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ASSESSEMENT OF COGNITIVE DYSFUNCTION IN ADULTS WITH MILD HEAD INJURY: A PROSPECTIVE STUDY

Neurosurgery

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ABSTRACT

BACKGROUND: Minor traumatic brain injury accounts for about 70% of the head injuries. The major dysfunctions which goes unnoticed are cognitive, behavioral and personality related complaints.

METHODS: A total of 166 cases of mild head injuries were included in the study. The outcome assessment was based upon the MMSE scale and tests like trail making A,B, naming, memory-(immediate, delayed), attention, language abstraction, orientation fluency, calculation visuoperception done immediately, after one week, 3 and 6 month.

RESULTS: 79.5% of patients were < 40 years. 81 patients had abnormal NCCT. MMSE scores were affected significantly in the group of frontal, temporal and parietal lesions both sided. Trail-A, B, abstraction, attention and arithmetic continued to show statistical difference followed by attention, memory, visuospatial and visuoperception. Least affected were naming ,language, abstraction, orientation.

CONCLUSION: MMSE scores improved in both with abnormal and normal NCCT at 6 months but the cognitive tests showed significant impairment.

KEYWORDS

Post traumatic amnesia (PTA), Mini mental state examination (MMSE), Computed tomography(NCCT), Glasgow coma scale(GSC)

INTRODUCTION

Traumatic brain injury (TBI), a significant public health and socioeconomic problem, is a leading cause of disability and mortality in all regions of the globe despite advancement in prevention and treatments. Its glob al incidence is rising, and it is predicted to surpass many diseases as a major cause of death and disability by the year 2020.[1] TBI is the main cause of one-third to one-half of all trauma deaths and the leading cause of disability in people under forty, severely disabling 15–20/100,000 populations per year.[2]

TBI is a leading cause of mortality, morbidity, disability, and socioeconomic losses in India as well. It is estimated that nearly 1.5–2 million persons are injured, and 1 million die every year in India. [3]

Motor vehicle accidents are the most common mode of injury followed by falls and inter personal violence. Minor traumatic brain injury accounts for about 70% of the head injuries. Most patients of this group remain unattended and untreated. The major dysfunction occurring which goes unnoticed are cognitive, behavioral and personality related complaints. These lead to work leaves, inefficiency. They are frequent and substantial source of stress and disability to the survivors and their families. Various neuropsychological tests are being developed by many to rate the amount of dysfunction in terms of cognition.

The major parameters tested are attention, memory, visuospatial, orientation, naming, processing speed and executive functioning. Rehabilitation of these individuals is a major issue in patients of head injury to make them able to lead a social and financially sound life and make their work and living environment suitable to the patient abilities. Hence we conducted this study: To evaluate cognitive dysfunction in mild head injury, correlate NCCT findings with the cognitive dysfunction immediately and follow up patients at 7 days, 3months, 6months intervals.

MATERIALAND METHODS:

A total of 166 TBI cases who were meeting inclusion and exclusion criteria were included in the study. The study was conducted in the Neurosurgery Department, VMMC and Safdarjung hospital between 2015-2017. Inclusion criteria: All adults with age 18-60 years with a Glasgow coma scale (GCS)-14,15 were taken into study. Exclusion criteria: Patients with moderate to severe head injury, with associated abdominal, chest trauma and spinal injury, age<18 yrs, previous psychiatric disease, chronic alcoholic or drug addict, critical ill, hemodynamically unstable, premorbid history of focal brain disease, history of previous head injury, <4 grade education and not willing to participate in the study.

A complete history and clinical examination was done. The patients classified into different groups based on severity of injury as assessed by GCS score. The outcome assessment was based upon the Mini mental state examination (MMSE) scale and the Safdarjung battery of tests: 1.Trail making test-A,B 2.Naming, 3.Memory-immediate,delayed, 4.Attention, 5.Language, 6.Abstraction 7.Orientation 8.Fluency 9.Calculation 10.Visuoperception. Imaging findings was correlated with observed cognitive dysfunction. Progression of cognitive dysfunction and recovery of function monitored immediately at presentation, at one week, at three months and subsequently at six months. Informed consent was obtained. All information was kept confidential.

STATISTICALANALYSIS:

Data was analysed in using SPSS software version 19.0. For qualitative data Chi square and Fischer exact test was used. For quantitative data Mann Whitney and student independent 't' test was used. A p value of <0.05 was considered statistically significant.

RESULTS: Of the 166 patients in our study 79.5% of all patients fall in the age <40 years. 76.51% patients were male. All patients were educated, of them 57.23% patients were 12 and above. 84.34% patients had GCS-15 and 15.66% had GCS-14. Posttraumatic amnesia (PTA) was present in 30.12% patients. In the study 51.2% patients had normal NCCT head findings and 48.80% patients had abnormal CT findings. Majority (97.59%) of the patients were right handed.

Of all patients with GCS-15, 23.23% of the patients had PTA and 70.83% of the patients presenting with GCS-14 had PTA. Of the total 166 patients, 33 patients had GCS -15 and PTA of which 45.45% had a normal NCCT, 54.54% had an abnormal NCCT head. 17 patients were of the GCS-14 and had PTA-of which 23.52% had a normal NCCT, and 76.47% had abnormal NCCT findings. Majority (65.66%) patients of the total 166 had GCS-15 and no PTA. 58.71% cases had normal

NCCT and 41.28% had abnormal NCCT. Of the 7 patients who had GCS-14 and no PTA-71.42% patients had an abnormal NCCT head.

We found statistically significant improvement and recovery in the scores of the patients both with normal and abnormal NCCT findings and also a difference in the patients with GCS-15 and PTA and in those with GCS-14 with or without PTA.

Table1:MMSE IN NORMAL NCCT

	0DAY	7DAYS	3MONTHS	6MONTHS	N=85
GCS-15 with PTA	25; 5.48	27.46; 1.98	28.92; 1.44	29.23,1.23	13
GCS-14 with PTA	27.87; 1.69	28.65; 1.51	29.1; 1.34	29.36; 1.18	66
GCS-15 without PTA	21.25; 7.18	24; 2.94	26,0.81	26.5;0. 57	4
GCS-14 without PTA	15; 4.24	23.5; 2.14	25.5; 2.12	26.5; 2.12	2

Table2: MMSE IN ABNORMAL NCCT

	0DAY	7DAYS	3MNTHS	6MNTHS	N=81
GCS-15 with PTA	19.17; 5.13	24.23; 4	26.82; 3.55	27.82; 2.40	17
GCS-14 with PTA	24.5; 4.82	27.61; 3.06	28.36; 2.31	28.72; 2.03	44
GCS-15 without PTA	12.93; 3.03	23.86; 2.26	27.13; 2.61	27.86; 2.26	15
GCS-14 without PTA	18.6; 5.54	26.2; 3.63	27.8; 3.34	29.2; 1.78	5

SUBGROUP 1. Age ≤40 YEARS, EDUCATION ≥4 TO 11GRADE -TOTAL NO. OF PATIENTS (48), MMSE-N≥27

There was an improvement in the GCS scores over the 6 months of follow-up. When we compared patients with normal and abnormal NCCT and the tests employed, no differences in the language function, Naming, memory, fluency, calculation but visuoperception showed significant difference, which improved in both and showed no significant difference at 3 months and later. Orientation, visuospatial and digit-span function were affected in patients with abnormal NCCT, improved in both and showed no statistical difference at 6months. Trail-A, B, abstraction, attention and arithmetic continued to show statistical difference even at 6 months in both the subgroups.

