ORIGINAL ARTICLE

Outcome of surgery for operable supratentorial mass lesions in patients presenting with decerebration following severe head injury: A retrospective analysis of factors affecting outcome

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ABSTRACT

Aim: Abnormal motor response in the form of decerebration signifies either injury or compression of brain stem. The presence of decerebrate rigidity following head injury is a grave prognostic sign. Mortality may increase up to 70% in patients showing signs of decerebration. Although many studies have identified the prognostic factors in severe head injuries, few studies have focused on the operated patients with decerebration in predicting the long-term outcome. This study was planned to determine the outcome in this group of patients for prognostication and to help plan further line of management.

Materials and Methods: All the patients admitted with severe head injury with decerebration (M2 motor response) admitted in neurosurgery department from September 2009 to January 2011 were included in the study. All the patients had operable supratentorial mass lesions with no direct evidence of brain stem damage. Patients with penetrating injury and diffuse injury with no operative mass lesions were excluded from the study. Clinical and computerized tomography (CT) data were correlated with outcome retrospectively. Glasgow outcome scale (GOS) was used as a measure of functional outcome.

Results: The patients admitted with decerebration (M2 motor response) comprised 8% of the total head injury related operative procedures performed at our institute during the period. Of the 72 patients, 14 (19%) patients were more than 60 years old and 21% (15) were females. The surgical mass lesions comprised extradural hematoma in 27 (38%), cerebral contusions in 19 (26%), acute Subdural Hematoma alone in 7 (10%), and acute Subdural Hematoma (SDH) with cerebral contusion in 19 (26%) of the patients. Of the 72 patients, 36(50%) were operated within 24 hours of injury Follow-up of all, but 2 (3%) was obtained. Favorable outcome (GOS 4 and 5) was obtained in 14% ($n = 10$) of the patients with 83% ($n = 60$) mortality rate. The favorable outcome rate among the patients operated for Extradural Hematoma was 26% and for cerebral contusions was 11%. Only 5% of the patients operated for acute SDH survived.

Conclusion: Radiological diagnosis (type of lesion), followed by duration of decerebration and age of the patient are the most important prognostic factors determining the outcome of surgery in decerebrating patients. Our results confirm that despite the poor prognosis in decerebrate patients, a significant number of patients may still survive and have a good outcome.

Key words: Decerebrating patients, Glasgow outcome scale, severe head injury

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Introduction

The most significant factor prognosticating outcome in head injury is Glasgow Coma Score (GCS), with motor response pattern being the most specific one.[1-4] The presence of decerebrate rigidity following head injury is a grave prognostic sign of brain stem damage or brain stem compression secondary to tentorial herniation. The mortality in severe head injury (GCS <8) is approximately 33%,[5] but after the patient shows signs of decerebration, it may reach up to 70%.[6] Hence, proper planning and aggressive management becomes mandatory for achieving good results.

It, therefore, seemed of value to review our experience with these patients in an effort to obtain some indication for improving their care. Our primary objective was to determine the overall mortality and long-term functional outcome. Our secondary objective was to identify the risk factors allowing prediction of mortality and morbidity in this patient population.

Materials and Methods

The records of 72 consecutive operated patients with decerebrate rigidity secondary to cranial trauma admitted to the Department of Neurosurgery from September 2009 to January 2011 were studied retrospectively. All the patients were in GCS 4 (M2) at the time of operation. Patients were included in the study if this state was present on admission after resuscitation or if they deteriorated subsequently to this state after admission. All the patients had operable supratentorial mass lesions with no direct evidence of brain stem damage. Patients with gunshot wounds were excluded.

Immediately after admission, each patient was examined by a neurosurgeon. Efficient respiratory function was promptly restored and possible shock was properly treated. After initial resuscitation, they were evaluated and investigated. Computed tomography (CT) scan was done in all the patients, and if any significant operable lesion was found, they were operated immediately. The operative procedures included trephine craniotomies for the evacuation of Extradural Hematoma (EDH) and routine trauma flaps for acute Subdural Hematoma (DH) and cerebral contusions. Decompressive craniectomy was done as and when required based on intraoperative decision if brain swelling persisted after the evacuation of mass lesion. Postoperatively, patients were shifted to ward. Intensive clinical monitoring was done in all the patients with aggressive medical management protocols. Repeat CT scans were done after 24 h and as and when required. Intracranial pressure monitoring was not carried out in this series. Assisted ventilation was used as and when necessary. Tracheostomy was performed in patients as and when required.

