patients with signs and symptoms of head injury.

➤ Method and Materials:

Method has been designed as cross-sectional and descriptive.

➤ Results:

In this research, from the beginning of September 2018 until the end of March 2019, out of 594 head injury patients who were brought to Neurosurgery ward of Ali Abad University Hospital, 69 percent were ordered CT scan, of which 52 percent of the results came out to be normal and the remaining 48 percent were reported abnormal.

➤ Conclusion:

Approximately in more than half of head injury patients head CT scans were reported unremarkable and normal.

Keywords:- Hematoma, Contusion, Head Trauma, Brain CT-scan.

I. INTRODUCTION

Computed tomography (CT scan) is one of the advanced methods of medical imaging that is most helpful in examining various body system lesions, especially hard tissue, and is an integral part of the diagnosis, and even treatment for many diseases. Using CT scans, body tissue can be studied and shape and structure can be defined and potential disease can be diagnosed. (Shaker, Said Husain et al. : 2012).

Today's CT scanners are so powerful that they can produce images less than a millimeter thick. Because CT scans can visualize the difference between fresh and old blood, it plays a significant role in showing different brain pathologies, including intracranial hematomas, strokes, birth defects, and brain tumors (Coutney, Lawha; Christopher, Buckle et al. : 2013).

In some cases of head traumas, despite clear clinical signs and trauma cause, no clear pathologic change in CT scan is seen, hence normal CT is reported (Pirzad.: 2018).

➤ **Statement of Problem:** Head trauma significantly cause deaths among youth and working people in society. CT scan is a modality of choice in head trauma (Waganekar, Archana; Sadasivan, Jagadish et al.: 2018).

CT scans are a combination of X-rays with computer processing at various sections, so CT scans, despite their many diagnostic and therapeutic benefits, has its risks, so specialists will have to use the least radiation dose to obtain important medical information. Unfortunately, CT scans are sometimes used unnecessarily, as in many cases CT scans are normal and the patient is unnecessarily exposed to X-rays (Saboori, Ahmadi, & Farajzadegan: 2007).

➤ **Aim of the study:** To obtain the incidence and percentage of normal computed tomography in patients with signs and symptoms of head trauma.

➤ **Research Question:** After studying CT scan report in Ali Abad University Hospital Neurosurgery Service, how many percent of them is normal and how many percent is abnormal?

II. REVIEW OF LITERATURE:

A review of previous studies reveals that there has been a great deal of research in international literatures and that different figures and results have been obtained. In a descriptive study performed over 880 patients with head injury in the first six months of the year 2000, CT scan was a modality of choice for patients with skull trauma and out of 880 patients, 630 (70%) had normal CT scans and 250 cases (30%) had brain injury (*Dehqani, Naser; Subhani, Abdulrasool; Mahdizada, Fahima.: 2000*).

In another study, published by Pierre Giglio and colleagues in the journal of Emergency Radiology, it was found that out of 128 patients with dizziness, 44 were given CT scans; (19 CT) 43% of CT scan was reported normal, in 25 CTs (57%) pathology was detected. (*Pierre, Giglio; Edward M, Bednarczyk et al.: 2005*).

In another study conducted by Mohammad Reza Ehsaei and colleagues over 312 patients, the results were as follows: 60% to 70% of patients with mild head trauma, computed tomography scans were normal and 30% to 40% had mild brain edema. (*Ehsaei, Reza; Bahadurkhan, Ghulam Reza et a.: 2005*) In another study by Mr. Mitsunaga et al., Published in the American Journal of Roentgenology, it is clear that - most patients with dizziness brought to emergency department do not really need CT scan unless they are elderly, have neurological deficit or have recent history of head trauma. (*Myles, Mitsunaga; Hyo-Chun, Yoon.: 2015*).

Similarly, in a study published by Iranian researcher Mujtaba Akbari and his colleagues, 63% of patients were male and 37% were female, such that in 55% of patients, CT scan detected a pathology and 45% of patients had normal CT (*Akbari, Mujtaba; Esfahani, M Naser et al.: 2012*). Another study published by the Indian researcher Waganekar and colleagues in the Journal of Emergencies, Trauma & Shock states: Of the 1782 patients, 50.9% of the total were "abnormal" positive CT scans. In mild head trauma this figure reaches 38%. Abnormality in the CT scans have been associated with five variables; more than five minutes of loss of consciousness, vomiting, convulsions, otorrhagia and rhinorrhagia. (*Waganekar, Archana; Sadasivan, Jagadish et al.: 2018*).