Table 3: COGNITIVE FUNCTION TESTS AND NCCT (SUBGROUP 1)

TESTS	NCCT NORMAL(n=19)	NCCT ABNORMAL (n=29)	P-VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	57.03±16.47	79.58 ±35.18	0.005
TRAIL-A-3MNTHS	53.83±13.77	71.16±29.74	0.014
TRAIL-6MNTHS	49.141±0.88	64.32±26.44	0.021
TRAIL-B 7DAYS	141.45±38.26	183.68±60.94	0.014
TRAIL-B 3MNTHS	131.41±33.4	168.37±52.31	0.015
TRAIL B-6MNTHS	123.52±30.5	142.42±41.23	0.049
NAMING-7 DAYS	2.79±0.41	2.42±0.61	0.019
NAMING-3MNTHS	2.93±0.26	2.84±0.37	0.329
NAMING-6 MNTHS	2.97±0.9	2.95±0.23	0.761
MEMORY-7DYS	3.76±0.83	3.1±0.81	0.014
MEMORY-3MNTHS	4.38±0.73	4±0.94	0.166
MEMORY-6MNTHS	4.72±0.53	4.42±0.77	0.147
ATTENTION-7 DAYS	4.24±0.91	3.58±1.02	0.024
ATTENTION-3MNTHS	4.76±0.99	4.16±0.96	0.037
ATTENTION-6MNTHS	5.17±0.8	4.63±0.9	0.024
LANGUAGE-7DAYS	1.79±0.41	1.58±0.61	0.195
LANGUAGE 3MNTHS	1.97±0.19	1.95±0.23	0.761
LANGUAGE-6MNTHS	2±0	2±0	1.000
ABSTRACTION-7 DAYS	2.59±0.63	2±0.82	0.007
ABSTRACTION-3MNTHS	2.79±0.41	2.37±0.5	0.003
ABSTRACTION-6MNTHS	2.9±0.31	2.58±0.51	0.011
ORIENTATION7 DAY	5.45±1.02	4.63±1.34	0.017
ORIENTATION-3	5.79±0.62	5.37±1.01	0.037
ORIENTATION-6	5.86±0.44	5.63±0.68	0.148
FLUENCY-7DAYS	1.14±0.64	0.79±0.71	0.026
FLUENCY-3MNTHS	1.55±0.69	1.37±0.9	0.084
FLUENCY-6MNTHS	1.83±0.38	1.53±0.51	0.145
CALCULATION-7 DAYS	2.97±0.19	2.47±0.61	0.003
CALCULATION-3MNTHS	2.97±0.19	2.9±0.32	0.327
CALCULATION-6MNTHS	2.97±0.19	2.9±0.32	0.327
VISUOPERCEPTION-7DAYS	1.72±0.75	1.1±1.1	0.036
VISUOPERCEPTION-3MNTHS	2.14±0.79	1.68±0.82	0.052
VISUOPERCEPTION-6MNTHS	2.45±0.69	2.1±0.81	0.096
VISUOSPATIAL-7DAYS	2.97±0.73	2.21±1.03	0.009
VISUOSPATIAL-3MNTHS	3.31±0.6	2.74±0.93	0.027
VISUOSPATIAL-6MNTHS	3.38±0.62	2.9±0.94	0.069
ARITHMATIC-7DAYS	14±2.28	12.32±2	0.004
ARITHMATIC-3MNTHS	14.83±1.91	13.37±1.83	0.010
ARITHMATIC-6MNTHS	15.45±1.86	14.32±1.97	0.022
DIGIT SPAN-7 DAYS	1.14±0.69	0.63±0.68	0.018
DIGIT SPAN-3MNTHS	1.55±0.63	1.16±0.69	0.041
DIGIT SPAN-6MNTHS	1.69±0.47	1.47±0.51	0.139

When we compared patients with and without PTA, a significant difference was seen in Trail-A, B; memory, attention, abstraction, orientation, fluency, visuoperception, visuospatialand arithmetic tests. Language showed a difference in the first 7 days; naming for the first 3 months. Calculation and digit span showed no difference from the beginning.

TABLE 4: COGNITIVE FUNCTION TESTS WITH AND WITHOUT PTA (SUBGROUP 1)

TESTS	PTA present (9)	PTA absent (39)	P-VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	103.25±31.59	58.72±20.06	0.001
TRAIL-A-3MNTHS	94.5±31.2	54.15±13.38	0.0005
TRAIL-6MNTHS	81.38±29.73	50.1±12.24	0.003
TRAIL-B 7DAYS	233.75±48.38	143.64±38.57	0.001
TRAIL-B 3MNTHS	211.25±40.51	133.59±33.76	0.001
TRAIL B-6MNTHS	180.5±42.92	121.64±25.07	0.003
NAMING-7 DAYS	2.25±0.46	2.72±0.51	0.030
NAMING-3MNTHS	2.62±0.52	2.95±0.22	0.025
NAMING-6 MNTHS	2.88±0.35	2.97±0.16	0438
MEMORY-7DYS	2.62±0.74	3.67±0.81	0.010
MEMORY-3MNTHS	3.5±0.76	4.36±0.78	0.017
MEMORY-6MNTHS	4±0.93	4.72±0.51	0.042
Attention-7DAYS	2.75±0.89	4.23/0.84	0.002
ATTENTION-3MNTHS	3.38±1.19	4.74±0.82	0.013
ATTENTION-6MNTHS	4±0.93	5.13±0.73	0.005
LANGUAGE-7 DAYS	1.25±0.71	1.8±0.41	0.033
LANGUAGE-3MNTHS	1.88±0.35	1.97±0.16	0.438
LANGUAGE-6MNTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	1.5±0.93	2.54±0.6	0.006
ABSTRACTION 3MNTHS	2.12±0.35	2.72±0.46	0.006
ABSTRACTION-6MNTHS	2.38±0.52	2.85±0.37	0.015
ORIENTATION-7 DAYS	4.12±0.99	5.31±1.17	0.013
ORIENTATION-3MNTHS	5.12±0.83	5.72±0.79	0.016
ORIENTATION-6MNTHS	5.38±0.74	5.85±0.49	0.029
FLUENCY-7DAYS	0.38±0.52	1.13±0.66	0.018
FLUENCY-3MNTHS	0.88±0.64	1.59±0.55	0.013
FLUENCY-6MNTHS	1.25±0.46	1.8±0.41	0.008
CALCULATION-7 DAYS	2.5±0.53	2.82±0.45	0.099
CALCULATION-3MNTHS	2.88±0.35	2.95±0.22	0.716
CALCULATION-6MNTHS	2.88±0.35	2.95±0.22	0.716
VISUOPERCEPTION-7DAYS	0.5±0.76	1.67±0.87	0.006
VISUOPERCEPTION-3MNTHS	1.12±0.64	2.1±0.75	0.004
VISUOPERCEPTION-6MNTHS	1.5±0.53	2.49±0.68	0.002
VISUOSPATIAL-7DAYS	1.5±0.93	2.9±0.75	0.002
VISUOSPATIAL-3MNTHS	2.38±0.52	3.23±0.78	0.008
VISUOSPATIAL-6MNTHS	2.5±0.76	3.33±0.74	0.015
ARITHMATIC-7DAYS	10.62±1.6	13.92±2.74	0.001
ARITHMATIC-3MNTHS	12.25±1.28	14.69±1.88	0.004
ARITHMATIC-6MNTHS	13.12±1.13	15.41±1.9	0.004
DIGIT SPAN-7 DAYS	0.5±0.53	1.03±0.74	0.178
DIGIT SPAN-3MNTHS	0.88±0.83	1.49±0.6	0.076
DIGIT SPAN-6MNTHS	1.38±0.52	1.64±0.49	0.275

We found 42.85% had mild, moderate impairment in 19.04%, 38.07% had severe impairment abnormal MMSE score. 42.85% recovered in 7 days, 71.42% patients in 3 months, 90.47% recovered in 6 months and no recovery was seen in 9.52%cases.

