

# Clinical Study of Mild Traumatic Brain Injury: An Experience in a Tertiary Care Hospital in Central India

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## Abstract

**Introduction:** Mild traumatic brain injuries have been the subject of intense investigation in recent years. It is realized that in spite of apparently normal computed tomography (CT) head, there may be subtle organic brain damage associated with distressing neuropsychological sequelae. Minor head injury constitutes the major bulk ranging from 80% to 90% of all head injuries.

**Materials and Methods:** This study of 100 patients attending the neurosurgical care in Sanjay Gandhi Memorial Hospital and Shyam Shah Medical College, Rewa, for minor head injury based on certain criteria that loss of consciousness was <30 min and after gaining consciousness Glasgow coma scale was between 13 and 15.

**Results:** In our study, most of the patients had symptoms of headache, dizziness, giddiness, lack of concentration, and memory impairment. CT abnormality was detected in 14%, and magnetic resonance imaging changes were seen in 35%. Most of these symptoms resolved within 60 days and only 27% had symptoms persisted beyond 90 days. 12% of patients had persisting symptoms after 180 days. Few patients had behavior and personality changes.

**Conclusion:** This study confirms that due emphasis should be given for the patients of mild traumatic brain injury as they constitute 80-90% of head injury cases.

**Keywords:** Minor head injury, Persistent post-concussion syndrome, Post-concussion syndrome

## INTRODUCTION

Mild traumatic brain injuries have become the subject of intense investigation in the recent years. It has been realized that in spite of normal computed tomography (CT) head there may be subtle organic brain damage associated with distressing neuropsychological sequelae. A patient with mild traumatic brain injury is a person who has had a traumatically induced physiological disruption of

brain functions with altered sensorium or loss of consciousness for <30 min.<sup>1,2</sup>

### Epidemiology

Head injury is the most common type of trauma seen in developing and developed countries. Incidence of head injury patients; severe head injury - 5%, moderate head injury - 11%, and minor head injury - 84%.<sup>3</sup>

### Criteria of Mild Traumatic Brain Injury

Brain injury interdisciplinary special interest group is an interdisciplinary special interest group of American Congress of Rehabilitation Medicine.<sup>1</sup>

Criteria:

- Loss of consciousness should not exceed 30 min,
- After 30 min, initial Glasgow coma scale should be between 13 and 15,
- Post-traumatic amnesia does not exceed 24 h.

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## MATERIALS AND METHODS

The study was conducted over 100 patients from January 2014 to January 2015 with 6 months follow-up attending and admitted in neurosurgical care of Sanjay Gandhi Memorial Hospital and Shyam Shah Medical College, Rewa, Madhya Pradesh, India.

## RESULTS

About 80% the patients shown significant improvement in headache and giddiness but few complaints persisted such as lack of concentration, irritability, and change in behavior for a longer duration. This study confirms that due emphasis is to be given for the patients of mild traumatic brain injury as they comprise 80-85% of head injury patients (Table 1).<sup>3,4</sup> As it is clear that most of the patients had symptoms which were sufficient to disrupt their daily activities, making them unable to perform their routine work of maintenance.<sup>5</sup> Some of the patients became incapable to perform their job or execute their profession for significant periods.<sup>6</sup> Few of them had personality and behavioral changes.<sup>7-9</sup>

## DISCUSSION

Minor head injury constitutes the major bulk ranging from 80% to 90% of all head injuries. The patients suffer from multiple complaints even though the CT scans are apparently normal (Table 2). Majority of the patients have chief complaints of headache and dizziness (Table 3).<sup>8,10</sup> Headache is a very common presentation as observed by Brenner *et al.*<sup>11</sup> It is usually over vertex or occipitocervical region. In our study, 94 out of 100 study subjects had headache as their chief presenting complaint. Giddiness was the next major presentation (50%) along with headache in our study (Table 4). It was quite frequent while changing the posture of the body and is usually associated with the fracture of petrous part of temporal bone along with trauma to vestibular nerve/inner ear. This problem gradually settles down but sometimes takes very long periods to get controlled. A significant number of patients (56%) had a lack of concentration which was sufficient to disturb daily activities. Another interesting observation in our study was behavioral changes; 47% of patients had significant behavioral changes following minor head trauma. Rimel *et al.*<sup>6</sup> has also observed the behavior and personality changes in their study. Cognitive function like memory impairment was observed in 18% of patients in our study (post-traumatic amnesia) while the study by Levin *et al.*<sup>7</sup> long-term memory storage was impaired in 10% of cases with good recovery. Usually, post-traumatic amnesia is seen which gradually shrinks in its duration.

