



# Functional Outcome Measures and Predictors of Neuropsychological Testing Following Brain Tissue Oxygen Monitoring in TBI

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## Introduction

The utility of monitoring brain tissue oxygenation (PBO<sub>2</sub>) remains uncertain in the setting of TBI. ICU care guided by PBO<sub>2</sub> values has been suggested to decrease mortality; few studies have focused on more descriptive functional outcome measurements or neuropsychological testing. We sought to compare patients with severe TBI requiring intraparenchymal monitoring consisting of both intracranial pressure and oxygen or intracranial pressure (ICP) sampling alone.

## Methods

A retrospective review of patients with severe TBI managed in the ICU with PBO<sub>2</sub> and ICP (Licox) or only ICP (Camino) monitoring of frontal cortex. PBO<sub>2</sub> guided interventions were based on three escalating treatment tiers to maintain a value >20 mm Hg. ICP was directed to maintain a value <20 mm Hg.

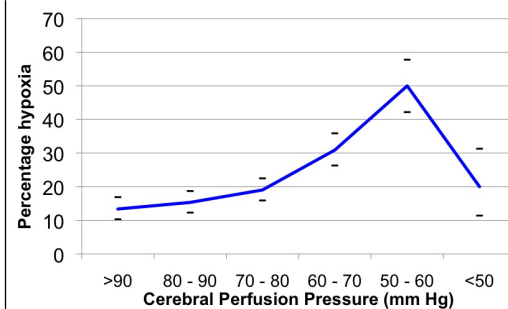
Concurrent hourly PBO<sub>2</sub>, ICP, CPP, Hgb, PaCO<sub>2</sub>, FiO<sub>2</sub>, and PaO<sub>2</sub> were extracted from the electronic medical record. Subjects were matched by age (within 5 years) and sex to those in the ICP only group.

Functional outcome measures comprising of Post traumatic amnesia (PTA), Disability Rating Scale (DRS), and Extended glasgow outcome score (GOSE) were compared between the two groups.

### Population Characteristics

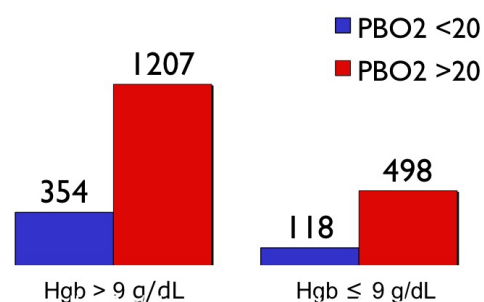
	PBO <sub>2</sub> -ICP Mean (SD)	ICP Mean (SD)	
Age	40.4 (18)	36.4 (15)	
No. Male	21	21	
No. Female	9	12	
ISS	33.6 (12)	35.5 (14)	
Head AIS	4.8 (0.4)	4.7 (0.6)	
ICU Days	23.6 (68)	10.4 (8)	p<.05
Hospital Days	42.2 (98)	15.7 (12)	p<.05
Years of Education	12.6 (2)	12.9 (1)	
GOSE30	3.1 (2)	3.3 (1)	
GOSE90	5 (1)	4.7 (2)	
DRS30	10.2 (7)	11(7)	
DRS90	4.2 (4)	5.1 (6)	
Post traumatic amnesia: Days	34.8 (33.8)	44.5 (55.6)	

### Hypoxia is associated with decreased CPP



CPP values below 60 mm Hg were associated with a greater prevalence of hypoxia (n= 2142 hours)

### Hypoxia was not associated with anemia



Hb values below 9 g/dL were not significant for a higher risk of brain hypoxia.

## Neuropsychological Testing

The 30 day composite comprised of: **California Verbal Learning subtests (CVLT-II)** tests encoding strategies and learning rates

- **Trials 1 - 5** immediate recognition and recall of a 16 word list

- **Long delay free recall** 20 minute extinction period and recall test from initial 16 word list

The 90 day composite comprised of: **Wechsler Adult Intelligence Scale subscores (WAIS-IV)** tests working memory and processing speed

- **Processing Speed Index** The ability to correctly identify sequential letters/ numbers.

- **Digit Span scaled score** Recall of numbers in specific sequence forward and backwards.

### Trails A & B

Connecting numbers and parallel processing of connecting alphabet sequences.

### Stroop I and II

Recognizing word color labels and visual color dissonance.

### Adjusted COWA

Naming as many words starting with a specified letter.

## Results

The ICU and hospital stay was significantly greater in the PBO<sub>2</sub>-ICP group. No differences were detected in GOSE or DRS. The mean number of days of patients reported having post traumatic amnesia was 34 days. No differences were detected in comparing the standardized composite scores from neuropsychological testing. The most significant predictor was age in determining outcome.

## Conclusions

- PBO<sub>2</sub>-ICP monitoring in the setting of severe TBI is associated with longer ICU and hospital duration.
- There are no differences in functional outcome measures and neuropsychological testing at 30 and 90 days following TBI.

## Learning Objectives

Examine outcome measures related to PBO<sub>2</sub>