The outcome was assessed on the basis of a Glasgow outcome scale (GOS): Grade I (death), Grade II (vegetative), Grade III (mostly dependent), Grade IV (minimally dependent), and Grade V (normal).[1,2] Patients were further classified into favorable (GOS 4 and 5) and unfavorable groups (GOS 1, 2, 3). Data were collected from the computerized data collection system in our department and patients followed telephonically or by post cards.

Results

Age and sex

A total of 72 patients admitted to our institute from September 2009 to January 2011 were included in our study. Out of these, 57 (79%) were males and 15 (21%) were females. Of the seventy two, 14 (19%) patients were more than 60 years old.

Presentation

Thirty-six patients (50%) presented to us after 24 h of injury and 36 (50%) presented less than 24 h of injury.

Radiological findings

Among the operable focal mass lesions, EDH was the commonest CT scan finding recorded in 27 patients (38%). This was followed by cerebral contusions in 19 patients (26%), acute SDH alone in 8 (10%), and acute SDH with cerebral contusion in 19 (26%) of the patients.

Operative procedures

Removal of EDH by craniotomy was done in 27 (38%) of patients and removal of SDH by trauma craniotomy was done in 8 (10%) patients. Removal of contusions and lobectomies as and when required was performed in 24 (33%) patients. Decompressive craniectomy with placement of bone flap in anterior abdominal wall was done in 16 (21%) patients as an intraoperative decision if brain swelling persisted after removal of the mass lesion.

Total mortality and outcome

Fifty-seven (79%) of the patients died during the hospital stay itself due to direct and indirect consequences of head injury. In all, 15 (21%) were discharged alive, though in the vegetative state. Of these, 3 (4%) died subsequently due to various complications. Thus, the total mortality rate in the series was 83%. Of the remaining patients, 10 (14%) had good functional outcome, i.e. GOS 4 and 5. Two patients could not be traced (3%).

CT scan findings and outcome

Overall, good functional outcome was achieved in 7 (26%) of the patients operated for EDH and 2 (11%) patients operated for cerebral contusion. Only 1 (5%) patient operated for acute SDH with cerebral contusion had a good outcome, while none of the patients with isolated acute SDH survived.

Age and outcome

All the patients with good outcome were less than 60 years Old, i.e. none of the patients who were more than 60 years old survived. Among the survivors($n=10$), 7 (70%) patients were operated within 24 h of injury.

Discussion

Due to the high mortality rate, questions have been raised as to whether these patients should be treated aggressively and whether they have any chance of a meaningful recovery. Consequently, an accurate early prediction of survival and functional outcome appears to be of paramount importance and allows for informed counseling of relatives and helps the treating physician in deciding the aggressiveness of treatment. In this series, we report our experience in the treatment of patients with blunt head trauma presenting with a GCS score of 4 with operable supratentorial mass

lesions. Our primary objective was to determine the overall mortality and long-term functional outcome. Our secondary objective was to identify the risk factors allowing prediction of mortality and morbidity in this patient population. The authors believe that patients having suffered traumatic brain injury and presenting with a GCS score of 4 should still be treated aggressively, since a good functional outcome can be obtained in some cases.

Although no one doubts the prognostic gravity of the decerebrate state following cranial trauma, a good number of patients in this series survived in a reasonably functional state. In particular, it has been demonstrated that evacuation of an intracranial hemorrhage of surgical proportions can result in recovery from a decerebrate state. The absence of serious neurological sequelae in a majority of the survivors demonstrates the reversibility of brain stem compression.

