

Clinical Application of Perfusion Computed Tomography in the Management of Traumatic Brain Injury Patients

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### Introduction

To share our experience of Contrast-enhanced and Perfusion CT (CEPCT) study in traumatic brain injury patients and also review the pertinent literature regarding other clinical implication of perfusion CT in these patients

#### **Methods**

In a prospective study named Contrast-enhanced and Perfusion CT (CEPCT) study, we evaluated the clinical significance of early PCT in moderate and severe TBI patients.

## Results

We made several important observations in this study. First, PCT can be used to assess the salvageability of patients with poor GCS and/or uncal herniation. In a study period of 26 months, we only enrolled 16 patients with poor GCS and uncal herniation who CEPCT were performed before aggressive surgical treatment. In all cases, the attending neurosurgeon was present during the exam and transport of these critically ill patients. The preserved CBF and CBV in the midbrain were shown on the PCT map. The patient had good neurological recovery after surgery.

Similarly, among the 9 patients with uncal herniation and acceptable perfusion of the midbrain and thalamus, 5 had favorable outcome and the other 4 had unfavorable outcome after emergent surgery. In contrast, all the 7 patients with infarction of midbrain or/and thalamus, all had unfavorable outcome even after emergent surgery (5 death and 2 persistent vegetative state). Analogous to the PCT data for patients with poorgrade aneurysmal SAH, these data suggest that TBI patients with hemispheric or global severe hypoperfusion or infarction have poor outcome even after aggressive treatment.

#### Conclusions

This early information provided by CEPCT is pivotal for both the surgeon and the family in terms of outcome prediction and clinical decision-making. Other clinical implications includes understanding BBB pathophysiology, surgical planning, brain death prediction/diagnosis, and diagnosis of the motor trephine syndrome.

# Learning Objectives

1. Early CEPCT can be used to assess the reversibility of moderate and severe traumatic brain injury patients

2. Most patients with global or hemispheric irreversible ischemic change will expire despite aggressive surgery

3. Theoretically, the irreversible tissues may be removed during surgery to provide more decompression

#### References

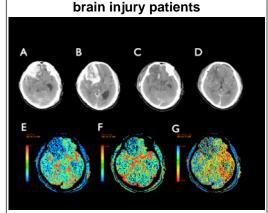
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# Clinical application of PCT in traumatic



This 53-years-old man suffered from right traumatic subdural hematoma and contusion hemorrhage presenting with a GCS of 3 and right dilated pupil (with trace pupil response). Non-contrast head CT showed uncal herniation with brain stem compression (A) and severe midline shift (B). Follow-up CT 1 month after surgery showed decompression of the brain stem and resolution of contusion hemorrhage (C & D). PCT done with the initial non-contrast CT showed preserved CBF (E), CBV (F),

and MTT (G) of the midbrain. After aggressive surgical treatment the patient recovered to E4M6V5 with a GOSE of 7 (lower good recovery) at 6 months.

