

ORIGINAL ARTICLE

Non Decompressive Single Stage Bilateral Craniotomy in Traumatic Brain Injury

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ABSTRACT

Background and Aim: There is a substantial morbidity and mortality associated with traumatic brain injury (TBI). TBI still results in cerebral edema, which increases intracranial pressure (ICP) and reduces cerebral perfusion pressure (CPP) after traumatic brain injury (TBI). The purpose of this study was to evaluate the non-decompressive single stage bilateral craniotomy (SSBC) in traumatic brain injury.

Patients and Methods: This prospective study was conducted on 44 TBI cases undergoing non decompressive single stage bilateral craniotomy (SSBC) in Neurosurgery Department of Prime Teaching Hospital, Peshawar from January 2022 to June 2022. All the patients underwent computed tomogram images and those fulfilling the inclusion criteria were enrolled. Demographic details, background parameters, measurement of intracranial pressure (ICP), and outcome were recorded.

Results: Of the total 44 TBI patients, 32 (72.7%) were male and 12 (27.3%) were females. Age-wise distribution of patients were as follows: 3 (6.8%) in <20 years, 10 (22.7%) in 21-40 years, 16 (36.4%) in 41-60 years, 11 (25%) in 61-80 years, and 4 (9.1%) in >80 years. Glasgow comma scale at the time of admission and discharge were compared. Bilateral Csdh was the most prevalent diagnosis found in 16 (36.4%) patients followed by Bifrontal contusion 9 (20.5%), Bifrontal Edh with contralateral contusion 6 (13.6%), Bifrontal Edh 6 (13.6%), Bilateral temporal contusion 4 (9.1%), Unilateral Asdh with Contralateral Edh 2 (4.5%), and Bilateral Fronto-parietal Edh 1 (2.3%). Outcome of the non-decompressive SSBC in TBI were as follows: LAMA 5 (11.4%), discharged 28 (63.6%), Chest infection and tracheostomy 5 (11.4%), and expired 6 (13.6%) respectively.

Conclusion: Our study concluded that male patients were more vulnerable to traumatic brain injury. Majority of the cases belonged to the age group 41-60 years. Non-decompressive single stage bilateral craniotomy is an effective, reliable, and economical procedure to manage traumatic brain injury patients. Single anesthesia along with single incision, shorter hospital stay, and postoperative management similar to unilateral procedure were the major advantages of non-decompressive SSBC.

Keywords: Traumatic brain injury, Surgical treatment, Non-decompressive SSBC

INTRODUCTION

Cerebrospinal edema remains one of the major complications of traumatic brain injury (TBI), in addition to increasing intracranial pressure (ICP) and reducing cerebral perfusion pressure (CPP) [1]. A catastrophic outcome could result from this because it would have a cumulative impact on cerebral oxygen metabolism [2, 3]. Brain swelling is induced by TBI within three to four hours after the cerebral contusion [4]. Inflammatory cascades are activated with the breakdown of blood cells within 2–5 days [5, 6]. There are thousands of individuals' worldwide suffering from traumatic brain injury and this disease is extremely heterogeneous. The different types of head injuries have different morbidity and mortality rates. There are several protocols surgeons use in order to reduce intracranial pressure. Surgery is typically required for trauma injuries such as fractures and bruising [7, 8]. Recent years have seen significant improvements in TBI management through both medical and surgical methods. Hematomas, fractures, and malignant cerebral edema are common traumatic injuries that require surgery. The majority of surgical cases are unilateral, with bilateral indications being retained for bilateral hematoma [9, 10].

The most prevalent injury location was bifrontal contusion, followed by unilateral epidural hematoma and contralateral contusion [11]. Epidural hematomas were the most common form of pathological damage discovered. The TBI associated basic pathophysiological pathways is the rising cycle of brain swelling, increased ICP, decreased supply of oxygen and blood, failure of energy generation, and apoptosis. As a result, the patient's management should prioritize the preserving blood flow, reducing ICP, oxygen delivery, and the energy state of the brain. When the victims were newly admitted to the hospitals' intensive care units, the trauma scenario demanded such handling. SBC is an exceptional TBI therapy option. As a result, the current study sought to assess non-decompressive SSBC in TBI patients.

