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Prognostic tools in nontraumatic coma-emphasis on worthwhile cost allocative management

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ABSTRACT

Background and Objectives: Estimation of prognosis in non traumatic cases of altered sensorium so to provide reassurance to those involved in a decision making process, including patients, families and physician.

Method: Fifty patients who came in altered sensorium of non traumatic origin, underwent medical and neurologic clinical evaluation at the time of admission including a detailed history. Neurologic condition was judged by evaluating fore brain and brainstem function using GCS score. Daily examination was conducted. The outcome at the end of one month was graded and recorded. The patient discharged earlier to one month were called at the end of one month for grading outcome.

Results: Infective followed by metabolic lesions accounted for majority of causes of Altered sensorium. Alteration in consciousness in patients with cerebrovascular accidents carries a high mortality. Younger age indicated a better prognosis. The absence of oculovestibular, oculocephalic reflexes, pupillary reflexes and / corneal reflexes suggests, poor outcome. The patient with low coma score of 3 to 4 had poorer prognosis. Combination of multiple clinical indicants enhanced the predictive ability. Mortality was 100% when there was combined absence of oculovestibular oculocephalic and pupillary/ corneal reflexes.

Conclusion: By interpreting the coma score and brainstem reflexes one can decide in choosing intensive (and expensive) therapy for patients most likely to benefit. Thus Simple, repeated painstaking observation at the bedside can help us predict the outcome of brain damage of whatever etiology.

INTRODUCTION

We come across many number of patients with ALTERED SENSORIUM who may be in various stages of Altered Sensorium, from delirious state to Coma. There may not be a reliable attendant of the patient to give the history of the patient's disease, and its onset¹. No matter what the Doctor or Physician has done promptly and accurately in diagnosing and treating a patient in Altered Sensorium, there is a question posed to him by the patient's attendants and a question which he himself should answer to. So the question is what should the physician do or depend on to get an idea about the prognosis and outcome in a patient in Altered Sensorium so as to tell about the prognosis to attenders. Investigations are not unequivocal or at hand all time and at all places to come to a diagnosis and predict an outcome. The answer lies with the patient. He has the clinical signs in him which should be read by the physician and interpreted and acted accordingly².

A study of patients in Altered Sensorium, especially in coma in the western world is a matter of great controversy involving the financial burden it costs on the society and ethical demand of doing everything for the patient who would be in a vegetative state. But in India, it is not such a practical problem yet as the interest is to gauge an outcome whether it is the death or the recovery with or without deficits as the outcome³.

Present study is concerned with the identification of clinical data required to make a prediction of outcome in cases of altered sensorium, as no single investigative procedure has been found to be unequivocally useful in predicting the outcome and also such procedures are not available in all centers

METHODOLOGY

The study was conducted on 50 patients with Altered Sensorium admitted between Jan 2009 to 2010 JANUARY at Karuna Medical College Hospital, Chittur, Palghat. The patients in Altered Sensorium due to head trauma were excluded. Transient unresponsiveness of syncope or the unresponsiveness of imminent death were excluded and only patients whose Altered Sensorium lasted at least 6 hours were included. Patients with transient postictal unconsciousness were also excluded. All patients underwent full medical and neurologic clinical evaluation at the time of admission (time of admission in study was arbitrarily taken as time of first neurologic assessment). Neurologic condition was judged by evaluating forebrain and brainstem function using criteria developed by Plum and Posner and Teasdale and Jennette (Glasgow coma scale)⁴.

The total coma score of the patient was calculated by adding up the three scores and it was taken to reflect the depth of unconsciousness (lower the score deeper the coma). Daily examination was conducted thereafter and profile of course of altered Sensorium was followed till death or discharge.