There was a significant difference in the MMSE scores with PTA (p=0.006) and abnormal NCCT (p=0.001), although an insignificant difference was seen among those with differences in GCS (p=0.073). We found there was a significant abnormal MMSE score association between the poor GCS and presence of PTA with abnormal NCCT findings (p=0.021). There was significant statistical difference in the recovered and the unrecovered population upto 7 days. But even though the MMSE scores improve there is no ststistical significance in the population in those patients who recovered after 3 months in the scoring for different tests and performed poorly inspite of the improving MMSE scores.

SUBGROUP 2. AGE ≤40YEARS AND EDUCATION ≥12GRADE -TOTAL No. Of PATIENTS n=84, MMSE N≥27

There was improvement in the GCS scores of the patients during the follow-up of six months. In our study when we compared NCCT with the tests, we found there was a statistical difference in all tests except, naming,language and calculation which did not have any difference in scoring from the beginning. Abstraction and orientation differed only upto first 3months.Trail-A,B,fluency were the most affected. Attention,visuospatial,visuoperception, arithmatic and digit span were less affected.

TABLE 5: NCCT WITH COGNITIVE FUNCTION TESTS(SUBGROUP 2)

TESTS	NCCT NORMAL (n=46)	NCCT-ABNORMAL (n=38)	P-VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	41.66±16.57	63.65±26.65	0.0001
TRAIL-A-3MNTHS	37.97±12.57	55.37±20.85	0.0001
TRAIL-6MNTHS	33.58±10.25	49.2±18.77	0.0001
TRAIL-B 7DAYS	110.92±30.97	145.22±51.96	0.0002
TRAIL-B 3MNTHS	102.94±23.5	129.91±40.38	0.0003
TRAIL B-6MNTHS	94.24±16.06	17.37±31.51	0.0001
NAMING-7 DAYS	2.9±0.31	2.67±0.6	0.62

NAMING-3MNTHS	2.95±0.23	2.89±0.38	0.532
NAMING-6 MNTHS	3±0	2.94±0.25	0.111
MEMORY-7DYS	4.53±0.73	3.8±1.11	0.002
MEMORY-3MNTHS	4.84±0.44	4.5±0.78	0.014
MEMORY-6MNTHS	4.97±0.16	4.76±0.52	0.017
Attention-7DAYS	5.11±1.13	4.17±1.34	0.001
ATTENTION-3MNTHS	5.5±0.8	4.96±1.15	0.026
ATTENTION-6MNTHS	5.76±0.54	5.39±0.93	0.045
LANGUAGE-7 DAYS	1.92±0.27	1.85±0.36	0.305
LANGUAGE-3MNTHS	2±0	1.98±0.15	0.363
LANGUAGE-6MNTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	2.76±0.54	2.5±0.69	0.033
ABSTRACTION 3MNTHS	2.95±0.23	2.72±0.58	0.030
ABSTRACTION-6MNTHS	2.97±0.16	2.87±0.4	0.144
ORIENTATION-7 DAYS	2.79±0.58	5.3±1.01	0.008
ORIENTATION-3MNTHS	5.95±0.23	5.74±0.61	0.051
ORIENTATION-6MNTHS	6±0	5.89±0.48	0.11
FLUENCY-7DAYS	1.74±0.55	1.24±0.82	0.002
FLUENCY-3MNTHS	1.84±0.37	1.59±0.62	0.04
FLUENCY-6MNTHS	1.95±0.23	1.76±0.48	0.032
CALCULATION-7 DAYS	2.92±0.27	2.8±0.5	0.284
CALCULATION-3MNTHS	3±0	2.96±0.21	0.196
CALCULATION-6MNTHS	3±0	2.98±0.15	0.363
VISUOPERCEPTION-7DAYS	2.55±0.76	1.76±1.14	0.001
VISUOPERCEPTION-3MNTHS	2.66±.0.66	2.17±0.97	0.008
VISUOPERCEPTION-6MNTHS	2.87±0.34	2.48±0.66	0.002
VISUOSPATIAL-7DAYS	3.58±0.76	2.04±1.13	0.022
VISUOSPATIAL-3MNTHS	3.79±0.53	3.46±0.84	0.031
VISUOSPATIAL-6MNTHS	3.9±0.31	3.65±0.57	0.025
ARITHMATIC-7DAYS	17.24±2.43	14.7±3.06	0.0002
ARITHMATIC-3MNTHS	18.16±2.02	16.28±2.7	0.002
ARITHMATIC-6MNTHS	18.87±1.68	17.22±2.42	0.002
DIGIT SPAN-7 DAYS	1.79±0.48	1.39±0.74	0.006
DIGIT SPAN-3MNTHS	1.92±0.27	1.67±0.52	0.010
DIGIT SPAN-6MNTHS	1.97±0.16	1.78±0.47	0.017

TABLE 6: COGNITIVE FUNCTION TESTS WITH AND WITHOUT PTA(SUBGROUP 2)

TESTS	PTA PRESENT (25)	PTA ABSENT (59)	P VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	78.32±25.52	45.25±18.44	0.0001
TRAIL-A-3MNTHS	66.73±16.48	41.41±15.48	0.0001
TRAIL-6MNTHS	56.72±15.02	37.27±41.1	0.0001
TRAIL-B 7DAYS	160.89±40.32	115.19±34.15	0.0001
TRAIL-B 3MNTHS	150.36±33.24	104.76±25.08	0.0001
TRAIL B-6MNTHS	136.22±30.76	97.64±20.1	0.0001
NAMING-7 DAYS	2.56±0.62	2.93±0.31	0.0001
NAMING-3MNTHS	2.89±0.32	2.97±0.18	0.034
NAMING-6 MNTHS	2.94±0.24	2.98±0.13	0.212
MEMORY-7DYS	2.67±0.97	4.46±0.82	0.0001
MEMORY-3MNTHS	4.5±0.71	4.81±0.51	0.0001
MEMORY-6MNTHS	4.72±0.57	4.95±0.22	0.004
Attention-7DAYS	3.78±1.31	5.05±1.06	0.0001
ATTENTION-3MNTHS	4.78±1.17	5.25±0.75	0.0001
ATTENTION-6MNTHS	5.33±0.84	5.76±0.57	0.0001
LANGUAGE-7 DAYS	1.83±0.38	1.97±0.18	0.0001
LANGUAGE-3MNTHS	2±0	2±0	0.004
LANGUAGE-6MNTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	2.44±0.7	2.8±0.45	0.0001
ABSTRACTION 3MNTHS	2.94±0.24	2.88±0.38	0.0001
ABSTRACTION-6MNTHS	2.94±0.24	2.95±0.29	0.001
ORIENTATION-7 DAYS	5.06±0.87	5.85±0.52	0.0001
ORIENTATION-3MNTHS	5.78±0.43	5.95±0.29	0.0001
ORIENTATION-6MNTHS	6±0	5.98±0.13	0.001
FLUENCY-7DAYS	1.17±0.79	1.68±0.6	0.0001
FLUENCY-3MNTHS	1.67±0.49	1.8±0.45	0.004
FLUENCY-6MNTHS	1.83±0.38	1.92±0.34	0.0001
CALCULATION-7 DAYS	2.78±0.43	2.98±0.13	0.0001
CALCULATION-3MNTHS	3±0	3±0	0.0001
CALCULATION-6MNTHS	3±0	3±0	0.004
VISUOPERCEPTION-7DAYS	1.72±1.13	2.44±0.82	0.0001
VISUOPERCEPTION-3MNTHS	2.22±0.88	2.63±0.69	0.0002
VISUOPERCEPTION-6MNTHS	2.56±0.62	2.8±0.41	0.0002
VISUOSPATIAL-7DAYS	2.72±0.12	3.6±0.66	0.0001