METHODOLOGY

This prospective study was conducted on 44 TBI cases undergoing non decompressive single stage bilateral craniotomy (SSBC) in Neurosurgery Department of Prime Teaching Hospital, Peshawar from January 2022 to June 2022. All the patients underwent computed tomogram images and those fulfilling the inclusion criteria were enrolled. Demographic details, background parameters, measurement of intracranial pressure (ICP), and outcome were recorded. Chronic subdural hematoma and aneurysm clipping were excluded. Surgical treatment inclusive criteria were as follows: hematoma >25 ml, midline shift >5 mm, and Characteristics of high intracranial pressure localization. A bicoronal incision with bilateral craniotomies or isolated individual craniotomies were used in the surgery. Supine on a head donut, the patient was placed, a bicoronal incision was performed, and the flap was raised forward. Depending on the findings, the incision may be prolonged a few millimetres anterior or posterior. A high speed craniotome was used to raise the bone flap independently after two burr holes were made bilaterally. The superior hematoma, mass effect side, temporal lesion side, or dominant side if lesions were ambiguous, was evacuated first, followed by the opposite side. On admission and discharge, the Glasgow coma scale (GCS), age, gender, location and kind of lesion, and the neurosurgical technique done were all noted. In cases where any neurological impairment found, a repeat scan was performed on the fifth day or sooner. At one month, the Glasgow Outcome Score (GOS) was used to assess the outcome.

RESULTS

Of the total 44 TBI patients, 32 (72.7%) were male and 12 (27.3%) were females. Age-wise distribution of patients were as follows: 3 (6.8%) in <20 years, 10 (22.7%) in 21-40 years, 16 (36.4%) in 41-60 years, 11 (25%) in 61-80 years, and 4 (9.1%) in >80 years. Glasgow coma scale at the time of admission and discharge were

compared. Bilateral Csdh was the most prevalent diagnosis found in 16 (36.4%) patients followed by Bifrontal contusion 9 (20.5%), Bifrontal Edh with contralateral contusion 6 (13.6%), Bifrontal Edh 6 (13.6%), Bilateral temporal contusion 4 (9.1%), Unilateral Asdh with Contralateral Edh 2 (4.5%), and Bilateral Fronto-parietal Edh 1 (2.3%). Outcome of the non-decompressive SSBC in TBI were as follows: LAMA 5 (11.4%), discharged 28 (63.6%), Chest infection and tracheostomy 5 (11.4%), and expired 6 (13.6%) respectively. Gender's distribution are revealed in Figure-1. Figure-2 illustrates the age-wise distribution. Glasgow coma score during admission and discharge are represented in Table-I. Patient's diagnosis are depicted in Figure-3. Surgery outcomes in both genders are depicted in Figure-4. Based on Glasgow outcome scale, surgery outcomes are demonstrated in Figure-5.

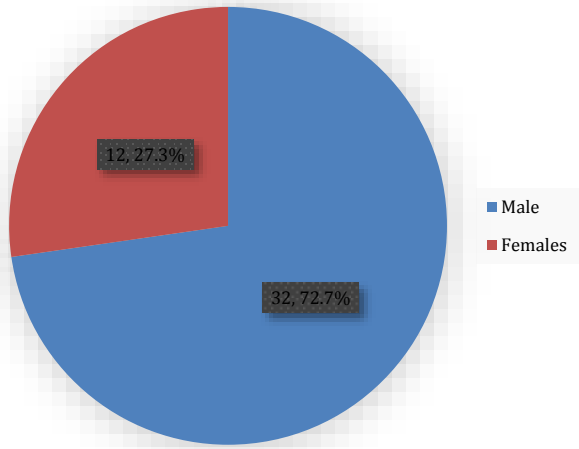


Figure-1: Gender's distribution (n=44)