Persistent post-concussion syndrome is defined when the post-concussion symptoms persist beyond 90 days. In our

**Table 1: Duration of unconsciousness**

Duration in minutes	Male (60)	Female (40)
Transient loss to 5	36	24
6-10	12	8
11-20	10	6
21-30	2	2

**Table 2: GCS after regaining consciousness**

GCS	Male (60)	Female (40)
13	38	24
14	14	10
15	8	6

GCS: Glasgow coma score

**Table 3: Presenting complaints**

Complaints	Male (60)	Female (40)
Headache	54	40
Giddiness	20	30
Dizziness	6	10
Irritability	10	24
Behavioral changes	15	32
Lack of concentration	32	24
Memory impairment	10	8
Others	5	3

**Table 4: Average duration of symptoms after injury**

Duration of symptoms	Male (days)	Female (days)
Headache	30	50
Giddiness	16	30
Dizziness	10	12
Irritability	15	16
Lack of concentration	40	64
Memory disturbance	50	70
Abnormal behavior	12	18
Personality changes	40	30

study, 27% of patients had persistent post-concussion syndrome. Faux and Sheedy<sup>12</sup> in their study has shown 15.34% with persistent post-concussion syndrome while Jain *et al.*<sup>13</sup> had it in 30%. In our study, 12% of patients had some symptoms persisting even after 180 days (Table 5). Leddy *et al.*<sup>14</sup> has reported up to 33% patients having persistent symptoms after 180 days in minor head injuries in normal group and 10% in sports injury patients. After 1 year of initial trauma, only 2% of the patients had gross personality changes and social behavioral changes to the extent that they became misfit to the society.

It is correlated with the magnetic resonance imaging (MRI) findings that most of the patients had axonal damage in the medial part of temporal lobe<sup>15</sup> (dentate gyrus, subicular complex, and endorhinal cortex). Experimental studies by Kotapka *et al.*<sup>16</sup> and Smith *et al.*<sup>17</sup> also confirms the damage to a medial temporal lobe in

**Table 5: Persistent post-concussion syndrome**

Symptoms	>90 days		>180 days	
	Male	Female	Male	Female
Headache	15	12	7	5
Irritability	2	4	2	1
Giddiness	5	3	1	1
Changes in mood and behavior	2	1	1	1

**Table 6: Investigations used**

Investigations	Male	Female	Sensitivity (%)
CT abnormality	10/60	4/40	14
MRI abnormality	8/20	6/20	35

CT: Computed tomography, MRI: Magnetic resonance imaging

subjects with minor head injury. Another experimental study by Nakatomi *et al.*<sup>18</sup> has shown regeneration of hippocampal neurons. In the study by Kant *et al.*<sup>19</sup> they found 50% of the patients have revealed an abnormality in single photon emission CT (SPECT) study. At present SPECT appears to be the ideal investigation to study post-traumatic syndrome but further studies have to be done in this field.

CT scan has very low sensitivity<sup>20,21</sup> in picking up lesions in minor head injuries. Neuropsychological testing, evoked potential, P300 testing<sup>13</sup> (event-related evoked potential), positron emission tomography, SPECT<sup>19,22,23</sup> and MRI have been the tools to investigate minor head injuries and these correlated with cerebral dysfunction and with symptoms in case of minor head injuries. In our study, CT scan has shown 14% sensitivity. Agrawal and Mahapatra<sup>3</sup> has found 9% CT sensitivity and Kant *et al.*<sup>19</sup> 4.6%. MRI scan has shown 35% sensitivity in our study Jain *et al.*<sup>13</sup> has shown 46% MRI sensitivity (Table 6).

Most of the patients have responded to analgesics, antidepressants, vasodilators, anti vertigo medications, antiepileptics, antipsychotic drugs along with psychological support and behavioral therapy.<sup>24,25</sup> Neurotropic agents such as Piracetam<sup>26</sup> and citicoline have shown significant improvement in cognitive dysfunction.

