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Neurosurgery

POSTTRAUMATIC BASIFRONTAL CONTUSION IN SOUTH INDIA: A PROSPECTIVE REVIEW

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KEYWORDS :

Introduction

Traumatic brain injury (TBI) is considered the most disabling of traumatic phenomena , almost always encompassing lifelong emotional, behavioral, and permanent physical impairment.(1,2) Long term disabilities are noted in more than half of the survivors. TBI is a broad term encompassing a multitude of injuries occurring to the brain. One of the most dangerous and dreaded varieties include basifrontal contusion.

Cerebral contusion is a bruise of the brain tissue. (3) The main pathophysiology includes the relative difference in the deceleration times of bony and parenchymal tissue of the skull as the head suddenly slows (eg. Road traffic accidents) and the subsequent damage to the brain as it collides with the hard unyielding calvarium. This leads to the shearing of blood vessels and collection of blood within the parenchyma of the brain in the frontal and basifrontal regions.

Cerebral contusions cause permanent damage to tissues of the cerebrum. The severity of the damage is related to the primary injury that is started by the kinetic energy absorbed by the collision and the cascade of secondary injury responses that exacerbate the primary damage. The hemorrhagic lesion is produced in the immediate moments after the head impact. (4)

The injury can cause a decline in mental function in the long term and in the emergency setting may result in brain herniation, a life-threatening condition in which parts of the brain are squeezed past parts of the skull.(5) In addition to the neurological deficits produced due to damage of the frontal lobes, death may also ensue following subsequent edema formation which then compresses upon the hypothalamus leading to a very poor outcome.

The most common cause of TBI and basifrontal contusions worldwide remain to be Road traffic accidents and with the increased availability of vehicles to the common man in recent times, this trend is unfortunately not going to reduce anytime soon. In this study, we aim to profile the cases of basifrontal contusions in our population and study the outcome of these cases at our hospital.

Materials and Methods

Study site: This study was conducted at Institute of neurosurgery, Madras Medical College and Research Institute

Study Population: A total number of eligible patients admitted in Institute of neurosurgery, Madras Medical College and Research Institute, during the study period of 2 years (January 2021–January 2023) were included in the study.

Sample Size: The sample size was 100 patients

Rationale for sample size: The sample size was calculated using the Leslie-Kish formula with expected proportion of 0.066, precision percentage of 5% and desired confidence interval of 95%.

Study design:
1. Explorative/descriptive study
2. Purposive sampling

Study Duration:
The study duration from January 2021 to January 2023 was taken. Initial data of cases of traumatic basifrontal contusions that presented to Institute of neurosurgery, Madras Medical College and Research Institute during this time period was recorded and followed up over a period of 6 months to yield useful data.

Inclusion Criteria:
All the patients admitted in Institute of neurosurgery, Madras Medical College and Research Institute, in the study duration and clinically diagnosed with basifrontal contusions were included in the study.

Exclusion Criteria:
Patients refusing to be a part of this study were excluded from the study.

Methodology and Procedure
Data of cases admitted with traumatic basifrontal contusions at Institute of neurosurgery, Madras Medical College and Research Institute during the time period were recorded and followed up over a period of 6 months to evaluate outcome of they fit into the inclusion criteria. After 6-month interval, necessary information was collected over a telephonic conversation. The data thus obtained was analayzed to yield useful information.

End Points of the Study:
The end points of the study measured age and sex distributions of the disease, the GCS at time of presentation, mode of presentation, type of management and outcome (both at discharge and at 6 months). Additional variables such as duration of hospital stay and comorbidities were documented and analyzed to yield useful data.

Analysis of data:
Collected data were analyzed and presented in the form of tables, figures, graphs, and diagrams wherever necessary.

Statistical Methods:
Descriptive statistics
1. Mean
2. Standard deviation
3. Frequency
4. Percentage.

Inferential statistics
1. Chi-square test (nonparametric data)
2. Cramer's *V* test (nonparametric data)
3. One-way ANOVA (parametric data).

Results

This retrospective observational study was carried out in Institute of neurosurgery, Madras Medical College and Research Institute, an apex tertiary care health center, in Chennai, Tamil Nadu. Cases from January 1, 2021, to January 31, 2023, were studied.
A total of 107 patients were obtained, but 7 patients had to be dropped due to lack of data.

The cases ranged from 18-60 years in age. Maximum patients presenting with basifrontal contusions were within 20-30 years age group (61%) (Figure 1). Seventy-seven patients were male (77%) as to the 23 females (23%) (Figure 2), bringing the male-to-female ratio to 2.98:1. This is in concert with the study done by Oertel et al [6]. The most

common occupations associated with the disease included salesmen (43%), engineers (32%), and students (18%) (Figure 3).

We see that the most common presenting GCS was that of a mild head injury variety (41%) followed by GCS 15 (38%) (Figure 4). A severe head injury GCS score was only noted in 9% patients. All cases of basifrontal contusion were of road traffic accidents of which the 2 wheeler related injuries ranged maximum (94%). Of these, 2 wheeler vs 2 wheeler injuries were maximum (76%) (Figure 5).

