

Analysis Of Prognostic Factors and Post Operative Outcome of Decompressive Craniectomy for Traumatic Brain Injury: Study at A Government Hospital

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Abstract

Introduction: Since the start of the 21st century, India has emerged as one of the major economic superpowers. In the process of rapid urbanization and changing socio-economic equation, a number of health problems have also emerged with a significant increase in the number of Road Traffic Accidents (RTAs) and hence Traumatic Brain Injuries (TBI). India being the second largest in world population, over a quarter of the world's trauma deaths occur here. Decompressive craniectomy (DC) has emerged as an attractive treatment modality for patients with persistently elevated ICP or at risk of brain herniation after trauma. A number of factors like age, alcoholism, co-morbidities, GCS, pupillary size and reactivity, injury to surgery interval, laterality of lesion on CT and degree of midline shift, etc have major impact on the outcome which has been analyzed in this study.

Materials and Methods: An institution based prospective study was conducted at the Department of Neurosurgery, Rangaraya Medical College, Kakinada, Andhra Pradesh during the period of December 2018 to January 2021. About 200 patients of TBI were taken into the study, taking into consideration their age, sex, co-morbidities, mode of injury, clinical assessment, radiological evaluation and indications for surgery. Patients of TBI who were managed conservatively without any indication for surgery and previously operated cases, were excluded. After obtaining consent, the patients were operated and meticulously monitored in the post-operative period for any complication. The discharged patients were followed up in the outpatient department.

Results: The study included patients ranging from 10 years to above 70 years, however the majority were from the third, fourth and fifth decade of life (59%). There was a male to female ratio of 4.1:1. 36% of the patients had co-morbidities like DM, Hypertension, stroke, epilepsy, etc. Hypertension was found to be the most common (66.7%), followed by DM (37.5%). The overall mortality rate in our study was 56% (112 deaths out of 200 operated cases). According to age, the highest mortality was reported in ≥ 30 years age group (56.3%). In modes of injury, two-wheeler RTA was the leading killer with the highest mortality (63.9%). Highest death rate was reported in patients with GCS ≤ 8 at admission and immediate pre-op. Bilateral lesions had higher mortality (85.2%) than unilateral lesions (51.4%). Midline shift of more than 5mm had poorer survival (14.1%) than midline shift of less than 5mm (69.4%). Early surgery (within 24 hrs) had a lower mortality (37.4%) than late surgery at ≥ 24 hrs (59.3%).

Keywords: RTA, TBI, DC, mortality

INTRODUCTION

One of the earliest skills developed by human beings was that of drilling a hole in the head. Archeological studies have shown that trephination of skulls was practiced as early as 12,000 BC.² The practice of trephination was well-described in the Greek Era by Hippocrates. The use of "large" DC for patients with raised intracranial pressure following TBI was first reported by Kocher³. Recently there has been a renewal of interest in defining the use and benefits of

DC, with large number of publications on the topic over the past twenty years.

A DC is most commonly undertaken in comatose patients with an acute subdural hematoma (ASDH) and associated brain edema in the early phase after injury⁴. It can also be performed in comatose patients who have intraparenchymal hemorrhage or contusions (usually frontotemporal) with significant mass effect.

Less common indications include closed TBI with diffuse brain edema without any significant hematomas/contusions, gunshot wound with gross hemorrhage and edema; and severe blast injury with gross edema.⁵

OBJECTIVES

1. To evaluate the surgical treatment of TBI.
2. To assess the post-operative outcome and follow-up of TBI patients.

MATERIALS AND METHODS

It was a prospective study conducted at the Department of Neurosurgery, Rangaraya Medical College, Kakinada during the period of December 2018 to January 2021. About 200 patients of TBI were taken into the study, taking into consideration their age, sex, co-morbidities, mode of injury, clinical assessment, radiological evaluation and indications for surgery. Patients of TBI who were managed conservatively without any indication for surgery and previously operated cases were excluded.

Clinical diagnosis of TBI was made by the treating surgeon in the Department of Neurosurgery, based on presenting symptoms of headache, vomiting, seizures or any other feature suggestive of raised ICP. 18 A complete neurological examination was done; all findings- GCS, pupillary reactivity, BP, PR, associated extracranial injuries were noted. Radiological assessment in the form of CT Brain after resuscitating the patient was then performed. The patients were subjected to further investigations for anesthetic workup. As per the location of SDH/contusion and degree of midline shift, patients were advised decompressive craniectomy. The patients/attendants had been explained regarding intraoperative complications, postoperative complications and follow up.

After obtaining consent, the patients were operated and meticulously monitored in the post-operative period for any complication. The discharged patients were followed up in the outpatient department for a total postoperative period of 6 months.

RESULTS

Overall mortality in our study was 56% (112 out of 200 patients expired). Following is the analysis of survival and death rates under various parameters considered in the study.