VISUOSPATIAL-3MONTHS	3.28±0.83	3.83±0.46	0.0001
VISUOSPATIAL-6MONTHS	3.7±0.46	3.88±0.33	0.0001
ARITHMATIC-7DAYS	12.73±2.67	17±2.38	0.0001
ARITHMATIC-3MNTHS	14.76±2.23	28±2.15	0.0001
ARITHMATIC-6MNTHS	15.78±1.89	18.63±1.89	0.0001
DIGIT SPAN-7 DAYS	1.22±0.81	1.81±0.39	0.0001
DIGIT SPAN-3MNTHS	1.78±0.43	1.88±0.33	0.0001
DIGIT SPAN-6MNTHS	1.94±0.24	1.93±0.25	0.0001

Statistical significance is seen in all tests except naming and language at 6months.

Of the 84 patients in this group,36 patients had abnormal MMSE scores at 0day of testing, 30.5% had mild, 33.3% had moderate , 33.33% had severe and 2.77% had grave impairment. Out of the 36 patients, 44.44% patients recovered by 7 days, 75% by 3months, 86.11% recovered by 6months but 13.8% did not show any recovery. In this group we found that all significant contributed to poor MMSE scoring-GCS if less than14 ($p<0.0001$), presence of PTA ($p<0.001$) and NCCT findings ($p<0.0001$).

When comparing the difference in tests in those recovered and not recovered-patients with an abnormal NCCT showed difference in all tests upto 7 days, at 3months significant difference was not found in language, calculation, naming, abstraction and orientation and visuoperception.

SUBGROUP 3. AGE ≥40 YRS, EDUCATION ≥4 TO 11GRADE, MMSE N≥26, TOTAL NO. OF PATIENTS(23)

There was an improvement in the MMSE scores over the follow-up time period. When comparing patients with the poor test scores with NCCT. Trail-B was the only test which showed a statistical significance all throughout the follow-up i;e it clearly remained impaired till the end of 6 months. Attention and Trail-A recovered by 3 months; orientation, abstraction, arithmetic, visuospatial functions showed a difference till the first week. Language, fluency, calculation, naming, memory, visuoperception and digit span did not show any difference in the scoring from the start of the study.

TABLE 7: COGNITIVE FUNCTION AND NORMAL AND ABNORMAL NCCT (SUBGROUP 3)

TESTS	NCCT NORMAL(12)	NCCT ABNORMAL(11)	P VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	58.17±23.28	72.27±17.09	0.036
TRAIL-A-3MNTHS	54.33±18.74	66.09±15.42	0.043
TRAIL-6MNTHS	49.42±15.61	57.82±10.37	0.060
TRAIL-B 7DAYS	140.67±52.03	172.73±40.77	0.033
TRAIL-B 3MNTHS	129.5±47.02	155.64±35.36	0.038
TRAIL B-6MNTHS	123.83±46.96	132.54±17.32	0.038
NAMING-7 DAYS	2.83±0.39	2.46±0.52	0.062
NAMING-3MNTHS	2.83±0.39	3±0	0.166
NAMING-6 MNTHS	3±0	3±0	1.000
MEMORY-7DYS	3.7±0.87	3.54±0.82	0.289
MEMORY-3MNTHS	4.33±0.98	4.18±0.6	0.329
MEMORY-6MNTHS	4.75±0.62	4.73±0.47	0.638
Attention-7DAYS	3.83±1.03	3.46±0.82	0.030
ATTENTION-3MNTHS	4.75±0.75	4.18±0.6	0.040
ATTENTION-6MNTHS	5.33±1.07	4.64±0.5	0.241
LANGUAGE-7 DAYS	1.75±0.45	1.73±0.47	0.903
LANGUAGE-3MNTHS	1.83±0.39	2±0	0.166
LANGUAGE-6MNTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	2.58±0.67	2±0.45	0.016
ABSTRACTION 3MNTHS	2.92±0.29	2.54±0.69	0.104
ABSTRACTION-6MNTHS	2.92±0.29	2.91±0.3	0.950
ORIENTATION-7 DAYS	5.5±1	4.91±0.7	0.036
ORIENTATION-3MNTHS	5.75±0.62	5.73±0.47	0.638
ORIENTATION-6MNTHS	5.83±0.58	5.91±0.3	1.000
FLUENCY-7DAYS	1.17±0.72	0.82±0.75	0.258
FLUENCY-3MNTHS	1.58±0.67	1.09±0.7	0.079
FLUENCY-6MNTHS	1.67±0.65	1.46±0.69	0.360
CALCULATION-7 DAYS	2.92±0.29	2.91±0.3	0.950
CALCULATION-3MNTHS	3±0	3±0	1.000
CALCULATION-6MNTHS	3±0	3±0	1.000
VISUOPERCEPTION-7DAYS	1.83±0.94	1±0.89	0.049
VISUOPERCEPTION-3MNTHS	2.17±1.03	1.54±0.52	0.059
VISUOPERCEPTION-6MNTHS	2.33±0.98	1.82±0.6	0.060
VISUOSPATIAL-7DAYS	3±0.74	2.46±0.52	0.022
VISUOSPATIAL-3MNTHS	3.17±0.83	3.09±0.3	0.377
VISUOSPATIAL-6MNTHS	3.42±0.67	3.09±0.3	0.105
ARITHMATIC-7DAYS	13.67±2.23	12.18±1.4	0.025
ARITHMATIC-3MNTHS	14.75±2.26	13.18±1.33	0.050
ARITHMATIC-6MNTHS	15.17±1.99	14.18±1.08	0.065
DIGIT SPAN-7 DAYS	1.25±0.75	0.64±0.67	0.056
DIGIT SPAN-3MNTHS	1.5±0.67	1.18±0.6	0.194
DIGIT SPAN-6MNTHS	1.67±0.65	1.46±0.52	0.236

When comparing patients with the poor test scores in patients with and without PTA;Trail-A,B showed a statistical differnce in scoring at all duration during the follow-up; attention and fluency had a differnce till 1 week. No significant difference was seen in tests like naming, memory, language ,abstraction ,orientation,calculation,visuospatial ,visuoperception,arithmatic and tests for digit span.