## REFERENCES

- Mild Head Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine. Definition of mild traumatic brain injury. *J Head Trauma Rehabil* 1993;8:86-8.
- World Health Organization. International Statistical Classification of Disease and Related Health Problems. 10<sup>th</sup> ed. Geneva, Switzerland: World Health Organization; 1992.
- Agrawal D, Mahapatra AK. In: Mahapatra AK, Kamal R, editor. *Minor Head Injury in Text Book*. 4<sup>th</sup> ed. New Delhi, India: Modern Publishers; 2014. p. 194-8.
- Sullivan KA, Edmed SL, Cunningham LC. A comparison of new and existing mild traumatic brain injury vignettes: Recommendations for research into post-concussion syndrome. *Brain Inj* 2013;27:19-30.
- Hughenoltz H, Stuss DT, Stethem LL, Richard MT. How long does it take to recover from a mild concussion? *Neurosurgery* 1988;22:853-8.
- Rimel RW, Giordani B, Barth JT, Boll TJ, Jane JA. Disability caused by minor head injury. *Neurosurgery* 1981;9:221-8.
- Levin HS, Grossman RG, Rose JE, Teasdale G. Long-term neuropsychological outcome of closed head injury. *J Neurosurg* 1979;50:412-22.
- Gulbradsen GB. Neuropsychological sequelae of light headinjuries in older children 6 months after lightheaded trauma. *J Clin Neuropsychol* 1984;6:257-68.
- Barth JT, Errico DR. A mild head injury and post-concussion syndrome: Does anyone really suffer? *Clin Electroencephalogr* 1996;27:183-6.
- Watson MR, Fenton GW, McClelland RJ, Lumsden J, Headley M, Rutherford WH. The post-concussion state: Neurophysiological aspects. *Br J Psychiatry* 1995;167:514-21.
- Brenner C, Friedman AP, Merritt HH, Denny-Brown DE. Post traumatic head ache. *J Neurosurg* 1944;1:379-91.
- Faux S, Sheedy J. A prospective controlled study in the prevalence of posttraumatic headache following mild traumatic brain injury. *Pain Med* 2008;9:1001-11.
- Jain KC, Mahapatra AK, Walia BS. Objective assessment of post minor head injury syndrome. A P300 and blood flow velocity study. *Clin Neurol Neurosurg* 1997;99:574.
- Leddy JJ, Sandhu H, Sodhi V, Baker JG, Willer B. Rehabilitation of concussion and post-concussion syndrome. *Sports Health* 2012;4:147-54.
- Zola-Morgan S, Squire LR, Amaral DG. Human amnesia and the medial temporal region: Enduring memory impairment following a bilateral lesion limited to field CA1 of the hippocampus. *J Neurosci* 1986;6:2950-67.
- Kotapka MJ, Gennarelli TA, Graham DI, Adams JH, Thibault LE, Ross DT, *et al.* Selective vulnerability of hippocampal neurons in acceleration-induced experimental head injury. *J Neurotrauma* 1991;8:247-58.
- Smith DH, Lowenstein DH, Gennarelli TA, McIntosh TK. Persistent memory dysfunction is associated with bilateral hippocampal damage following experimental brain injury. *Neurosci Lett* 1994;168:151-4.
- Nakatomi H, Kuriu T, Okabe S, Yamamoto S, Hatano O, Kawahara N, *et al.* Regeneration of hippocampal pyramidal neurons after ischemic brain injury by recruitment of endogenous neural progenitors. *Cell* 2002;110:429-41.
- Kant R, Smith-Seemiller L, Isaac G, Duffy J. Tc-HMPAO SPECT in persistent post-concussion syndrome after mild head injury: Comparison with MRI/CT. *Brain Inj* 1997;11:115-24.
- Haydel MJ, Preston CA, Mills TJ, Luber S, Blaudeau E, DeBlieux PM. Indications for computed tomography in patients with minor head injury. *N Engl J Med* 2000;343:100-5.
- Stiell IG, Lesiuk H, Wells GA, McKnight RD, Brison R, Clement C, *et al.* The Canadian CT Head Rule Study for

- patients with minor head injury: Rationale, objectives, and methodology for phase I (derivation). *Ann Emerg Med* 2001;38:160-9.
22. Jacobs A, Put E, Ingels M, Put T, Bossuyt A. One-year follow-up of technetium-99m-HMPAO SPECT in mild head injury. *J Nucl Med* 1996;37:1605-9.
23. Nedd K, Sfakainakis G, Ganz W, Urichhio B, Vernberg D, Villaneva P, *et al.* 99Mtc-HMPAO SPECT of the brain in mild to moderate traumatic brain patients compared with CT--A prospective study. *Brain Inj* 1993;7:469-79.
24. Brooks DN. Recognition memory, and head injury. *J Neurol Neurosurg Psychiatry* 1974;37:794-801.
25. Yang CC, Tu YK, Hua MS, Huang SJ. The association between the postconcussion symptoms and clinical outcomes for patients with mild traumatic brain injury. *J Trauma* 2007;62:657-63.
26. Gouliaev AH, Senning A. Piracetam and other structurally related nootropics. *Brain Res Brain Res Rev* 1994;19:180-222.

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