Another study published by Iranian researchers Razieh Falah and Mehdi Abedi in the Journal of Horizon of Knowledge, Journal of Gonabad University of Medical Sciences and Health, states that a total of 100 CT scans for 40 girls and 60 boys with a mean age of 17/49+-17/42 months was recommended; 61% were normal and the most common abnormalities included 21% brain atrophy and 5% intracranial hemorrhage (*Fallah, Razeyeh; Abedi, Mahdi.: 2008*)

III. METHOD AND MATERIAL

- **Methods:** This is a cross-sectional descriptive study.
- **Study setting:** Aliabad University Hospital Neurosurgery Service.
- **Sample size:** All patients who were admitted to the hospital with the diagnosis of head trauma in the period from the beginning of the September 2018 until the end of March 2019 and were given a head CT scan.
- **Sampling Method:** It has two types of Criteria Specifications:
 - Inclusion criteria: All brain injured patients who have been advised to have a head CT scan.
 - Exclusion criteria: Non-brain injured patients recommended to do a head CT scan.
- **Method, research tools and data collection source and analysis type:** All Patients Admitted to Neurosurgery Service of Aliabad University Hospital (Kabul, Afghanistan) and from this group, patients who were recommended a head CT scan.
- **Major variables under study:** age, sex, causes and CT scan report.
- **Research tools and data collection source:** Data on age, sex, causes, and normal or abnormal computed tomography reports in patients are obtained from the brain injured patients preforms and CT scan report.
- **Features:** Availability of archived patient proformas along with CT scans and their reports.
- **Limitations:** Poor quality of some CT scans.
- **Ethics:** Because data and figures are obtained from CT scans and their reports, so there is no ethical barrier.

IV. RESULTS

In this study, all patients admitted to Neurosurgery service and for whom a head CT scan was ordered were studied, so that 594 brain injured patients attended the neurosurgery department of Ali Abad University hospital in the period from the beginning of the September 2018 until the end of March 2019. out of which 410 patients were admitted to the Neurosurgery Service in a CT scan was ordered to. Based on the main variables of research on normal and abnormal CT scan report age, sex the following results were obtained:

Patients included in the study	Number	Percentage
All brain injured patients attended to the Neurosurgery Service.	594	100 %
Brain injured patients admitted to the Neurosurgery Service and to whom Brain CT scan was ordered.	410	69 %

Table 1:- Number and percentage of all Head trauma patients

This table shows that 594 brain injured patients attended the Neurosurgery Service of Aliabad university hospital from the beginning of September 2018 until the end of March 2019, of which 410(69 %) patients admitted to the Neurosurgery Service and Brain CT scan was ordered.

Sex	Number	Percentage
Male	364	88.8 %
Female	46	11.2 %
Total	410	100 %

Table 2:- Number and percentage of Brain injured patients to whom Brain CT scan was ordered, sex-wise

According to this table, among Brain injured patients to whom Brain CT scan was ordered, the majority amount and percentage was male, 364 patients (88.8 %).

Interval of the age	Number	Percentage
16-30 Y	237	57.8 %
31-45 Y	83	20.2 %
46-60 Y	49	12 %
61-75 Y	38	9.3 %
Over than 75 Y	3	0.8 %
Total	410	100 %

Table 3:- Number and percentage of brain injured patients to whom Brain CT scan was ordered, age-wise

According to this table, out of all brain injured patients to whom brain CT scan was ordered, the majority and highest percentage was patients with the age range of 16-30 years, 237 patents (57.8 %).

Cause of head injury	Number	Percentage
Motor Vehicle Accident	181	44.1 %
Fallen down	127	31 %
Criminal events	85	20.7 %
War events	13	3.2 %
Boiler expulsion	4	1 %
Total	410	100 %

Table 4:- Number and percentage of brain injured patients to whom Brain CT scan was ordered, caused by head injury

According to the table, from all brain injured patients to whom Brain CT scan was ordered, the majority amount and percentage cause of head injury was motor vehicle accident. 181 patients (44.1 %).

Brain Ct Scan	Number	Percentage
Normal result	213	52 %
Pathologic result	197	48 %
Total	410	100 %

Table 5:- Number and percentage of Brain CT scan, according to its results

According to the table, from all brain injured patients to whom Brain CT scan was ordered, the majority and highest percentage of the brain Ct scan results were Normal, 213 patients (52 %).

