

SPECIAL ARTICLE

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## Disparities in the Utilization of Craniectomy in Management of Traumatic Brain Injury (TBI): Results from the US Nationwide Inpatient Sample Database

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### Introduction

Decompressive craniectomy (DC) improves survival in patients with TBI and refractory elevated intracranial pressure. Although gender, racial and socioeconomic disparities have been identified in management of TBI, disparities in utilization of DC and their impact on outcomes remain poorly studied. We aim to investigate these disparities using a large US administrative database.

### Methods

Hospitalizations between 2004 and 2014 were extracted from the Nationwide Inpatient Sample (NIS). Criteria included: age  $\geq 18$  years, TBI diagnosis with any of the following: herniation, coma, cerebral edema, hydrocephalus, mechanical ventilation, ventriculostomy. Poor outcomes were defined as discharge to institutional care and death. Multivariate regression assessed associations of independent variables with DC utilization and outcomes.

### Results

Out of 70,657 hospitalizations, 6.8% (4,798) underwent craniectomy. Older age (OR=0.7), females (OR=0.8), Whites with medicare (OR=0.3), Blacks with medicare (OR=0.2), Whites with self-pay (OR=0.2) and Blacks with self-pay (OR=0.5) were less likely to undergo DC. Older age (OR=1.4), females (OR=1.3), Whites with medicare (OR=1.7) and Hispanics with medicare (OR=2) had poorer outcomes. Whites (OR=0.7) and Hispanics (OR=0.6) with self-pay were less likely to have poorer outcomes. All *P* values are  $< 0.0001$ .

### Conclusions

Female and older patients are less likely to undergo DC, and they suffer poorer outcomes post-DC. Medicare patients and those without insurance are less likely to undergo DC. Whites and Hispanics with medicare have poorer DC outcomes. This study provides evidence of an association between gender, racial and insurance status and the utilization and outcome of a lifesaving DC treatment among severe TBI patients. Designing new healthcare system strategies to reduce or eliminate these disparities is warranted.

## Patients with Traumatic Brain Injury have an Elevated Risk of Venous Thromboembolism Following Craniectomy: Results from the US Nationwide Inpatient Sample Database

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### Introduction

Decompressive craniectomy (DC) is used to manage elevated intracranial pressure secondary to traumatic brain injury (TBI). Risk of venous thromboembolism (VTE) and their effect on outcomes following DC are not well understood. We aimed to assess the incidence and outcomes of VTE after DC.

### Method

Hospitalizations with age > 17, non-elective admission and features consistent with a diagnosis of moderate/severe TBI between 2004 and 2014 were retrieved from the National Inpatient Sample database. VTE was identified with pre-specified ICD-9-CM codes. Outcome assessed was a composite variable combining mortality and disposition. Any concomitant diagnosis of coma, hydrocephalus, cerebral edema, herniation, external

ventricular drain placement and mechanical ventilation was considered an indicator of moderate/severe TBI.

### Results

Of 70,657 hospitalizations, 4,798 (6.79%) patients underwent DC. The overall incidence of DVT and PE was higher in the patients with DC than in the non-DC group patients (4.88% versus 3% and 1.67% versus 1.16%)  $P < 0.0001$ . Median length of stay (LOS) with DVT and PE for a DC patient was 26 days and 30 days, respectively, whereas for a non-DC patient, it was 14 days for both ( $P < 0.0001$ ). Within the DC group only, factors that were independently associated with DVT on multivariate regression are obesity (OR = 1.83), alcohol (OR = 0.61), LOS (OR = 1.015) and age (OR = 1.01)  $P < 0.0001$ . The impact on mortality for having DVT/PE in the craniectomy-only group was nonsignificant. However, there was trend toward poor outcome with DVT only compared to no DVT (64.5% vs 58.3%)  $P = 0.056$ .

### Conclusions

Our study demonstrates that DCs are associated with an increased risk of VTE and subsequent LOS of TBI patients. Future studies are needed to delineate the mechanisms underlying this association and to evaluate the cost-effectiveness of screening for VTEs in DC patients.

## Correlation Between CSF Glucose Estimation Using Glucometers Against the Conventional Laboratory Technique in Determining Bacterial Meningitis: An Indian Study

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### Introduction

Bacterial meningitis remains a disease with devastating attack rates and growing drug resistance among causative bacteria. Early diagnosis and timely management has an implication on the prognosis and outcome. However, lack of laboratory facilities, travel time for the sample to reach the laboratory and the laborious laboratory methods may result in deferment in precise treatment resulting in avoidable morbidity and mortality. Such delays can be avoided by determining CSF sugar in the emergency room using bedside glucometers, which can assist in crucial decision-making on the use of antibiotics in suspected patients. The aim of this study is to test the accuracy of CSF glucose estimation using glucometers in detecting bacterial meningitis.

### Methods

This single-centered, prospective, comparative study was conducted in 50 consecutive patients in the intensive care unit or outpatient department suspected with CNS infections. Methods and Material: Lumbar puncture for CSF collection was performed by intensivists under strict aseptic conditions. 3 mL CSF was utilized to test for glucose by both the laboratory evaluation and a glucometer.