TABLE 8: COGNITIVE FUNCTION TESTS AND PTA (SUBGROUP 3)

TESTS	PTA PRESENT(12)	PTA ABSENT(11)	P VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	75.91±22.84	52.54±12.52	0.025
TRAIL-A-3MNTHS	69.36±19.05	49.64±10.77	0.019
TRAIL-6MNTHS	60.18±14.18	45.73±9.4	0.023
TRAIL-B 7DAYS	179.82±54.81	130±28.28	0.039
TRAIL-B 3MNTHS	163.73±50.27	118.73±19.55	0.019
TRAIL B-6MNTHS	142.18±44.06	111.82±16.45	0.016
NAMING-7 DAYS	2.64±0.5	2.73±0.47	0.356
NAMING-3MNTHS	2.91±0.3	2.91±0.3	0.953
NAMING-6 MNTHS	3±0	3±0	1.000
MEMORY-7DYS	3.36±1.03	4±0.45	0.103
MEMORY-3MNTHS	4±1	4.54±0.52	0.337
MEMORY-6MNTHS	4.54±0.69	4.91±0.3	0.261
Attention-7DAYS	3.27±0.79	4.09±0.94	0.015
ATTENTION-3MNTHS	4.27±0.9	4.73±0.47	0.213
ATTENTION-6MNTHS	4.54±0.82	5.54±0.69	0.068
LANGUAGE-7 DAYS	1.64±0.5	1.82±0.4	0.534
LANGUAGE-3MNTHS	1.91±0.3	1.91±0.3	0.953
LANGUAGE-6MNTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	2±0.63	2.64±0.5	0.055
ABSTRACTION 3MNTHS	2.54±0.69	2.91±0.3	0.261
ABSTRACTION-6MNTHS	2.82±0.4	3±0	0.319
ORIENTATION-7 DAYS	4.91±0.94	5.54±0.82	0.176
ORIENTATION-3MNTHS	5.64±0.67	5.82±0.4	0.732
ORIENTATION-6MNTHS	5.73±0.65	6±0	0.320
FLUENCY-7DAYS	0.91±0.7	1.09±0.83	0.046
FLUENCY-3MNTHS	1±0.63	1.64±0.67	0.846
FLUENCY-6MNTHS	1.27±0.79	1.82±0.4	0.134
CALCULATION-7 DAYS	2.82±0.4	3±0	0.319
CALCULATION-3MNTHS	3±0	3/0	1.000
CALCULATION-6MNTHS	3±0	3±0	1.000
VISUOPERCEPTION-7DAYS	1.09±0.83	1.82±1.08	0.182
VISUOPERCEPTION-3MNTHS	1.46±0.69	2.27±0.9	0.096
VISUOPERCEPTION-6MNTHS	1.73±0.79	2.46±0.82	0.099
VISUOSPATIAL-7DAYS	2.54±0.69	3±0.63	0.155
VISUOSPATIAL-3MNTHS	2.91±0.7	3.36±0.5	0.210
VISUOSPATIAL-6MNTHS	3.09±0.54	3.46±0.52	0.262
ARITHMATIC-7DAY	12.46±2.07	13.54±1.92	0.250
ARITHMATIC-3MNTHS	13.46±2.16	14.54±1.86	0.319
ARITHMATIC-6MNTHS	14.27±1.79	15.09±1.58	0.330
DIGIT SPAN-7 DAYS	0.82±0.75	1.0±0.83	0.710
DIGIT SPAN-3MNTHS	1.27±0.79	1.46/0.52	0.720
DIGIT SPAN-6MNTHS	1.46±0.69	1.730.47	0.324

Of the 23 patients,12 of them showed abnormal MMSE scoring, of these 25% had mild, 33.33% moderate, 41.66% had severe impairment in MMSE scores; of the12 pts 33.33% improved in 7 days,75% by 3months and 83.33% recovered by 6 months and 16.66% failed to show recovery in the MMSE scores. There was significant difference with abnormal MMSE scoring with GCS -14 (p=0.037), with PTA present (p=0.003) and NCCT findings(p=0.012).

Again there was statistical significance in that the patients with a poor GCS and PTA both and presence of any one of both (0.004). Except for naming and calculation all tests show a differnce in the scores at 7days when comparing those patients with a normal and those with abnormal scoring of MMSE.Those patients with recovery in MMSE scores at 7 days showed still a difference in scores of Trail-A,B. At 3months and 6 month the scores of the tests showed no difference among those recovered and those unrecovered.

SUBGROUP 4: AGE>40 YRS, EDUCATION ≥12 GRADE, TOTAL NO. OF PATIENTS-(11),MMSE-≤27

There was an improvement in the MMSE scoring with time. When Comparing between the scoring in those with an normal and abnormal NCCT-Only Trail-A,B showed a significant change in the scores when followed up for 6 months. memory, fluency and visuospatial function were affected till 3 months. Rest all tests were statistically insignificant throughout the period.

TABLE 9: COGNITIVE FUNCTION TESTS WITH NCCT(SUBGROUP 4)

TESTS	NCCT NORMA(6)	NCCT ABNORMAL(5)	P VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	42.5±7.64	75.2±28.02	0.013
TRAIL-A-3MNTHS	39.67±8.14	63.08±20.05	0.017
TRAIL-6MNTHS	37.33±7.45	54.8±20.18	0.035
TRAIL-B 7DAYS	105.67±13.47	179.2±76.83	0.010
TRAIL-B 3MNTHS	99.67±11.41	149.2±58.42	0.013
TRAIL B-6MONTHS	97±11.92	127.2±41.58	0.045
NAMING-7 DAYS	3±0	2.8±0.45	0.273
NAMING-3MONTHS	3±0	2.8±0.45	0.273
NAMING-6 MONTHS	3±0	3±0	1.000
MEMORY-7DAYS	4.67±0.52	3.6±0.89	0.024
MEMORY-3MONTHS	5±0	4.2±0.84	0.036
MEMORY-6MONTHS	5±0	4.4±0.89	0.104
Attention-7DAYS	4.83±0.75	3.6±1.14	0.069
ATTENTION-3MONTHS	5.17±0.41	4.4±1.52	0.340

ATTENTION-6MONTHS	5.67±0.52	4.8±1.1	0.106
LANGUAGE-7 DAYS	2±0	1.8±0.45	0.273
LANGUAGE-3MONTHS	2±0	1.8±0.45	0.273
LANGUAGE-6MONTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	2.83±0.41	2.2±0.84	0.134
ABSTRACTION 3MONTHS	2.83±0.41	2.4±0.89	0.351
ABSTRACTION-6MONTHS	3±0	2.8±0.45	0.273
ORIENTATION-7 DAYS	6±0	5.4±0.89	0.104
ORIENTATION-3MONTHS	6±0	5.6±0.89	0.273
ORIENTATION-6MONTHS	6±0	5.8±0.45	0.273
FLUENCY-7DAYS	1.83±0.41	0.8±0.84	0.034
FLUENCY-3MONTHS	1.83±0.41	1±0.71	0.041
FLUENCY-6MONTHS	2±0	1.6±0.55	0.102
CALCULATION-7 DAYS	3±0	2.8±0.45	0.273
CALCULATION-3MONTHS	3±0	3±0	1.000
CALCULATION-6MONTHS	3±0	3±0	1.000
VISUOPERCEPTION-7DAYS	2.33±0.52	1.6±0.89	0.103
VISUOPERCEPTION-3MONTHS	2.67±0.52	1.8±1.1	0.106
VISUOPERCEPTION-6MONTHS	2.83±0.41	2±1.22	0.134
VISUOSPATIAL-7DAYS	3.83±0.41	3±0.71	0.041
VISUOSPATIAL-3MONTHS	3.83±0.41	3.2±0.84	0.036
VISUOSPATIAL-6MNTHS	4±0	3.2±0.84	0.134
ARITHMATIC-7DAYS	17±1.9	13±4.95	0.074
ARITHMATIC-3MONTHS	17.17±2.14	14.2±4.82	0.270
ARITHMATIC-6MONTHS	18±1.9	15.6±4.34	0.351
DIGIT SPAN-7 DAYS	1.5±0.55	1.2±0.84	0.545
DIGIT SPAN-3MONTHS	1.83±0.41	1.4±0.89	0.351
DIGIT SPAN-6MONTHS	2±0	1.8±0.45	0.273