Kind of Pathology	Number	Percentage
Skull Fracture	25	6.1 %
Intracranial hematoma	42	10,2 %
Brain Contusion	53	12.9 %
Skull Fracture and Pneumocephaly	7	1.7 %
Skull Fracture and Brain Contusion	18	4.4 %
Skull Fracture and Intracranial hematoma	18	4.4 %
Intracranial hematoma and Brain Contusion	21	5.1 %
Intracranial hematoma, Skull fracture and Brain Contusion	5	1.2 %
Intracranial hematoma, Skull fracture and Pneumocephaly	3	0,7 %
Brain contusion, Skull fracture and Pneumocephaly	1	0.2 %
Brain contusion, Intracranial hematoma, Skull fracture and Pneumocephaly	1	0.2 %
Unexpected events (Hydrocephalus and Brain tumors)	3	0.7 %
Total	197	48 %

Table 6:- Number and percentage of Brain CT scan, according to its kind of pathologic results

According to the table, from all brain injured patients to whom Brain CT scan was ordered, the majority and highest percentage of the brain CT scan had Contusion, 53case (12.9 %).

Variables		Brain Ct scan results				P Value
		Normal		Pathologic		
		Number	Percentage	Number	Percentage	
Sex	Fmale	33	71.7 %	13	28.3 %	0,003
	Male	180	49.5 %	184	50.5 %	
Cause	Motor vehicle accident	84	46.4 %	97	53.6 %	0,018
	Fallen down	71	55.9 %	56	44.1 %	
	Criminal events	53	62.4 %	32	37.6 %	
	War events	5	38.5 %	8	61.5 %	
	Boiler expulsion	0	0 %	4	100 %	

Table 7:- Number and percentage of Brain CT scan, according to its results than sex and cause

According to the table, among all brain injured patients to whom Brain CT scan was ordered, the majority and highest percentage of the brain CT scans in women were normal. (71,7 %). However, for men, the normal CT Scan was 49.5 %.

V. DISCUSSION

In this study, 594 patients referring to Ali Abad University Hospital Neurosurgery service in the period from the beginning of the September 2018 until the end of March 2019, were recruited to the study. A total of 410 patients, representing 69% of patients, were admitted to the hospital and had CT scans recommended. Of those, 213 were reported as normal (52%) and in the other 197 (48%) pathology was reported.

In a descriptive study performed in the first 6 months of 2000 on 880 patients with Head trauma, 630 cases (70%) has normal brain CT and 250 (30%) had lesions in the brain. (*Dehqani, Naser; Subhani, Abdulrasool; Mahdizada, Fahima .: 2000*). In another study by Iranian researchers, 60% to 70% of patients with mild head trauma, had normal CT and only 30 to 40% had mild edema (*Ehsaei, Reza; Bahadurkhan, Ghul). Reza et al.: 2005*).

Comparing this research with our results, it can be seen that higher number and percentage of CT scans in Iranian sources are found to be normal compared to ours with the ratio of 70:52, It is thought that in our country,

only most of the serious illnesses are primarily transferred to hospitals and, hence, in their head CT scans pathologies are found and that the patients with better health conditions are not brought to the hospital due to economic, Transport restrictions and war situations. Secondly, Since Aliabad University hospital lacks CT scan facility, neurosurgery specialists try their best to make diagnoses considering clinical assessments and avoid patient referrals to radiological facilities outside hospital to do CT scan. And thirdly, because the cost of running a CT scan is high, so most neurosurgery doctors often try to recommend only CT scans to patients with potential pathologic evidence. For the above reasons, the percentage of Normal head CT scans reports are lower in our study.

In another study published in the Journal of Emergency Trauma and Shock: Of the 1782 patients, 50.9 percent were generally "abnormal" positive CT scans (*Waganekar, Archana; Sadasivan, Jagadish et al.: 2018*). The results of this study are in line with our results and this may be due to the close social status of the Indian community with our country.

In a study published in the journal Emergency Radiology, of the 44 people who were ordered CT scans, 19 were reported normal (43 percent) and 25 were pathologic (57 percent) (*Pierre, Giglio; Edward. M, Bednarczyk et al; 2005*). Although the sample size was very small in the above study, it is consistent with our research.

According to a study published in the Journal of Isfahan University of Medical Sciences, 63 percent were male and 37 percent female, such that 55 percent of patients had pathology in their CT scans and 45 percent of CT scans were normal (Akbari, Mujtaba; Esfahani, M Naser et al. al 2012). This research on normal and abnormal CT scan reports is almost similar to ours, but the difference between the prescription of CT scans in males and females (females 11: 37 percent and males 88: 63 percent) should be noted that due to the closed structure of our society, most women are home-based and do not deal with out-of-home affairs, and most of them are less likely to have head trauma and thus need less CT scans.

