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Carr KR, Rodriguez M, Ottesen A, Michalek J, Son C, Pate V, *et al*. Association between relative anemia and early functional recovery after severe traumatic brain injury (TBI). Neurocrit Care 2016 [Epub ahead of print].

Severe traumatic brain injury (TBI) has a high risk of secondary injury owing to multi-system response and changes in metabolic demand. Therefore, they mandate resuscitation to maintain optimum oxygenation. Anaemia is quite common in critically ill patients, and the likelihood of blood transfusion increases in critically ill trauma patients.[1] The authors planned this retrospective cohort study with a view to illustrating a suitable transfusion threshold in a comparable subgroup of severe TBI population, which correlates to the most favourable early functional recovery, while defining severe TBI as those requiring ventriculostomies or intracranial pressure monitor placement. In a level 1 trauma facility institution, electronic medical records of patients between January 2011 and December 2013 were retrieved and studied. Patients above 18 years with a primary diagnosis of TBI were included in the study. Patients with other primary systemic injuries, requiring emergent non-neurosurgical intervention within 48 h of admission, patients who died within 48 h of admission, penetrating head trauma and admission Glasgow coma scale (GCS) score >8 were excluded from the study. All patients included had their GCS scores recorded on admission and upon discharge from the Intensive Care Unit (ICU) and hospital, respectively. Patients were transfused if haemoglobin (Hb) concentration fell below 7 g/dL as recommended by the Society of Critical Care Medicine[2] or in the case of acute active haemorrhage, ischaemia or if clinically needed. Increased intracranial pressures were treated on the basis of TBI management guidelines.[3] Clinical improvement which was defined as mean change in GCS of either 3 or 4 points compared to baseline score was assessed according to different haemoglobin transfusion thresholds: Hb ≤7 g/dL, Hgb ≤8 g/dL, Hb ≤9 g/dL, Hb ≤ 10 g/dL and Hb ≥10 g/dL. A total of 3923 patients were included, of which 89 patients had a primary admission diagnosis of TBI requiring either ICPM or ventriculostomy.

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While comparing transfused versus non-transfused cohorts, there was no statistically significant difference in their baseline clinical status; 40% of the transfused patients underwent ventriculostomy compared to 60% in the non-transfused cohort. Forty per cent of the transfused patients required surgical decompression compared to 36% of the non-transfused admissions. In total, 36 patients received ventriculostomies and 53 patients received ICPMs, while 34 patients required decompressive craniotomies. The overall mortality rate was 16.85% and only 6 (6.74%) patients were discharged to home after hospitalisation. In assessing clinical improvement defined by change in GCS scores, the authors' findings failed to demonstrate any association between either baseline Hb thresholds or transfusion status on clinically significant improvement. Secondarily, there was no mortality benefit associated with red blood cell (RBC) transfusions in this cohort. Of significance was the observation that patients with baseline Hb concentrations of 8 or 9 mg/dL were associated with decreased ICU hospitalisations. A study done by Sekhon *et al*. suggested an increased mortality in TBI patients with over a week mean haemoglobin concentration of <90 g/L.[4] In Transfusion Requirements in Critical Care trial,[5] 30-day mortality was recorded as 13% versus 17% for the liberal (transfusion threshold 7 g/dl) and restrictive groups (transfusion threshold 10 g/dl), respectively. However, in their report, length of stay for ICU and hospital admissions was not significantly different between both groups. Al-Dorzi *et al*. in their retrospective study identified that though anaemia was correlated to worse patient outcomes in patients with isolated TBI, packed RBC transfusion was independently associated with hospital mortality.[6]

The important limitation of this study was that the study being conducted in a single centre having level 1 trauma facility and small sample size findings may have differed in centres with different management protocols. In addition, advanced neuromonitoring such as tissue oxygenation to guide treatment strategies were lacking. Another important limitation was the use of GCS as scoring system as patients with non-verbal response at discharge may show less than expected clinical recovery.