### Results

The mean CSF glucose value using the conventional laboratory technique was  $98.97 \pm 61.10$  mg/dL and with glucometer was  $109.59 \pm 67.85$  mg/dL. There was no significant difference ( $p=0.4613$ ) among the mean glucose levels by the two methods. A statistically significant association was noted between bacterial meningitis and CSF glucose using the conventional technique (OR, 0.976; 95% CI, 0.957–0.993;  $p=0.0165$ ) and CSF glucose using the glucometer (OR, 0.975; 95% CI, 0.956–0.996;  $p=0.0066$ ).

### Conclusions

Bedside glucose testing from CSF fluid may be an alternative to laboratory plasma glucose measurement.

## **D-Dimer Level is Correlated to Prognosis, Infarct Size & NIHSS Score in Acute Ischemic Stroke (AIS) Patients**

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### **Introduction**

Stroke is the fourth leading cause of adult death and disability. The objectives of this study are as follows: (1) To investigate the diagnostic and prognostic value of elevated plasma D-dimer in the setting of acute ischemic stroke. (2) To study the correlation of plasma D-dimer levels and ischemic infarct size in MRI brain. (3) To show the correlation between elevated plasma D-dimer (D–D) and between APACHEII and NIHSS in stroke patients.

### **Methods**

We conducted a prospective, observational cohort study in the critical care department and enrolled 30 patients

with AIS and 10 age and sex-matched healthy controls. Plasma D–D concentrations, determined by a particle-enhanced, immune-turbidimetric assay, were measured on admission D0 & 24 h later D1. Each patient's medical record was reviewed, and demographic, clinical, laboratory and neuroimaging information was abstracted.

### **Results**

D-dimer levels were significantly higher in AIS patients than healthy controls. Elevated D-dimer level > 310 ng/ml can predict stroke > 1.5 cm in MRI with 100% sensitivity and 83.3% specificity and also a D-dimer D0 with cutoff level 350 ng/ml & D1 cutoff level 370 ng/ml can predict a complicated course with 100% sensitivity and 84.6% specificity; however, there was no significant difference between D0 and D 1 D-dimer as *P* value > 0.05.

### **Conclusions**

The plasma D-dimer assay is a simple easily available emergency test that can reliably predict ischemic stroke size > 1.5 cm in MRI as well as prognosis in association with the common routine instrumental tests.

## The SET Score as a Predictor of ICU Length of Stay and the Need for Tracheostomy in Stroke Patients Who Need Mechanical Ventilation

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### Introduction

In ventilated stroke patients, it is common to do a tracheotomy for patients who will require long-term ventilation, due to its advantages over the endotracheal tube. The SET point study demonstrated that there is significant reduction in ICU mortality in the patients adopted early tracheotomy. The Stroke Early Related Tracheostomy (SET) score is a trial to help these people to benefit from earlier decision about doing tracheostomy and early weaning.

### Methods

This study included 164 ventilated stroke patients. These patients were assessed by The Stroke Related Early Tracheotomy score (SET score) in the first 24 h after admission to ICU for the possibility of doing early tracheostomy. Our primary end point was doing tracheostomy

within 7 days of admission. Secondary end point was evaluation of length of stay in ICU after doing tracheostomy and length of mechanical ventilation, using standard statistical analysis methods.

### Results

Regarding duration of mechanical ventilation, those who did not do tracheotomy, their median values were  $6.3 \pm 3.6$ , and those who had early tracheotomy their values were  $9.1 \pm 3.0$ . Totally mean and standard deviation values were  $8.4 \pm 3.5$ , with a value  $< 0.001$ . According to ICU stay, those who did not do tracheotomy, their median values were  $8.4 \pm 4.9$ , but those who had early tracheotomy their values were  $12.4 \pm 4.1$ , and those who had late tracheotomy values were  $13.8 \pm 2.9$ . Totally, mean and standard deviation values were  $11.3 \pm 4.7$ , with a  $P$  value  $< 0.001$ .

### Conclusion

SET score has been proved to be a good tool as a predictor for doing early tracheotomy in ventilated stroke patients, with shorter stay in ICU and shorter ventilation time.

## **Efficacy of Ketamine in Treatment of Super-Refractory Status Epilepticus: A Case Report**

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### **Aim**

To demonstrate efficacy of ketamine in treating super-refractory status epilepticus.

### **Case history**

A 74-year-old woman with history of diabetes, liver cirrhosis and hypothyroidism was found unconscious at her home. Imaging showed a left cerebral convexity subdural hematoma with mass effect and a 1 cm midline shift. She was started on levetiracetam 500 mg twice a day prophylactically, and the hematoma was successfully evacuated on the first day of admission, but the patient's mentation did not improve. A scalp electroencephalogram (EEG) was done. Initial recording shows continuous generalized periodic discharges over an attenuated background with no

clinical correlate indicative of electrographic status epilepticus. The patient's levetiracetam dosage was increased to 1500 mg twice daily along with a phenytoin loading dose at 20 mg/kg and maintenance of 300 mg daily. She continued to have electrographic status epilepticus at which time midazolam drip was started as well as lacosamide loading dose at 400 mg followed by maintenance at 200 mg twice a day. No response was seen; hence, ketamine drip was started and titrated up over the next 48 h. At this time, EEG findings showed a burst suppression pattern indicating response to treatment.

### **Conclusion**

Several cases have been reported describing response of refractory and super-refractory status epilepticus to Ketamine infusion. Further research is needed to evaluate whether response to ketamine is related to specific seizure types or underlying etiologies.