

ROLE OF REPEAT CT SCAN IN DETECTING DELAYED INTRACRANIAL BLEEDMadhukar T. Nayak¹, Purohit Aniruddh Kumar²**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: Radiological evaluation of a patient using CT scan brain has become an essential attribute in the emergency management a patient with head injury. Virtually every patient who presents in the emergency room with head injury undergoes an immediate CT scan of the brain. This leaves lot of room for missing delayed bleeds and evolving lesions which might sometimes prove prohibitive. In this context, a policy of electively repeating the CT scan brain in all patients undergoing the first CT scan within 6 hours of the injury was adopted. **METHODS:** All patients included [n= 42] in the study were admitted under Neurosurgical unit headed by the senior author [AKP] between December 2010 and November 2011 and had presented within 6 hours of the incident. All the patients were subjected to repeat CT brain, on the coming early morning with an effective duration of 18-24 hours post head injury. Patients were evaluated clinically and radiologically. The data was tabulated and statistically analysed. **RESULTS:** The commonest age group was 18-60 yrs [n=26] which constituted 61.9%. The Male: Female ratio was 11: 3. The cause of head injury was high velocity road traffic accident [vehicle rider] in [n=28] 66.6% {Group A} and low velocity road traffic accident [pedestrian] or assault by blunt object in [n=14] 33.3% {Group B}. Early mean GCS was 15 & 14.92 in groups A & B compared to 14.07 & 15 delayed GCS score. Adverse outcome [need for surgical intervention, need for anti-edema measures (Inj. Mannitol, Inj. Furosemide) or ventilatory support] was seen in 0% & 14.29% [n=4] in groups A & B. There was 0% & [n=2] 7.1% mortality in A & B groups respectively. The overall mortality was [n=2] 4.8%. **CONCLUSIONS:** With the easy accessibility of early CT scan brain becoming a reality, missing delayed bleeds is surely a cause for concern. In this context, resorting to routine repeat CT scan brain seems to be a logically sound step, not with-standing the increased burden on the healthcare setup as well as the increased risk of radiation exposure. This aspect needs further validation using larger well-structured studies so that a statistically sound guideline be elucidated.

KEYWORDS: Head injury, CT scan brain, delayed intracranial bleed, evolving intracranial lesions, cranio cerebral trauma.

INTRODUCTION: The twenty first century has seen a welcome trend in the developing countries. The economic boom has facilitated large scale cropping up of private diagnostic centers along with government and private medical colleges. Increased commercialization, better awareness and health consciousness among the masses and ease of availability of CT scan facilities have led to liberal utilization of CT scan brain. However, there is a concern about the adverse impact of harmful X-rays and the financial burden involved, which needs to be analysed. Virtually every patient who presents in the emergency room with minor or major head injury is undergoing an immediate CT scan of the brain. This leaves lot of room for missing delayed bleeds and evolving lesions which might sometimes prove fatal. In this context, a policy of electively repeating the CT scan brain in all patients undergoing the first CT scan within 6 hours of the injury needs to be critically proposed.

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METHODS: This is a retrospective study conducted by analyzing the data obtained from the Register database in the Department Of Neurosurgery at the Nizam's Institute of Medical Sciences, Hyderabad, India. All patients included [n= 42] in the study were admitted under Neurosurgical unit headed by the senior author [AKP] between December 2010 and November 2011 and had presented within 6 hours of the incident. All the patients were subjected to repeat CT brain, on the coming early morning with an effective duration of 18-24 hours post head injury. Patients were evaluated clinically and radiologically.

All patients having obvious Neurological deficits or localizing signs clinically or obvious radiological evidence of intracranial bleed, cerebral edema or mass effect were excluded from the study. Data obtained included age, sex, category of head injury [high velocity or low velocity], initial GCS [Glasgow coma score], history of Hypertension, history of taking antiplatelets or anticoagulant medications, history of alcoholism, hematologically deranged parameters like thrombocytopenia, altered bleeding and clotting time, prolonged prothrombin time or activated partial thromboplastin time, findings of initial CT scan brain, GCS at the time of repeat CT scan and repeat CT scan findings. The data was tabulated and statistically analysed using Microsoft Excel and Word software.

RESULTS: The commonest age group was 18-60 yrs [n=26] which constituted 61.9% [Table 1]. The Male: Female ratio was 11: 3. The cause of head injury was high velocity road traffic accident [vehicle rider] in [n=28] 66.6% {Group A} and low velocity road traffic accident [pedestrian] or assault by blunt object in [n=14] 33.3% {Group B}. Early mean GCS was 15 & 14.92 in groups A & B compared to 14.07 & 15 delayed GCS score [Table 2]. Adverse outcome [need for surgical intervention, need for anti-edema measures (Inj Mannitol, Inj Furosemide) or ventilatory support] was seen in 0% & 14.29% [n=4] in groups A & B. There was 0% & 7.1% [n=2] mortality in A & B groups respectively.

The overall mortality was 4.8% [n=2]. 14.3%[n=6] patients were known hypertensives, out of which 3 patients were on antiplatelet medications [aspirin+clopidogrel], 1 patient was on anticoagulants for valvular heart disease & 1 patient had moderately prolonged a PTT [activated Partial Thromboplastin Time]. Out of the 2 patients who died, both were in category A [high velocity injury]. One patient who died, was in the >60 yrs age group, had history of hypertension, was on antiplatelet medications and warfarin. One patient in the 18-60 yrs age group was a chronic alcoholic with initial CT brain showing significant Cerebral atrophy.

