Co-relation of initial Computed tomography findings with prognosis in head injury cases, mainly based on basal cistern status and mid-line shift parameters

Anuj Kumar Tripathi[1], Saurabh Pathak[2,*]

[1]Assistant Professor, [2]Associate Professor, Dept. of Surgery, [1,2]Career Institute of Medical Sciences and Hospital, Lucknow, Uttar Pradesh, India

***Corresponding Author: Saurabh Pathak**
Email: drsaurabhpathak@yahoo.com

Abstract
Head injury is a major public health problem with higher morbidity and mortality in young people and continues to be one of the most common clinical problems treated by neurosurgeon. In 1973 Hounsfield introduced computerized scanning of head. Invention of CT scan was a major breakthrough in management of head trauma patients.
This technique involved no hazards or discomfort for the patient**,** and structural disease processes affecting the brain were identified with a clarity exceeding traditional methods. Neuroradiologic practice was transformed overnight and Hounsfield was subsequently awarded the Noble prize for medicine.

Keywords: Head injury, Computed tomography (C.T Scan), Health problem.

Introduction
Head injury is a major public health problem and has already attained an epidemic proportion in India. It has higher morbidity and mortality in young people and continues to be one of the most common clinical problems treated by neurosurgeon. Computerized tomography scan has established itself as a rapid, reliable and non invasive tool to diagnose various head trauma lesions. The lesion or lesions in CT scan if they can definitely be linked with prognosis, may help a lot in management of head injury patients.
In 1974, Jennet B and Teasdale J[2] grave a neurological scale for head injury patients which came be known widely as a Glasgow Coma Scale. After GCS score another major breakthrough management of head trauma patients was invention of CT scan (1973). Soon after CT scan began to show promise as a neuroradiological diagnostic test, one of its most use aspect appeared to be the evaluation of patients with head injury because of its rapidity, reliability and non invasiveness.
Backer DP el al[3] 1977) noted that patients with intracranial mass lesion had a poorer outcome than those with diffuse brain injury and the patient with longer midline shift in mass lesion group had still poorer outcome. They found that abnormal motor response, impaired or absent oculocephalic response and bilateral absence of pupillary light response were all more common in patient with midline shift of 10mm or more. Young B et al[4] (1981) analyzed relationship between Glasgow coma scale score, midline shift and outcome of patient in their study of 170 patients of head injury. The patient with initial GCS score of 5-7 with midline shift of less than 4.1 mm on initial CT scan had a significantly higher favorable outcome rate when compared to patient with a large shift.

Material and Method
This retrospective study is based on 518 head injury cases admitted in apex trauma center of Career Institute of Medical Sciences and Hospital, Lucknow between Feb 2017 to May 2018 and who subsequently underwent computerized tomographic scanning within 24 hours of head injury.

Criteria for Inclusion
CT scan cranium within 24 hours of injury, No firearm injury, Not associated with other systems involvement like chest injury Abdominal injury, Major fracture. The status of basal cistern (perimesen cephalic cistern), and degree of mid line shift and amount of mass lesion (extradent hematoma, subdural hematoma, intracerebral hematoma, contusion and diffuse cerebral edema were noted.

Observation
The present study is comprising of retrospective study of 518 cases of head injury admitted in the CIMSH, Lucknow between Feb 2017 to May 2018.Male to Female ratio was 8.1:1 and maximum head injury was seen in 21-30 yr. (37.7%).The mode of injury in the majority of the cases has been found to be road traffic accident (38.0%) and fall from height (36.5%).

Radiological Features
The patients of head injury were subdivided into six major groups according to their initial CT findings. The frequency of diagnostic categories are shown in Table 1

Table 1: Incidence of various diagnostic categories

Diagnostic category	No of Cases	Result	
		Survived (percentage)	Expired (percentage)
Extradural hematoma	81(15.6%)	70(86.4)	11(13.6)
Acute subdural hematoma	42(8.1%)	23(54.8)	19(45.2)
Intracerebral hematoma	27(5.2%)	17(63)	10(37)
Contusion	112(21.6%)	80(71.4)	32(28.6)
Diffuse Cerebral edema	117(117%)	97(82.9)	20(17.1)
Normal scan	139(26.9%)	133(95.7)	6(4.3)
Total	518	420	98

Abnormal CT was seen in 379 cases (73.2%) out of 518 cases. Amongst abnormal CT scan group, least mortality was seen in EDH group (13.6%) while acute SDH group was associated with highest mortality (45.2%).

In EXTRADURAL HEMATOMA Group Mortality rate was 4.7%, 7.4% and 63.6% in <50 cc, 50 to 100 cc and >100 cc group respectively. Relation with mid line shif and basal cistern is given in table2 and 3 respectively.

Table 2: Relation between midline shift and outcome

Midline shift	No. of cases (n.81)	Result	
		Survived (%)	Expired (%)
No shift	11	11 (100)	-
<2 mm	15	15 (100)	-
2-5 mm	18	17 (94.4)	1 (5.6)
>5 to <10 mm	30	25 (83.3)	5 (16.7)
≥10 mm	7	2 (28.6)	5 (71.4)

Table 3: Relation between status of basal cistern and outcome

Basal cistern status (Perimesencephalic cistern)	No. of cases (n=81)	Result	
		Survived (%)	Expired (%)
Normal	21	21 (100)	-
Effaced	47	44 (93.6)	3 (6.4)
Obliterated	13	5 (38.5)	8 (61.5)

Acute Subdural Hematoma

In this study there was 42 cases of acute SDH. 19 patients expired out of 42 cases of acute SDH. The mortality rate was 45.2% in this study. Maximum thickness of acute SDH varied between 3 mm to 12 mm. Mortality rate was 27.6% and 84.6% in <5 mm and >5mm thickness group respectively. Relation with mid line shif and basal cistern is given in table 4 and 5 respectively.