The outcome at the end of one month was graded and recorded. The patients discharged earlier to one month were called at the end of one month for grading outcome. The following outcomes were identified viz., Death, Persistent vegetative state (awake but unaware), severe disability (dependent but conscious), moderate disability (independent but disabled) and good recovery (Jennet and Bond)⁵. We graded the outcome into 4 categories:

- Death
- Vegetative state
- Recovery with functional disability – severe and moderate
- Good recovery

OBSERVATION AND RESULTS

There is even distribution among the sexes. Patients who were above 30 years had one or other risk factors which contributed to the altered sensorium. Patients of younger age were treated intensively as the results were very positive.

Among the studied cases, infective aetiology stands the most common cause where Meningoencephalitis due to tubercular aetiology followed by other pyogenic and viral infection was made out. Immunocompromised state due to HIV I and II infection developing secondary central nervous system infection came under this infective group. Treating infections always gave promising outcomes so costwise no compromise taken.

Infective was followed by Cerebrovascular accident which included Hemorrhage, Ischemic infarcts and SAH. The patients who suffered CVA had definitive risk factors like Diabetes mellitus, Hypertension, smoking etc. CVA showed mixed results in recovery and here believing on prognostic tools mattered a lot.

This was followed by metabolic coma due to Liver failure, Ketosis, Hyperglycaemia, Renal failure, Hypoglycaemia and Hyponatremia. Metabolic aetiology was worth treating effectively as it always showed good results. Shown in table in 1.

Table1 Showing Aetiology distribution

Diagnosis	Number	Percentage
Hemorrhage	5	10
Ischemia/infarction	5	10
SAH	2	4
Hypoxia	2	4
Infective	16	32
Drugs/Toxins	5	10
Hepatic encephalopathy	4	8
Ketosis	1	2
Others	10	20

In the present study Metabolic and Infective aetiology of altered sensorium showed comparatively good outcome with complete recovery. Cerebro vascular accidents due to bleed had poor outcome resulting in death. The patients who showed good recovery were anticipated to do so on 2nd and 3rd day of admission itself based on the clinical brainstem clinical signs. This helped us to go ahead with required cost effective treatment like higher antibiotics in infective aetiology, Dialysis in Uraemia and Drug induced Coma, Neurosurgical Intervention in bleed and brain abscess.

In the age group between 12-50 years mortality was 18.75% and in the age group of 50 and above mortality was 55.55%. Thus in this study younger patients had a more favorable outcome when compared to the elderly. Elder patients with other added risk factors like IHD, previous CVA, Nephropathy, anemia, all added to the mortality and recovery. Young patient with immunocompromised status showed poor recovery which was mainly dependent on the CD4 count. But overall, young patient showed good recovery.

The lower the coma scores of 3 and 4, the death rate is more but it was not a specific indicator of prognosis taken alone. Coma score helped us to know the effect of pathology on RAS and its effect on ocular and vestibular reflexes. It also helped us to know whether pathology is worsening or improving with treatment. GCS score helps to compare the numerical score day after day and guide our line of treatment.

. The absence of Oculocephalic, Oculovestibular response, pupillary and corneal reflexes suggested poor prognosis with a mortality of 86.66%, 93.33%, 87.5% and 88.23% respectively. In metabolic and infective aetiologies the absent neuro ophthalmologic signs initially showed signs of recovery later with treatment which helped to continue the same line of treatment. Shown in table in 2.

Table 2 Showing Coma score and Outcome

	3		4		5 and above	
	No. of cases	%	No. of cases	%	No. of cases	%
I	9	100	3	75	4	11.11
II	-	-	-	-	5	13.89
III	-	-	1	25	27	75

Although low coma score, absence of oculomotor response, pupillary and corneal reflexes in isolation predict death to the tune of 90%, emphasis on single clinical sign to the exclusion of all other information in predicting outcome cannot be made. Therefore to enhance predictive ability, combination of Oculovestibular, oculocephalic ,pupillary and corneal reflexes and Absence of two or all the three reflexes namely Oculovestibular response, pupillary and corneal reflexes were correlated with outcome

DISCUSSION

In the age group between 12-50 years mortality was 18.75% and in the age group of 50 and above mortality was 55.55%. The outcome of severe brain damage of whatever aetiology has been related to age by Marquardesen, Mack Kissock, Trey⁶ showed similar conclusions as in our study. Infact, unconsciousness per se is an important unfavourable sign in older people as given by Overgaard et al which also remained the same in our study. But plum and carona in their series found no significant relation between age and outcome.