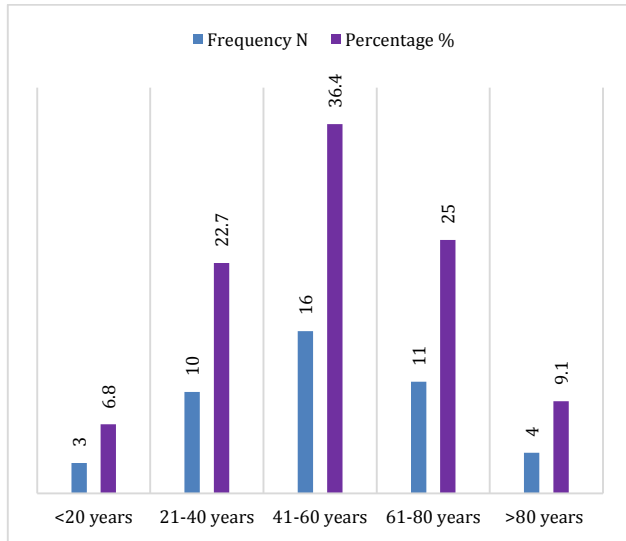


Figure-2: Age-wise distribution of all cases (n=44)

Table-1: Glasgow coma score during admission and discharge

GCS	GCS during admission N (%)	GCS during discharge N (%)
Less than 8	12 (27.3)	5 (11.4)
10-14	14 (31.8)	3 (6.8)
15-16	18 (40.9)	20 (45.5)
Total	44 (100)	28 (63.7)

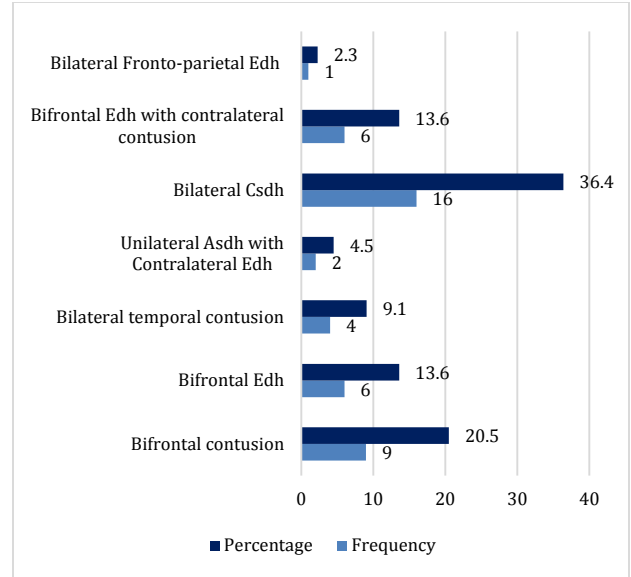


Figure-3: Patient's diagnosis (n=44)

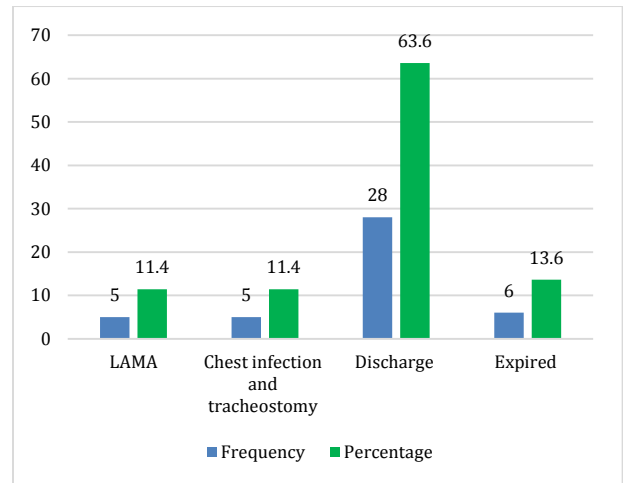


Figure-4: Surgery outcomes in both genders (n=44)