DISCUSSION: ANALYSIS OF RESULTS: The overall satisfactory outcome was seen in 90.5% [n=38] patients. Out of the 4 cases with unfavorable outcome, 3 underwent surgical decompression out of which only 1 has survived. The patient who survived had a near normal CT scan brain initially, except for a small [5mm] speck of contusion in the right Parietal lobe. Delayed CT scan brain showed a large hematoma in that area causing significant mass effect. Post-surgical evacuation, patient had a good recovery.

Various studies have demonstrated the significant role of elderly age, male sex, very early initial CT scan, prolonged coagulation parameters, uncontrolled hypertension and chronic alcoholism as predictors of adverse outcome. The extent and significance of each parameter in determining the overall outcome has been a subject of controversy. Certain studies have tried to depict the importance of 2nd and 3rd hour post head injury. Any imaging done before this time period has been shown to miss quite a few cases of delayed intracranial bleeds.^{1,2} Oertel et.al., demonstrated a

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whopping 50% incidence of significant hemorrhagic transformation whenever imaging is done within first 2 hours.³ His study also reemphasized the importance of advanced age, male sex and delayed a PTT in preicting a poorer outcome.

The pathophysiological basis of advanced age factor in bringing about delayed bleeds maybe due to tense and atherosclerotic but fragile blood vessels in addition to increased incidence of Diabetes mellitus and amyloidosis.⁴

The increased male preponderance in the incidence of head injuries might be due to social reasons like increased exposure to outdoor activities and increased use of motor vehicles. Roof et.al., have elucidated the protective role of estrogens and progesterone in women which leads to reduced lipid peroxidation, inhibition of glutamate receptors, reduced breakdown of cell membrane, reduced platelet aggregation, reduced apoptosis and better blood flow to the brain.⁵ Stein et al., have demonstrated the role of coagulation and bleeding parameters in the incidence and outcome of delayed intracranial bleeds.⁶ Poor outcome in chronic alcoholics might be due to hypoxia and hypoglycemia along with a shrunked brain in which the subdural friable veins are highly susceptible for damage and resulting bleeds. In addition, impaired platelet function, altered liver functions and deranged coagulation parameters add to the existing maladies.⁷

Our findings are in tune with above studies. In our study all the 4 patients with poor outcome [2 deaths] were males. Out of the 2 patients who died, 1 was a young male with chronic alcoholism. Certain studies even claim enlargement of intracerebral hematoma in CT scan performed at 48-72 hrs after the injury.⁸

LIMITATIONS OF THE STUDY: Our study does have its fair share of limitations. Most glaring being lack of any long term followup. The study nature being retrospective, non-randomized study with its inherent selection and treatment biases does no good to the relevance of its findings. Also, the role of exact duration of repeat CT scan and its correlation with the outcome which is an important variable was not analysed. Intracranial pressure [ICP] monitoring plays an important role in prognosticating outcome in conservatively treated head injuries.⁹ This parameter was outside the scope of this study.

CONCLUSION: High velocity injuries along with history of hypertension, intake of antiplatelets and anticoagulants, chronic alcoholism, male sex and elderly age group are factors adversely affecting outcome in head injury. With early CT scan brain becoming a reality, missing delayed bleeds is surely a cause for concern. In this context, resorting to routine repeat CT scan brain seems to be a logically sound step, not with-standing the increased burden on the healthcare setup as well as the increased risk of radiation exposure. This aspect needs further validation using larger well-structured prospective, multicentric, randomized trials so that a statistically sound guideline be framed.

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Sl. No.	Parameter	Group A	Group B	Total
1	Sex Male	23	10	33
2	Female	5	4	9
3	Age <18yrs	0	3	3
4	18-60yrs	23	3	26
	>60 yrs	5	8	13
5	Hypertension +	5	1	6
	-	23	13	36
6	Anti patelets/ Anticoagulants +	3	0	3
	-	25	14	39
7	Altered Hematology +	2	1	3
	-	26	13	39
8	Alcoholism +	3	1	4
	-	25	13	38

Table 1: Showing distribution of case according to various parameters among the 2 groups

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Sl. No.	Category	1 st Normal CT scan	2 nd Normal CT scan	Fall in GCS n[%]	Mean Fall in GCS	Adverse outcome n[%]	Death n [%]	Total n[%]
1	A[High velocity Head injury]	28	24	4[14.3%]	0.9	4[14.3%]	2[7.1%]	28[100%]
2	B[Low velocity Head injury]	14	14	0	0	0	0	14[100%]
3	Sex Male	33	29	4[12.1%]	0.8	4[12.1%]	2[6%]	33[100%]
	Female	9	9	0	0	0	0	9[100%]
4	Age <18yrs	3	3	0	0	0	0	3[100%]
	18-60yrs	26	24	2[7.7%]	0.6	2[7.7%]	1[3.8%]	26[100%]
	>60 yrs	13	11	2[15.4%]	1.2	2[15.4%]	1[7.7%]	13[100%]
5	Hypertension +	6	4	4[66.7%]	2.7	4[66.7%]	1[16.7%]	6[100%]
	-	38	36	2[5.3%]	0.2	2[5.3%]	1[2.6%]	38[100%]
6	Anti patelets/ Anticoagulants +	3	1	2[66.7%]	3.7	2[66.7%]	1[33.3%]	3[100%]
	-	39	37	2[5.6%]	0.4	2[5.6%]	1[2.8%]	39[100%]
7	Altered Hematology +	4	2	2[50%]	3.75	2[50%]	1[25%]	4[100%]
	-	38	36	2[5.3%]	0.4	2[5.3%]	1[2.6%]	38[100%]

Table 2: Showing various categories of head injuries, role of various parameters and their comparative outcome as documented following repeat CT scan brain

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