



## Technical Note & Surgical Technique

# Bradycardia without hypertension and bradypnea in acute traumatic subdural hematoma is a sensitive predictor of the Cushing triad: 3 case reports



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## ABSTRACT

Acute traumatic subdural hematomas (SDHs) are very common. These hematomas are usually neurosurgical emergencies, although conservative therapy is indicated in certain cases. SDH can increase intracranial pressure (ICP) and compress or stretch the brainstem. Lately, it has been recognized that increased ICP can lead to hemodynamic instability and bradycardia. Bradycardia can be an early warning sign in many neurosurgical conditions. We observed bradycardia in serial cases of the patient without hypertension and bradypnea, classically known as *Cushing's triad*, in an acute traumatic SDH patients who were receiving conservative treatment and the bradycardia were proved as an early sign of an increasing ICP. The onset of bradycardia can indicate the need for **further evaluation from** a conservative management strategy to perform definitive surgery treatment.

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## 1. Introduction

Acute traumatic subdural hematomas (SDHs) are very common. These hematomas are usually neurosurgical emergencies, although conservative therapy is indicated in certain cases [1]. SDH can increase intracranial pressure (ICP) and compress or stretch the brainstem. The observation that increased ICP can result in hemodynamic instability and bradycardia has been increasingly recognized [2]. Bradycardia can be an early warning sign in many neurosurgical conditions. The "*Cushing's triad*" is characterized by the occurrence of hypertension, bradycardia and bradypnea secondary from raised ICP, and it can compress or stretch the brainstem. We observed bradycardia, without concomitant hypertension and bradypnea, in an acute SDH patients who were receiving conservative treatment, and it proved to be an early sign of increasing ICP. As we report in the three cases below, the occurrence of bradycardia can be a sole sensitive predictor of surgical intervention in the setting of acute traumatic brain injury.

## 2. Case 1

A twenty nine year old female suffered a motorcycle accident. A computed tomography (CT) of the head performed 3 h after the injury showed a left-sided, thin acute traumatic SDH with no midline shift (Fig. 1A). The patient had a GCS of 13 (GCS E3 M6 V4 = 13), and she had normal vital signs at the time of admission (blood pressure 110–120/70–80 mm Hg, pulse rate 80–84×/min, respiration rate

16–18×/min, with temperature 36,5–37 °C) and remained stable for 48 hour range. She was transferred to our hospital for neurosurgical care. The patient was treated conservatively, and she was hospitalized in the intensive neurological care unit. On the 3rd day of close observation, she developed bradycardia (40–60 bpm) without hypertension and bradypnea and decreased level of consciousness (GCS E3 M5 V4 = 12). A repeat head CT scan (Fig. 1B) performed after the 3rd day of observation showed an increasingly hyperdense lesion in the left temporoparietal region and increased thickness of the SDH; after further evaluation, we performed a craniectomy decompression and evacuation soon after reviewing the CT results. After surgery, the bradycardia was resolved (80–90 bpm). The patient's GCS improved to E3 M6 V5 = 14 on the first postoperative day and to GCS 15 on the second postoperative day; she was discharged on the 5th postoperative day with no neurological deficits.

## 3. Case 2

A forty year old male pedestrian was struck by a motorcycle. A head CT performed 8 h after the injury showed a right-sided, thin acute traumatic SDH with no midline shift. There was a hyperdense shadow in the subarachnoid space as a evidence of subarachnoid hemorrhage (SAH). The patient's GCS was 10 (GCS E3 M5 V2 = 10) and he had normal vital signs at the time of admission (blood pressure arrange 110/70 mm Hg, pulse rate arrange 80×/min, respiration rate 18×/min, with temperature afebrile) and remained stable for 15 hour range. He was transferred to our hospital from the Garut district for neurosurgical care. The patient was treated conservatively, and he was hospitalized in the intensive neurological care unit. After 15 h of close observation, the patient developed bradycardia (<40 bpm) without hypertension

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