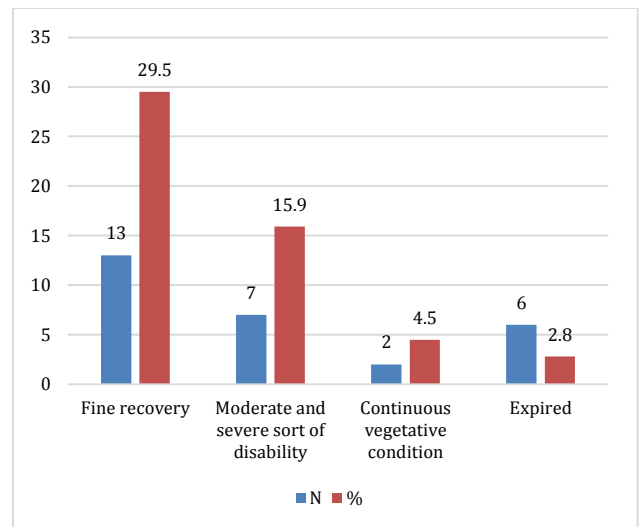


Figure-5: Based on Glasgow outcome scale, surgery outcomes

DISCUSSION

The present study mainly focused on the non-decompressive single stage bilateral craniotomy in traumatic brain injury and found that the majority of the cases were recorded between the ages of 41 to 60 years. The condition primarily affected middle-aged males. In terms of the severity of the traumatic brain damage, the cases were nearly comparable in number. Other patients got ventilator-acquired pneumonia, and some individuals had urinary tract infections as well as a case of wound infection. Despite advances in pharmacological therapies, standardization of surgical criteria and procedures, and the combination of both, TBI remains a serious health-care problem globally [12]. TBI surgery comprises instances with significant acute or chronic hematomas, penetrating injuries, depressed fractures, or severe brain swelling that is refractory to conventional care. There are no documented statistics in Pakistan for TBI patients having SSBC, however there are reports for other TBI operations [13, 14]. The majority of SSBC research focus on decompressive craniotomy, with detailed descriptions of indications, outcomes, and procedures [15, 16].

The exact rate of bilateral craniotomy remains unclear, the incidence of SSBC remains very low at just 4.6% [17]. Although TBI is more frequent in younger age groups, this study discovered that SSBC is more common in the middle and older age groups. The most prevalent reasons for SSBC were hemorrhage, contusion, and fractures which were comparable to neuro-trauma. The frontal and temporal lobes were the most commonly injured areas, which might explain direct impact and counter coup injuries.

Karmacharya et al., [18] reported that the fine recovery group comprised the majority of the patients, whereas the other groups contained about equal numbers of patients. Previous research has proven that the Glasgow coma scale is a solid prognosticating approach that has long been utilized in the treatment of traumatic brain injury. Most traumatic brain injuries occur in the parietal, temporal, or frontal regions, all instances of traumatic brain injuries can be operated on with a single incision in the bicoronal site. However, if the case involves an isolated bilateral temporal contusion, a single incision cannot be accomplished since two bilateral incisions are required [19, 20]. The care following the procedure is determined on the initial GCS and the patient's medical condition. In terms of cost, SSBC is considerably more cost efficient than other treatments, as it cuts intraoperative procedure costs by 50%. The hospital stay is likewise decreased to 2-5 days following SSBC, as are the many CT scans and pathology lab expenses. In certain circumstances, the issue of abrupt worsening of the surgery is also managed, usually when the lesion worsens. If there is a center that does not have intracranial pressure monitoring, this strategy may be beneficial [21, 22].

SSBC, like any other surgical treatment, has pros and cons. The benefits include single anesthetic and surgery expenses, the same postoperative care for unilateral treatments, a shorter hospital stay, the avoidance of potentially hazardous effects of increasing the opposite lesion, and a single wound scar. There are various potential drawbacks, including extensive operational times that may not be appropriate for the old or young, increased possibilities of infection/morbidity, difficulty in positioning, compromise in surgical evacuation, and the likelihood of bilateral neurological deficit.

CONCLUSION

The present study reported that male were more susceptible to traumatic brain injury. Majority of the cases belonged to the age group 41-60 years. Non-decompressive single stage bilateral craniotomy is an effective, reliable, and economical procedure to manage traumatic brain injury patients. Single anesthesia along with single incision, shorter hospital stay, and postoperative management similar to unilateral procedure were the major advantages of non-decompressive SSBC.

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