

## Original Article

# Computerized Tomography of the Brain for Elderly Patients Presenting to the Emergency Room with Acute Confusion State in Eastern Nepal

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### Abstract

**Background:** Acute confusion is a common reason for presentation of elderly patients to the emergency which may be of neurological or non-neurological origin. Computerized tomography (CT) scans are often routinely ordered to investigate the cause.

**Objective:** To determine the usefulness of CT scan brain in confused elderly patients.

**Methods:** A cross-sectional observational study was conducted in emergency room (ER) of B. P. Koirala Institute of Health Sciences over a period of 6 months in 84 patients above the age of 65 years who had CT scan brain done in view of acute confusion. They were reviewed for symptoms, indications of CT scan and presence of focal neurological deficits (FND).

**Results:** Among patients presenting in confusion and with loss of consciousness or limb weakness, CT scan was abnormal in 90% and 92% cases respectively ( $p < 0.05$ ) whereas those presenting with fever, cough, headache, dizziness, seizure in confusion also had abnormal CT but was statistically not significant ( $p > 0.05$ ). Out of 84 elderly cases of acute confusion, 52 had FND and the remaining 32 cases were without FND. Among those with FND, 40% and 46% cases had features of ischemic and hemorrhagic stroke respectively. Among the 32 without FND, 66% patients had normal scan and 38% had cerebral atrophy. In patients with Glasgow Coma Scale (GCS)  $< 9$  with FND, 75% had CT scan suggestive of hemorrhagic stroke whereas those with GCS  $> 13$  with FND, 57% and 29% cases had ischemic and hemorrhagic stroke respectively.

**Conclusion:** CT scan brain for confused elderly should be advised for those with focal neurological symptoms and may be suggested in cases of head trauma or alleged history of fall irrespective of GCS and symptomatology.

**Key words:** Computerized tomography, Emergency room, Acute confusion, Elderly.

### Introduction

Acute confusion is a common reason for presentation of elderly patient to the Emergency Room (ER), with prevalence rates of delirium estimated between 10-14%.<sup>1,2</sup> The American Psychiatric Association's Diagnostic and Statistical Manual, 4th edition (DSM-IV) lists four key features that characterize delirium<sup>3</sup>: (a) Disturbance of consciousness with reduced ability to focus, sustain, or shift attention. (b) A change in cognition (e.g., memory deficit, disorientation, language disturbance). (c) The disturbance develops over a short period of time (usually hours to days) and tends to fluctuate

during the course of the day. (d) There is evidence from the history, physical examination, or laboratory findings that the disturbance is caused by a medical condition, substance intoxication, or medication side effect. The causes of acute delirium in these patients are stroke, fever, sepsis and metabolic derangement. Finding and treating the cause of delirium is the mainstay of management.<sup>4</sup>

Since its development in 1972,<sup>5</sup> computed tomography scan of the brain has become one of the most ubiquitous tests in clinical medicine, despite its costs.<sup>6,7</sup> CT scans have become widely used for a broad range of medical conditions because of their ability to provide anatomical detail in a noninvasive fashion.<sup>8,9</sup> Many brain scans continue to be ordered for conditions with low diagnostic yield (such as:

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syncope, cerebral vascular accident, and altered mental status).<sup>10</sup> Elderly patients have higher occurrence rates of these conditions that would, in turn, predispose clinicians to order brain CT scans;<sup>11</sup> thus, elderly patients are potentially at high risk of receiving unnecessary scans.

It was also assumed that acute abnormalities would only be found in those with positive neurological findings or, as suggested by the delirium guidelines, those who had suffered a fall. This study was undertaken with the objective to determine the usefulness of CT brain in confused elderly patients. In a developing country like ours where only a limited population have access to Health Care insurances, this would help us to avoid unnecessary scan ordered in confused elderly patient and help in better health care delivery.