According to age, the highest mortality was reported in ≥ 30 years age group (56.3%). In modes of injury, two-wheeler RTA was the leading killer with the highest mortality (63.9%) mainly because it is the main mode of transport in this region. Self-fall had the lowest mortality (29.6%). In 72 patients with co-morbidities, only 26.4% survived. Diabetics with pre-existing HTN had 100% mortality; followed by pure diabetics with 94.7% mortality. Among alcoholics, only 42.1% survived.

Highest death rate was reported in patients with $GCS \leq 8$ at admission and immediate pre-op (98.1%;98.2% respectively). Sinha *et al*⁶ reported a mortality of 41.7%. In our study, none of the patients with anisocoria survived.

Radiologically, maximum death rates were reported in patients with both acute SDH and contusions (73.6%); followed by acute SDH alone (47.5%) and contusions alone (37%). Bilateral lesions had higher mortality (85.2%) than unilateral lesions(51.4%).Midline shift of more than 5mm had poorer survival(14.1%) than midline shift of less than 5mm(69.4%).

Early surgery (within 24 hrs) was associated with a lower mortality (37.4%) than late surgery at ≥ 24 hrs(59.3%).

The Glasgow Outcome Score at discharge showed deaths in 112 patients (56%); unfavorable outcome in 18(9%) and favorable outcome in 70(35%) patients. The mean Glasgow Outcome Score at 3 months and 6 months follow-up showed no further mortality and the favorable outcome improved to 41.5% and 44% respectively. This was in contrast to another study on 72 patients conducted by Laghari *et al*⁷ in which Glasgow Outcome Score showed a favorable outcome of 46.6%; 50% and 51.4% at discharge;3 months and 6 months follow up respectively.

Table 1

PARAMETER WITH NO. OF PATIENTS	NO. OF PATIENTS SURVIVED WITH PERCENTAGE	NO. OF PATIENTS EXPIRED WITH PERCENTAGE
Age < 30 years (42)	19(45.2%)	23(54.8%)
Age > 30 years (158)	69(43.7%)	89 (56.3%)
Two-wheeler RTA (122)	44(36.1%)	78(63.9%)
Self-fall (27)	19(70.4%)	8 (29.6%)
Assault (8)	3(37.5%)	5(62.5%)
Co-morbidities (72)	19(26.4%)	53(73.6%)
Alcoholism (95)	40 (42.1%)	55(57.9%)
Anisocoria (70)	-	70(100%)
Midline shift<5mm (108)	75(69.4%)	33(30.6%)
Midline shift > 5mm (92)	13(14.1%)	79(85.9%)
Unilateral lesions (173)	84(48.6%)	89(51.4%)

Table 2

PARAMETER WITH NO. OF PATIENTS	NO. OF PATIENTS SURVIVED WITH PERCENTAGE	NO. OF PATIENTS EXPIRED WITH PERCENTAGE
Admission GCS \leq 8(104)	2(1.9%)	102(98.1%)
Admission GCS 9- 12(72)	70(97.2%)	2(2.8%)
Admission GCS 13- 15(24)	16(66.7%)	8(33.3%)
Pre-op GCS \leq 8(111)	2(1.8%)	109(98.2%)
Pre-op GCS 9-12(75)	71(94.7%)	4(5.3%)
Pre-op GCS 13-15(14)	13(92.9%)	1(7.1%)
Pure Acute SDH(40)	21(52.5%)	18(47.5%)

Pure Contusions(73)	46(63%)	27(37%)
Surgery within 24 hrs(173)	77(62.6%)	96(37.4%)
Surgery at ≥ 24 hrs(27)	11(40.7%)	16(59.3%)

DISCUSSION

Most commonly affected group with TBI in our area was between 20-50 years of age because they are the most active of all. Males were more commonly affected than females; male to female ratio was 4.1:1. Two-wheeler RTA was the most common mode of injury in this region. Alcoholism was one of the main factors (47.5%) associated with TBI. HTN and DM were the commonest associated co-morbidities. Variables like age, mode of injury, alcoholism, comorbidities, GCS, anisocoria, laterality of lesion, degree of midline shift on CT scan and injury-to-surgery interval, had a significant effect on the post-operative outcome of TBI. Older age, two-wheeler RTA under alcohol influence, assaults in elderly, co-existent DM & HTN, admission and pre-op GCS ≤ 8 , anisocoria, bilateral lesions >5 mm, late surgery were poor prognostic factors. Patients of GCS ≤ 8 with MLS ≥ 6 mm under alcohol influence had 100% mortality.

CONCLUSION

Decompressive craniectomy indeed has a definite and well-established role in management of TBIs. A number of factors like age, alcoholism, co-morbidities, GCS, pupillary size and reactivity, injury to surgery interval, laterality of lesion on CT and degree of midline shift, etc have major implications on the survival after surgery.

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