TABLE10: COGNITIVE FUNCTION TESTS AND PTA (SUBGROUP 4)

TESTS	PTA PRESENT(4)	PTA ABSENT(7)	P VALUE
	MEAN±S.D	MEAN±S.D	
TRAIL-A-7DAYS	65±31.22	46.57±10.31	0.217
TRAIL-A-3MNTHS	60.67±26.63	42.14±8.57	0.249
TRAIL-6MNTHS	58±26.91	37.71±5.59	0.193
TRAIL-B 7DAYS	173.33±101.16	111.43±16.64	0.300
TRAIL-B 3MNTHS	153.33±83.86	104.86±13.8	0.357
TRAIL B-6MNTHS	135.33±56.23	98.86±12.27	0.300
NAMING-7 DAYS	2.67±0.58	3±0	0.264
NAMING-3MNTHS	2.67±0.58	3±0	0.264
NAMING-6 MNTHS	3±0	3±0	1.000
MEMORY-7DYS	4±1.73	4.29±0.49	0.813
MEMORY-3MNTHS	4.33±1.15	4.86±0.38	0.265
MEMORY-6MNTHS	4.33±1.15	5±0	0.074
Attention-7DAYS	4±2	4.43±0.79	0.807
ATTENTION-3MONTHS	4.33±2.08	4.86±0.38	0.250
ATTENTION-6MONTHS	4.67±1.53	5.43±0.53	0.447
LANGUAGE-7 DAYS	1.67±0.58	2±0	0.264
LANGUAGE-3MONTHS	1.67±0.58	2±0	0.264
LANGUAGE-6MONTHS	2±0	2±0	1.000
ABSTRACTION-7DAYS	2±1	2.71±0.49	0.319
ABSTRACTION 3MONTHS	2±1	2.86±0.38	0.183
ABSTRACTION-6MONTHS	2.67±0.58	3±0	0.264
ORIENTATION-7 DAYS	5.33±1.15	5.86±0.38	0.633
ORIENTATION-3MONTHS	5.33±1.15	6±0	0.264
ORIENTATION-6MONTHS	5.67±0.58	6±0	0.264
FLUENCY-7DAYS	1±1	1.57±0.79	0.447
FLUENCY-3 MONTHS	1±1	1.71±0.49	0.275
FLUENCY-6MONTHS	1.67±0.58	2±0	0.052
CALCULATION-7 DAYS	2.67±0,58	3±0	0.264
CALCULATION-3MNTHS	3±0	3±0	1.000
CALCULATION-6MONTHS	3±0	3±0	1.000
VISUOPERCEPTION-7DAYS	1.67±1.53	2.14±0.38	0.935
VISUOPERCEPTION-3MONTHS	2±1.73	2.43±0.53	0.780
VISUOPERCEPTION-6MONTHS	2±1.73	2.57±0.53	0.756
VISUOSPATIAL-7DAYS	3.33±1.15	3.57±0.53	0.665
VISUOSPATIAL-3MONTHS	3.33±1.15	3.71±0.49	0.484
VISUOSPATIAL-6MONTHS	3.33±1.15	3.86±0.38	0.265
ARITHMATIC-7DAYS	13±7.21	16.57±1.72	0.339
ARITHMATIC-3MNTHS	13.67±7.09	17±1.41	0.329

ARITHMATIC-6MONTHS	14.67±6.11	18±1.29	0.404
DIGIT SPAN-7 DAYS	1±1	1.43±0.53	0.447
DIGIT SPAN-3MONTHS	1.33±1.15	1.71±0.49	0.765
DIGIT SPAN-6MONTHS	1.67±0.58	2±0	0.264

No statistical difference was seen in patients scoring of tests with and without PTA. All scores were inconclusive.

Of the 5 patients who had abnormal NCCT, 3 patients had mild,2 moderate and 1 severe impairment in the MMSE scores –of the 5 patients 40% had recovered their MMSE scores by 7 days, 60% recovered by 3 mnths,80% recovered by 6 months and 20% showed no recovery. No significant difference was seen in the MMSE scores between patients with GCS<14, PTA or abnormal NCCT. Similarly no statistical significance was seen in patients with poor GCS and PTA (p=0.402). No comparable difference was seen in the scoring of tests in patients with normal and abnormal MMSE scores over the time of 0 day, 7 day, 3months, 6months .

Of the total 166 patients in our study, 81 patients had abnormal NCCT findings and 85 patients had normal NCCT head. Majority of the lesions occur in frontal and frontotemporal area.

TABLE11: SITE OF LESION IN ABNORMAL NCCT

NCCT ABNORMAL N=81	PERCENTAGE
LT FRONTAL CONTUSIONS	4.93%(4)
RT FRONTAL CONTUSIONS	8.64%(7)
RT FRONTAL CONTUSIONS	2.46%(2)
B/L FRONTAL PARIETEL CONTUSIONS	3.70%(3)
B/L FRONTAL TEMPORAL CONTUSIONS	8.64%(7)
B/L FRONTAL CONTUSIONS	8.64%(7)
RT FRONTOPARIETEOTEMPORAL CONTUSIONS	4.93%(4)
LT FRONTAL CONTUSIONS	1.23%(1)
RT PARIETEL CONTUSIONS	1.23%(1)
LT PARIETEL CONTUSIONS	1.23%(1)
LT TEMPOROPARIETEL CONTUSIONS	1.23%(1)
TEMPORAL CONTUSIONS	6.17%(5)
OCCIPITAL CONTUSIONS	3.70%(3)
SDH	11.11%(9)
EDH, PNEUMOCEPHALUS	32.09%(26)

MMSE scores were affected significantly in the group of frontal, temporal and parietal lesions both left and right side. Scores failed to return to normal by 6months in frontoparietal and temporoparietal lesions. Trail-A,B, attention, arithmatic and digit span all were affected in those with frontotemporal lesions more on left side. Naming, memory, language ,abstraction, orientation, visuospatial and visuoperception were affected in all patients with all lesions. Fluency was affected in all patients with frontotemporal lesions. Calculation was unaffected. Lt frontotemporal contusions affect the trail-A,B,arithmatic, digit span,visuoperception and visuospatial ,memory and little effect on tests like naming,orientation, fluency, attention, calculation, language and abstraction. Rt frontotemporal affects all above with major impairment of trail-A,B, arithmatic, digit span scores alongwith fluency.Temporal contusions affect all with sever impairment in memory, attention and fluency along with tests of trail-A,B, arithmatic tests.Visuoperception and visuospatial tests were severly affected in those with right frontoparietal lesions along with other tests. Patients with bilateral frontal and bilateral frontotemporal area lesions show severe affections in the trail-A,B, arithmatic scores but naming was found more impaired in fronal lesions and frontotemporal lesions showed maximum impairments in attention, language and abstraction. The more the no of lobes involved so increase in the impairment in MMSE scores