### **Methodology**

A prospective cohort study was conducted for a period of 6 months, from Nov 2011 to April 2012 in patients 65 years and above presenting to the ER with acute confusion or delirium irrespective of any other co-morbid medical or surgical condition and having a CT scan of the brain as part of the assessment were included in the study. CT scans were multi-slices and 10 mm but thin sections were also taken in the region of interest. The interpretation of brain CT scan was done by our radiologist co-investigator. Elderly patients referred from outside with confusion state were also included if they had CT scan done outside but report were verified by our co-investigator.

Selection of acute confusion patients was achieved by triage sheet which were seen by emergency physician and diagnosed either as acute confusion or as confused or delirious in the provisional diagnosis were considered for the inclusion in this study. Based on the DSM IV, acute confusion patients were detected by current and past history and clinical examination including routine neurological examination, conscious level or the Glasgow coma scale (where GCS <8 indicated Severe brain injury, GCS 9-12 Moderate and GCS  $\geq$  13 Minor brain injury), evidence of pyrexia, evidence of

alcohol abuse or withdrawal and cognitive function.

Routine investigations included: Full Blood Count, Urea and electrolytes, Liver function tests, Glucose, Chest X-ray, Electro Cardio Graphy, Blood cultures (if fever), Urine analysis, Arterial Blood Gas and Lumbar Puncture (if meningism or headache and fever) and to further these, all patients had CT scan head. Before CT scan, patients were further assessed clinically for any focal neurological deficit (FND). These focal neurological deficits included right and left motor deficits, sensory deficits, decreased reflexes, tongue deviation, decrease in fluency of speech, nystagmus and ataxia. The ER admission notes and case sheets of these patients were reviewed, then followed again when the patient was admitted to the ward, or in the Medical Records Department, to determine whether the final diagnosis was still acutely confused patient as primarily diagnosed in ER or otherwise. The study was approved by BPKIHS Research Ethics Committee.

### **Evaluation and Statistical Analysis**

The notes of all patients were reviewed for presenting complaints, finding on CT scans and the presence or absence of focal neurological deficits. The official Radiologist report of the CT scan was subsequently reviewed for each patient to determine the presence of acute intracerebral abnormalities and non-acute incidental findings. Acute intracerebral abnormalities were defined as intracranial bleeding, new stroke, infection, neoplasm or other finding that would likely affect management, whereas atrophy, small-vessel ischemic changes and old strokes were defined as non-acute incidental findings. The data was filled in the proforma and entered in Microsoft Excel. In this way, the data for each patient were either 'present' or 'absent' for each of the parameters analyzed such as responses for confusion, acute neurological findings, acute CT findings; and the specific acute findings. This datum was then analyzed using SPSS 11.5 version.

**Results**

A total of 296 patients with acute confusion patients presented to the emergency room, BPKIHS, Dharan, Nepal over 6 month study period. Eighty four patients were included whereas the rest were younger than 65 years and without CT scan, therefore, were excluded.

**Demographic parameters**

The age of the patients ranged from 65 to 95 years, with a mean age  $\pm$  standard deviation 70.54 $\pm$ 6.42 years. Majority of the patients belonged to age group 65-74 years.

**Distribution of Cases as per presenting complaints**

All the patients included had presented in ER for multiple complaints, along with acute confusion. The common presenting complaints were fever, altered sensorium, cough, dizziness, headache, seizure, history of fall, jaundice and limbs weakness. Fifty patients (59.5%) had altered sensorium and 38 patients (45.2%) had limb weakness. About 40% patients had loss of consciousness, 28.6% fever, 25% dizziness, 18% headache and 3.6% had sustained fall injury.

**Relating CT Scan findings and presenting complaints**

Patients who had presented either with loss of consciousness (RR= 1.45) or limb weakness (RR= 1.63) had abnormal CT scan report in