Commonest cause of altered sensorium in the present series is infection (32%). The next in order of frequency are cardiovascular accident (Hemorrhage, Ischemia, SAH) (24%), drug/exogenous toxins (10%), metabolic (Ketosis, Hepatic, Hypoxia, Uraemia) 34%. The order of frequency in Plum and Posner series is exogenous toxins (29.8%), CVA (13.2%), hepatic coma (3.4%) and infections (2.6%).

In our series, infective cause formed the second main cause of altered sensorium, but in the K. Srinivasan study infection (50%) is the main cause⁷. Infective causes were much less in Plum and Posner series. This reflects the difference in geographic distribution of infections particularly that of viral encephalitis which is more rampant in this country. Given in table 3 and 4.

Table 3 Showing Comparitive Study Between Present, Plum and Posner and K. Srinivasan

Type of lesion	Plum and Posner (1981)		K. Srinivasan (1980)		Present study	
	No. of Cases	%	No. of Cases	%	No. of cases	%
Toxic/metabolic	326	65.2	93	40	43	86
Structural	166	33.2	138	60	7	14
Psychogenic	8	1.6	-	-	-	-

Table 4 showing comparison between Plum and Posner and present study based on aetiologic diagnosis

Diagnosis	Plum and Posner		Present Study	
	Number	Percentage	Number	Percentage
Hemorrhage	44	8.8	5	10%
Ischemia/infarction	9	1.8	5	10%
SAH	13	2.6	2	4%
Hypoxia	13	2.6	2	4%
Infective	14	2.8	16	32%
Drugs/Toxins	149	24.8	5	10%
Hepatic coma	17	3.4	4	8%
Ketosis	12	2.4	1	2%
Others	196	39.2	10	20%

PREDICTION OF OUTCOME

Out of 50 cases in the study 16 died, with overall mortality of 32%.

Functional disability 10%

Moderate good recovery 58%

In Levy et al study mortality of 62% at end of one month i.e. 306 out of 500 died³⁸. In Plum and Carona's study mortality was 56% (27 out of 48 died)⁸. As most of the aetiologies of altered sensorium were reversible with good intervention, mortality rate was low compared to other group in our study. Out come among most of the cases was predicted within 72 hours of admission based on neuro ophthalmologic signs.

AETIOLOGY AND OUTCOME

Cerebrovascular Accident:

Presence of any degree of altered sensorium substantially reduces the chance of a good outcome of patients with ischemic stroke and a poor chance of outcome in patients with cerebral hemorrhage. Among 153 patients studied by Carter 75% of those in coma had intracranial bleeding who all showed a high mortality rate. Similar finding was noted in our study in which all 3 patients with Intracranial bleed showed 100% mortality. Size of intracranial haemorrhage correlates with level of altered sensorium. Obtundation, stupor, coma with ischemic stroke showed a poor outcome as equally as poor as intracranial bleed. Carter reported that among 95 patients with cerebral infarction in coma for less than 24 hours, 44% died within 4 weeks⁹. Similarly in our study patient who presented with infarction and altered sensorium not lasting more than 24hours showed good recovery. This was true among our study in which four patients with ischemic infarction showed good recovery. More long standing unresponsiveness continuing upto 48 hours led to a mortality of 86% and when over 48 hours led to a mortality of 95%. Cooper and associates gave similar figures¹⁰ and even Jones and Milliken noted that addition of altered sensorium with hemiplegia increased the mortality from 2 to 41%¹¹. Oxbury, Greenhall and Gainger found that any alteration in consciousness with ischemic stroke predicted at least a 30% mortality and the death rate climbed as coma descended¹². In present series among 3 cerebral hemorrhages all three died

with a mortality of 100% and among five ischemic stroke, only one died with mortality of 60%. The case of ischemic stroke who expired had presented in a deeply comatose state with wide area of infarction in MCA territory.