➤ *The strengths, weaknesses, and generalizability of this research:*

Since the neurosurgical service of Ali Abad Hospital is one of the best centers for the diagnosis and treatment of neurosurgical diseases, most patients from different parts of the country referred to this service, so studying in this center is one of the strengths of this study. In the weaknesses of this study, it should be noted that the samples were obtained only from the Neurosurgery department of Aliabad University hospital and that better results would have been obtained if samples from other hospitals provinces of the country were used.

VI. CONCLUSION

In this study, out of 594 patients referred to Neurosurgery department of Aliabad University Hospital, 410 patients (69%) were ordered CT scans, CT scan of 213 patients were reported normal (52%) and 197 (48%) were found to be abnormal and pathologic.

SUGGESTIONS

In view of the final results, I suggest the following:

- In view of the results of this study, further research on how and when to recommend CT scans to patients with head trauma should be planned, designed, and implemented in the country's health centers.
- From the results obtained, we find that most head CT scans ordered for patients with head trauma are due to traffic accidents for ages of 16-30 years. Therefore, it is suggested that thorough attention should be paid in the standardization of transport structure, traffic rules and media awareness should be escalated.
- Because most of the brain injured patients' condition is poor and their transfer is not reasonable enough to obtain a head CT scan outside of the hospital, it is respectfully suggested to the authorities Ali Abad hospital should be equipped with CT scan machine and if possible with MRI machine

REFERENCES

- [1]. Akbari, Mujtaba; Esfahani, Mohammad Naser ; Masoomy, Babak; Tabaruk, Saba;. (2012). Indication of Ct-scan in children under 2 years with mild head injury. *Journal of Esfahan medical School*, 255-263.
- [2]. Coutney, Lawha; Christopher, Buckle; Gregory, Christoforidis; Christopher, Straus;. (2013). Utility of head Ct in the evaluation of vertigo and dizziness in the emergency department. *Journal of Emergency Radiology*., 45-49.
- [3]. Dehqani, Naser; Subhani, Abdulrasool; Mahdizada, Fahima;. (2000). The Ct-scan finding in motor vehicle accident patients. *Gilan University of medical Sciences journal*, 46-52.
- [4]. Ehsaei, Reza; Bahadurkhan, Ghulam Reza; Ghayoor, Karemeyane;. (2005). Evaluation of clinical and Ct-scan finding in 312 head trauma patients. *Research journal of Babul medical university*, 94-100.
- [5]. Fallah, Razeyeh; Abedi, Mahdi;. (April 2008). Survy the Resutls of Children Brain Ct scan and its association with Applying for Ct scan. *Ofuq Danesh, Gunabad Medical Sciences University Journal*, 1.
- [6]. Mujtaba, A., Masomy, B., Esfahani, M., & Tabaruk, S. (2012). Indication of Ct-scan in children under 2 years with mild head injury. *Juurnal of Esfahan medical school*, 255-263.
- [7]. Myles, Mitsunaga; Hyo-Chun, Yoon;. (2015). Head Ct-scan in the emergency department for syncope and dizziness. *American journal of Roentgenology*, 24-28.
- [8]. Pierre, Giglio; Edward M, Bednarczyk; Karen, Weiss; Rohit, Bakshi;. (2005). Syncope and head Ct-scan in the emergency department. *Journal of emergency Radiology*, 44-46.
- [9]. Pirzad, Prof. Ahmad Fawad. (2018). Biomarkers for Head Injury. *Afghan Medical Journal*, 1-2.
- [10]. Saboori, M., Ahmadi, J., & Farajzadegan, Z. (2007). Indication of Brain Ct-scan in patients with minor head injury. *Clinical Neurology and Neurosurgery journal*, 399-405.
- [11]. Shaker, Said Husain; Qanbari, Hamed Reza; Eqbal, Hamed; Meer Afzal, Amir Husain;. (2012). Interpretation of brain Ct-scan in head injury patients by emergency and radiology medicines. *Military medical journal*, 1-4.
- [12]. Waganekar, Archana; Sadasivan, Jagadish; HarichandraKumar, K.T;. (Jan-Mar 2018). Computed Tomography Profile and its Utilization in Head Injury Patients in Emergency Department: A Prospective Observational Study . *Journal of Emergencies, Trauma and Shock*, 1-2.