

## **Serum uric acid as a predictor of cerebral injury outcome.**

**Weilai Chen<sup>1#</sup>, Peng Yang<sup>2#</sup>, Chenjia Li<sup>1#</sup>, Shuo Zhang<sup>3#</sup>, Xuezhen Hu<sup>3\*</sup>**

<sup>1</sup>Department of Neurology, Wenzhou People's Hospital, Wenzhou, PR China

<sup>2</sup>Department of Emergency, the First Affiliated Hospital of Soochow University, 188 Shizi Street, Suzhou, PR China

<sup>3</sup>Department of Emergency Medicine, the Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University, Wenzhou, PR China

#These authors contributed equally to this work

### **Abstract**

**Background:** The relationship between serum uric acid levels and the prognosis of acute stroke and Traumatic Brain Injury (TBI) is not clear. We investigated the value of serum uric acid levels for predicting poor neurological outcomes of acute stroke and traumatic brain injury.

**Methods:** 140 patients with acute ischemic stroke and Traumatic Brain Injury (TBI) were admitted to hospital and levels of serum uric acid ( $\mu\text{mol/L}$ ) were determined from venous blood within 24 h. Clinical data was analysed by logistic regression and Receiver Operating Characteristic (ROC) curves. Patients were monitored after 180-day discharge and grouped as unfavorable or favorable based on Glasgow Outcome Scale (GOS) scores.

**Results:** There was a significant difference in serum uric acid (285 (range 196 to 362) vs. 185 (range 120 to 258),  $p=0.0001$ ) between unfavorable and favorable groups, respectively. Uric acid was determined to be an independent predictor for poor neurological outcomes of acute stroke and TBI. After adjusting for age and Glasgow Coma Scale (GCS) score, the Odds Ratio (OR) for uric acid was 1.005 (95% CI: 1.0002-1.0101,  $p=0.039$ ). The area under the ROC curve for serum uric acid was 0.714 (95% CI: 0.632-0.787). The optimal cut-off value of serum uric acid determined by the maximum Youden index was 265  $\mu\text{mol/L}$  (sensitivity 55.4%, specificity 82.1%). ROC analysis showed that the positive predictive value of serum uric acid was 88.9% while the negative one was 41.6%.

**Conclusions:** The observations suggest that serum uric acid levels could be used as an independent predictor of poor outcome following acute stroke or TBI.

**Keywords:** Acute stroke, Traumatic brain injury, Uric acid, Prognosis.

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### **Introduction**

More than 150 years ago, Garrod observed elevated uric acid levels in the blood of patients suffering from gout [1]. More recent years have seen a renewed interest in hyperuricemia and its association with clinical disorders other than gout, including hypertension, atherosclerosis, cardiovascular disease, and chronic kidney disease [2]. In addition, studies have revealed the impact of uric acid on cellular metabolism [3-6]. For example, uric acid can act as an endogenous antioxidant and a powerful scavenger of Reactive Oxygen Species (ROS) and hydroxyl radicals (OH) [7]. Paradoxically, uric acid has also been implicated as a pro-oxidant and pro-inflammatory factor. Recently, *in vivo* studies by Kono et al. demonstrated a key role of uric acid in the inflammatory response to necrotic cells in mice. Uric acid was not only released from intracellular stores of dead cells but was generated in large amounts in association with the degradation of nucleic acids [8]. In the

area of cerebral injury, considerable debate has centered on whether uric acid acts as a neuroprotective anti-oxidant or a neurotoxic pro-oxidant [9-11].

In this study, we ascertained potential correlation of serum uric acid levels in patients with acute ischemic stroke and Traumatic Brain Injury (TBI) with results from a 180 d follow-up using the Glasgow Outcome Scale (GOS). The aim of the study was to investigate the potential value of serum uric acid as a prognostic indicator of favorable vs. unfavorable outcomes of cerebral injury.

### **Materials and Methods**

#### ***Patient characteristics***

The study group consisted of 140 patients with acute ischemic stroke or Traumatic Brain Injury (TBI) admitted to the