Sub Arachnoid Haemorrhage:

Level of consciousness is of major importance in anticipating outcome from subarachnoid hemorrhage. According to Richardson the mortality in the first 6 months is 29% for alert patients, 55% for drowsy patients, 71% for stuporous patients, and 90% for patients in coma. Age is important, young and alert patients have a mortality one third that of elderly (McKissock et al). In the present series of the 2 patients who had SAH with altered sensorium at the time of presentation died with a mortality of 100%¹³. Death in both patients were seen in 2nd week of their follow up.

Metabolic Encephalopathy:

Hepatic coma: The cause of hepatic coma influences the outcome, prognosis being worse in fulminant hepatic failure than in coma associated with chronic cirrhosis or portocaval shunting (Prytz, Ritt)¹⁴. In Bate's series none of the comatose patients with acute hepatitis survived and among 48 patients in coma secondary to subacute or chronic hepatic disease 22 of them made a moderate/good recovery¹⁵. In the present series one of 4 cases died which was a case of fulminant hepatic failure with altered sensorium. The other 3 cases showed good recovery where cirrhosis with portal hypertension with a chronic liver pathology.

Septic Encephalopathy:

Deep stupor or coma in infections like bacterial meningitis, viral encephalitis carries mortality of 50% or higher (Baird et al Dodge). But attention has to be given to the virulence of the organism and delay in beginning of effective treatment along with neurologic details. Correlations between altered state of consciousness, the presence of other neurological abnormality, and outcome are difficult to deduce from published reports on fungal and viral infection of the nervous system¹⁶. In the present series 16 cases of CNS infections were noted among which 10 recovered completely, two recovered with disability and four of them expired with a mortality of 25%. The four cases which died had very low GCS score and were deeply comatose.

COMA SCORE AND OUTCOME

The lower the coma scores of 3 and 4, the death rate is more but it was not a specific indicator of prognosis taken alone. Patient with GCS score of more than 6 to 8 were 7 times more likely to improve than those with a score of 3 to 5. GCS less than four has high mortality. This was seen in a study done by Saccorl, Vangool R et al¹⁷. Thus GCS helps to predict outcome and identification of comatose patients at high risk for death or severe disability. Patients with abnormal brain stem response, absent verbal response, absent withdrawal response to pain on day 3 showed more mortality. A study done on 596 patients by Hamel M.B, Goldman L et al showed the absence of above clinical signs carries poor outcome¹⁸. Chance of regaining an independent existence was greater in response to noxious stimuli or who had attained any of the following- Orienting eye moments, normal response to Oculocephalic/ Oculovestibular stimulation, or normal muscle tone. This was also proved the same in a study done by Bates D, Caronna JJ et al. Patient with absent brain stem reflexes died early which was also the conclusion in a study done in CMC Vellore by George John¹⁹.

NEURO OPHTHALMOLOGIC SIGNS AND OUTCOME

The absence of Oculocephalic, Oculovestibular response, pupillary and corneal reflexes suggested poor prognosis with a mortality of 86.66%, 93.33%, 87.5% and 88.23% respectively. Table showing combined

absence of OVR, OCR, Pupillary and corneal reflex shows that all the 24 patients with absent oculovestibular, oculocephalic, papillary and corneal reflex had a mortality of 100%. Even Plum and Carona's finding in their study of 48 patients was similar⁸. In LEVI et al's series, 120 out of 500 had similar findings, and only one of them regained consciousness to die 2 weeks later²⁰. Thus the accuracy of predictability of death increases when combination of signs rather than when single clinical sign is used.

CONCLUSION:

By interpreting the coma score and brainstem reflexes one can decide in choosing intensive (and expensive) therapy for patients most likely to benefit. Thus Simple, repeated painstaking observation at the bedside can help us predict the outcome of brain damage of whatever etiology.

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