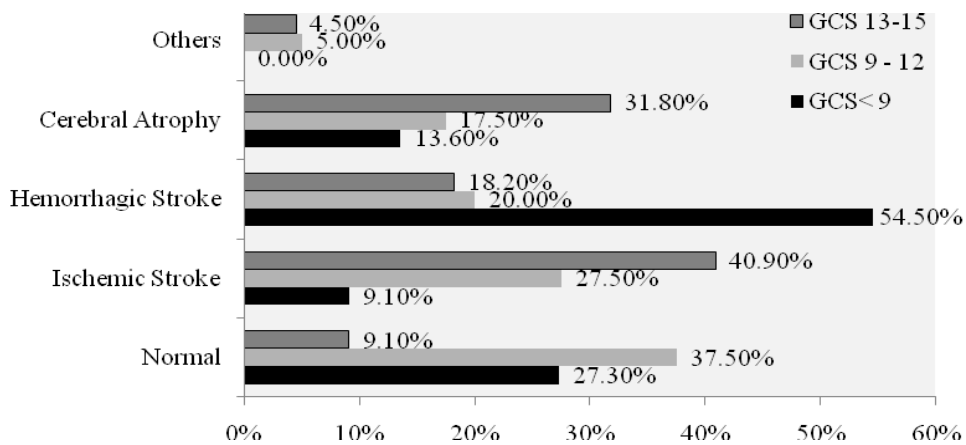
90% and 92% cases respectively ( $p < 0.05$ ) whereas those patients presenting with fever, cough, headache, dizziness, seizure etc. in confusion also had abnormal CT but was statistically not significant. Among 31 patients presented with loss of consciousness, CT scan of 20 patients (64.5%) showed intracerebral hemorrhage and 19.4% showed ischemic infarct. Among 38 patients with limb weakness, CT scan of 52.6% had intracerebral hemorrhage and 39.5% showed ischemic infarct.

**Distribution of Focal Neurological deficit and CT Scan findings**

In this study, acute focal neurological deficit sign was found in 52 (62%) of the patients and 32 (38%) patients had no signs of focal neurological deficit on neurological examination. On performing CT scan, 27.4% patients had normal scan and 72.6% had abnormal CT Scan - 26.2% had Ischemic infarct, 28.6% intracerebral hemorrhage, 20.2% cerebral atrophy and 3.6% had other findings as SOL, contusion and calcified granuloma. Atrophic changes and calcified granuloma were considered incidental and non-acute findings.

**Correlation between Glasgow Coma Scale and CT Scan**

Twenty two patients (26.2%) had GCS below 15 and above 13 whereas 40 patients (47.6%) had GCS between 9-12.



**Figure 1: GCS and CT Scan**

Those with GCS scores less than 9 had CT scan suggestive of hemorrhagic stroke in 12 (54.5%) and ischemic stroke in 9.1% whereas when GCS was  $\geq 13$ , 40.9% (n= 9) had ischemic stroke and 18.2% had hemorrhagic stroke. In those with GCS between 9-12, an almost equal percentage i.e. 27.5% and 20% had ischemic and hemorrhagic stroke respectively as shown in Figure 1.

**Correlation between CT Scan and Focal Neurological Deficit (FND)**

Among 52 patients with focal neurological deficits, 40.4% and 46.2% had ischemic and hemorrhagic stroke respectively. In contrast

among those without FND, 65.6% had normal CT scan, 37.5% cerebral atrophy and 3.1% ischemic stroke. Abnormal CT scan was seen in more than 86% with focal neurological deficits (Table 1).

In patients with FND and Glasgow Coma Scale less 9, 75% had CT scan suggestive of hemorrhagic stroke whereas those with FND and GCS  $>13$ , 57% and 29% had ischemic and hemorrhagic stroke. Majority of patients without FND, irrespective of the Glasgow Coma Scale score, had normal CT scan (Table 2).

**Table 1: CT Scan finding as per Focal Neurological Deficit (FND)**

FND	CT Scan					Total n= 84
	Normal	Ischemic Stroke	Hemorrhagic Stroke	Cerebral Atrophy	Others	
<b>Yes</b>	2 3.8%	21 40.4%	24 46.2%	5 9.6%	2 3.8%	52
<b>No</b>	21 65.6%	1 3.1%	0 .0%	12 37.5%	1 3.1%	32