Table 4: Relation between midline shift and outcome

Midline shift	No. of cases (n=42)	Result	
		Survived (%)	Expired (%)
No shift	-	-	-
<2 mm	-	-	-
2 to 5	16	14 (87.5)	2 (12.5)
>5 to <10 mm	20	8 (40)	12 (60)
≥10 mm	6	1(16.7)	5(83.3)

Midline shift was present in all cases of acute SDH. The maximum mortability was seen in ≥10 mm group (83.3%).

Table 5: Relation between basal cistern status and outcome

Basal cistern status	No. of cases (n=42)	Result	
		Survived (%)	Expired (%)
Normal	4	4 (100)	-
Effaced	20	13 (65)	7 (35)
Obliterated	18	6 (33.3)	12 (66.7)

Intracerebral Hematoma

The approximate volume of ICH was varied between 15 cc to 130 cc. The mortality rate was 20% in <50 cc, 83.3% in 50 to 100 cc and 100% mortality rate in >100 cc group. Relation with mid line shif and basal cistern is given in table6 and 7 respectively

Table 6: Relation between midline shift and outcome

Midline shift (mm)	No. of cases (27)	Result	
		Survived (%)	**Expired** (%)
No shift	7	6 (85.8)	1 (14.2)
<2	1	1 (100)	-
2 to 5	9	7 (77.8)	2 (22.2)
>5 to <10	6	3 (50)	3 (50)
10	4	-	4 (100)

Table 7:Relation between basal cistern status and outcome

Basal cistern status	No. of cases (n=27)	Result	
		Survived (%)	**Expired (%)**
Normal	8	7 (87.5%)	1 (12.5%)
Effaced	11	8 (72.7)	3 (27.3%)
Obliterated	8	2 (25%)	6 (75%)

It was observed that greater the compression over basal cistern grater was the risk of death.

Contusion

In this study, 112 cases of contusion were present. Mortality rate was 28.6% (32 cases).

Table 8: Relation between number of contusion and outcome

Number of contusion	No. of cases (n=112)	Result	
		Survived (%)	**Expired (%)**
Unilateral Single Multiple	53 25	39 (73.6) 17 (68)	14 (26.4) 8 (32)
Bilateral	34	24 (70.6)	10 (29.4)

Table 9: Relation between midline shift and outcome

Midline shift (MM)	No. of cases (n.112)	Result	
		Survived (%)	**Expired (%)**
No shift	36	34 (94.4)	2 (5.6)
<2	14	12 (85.7)	2 (14.3)
2 to 5	32	27 (84.3)	5(15.7)
>5 to <10	24	6 (25)	18 (75.0)
≥10	6	1 (16.7)	5 (83.3)

Mortality rate was maximum in >5 to <10 mm (75%) and >10 mm group.

Table 10: Relation between basal cistern status and outcome

Basal cistern status	No of cases (n=112)	Result	
		Survived (%)	**Expired (%)**
Normal	64	62 (96.9)	2 (3.1)
Effaced	31	15 (48.4)	16 (51.6)
Obliterated	17	3 (17.7)	14 (82.3)

Diffuse Cerebral Edema

There were 117 cases of cerebral edema out of 518 cases of head injury. The mortality rate in this group was 17.1% (20 cases).

Midline Shift

Midline shift was present in 208 cases out of 518 cases of head injury.in no midline shift group mortality rate was 1.8%.mortality was 6.7%in <2mm group,16% in 2to 5 mm group,45%in >5<10 mm group and 82.6%in >10 mm group

Table 11.comparison with other studies

Author	midline shift	death/poor response
Becker DP et al(3) (1977)	<10	15%
	>10	53%
Young B etal (4) 1981	<4.1	38.6%
	>4.1	68%
LipperMHetal(10) 1985	<3.8	30%
	>3.8	63%
AthippanSet al(11) 1993	Present	69%
	Abscent	39%
Present study 2018	<5	13.3%
	>5	53.3%

The present study showed that >10mm and >5mm and<10 mm midline shift on initial CT Head were statistically significant (p<0.001and p<.0.01)

Basal Cistern

Normal basal cistern was seen in 156 cases (41.2%) out of 379 abnormal CT Scan. Mortality rate was 2.6%, 22.8%and 73% in normal, effaced and obliterated group respectively.

Table 12: comparison of mortality/poor response in other series

Author	status of basal cistern	death/poor response (%)
Esperson (5) JOetal(1982)	Obliterated	66
Dongen KJVet al (12)(1983)	Obliterated	93
	Effaced	38
	Normal	35
Toutant SM etal(7)(1984)	Obliterated	77
	Effaced	39
	Normal	22
Athippan Set al (11)(1993)	Obliterated	76
	Normal	27
S Ratanaalest et al (13)(2002)	Obliterated	53.6
	Effaced	21.4
	Normal	3.9
Long LS and Jiang JY(14) (2003)	Obliterated	62.9
Present study	Obliterated	73
	Effaced	22.8
	Normal	2.6

Discussion

In this study group we mainly focused on midline shift and basal cistern status within 24 hours CT Head on outcome in head injury cases.

This study showed that obliterated basal cistern was statistically significant (p<0.001) for mortality outcome in comparison to their other counterparts.

Conclusion

Midline shift and Basal cister status are independent prognostic factor in head injury cases in initial CT Head. Presence of associated lesion (EDH, SDH, ICH, Contusion, Diffuse edema) increases the mortality and morbidity.

Conflict of Interest: None.

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