DISCUSSION:

Of the 166 patients in our study 79.5% of all patients fall in the age <40 yrs ,76.51% patients were male. All patients were literate, of them 57.23% patients were 12th grade and above, and rest were between grades 4-11. As patients in our study comprised of mild head injury-84.34% patients had GCS-15 and 15.66% had GCS-14. Majority were right handed (97.59%). Our results are similar to other studies. [4,5]

PTA was present in 30.12% patients. Of all patients with GCS-15, 23.23% of the patients had PTA, and 70.83% of the patients presenting with GCS-14 had PTA. 51.2% patients had normal NCCT head findings and 48.80% patients had abnormal CT findings. Of the total 166 patients, 33 patients had GCS -15 and PTA of which 45.45% had a normal NCCT, 54.54% had an abnormal NCCT head. 17 patients were of the GCS-14 and had PTA-of which 23.52% had normal NCCT, and 76.47% had an abnormal NCCT findings. Majority (65.66%) patients had GCS-15 and no PTA-58.71 normal NCCT and 41.28% had abnormal NCCT. Of the 7 patients who had GCS-14 and no PTA-71.42% patients had an abnormal NCCT head. There was statistically significant improvement and recovery in the MMSE scores of the patients both with normal and abnormal NCCT findings and also a difference in the patients with GCS-15 and PTA and in those with GCS-14 with or without PTA and a significant difference in the MMSE scores with decreased mean scores in patients with PTA and poor GCS(14).

The study population was divided into 4 subgroup to avoid the confounding factors of age and occupation. There was improvement in the MMSE scores over the 6 months of follow-up in all subgroups. Comparison between the scoring in those with an normal and abnormal NCCT- In the first group; patients between the two subgroups-no difference in the language function. Naming, memory, fluency, calculation and visuoperception showed difference which improved in both and showed no significant difference at 3 months and later. Orientation, visuospatial and digit-span function were affected in patients with abnormal NCCT, improved in both and showed no statistical difference at 6months. Trail-A, B, abstraction, attention and arithmetic continued to show statistical difference even at 6 months in both the groups.

In second group;there was a statistical difference in all tests except, naming, language and calculation which did not have any difference in scoring from the beginning. Abstraction and orientation differed only upto first 3months.Trail-A,B, fluency were the most affected. Attention, visuospatial, visuoperception, arithmatic and digit span were less affected.

In the 3rd group; Trail-B was the only test which showed a statistical significance all throughout the follow-up i;e it clearly remained impaired till the end of 6 months. Attention and Trail-A recovered by 6months; orientation, abstraction, arithmetic, visuospatial functions showed a difference till the first week. Language, fluency, calculation, naming, memory, visuoperception and digit span did not show any difference in the scoring from the start of the study

In group 4 Only Trail-A,B showed a significant change in the scores when followed up for 6 months. Memory, fluency and visuospatial function were affected till 3 months. Rest all tests were statistically insignificant throughout the period.

Comparison to see difference in the groups with and without PTA

In the first subgroup; significant difference is seen in Trail A, B; memory, attention, abstraction, orientation, fluency, visuoperception, visuospatial and arithmetic tests all throughout. Language showed a difference in the first 7 days; naming for the first 3 months. Calculation and digit span showed no difference from the beginning. In the second group;statistical significance is seen in all tests except naming and language at 6months. In group three;Trail-A,B showed a statistical differnce in scoring at all duration during the follw-up;attention and fluency had a differnce till 1 week. No significant difference was seen in tests like naming, memory, language, abstraction ,orientation, calculation, visuospatial ,visuoperception, arithmatic and tests for digit span. In the last group; no statistical difference was seen in patients scoring of tests with and without PTA. All scores were inconclusive.

In group 1; 21/48 patients had abnormal MMSE scores at day 0, 42.85% had mild, moderate in 19.04%, 38.07% had severe impairment in MMSE scores. Of the 21 patients- 42.85% recovered in 7 days,

71.42% patients ,90.47% recovered in 6 months and no recovery was seen in 9.52%. In group 2; of the 84 patients in this group, 36 patients had abnormal MMSE scores at 0 day of testing, 30.5% mild, 33.3% moderate , 33.33% severe and 2.77% had grave impairment. Out of the 36 patients, 44.44% patients recovered by 7 days, 75% by 3months, 86.11% recovered by 6months but 13.8% did not show any recovery. Of the 23 patients in group 3, 12 of them showed abnormal MMSE scoring, of them 25% had mild, 33.33% moderate, 41.66% had severe impairment in MMSE scores; of the12 patients 33.33% improved in 7 days, 75% by 3months and 83.33% recovered by 6 months and 16.66% failed to show recovery in the MMSE scores. In the last group; of the 5 patients who had abnormal NCCT of the 11 patients who had abnormal NCCT, 5 patients had mild, 4 mod and 2 severe impairment in the MMSE scores of the 11 patients-40% had recovered their MMSE scores by 7 days, 60% recovered by 3 months, 80% recovered by 6 months and 20% showed no recovery. Binder LM et al found in their meta-analysis of 312 patients suggested an approximately 5% deficit in cognitive function more than three months after mild traumatic brain injury. [6]

There was a significant difference in the MMSE scores with PTA and abnormal NCCT ,although an insignificant difference was seen among those with differences in GCS in all groups except the fourth one. In group 1;there is significant statistical difference in the recovered and the unrecovered population upto 7 days in all the test scores. But even though the MMSE scores improve there is no ststistical significance in the population in those patients who recovered after 3 months in the scoring for different tests and performed poorly inspite of the improving MMSE scores. In the 2nd group; when comparing the difference in tests in those recovered and not recovered-patients with an abnormal NCCT showed difference in all tests upto 7 days, at 3mnths only significant difference was not found in language, calculation, naming, abstraction and orientation and visuoperception. In group 3;except for naming and calculation all tests show a differnce in the scores at 7days when comparing those patients with a normal and those with abnormal scoring of MMSE.Those patients with recovery in MMSE scores at 7 days showed still a difference in scores of Trail-A,B. At 3mnths and 6 mnth the scores of the tests showed no difference in the scoring among those recovered and those unrecovered. No comparable difference was seen in the scoring of tests in patients with normal and abnormal MMSE scores over the time of 0 day, 7 days,3months, 6months in the last group in those recovered and unrecovered.