A conservative mode of management was followed for 83% of patients while only 17% underwent bifrontal decompressive craniectomy (Figure 6). Of the total number of cases that came, 57 were discharged home with varying degrees of neurological deficit while 43 (43%) succumbed to the injury (Figure 7). Most of these cases were from the low GCS category and all mortalities occurred within the initial admission. This is in concert with the study conducted by White et al. [7]

Discussion

Traumatic brain injury encompasses a spectrum of pathological features from axonal to hemorrhagic injuries. Of these, frontal cerebral contusions are a significant contributor to death and disability. [8,9] As a result of ongoing pathophysiological mechanisms initiated at the time of initial injury, the injury tends to exacerbate. Traumatic contusions are notorious to exacerbate leading to subsequent clinical deterioration and requirement for surgical intervention. [9,10]

Frontal contusions are often the result of sufficient inertial loading and acceleration combined with a sudden stop (i.e., head impact or abrupt change in the direction of the head's movement, which is often referred to as deceleration). This causes the brain to come into sudden contact with the internal surfaces of the skull. As the posterior areas within the skull are relatively smooth, primary contusion injuries in the posterior portions of the brain are rare in the absence of direct trauma to the occiput or posterior skull regions. The anterior and inferior portions of the brain (the frontal poles, orbitofrontal cortex, and anterior temporal lobes) become contused against the bony prominences of the skull (e.g., sphenoid wing and temporal fossa). The expansion (or blossoming) of the contusion may result in extensive frontal edema and hemorrhage either early after injury or even days later and may require neurosurgical intervention. [11] In addition to the above, the edema that then develops may compress upon the hypothalamus causing either direct injury or reduction in the levels of cortisol that may subsequently lead to the clinical deterioration of the patient. Routine testing f cortisol however is not recommended at present.

The frontal cortex is involved in a number of vital functions that govern the working of the body including but not limited to language and memory functionality. It helps to organize, plan and execute cognitive functions, and helps to maintain mood and behavior. Executive control is a critical aspect of cognition that is commonly impaired after traumatic brain injury. [11,12]

Despite all the advances in medicine, frontal contusions remain to be a feared entity with high morbidity and mortality. A testament to this fact is that the approach to management of these lesions has not changed much in the past fifty years and mainly includes use of antiedema measures, antiepileptic measures and in case of severe mass effect, a bifrontal decompressive craniectomy, a procedure with its own high morbidity and mortality rate. The fact that there is now increased accessibility of vehicles to the common man has only increased the frequency of encountering this dreaded pathology and that too in extreme debilitated conditions.

It is to be noted however that though there is a higher likelihood of frontal contusion progression compared to other lesions, many studies prefer to investigate the phenomenon of 'progressive hemorrhagic injury, which represents progression of subarachnoid hemorrhages (SAH), subdural hemorrhages (SDH), and extradural hemorrhages (EDH), in addition to contusions. [6,13,14]. This has led to limited profiling and identification of risk factors of this disease.

Conclusion

Despite gargantuan advances in the field of medical science, traumatic brain injuries and basifrontal contusions continue to remain a bane. This does not seem to be problem that is easily going away with the increasing availability of vehicular transport to the common man. The extreme morbidity and mortality associated with the disease remain largely unchanged. Educating the masses on the dangers remains the only viable option.

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Nil

Conflicts of interest
There are no conflicts of interest

Figures

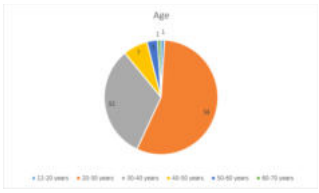

Figure 1: Age

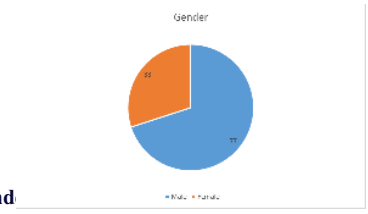

Figure 2: Gend

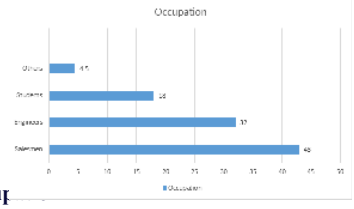

Figure 3: Occup

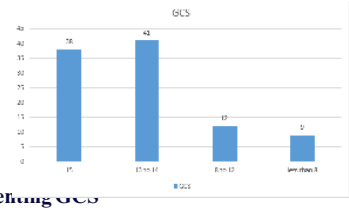

Figure 4: Presenting GCS

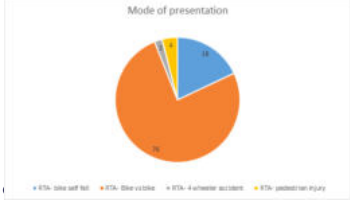

Figure 5: Mode

Figure 6: Mode

Figure 7: Outco

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