**Table 2: CT Scan finding as per Focal Neurological Deficit (FND) and GCS**

FND	GCS	CT Scan (%)				Others
		Normal	Ischemic Stroke	Hemorrhagic Stroke	Cerebral Atrophy	
<b>Yes</b>	<b>&lt; 9</b>	12.5	12.5	75	6.3	0
	<b>9- 12</b>	0	50	36.4	4.5	9.1
	<b>13- 15</b>	0	57.1	28.6	21.4	0
<b>No</b>	<b>&lt; 9</b>	66.7	0	-	33.3	0
	<b>9- 12</b>	83.3	0	-	33.3	0
	<b>13- 15</b>	25	12.5	-	50	12.5

**Past Medical History and Stroke**

In this study, 45.2% (n= 38) had past history of Hypertension, 9.5% diabetes, 6% stroke and 2.4% had dilated cardiomyopathy. Among hypertensive patients, 29 (76.3%) had CT scan suggestive of either form of stroke; likewise among diabetes, 75% had stroke; among past history of stroke, 100% had repeat episode of stroke and among DCM, all had ischemic stroke.

**Discussion**

Delirium is a major burden to health care services and has been largely ignored by health service planners and practitioners. Delirium is an important problem for all clinical services providing care in older people, particularly emergency departments; general, medical, elderly care, surgical, and oncology wards; intensive care units; and, in the community, residential and nursing homes. Delirium is the most common complication of hospital admission for older people.

In this study, 84 delirium patients were taken for evaluation who had undergone CT scan for the evaluation of acute confusion in older patients age >65 years. After evaluation, 62% patients had focal neurological deficits in our study. In a study done by Hirano LA et al. 2006<sup>13</sup>, CT scan of 41% older patients was done for confusion and mental state changes from ER department and 43.8% of all patients with confusion and mental state changes had new onset of focal neurological deficits.

In the study by Naughton et al<sup>14</sup>, 59.4% patients were prospectively classified as having impaired cognition, impaired consciousness, or delirium. This study combined prospective data for 79 patients with delirium, impaired consciousness or impaired cognition without delirium, with retrospective data for 200 patients, all of whom had a CT scan in the prior 6 months. A positive finding on the CT scan was seen in 15%. Of those with a positive scan, 95% had positive neurological examination findings, and the two patients, who did not have, were not delirious had suffered a fall injury.<sup>15</sup>

In the present study, positive findings on CT scan was found in 73% in those above 65 years with acute confusion and 86.6% had neurological abnormality or FND. In this study among those patient with loss of consciousness or limb weakness, abnormal CT scan was seen in 90% and 92% respectively (p<0.05). Abnormal CT scan was seen in 96.2% with focal neurological deficits (40.4% ischemic stroke, 46.2% hemorrhagic stroke and 9.6% cerebral atrophy). In the study done by Naughton et al.<sup>14</sup> 95.1% of the acute findings on CT scan were found in the patients who had focal neurologic findings or coma detected. In the same study, it was suggested that delirium is commonly evaluated using a head CT scan.

In a study done by Koponen H<sup>16</sup>, out of 35 patients admitted in psychogeriatric ward, all the patients received diagnosis of delirium and 25 patients had CT scan. Out of them, 77% had diagnosis of underlying brain diseases where 89% (24/27) had feature suggestive of stroke. In this study among 84 delirium patients, 73% had

abnormal CT Scan and among abnormal CT Scan, 54.8% patients had stroke.

In present study, abnormal CT scan was found in 73% cases and among them, around 90% cases had focal neurological deficit. In a study conducted by Marik PE, new pathological findings were found in 91 (25%) patients in CT.<sup>9</sup> The commonest new lesions were ischaemic infarcts (43%), followed by intracerebral haemorrhage (13%) and space occupying lesions (11%) that showed 56% of stroke cases. In present study, it was found that among 73% abnormal CT Scan, 55% had stroke.

### **Limitation**

This study needs more sample size and should be included data from many hospitals for more convincing results. Age group taken in this study was more than 65 years, thus, this study can be considered in wider range of age group. Electrolyte abnormality should be considered in details.

### **Conclusion**

There is a higher probability of abnormal CT among confused elderly patients with FTD whereas confused elderly without FND have a much lower probability of abnormal CT scan. This study shows that CT scan brain is to be considered for confused elderly with FND.

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