Of the total 166 patients in our study, 81 patients had abnormal NCCT findings and 85 patients had normal NCCT head. Majority of the parenchymal lesions occur in frontotemporal area, alone or involve 1,2 or ≥3 lobes. MMSE scores were affected significantly in the group of frontal,temporal and parietal lesions both left and right side. Scores failed to return to normal by 6months in frontoparietal and temporoparietal lesions.More severly affected the frontal than the temporal followed by the parietal and than the occipital lesions. MMSE scores and lobes involved: As the no of lobes involved increases, so does increase the impairment in MMSE scores. Trail-A,B.attention,arithmatic and digit span all were affected in those with frontotemporal lesions more on left side.Naming,memory,language, abstraction,orientation,visuospatial and visuoperception are affected in all patients with all lesionsFluency is affected in all patients with frontotemporal lesionsCalculation was unaffected significantly. Lt frontotemporal contusions affect the trail-A,B,arithmatic ,digit span,visuoperception and visuospatial ,memory and little effect on tests like naming,orientation,fluency,attention,calculation,language and abstraction.Rt frontotemporal affects all above with major impairment of trail-A,B,arithmatic,digit span scores along with fluency.

Temporal contusions affect all with sever impairment in memory,attention and fluency along with tests of trail-A,B,arithmatic tests.Visuoperception and visuospatial tests were severly affected in those with rt frontoparietal lesions along with other tests.Patients with bilateral frontal and bilateral frontotemporal area lesions show severe affections in the trail-a,b,arithmatic scores but naming was found more impaired in fronal lesions and frontotemporal lesions showed maximum impairments in attention,language and abstraction. Only a small percentage of patients with mild TBI demonstrate visible pathology such as fractures, contusions, and hemorrhages on head CT. In a review study that examined 4000 patients, 5-10% of mild TBI patients with a GCS score of 15 had an abnormal head CT. [7] In a similar study by Harad FT et al. only 20-30% of patients with initial GCS score of 13 had an abnormal head CT. [8]

Rajasekher R et al in their study found cognitive impairment was highest in individuals with frontal lobe injury (mean MMSE score– 24.13) followed by temporal lobe injury (mean MMSE score – 25.25) and parietal lobe injury (mean MMSE score 26.28). Individuals with no radiologically detectable injury had least cognitive impairment (mean MMSE score - 27.97) Disturbances of attention, memory, and executive functioning were the most common neurocognitive consequences of TBI at all levels of severity MMSE scores at the time of interview were positively correlated with Glasgow coma scale at the time of admission. The mean MMSE score was least in the individuals with frontal lobe injury (mean=24.13) followed by temporal (mean=25.25) and parietal (mean=26.28).Individuals with no radiologically detectable brain injury had higher MMSE scores (mean=27.97) than those with injury to any of the lobes of brain. [9]

Thurman DJ et al followed-up memory functions after head injury, patients were tested with P.G.I. Memory Scale. They found presence of fracture of skull or early neurological deficits was not associated with poor performance. Among contact injury patients, lateralization and location of the injury were not found to be discriminatory.[10] Sabhesan R et al concluded that lateralized cerebral dysfunctions in individual cases tended to obscure when mass-data were considered. Diffuse changes further tended to mask the focal effects in individual test performance. Effects of lateralization and localization in contact injuries did not reveal any significant difference, though overlap of diffuse disturbances was absent in these patients [11]

Eliane CM et al [12] in a study of 12 patients showed a significant impairment on their information processing speed. They found the second most affected function was verbal episodic memory recognition, followed by impairments in immediate verbal recall , delayed verbal recall and naming; further impairment in visuospatial recall and nominal verbal fluency. In terms of the associations between cognitive changes and localization of brain lesions, most patients with left frontal lesions presented important impairments especially on verbal episodic memory (delayed recall and recognition) and presented normal performance on visuospatial episodic memory (recognition), short-term memory, non-verbal skills. Patients with right and left hemisphere temporal lesions presented moderate to severe deficits in most cognitive functions. Significant impairments were observed on nominal verbal fluency, naming, and information processing speed in patients with left and right frontal-temporal lesions. The patient with right parietal lesion showed moderate to severe deficits in most of the functions evaluated, with performance within an expected range only on naming and non-verbal intellectual abilities.The patient with left temporal-parietal lesion presented severe deficits in verbal episodic memory (immediate, delayed recall and recognition), naming, categorical verbal fluency, information processing speed and normal performance on visuospatial immediate and delayed recall and recognition, short-term memory and visuoperceptive functions. The patient with right frontal-temporal-parietal lesion had a moderate to severe impairment on all functions evaluated, except for visuoperceptive functions. The patient with left parietal-occipital lesion showed a severe difficulty on information processing speed and nominal verbal fluency and moderate deficit on intelligence function. Memory, visuoperceptive and visospatial functions, mental flexibility and categorical verbal fluency were preserved.

CONCLUSION:

Motor vehicle accidents account for the highest mode of accidents. It was found that NCCT was found abnormal in patients with GCS-14 and PTA. MMSE scores improved in both patients with abnormal and normal NCCT at the 6 months with decreased recovery in patients with abnormal NCCT. Both an abnormal NCCT and PTA had an effect on both MMSE and the battery of tests. However, PTA has greater and long lasting effect than abnormal NCCT. Although MMSE scores reached a normal level, the cognitive function tests still showed significant impairment. Trail-A,B, arithmetic, digit span were the maximum affected followed by attention, memory, visuospatial and visuoperception. Least affected were naming, language, abstraction, orientation.

LIMITATIONS OF THE STUDY:

In our study sample size was small, hence study with large sample size should be done to confirm the results.

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REFERENCE:

1. World Health Organization. Projections of Mortality and Burden of Disease to 2030: Deaths by Income Group. Geneva; 2002 12/01/06.
2. Dikmen SS, Corrigan JD, Levin HS, Machamer J, Stiers W, Weisskopf MG. Cognitive outcome following traumatic brain injury. J Head Trauma Rehabil 2009;24:430-8.
3. Vakil E. The effect of moderate to severe traumatic brain injury(TBI) on different aspects of memory: a selective review. J Clin Exp Neuropsychol 2005;27:977-1021.
4. Ghajar J, Richard BI. The predictive brain state: timing deficiency in traumatic brain injury? Neurorehabil Neural Repair 2008;22: 217-227.
5. Katz RT, DeLuca J. Sequelae of minor traumatic brain injury. Am Fam Physician, 1992. 46:1491–8.
6. Binder LM, Rohling ML, Larrabee GJ. A review of mild head trauma. Part I: Meta-analytic review of neuropsychological studies. J Clin Exp Neuropsychol 1997;19:421-31.
7. Borczuk P. Predictors of intracranial injury in patients with mild head trauma. Ann Emerg Med,1995;25:731-36.
8. Harad FT, Kerstein MD. Inadequacy of bedside clinical indicators in identifying significant intracranial injury in trauma patients. J Trauma, 1992. 32:359–61.
9. Rajasekhar Reballi, Siva Prasad Kasimahanti, Incidence of epilepsy and cognitive impairment following traumatic brain injury: a hospital based cross-sectional study. Archive of mental health.2014(15)2:240-244.
10. Sniezek, J. E. Traumatic brain injury in the United States: A public health perspective. Journal of Head Trauma Rehabilitation, 1999, 14(6), 602-615.
11. Sabhesan R. Arumugham M.Natarajan: Clinical indices of head injury and memory impairments. Indian J. Psychiat. (1990), 32(4), 313-317.
12. Eliane Correa Miotto, Fernanda Zanetti Cinalli, Valéria Trunkl Serrao, Glaucia Guerra Benute, Mara Cristina Souza Lucial, Milberto Scaff: Cognitive deficits in patients with mild to moderate traumatic brain injury Arq Neuro psychiat. 2010;68(6):862-868