In a published series reporting the outcome of patients with severe blunt head injury, a GCS score of 4 (M2) on presentation has been found to be a particularly poor prognostic factor. In a series in 1977, Bricolo *et al.* reported a mortality rate of 72% and good outcome in 16% of the patients.[7] Mahapatra *et al.* in their series reported 68% mortality and 18% good functional recovery,[8] which is in accordance with our results.

Our results confirm that despite the present improved methods of treatment, the unfavorable prognosis persists as elucidated by Sherman *et al.* in their review of 127 case series on severe head injury in 2010.[9]

There was a definite relationship between the type of intracranial hematoma and recovery from the decerebrate state. Survival was greatest with acute epidural hematomas and worst with acute subdural hematomas. Survival of patients with cerebral contusions was poor, but still better than those with acute subdural hematomas. This corroborates previous reports[10,11] and is undoubtedly related to the fact that patients with acute subdural and intracerebral hematomas almost always have associated severe brain damage.

The duration of the decerebrate state prior to surgical intervention significantly influenced the chances for survival. While 20% of the patients operated within 24 h of injury had good outcome, only 8% of the patients operated after 24 h survived. Munro and Sisson,[12] in discussing tentorial herniation, described edema, thrombosis, and hemorrhage in both the herniated cortex and the brain stem. Obviously, the earlier the evacuation of a hematoma is accomplished, the greater the chance to prevent or reverse these changes. It is quite clear, as emphasized by Freedman,[13] that the appearance of decerebration in association with a supratentorial mass lesion calls for immediate surgical evacuation of the mass if there is to be any hope for survival.

The unfavorable results of surgical treatment of intracranial complications in patients with complete decerebrate rigidity suggest that the expanding lesion is not the only determining factor in the neurological picture. In these cases, diffuse brain damage may be the major prognostic factor, rather than purely mechanical factors, which have been emphasized for a long time by other authors.[13,14]

Recovery from the decerebrate state was a good prognostic sign for eventual survival of the patient in both surgical and non-surgical groups. Only 4 (5%) patients who recovered from the decerebrate state failed to survive.

The age of the patient suffering traumatic decerebration played an important role in his chances of survival. As in other series[15], the recovery rate was best in our patients under 60 years and poorest in patients over 60.

The quality of survival following severe head injury, as emphasized by many authors,[16,17] is of crucial importance in order to justify the great amount of money and human resources spent in the management of neurosurgical intensive care. In our series, 14% of such patients recovered to have a good functional outcome. Therefore, the abandonment of these patients appears unacceptable.

In retrospect, one cause of slightly increased mortality in our series was delayed presentation of our patients. Ours, being a tertiary care referral center, poor patients come from far away places only to delay the management, compounding the severity of brain damage.

Due to infrastructural problems, we could not employ Intracranial pressure monitoring in our patients and could provide assisted ventilation in very few of them. These facilities, if available, could have helped us to increase the functional outcome and to decrease the mortality, as elucidated by Sherman *et al.* in their review of 127 case series on severe head injury in 2010.[9]

Limitations of the present study

This study has several weaknesses that should be accounted for. Due to the retrospective nature of the study, conclusions related to predictive factors of outcome should be made with caution. Furthermore, few patients were lost to follow-up, adding to the limitations of the analysis. Although the overall outcome is likely related to the aggressive medical and surgical management undertaken, the potential impact of such a management strategy could only be indirectly evaluated by comparing our results to those of others, where a more conservative strategy was advocated.

Another limitation of our study, due to retrospective nature of analysis, was that the exact duration of decerebration, which is a critical factor affecting the ultimate outcome of decerebrate patients, as reported by Gutterman *et al.*,[18] was not studied.

Conclusions

Decerebrating patients following severe head injury should be treated aggressively. Also, those with operable supratentorial mass lesions should be offered early surgery. In the present series, 21% of the patients survived the injury and 14% achieved a good functional outcome at follow-up. The type of lesion, followed by duration of decerebration and age of the patient are the most important prognostic factors determining the outcome of surgery in this subgroup of patients. Our results confirm that despite the poor prognosis in decerebrate patients, a significant number of patients may still survive and have a good outcome.

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