The authors finally concluded that keeping specific Hb goal or transfusion threshold in severe TBI which required ventriculostomy/ICPM placement has no clinical benefits and does not decrease mortality, although keeping Hb in higher range can decrease ICU and hospital stay.

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Akins PT, Axelrod YV, Arshad ST, Guppy KH. Initial conservative management of severe hemispheric stroke reduces decompressive craniectomy rates. Neurocritical Care 2016;25:3-9.

Decompressive craniectomy (DC) for hemispheric stroke can lead to severe neurologic disability and hence this practice is controversial.[1,2] The European Decimal/Destiny/Hamlet trials of hemispheric stroke recommends early DC (within 48 h of stroke onset).[3,4] These trials required ischaemia affecting a large portion of the middle cerebral artery (MCA) territory, but clearly stated that mass effect and midline shift were not a requirement prior to DC. The authors planned this retrospective study with a hypothesis that only risks were present and no benefits of DC from hemispheric stroke patients could be attained, if the stroke did not cause mass effect on computed tomography (CT) head. A standardised database review was performed reviewing the electronic medical records for admissions of all patients who were admitted with hemispheric stroke from October 2007 to March 2015 in Kaiser Sacramento Medical Center in the Northern Central Valley, USA. Inclusion criteria were compared to the European early DC stroke trial.[3] Authors studied the files of 95 patients admitted to the neurocritical care unit with hemispheric stroke. Fifty-six patients >60 years were excluded from the study. Nine patients with <50% of MCA territory involvement and the National Institutes of Health Stroke Scale <15 were also excluded from the study. A retrospective study was done for thirty patients. The management protocol for hemispheric patients included hourly neuro checks, CT head at initial presentation, post-stroke day 1 and 2, neurosurgical consultation and additional CT imaging if clinically indicated. Patients developing mass effect were followed up through post-stroke day 4, and a head CT was done before transfer or earlier if the patient deteriorated neurologically. Involvement of the deep (M1), anterior division and posterior division of MCA territories was noted to determine whether ≥50% of the MCA territory was infarcted on CT imaging. Septal shift and pineal shift were measured. There was no time limit for DC, and this was done at the discretion of the treatment team. Modified Rankin scores (MRs) were calculated at hospital discharge and at 3 months. On hospital day 1, average midline septal shift was 3 mm and midline pineal shift was 1.6 mm. Four patients (13%) on hospital day 1 had midline septal shift of 8 mm or more. On hospital day 2, average midline shift was 5.9 mm at the septum and 3.6 mm at the pineal gland. Twenty-two per cent of MTO (medical treatment only) patients required mechanical thrombectomy compared to 8% of DC patients, but this difference did not reach statistical significance. DC was performed on the same day of admission in two patients, post-stroke day 1 in four patients, post-stroke day 2 in three patients and post-stroke day 3 in three patients. The median time was 2.5 hospital days (1.5 post-stroke days). No patient developed brainstem herniation before DC. Three out of four patients died in MTO group who refused to undergo DC. The surgical complication rate was 4/12 (33%). One patient expired after emergency re-operation whereas three patients developed delayed complications.

Overall DC was performed in 40% of the patients (12/30). Mortality in this series (13%) was less when compared to mortality in the European early DC stroke trial (22%). In the European trial, 43% of the patients undergoing early DC achieved a MRs ≤3 compared to 60% in this study. The surgical complication rate for DC was 20%, and for cranioplasty, it was 21.4% in a trial of DC for severe traumatic brain injury[5] which was similar to the 33% complication rate in this study.

A neurocritical care protocol for delayed DC for hemispheric stroke reduces DC rates by 60% without any increase in mortality or severe neurological dependency compared to the European early DC stroke trial results, which is the key finding of this study.

The single-centre nature of the study and small sample size are the major limitations of this study whereas recognition of a successive case series with a prospective catalogue, use of a standardised means for data collection, direct oversight and treatment of all patients by the authors and treatment of patients in a tertiary care centre are the strengths of this study.