



# Management of Central Hyperthermia in Traumatic Brain Injury using Baclofen

Dr. Ijaz N. Pillai<sup>1</sup>, Dr. Gaurav Gomez<sup>2</sup>  
ST. JOHN'S MEDICAL COLLEGE AND HOSPITAL



## INTRODUCTION

Central hyperthermia in CNS disorders is a **peculiar condition which is** and often misdiagnosed or underdiagnosed. Damage to the diencephalon, either traumatic or non-traumatic has been shown to cause central hyperthermia. Hypothalamus has been associated with central hyperthermia in previous studies.

The existing guidelines by American Heart Association and American Stroke Association of 2013 for the management of central hyperthermia are mainly supportive. Antipyretic therapy has been advised for temperatures above 38°C.

The European guidelines focus on aggressive methods to control fever such as sand body-conformed wraps, intravascular cooling devices, head-only cooling caps, or inhaled perfluorocarbon cooling systems to attain normothermia.

## CASE SUMMARY

This was a 33 year- old gentleman with no known comorbidities **who** had a road traffic accident on 31/05/2020. He sustained a Traumatic brain injury, following which he lost consciousness and was brought to EMD, St Johns Medical College Hospital. **Initial GCS** : E1M2V4. In view of low GCS, he was intubated and mechanically ventilated.

**CT Brain (1/6/2020)**: Hemorrhagic contusion of the left cerebral peduncle, left midbrain and right superior cerebellar peduncle with a mild SAH in the left frontal region.

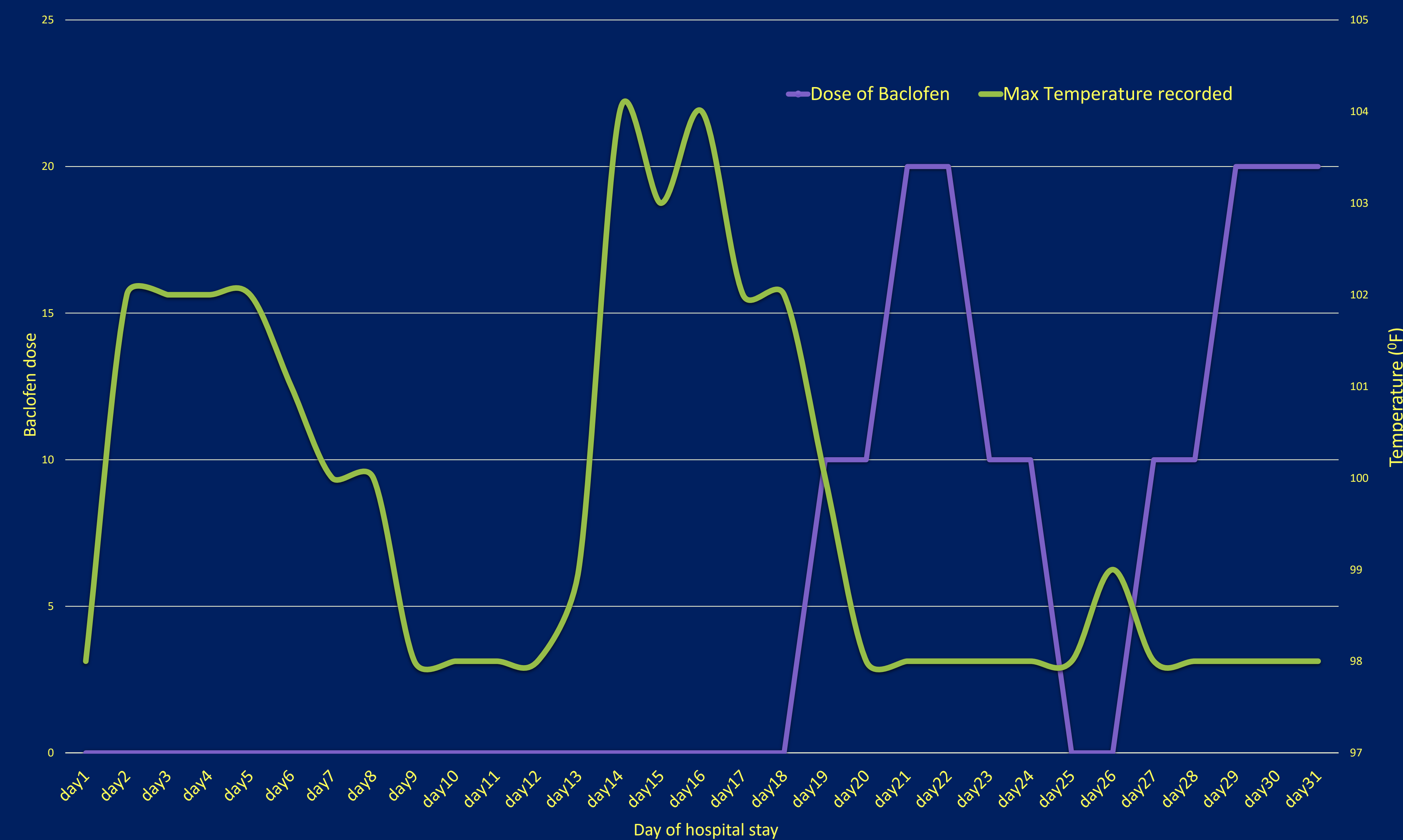
**In ICU** : brain injury was conservatively managed. He was intubated, mechanically ventilated and further tracheostomized in view of prolonged ventilation. He had multiple fever spikes, attributed to an LRTI for which he received multiple culture specific antibiotics. Once the patient was afebrile and medically stable, he was shifted to the Department of Physical Medicine and Rehabilitation.

**On admission to PMR**: Patient was in a minimally conscious state. **On day 3**, he developed high fever of sudden onset, ranging from 100-102° F. An infectious etiology was suspected. He was symptomatically managed with oral and IV Paracetamol and tepid sponging with cold water. There was a transient reduction in the body temperature.

Blood investigations for malaria, filarial parasite and dengue were negative. Procalcitonin was normal. Total leucocyte count was serially found to be normal. In view of persistent fever, a cross consultation with Department of Internal Medicine was done, following which IV antibiotics- Inj. Colistin 4.5g IV twice daily and Inj. Vancomycin 1g IV twice daily were administered for 10 days. Throughout the course of antibiotics, total leucocyte counts remained within normal range. Blood culture after receiving injectable antibiotics showed no bacterial growth. He was briefly afebrile for a period of 3 days, after which, he continued to show hyperthermia (100-101°F)

Non-infectious causes of fever were suspected as the patient remained febrile. Differential diagnoses such as PSH and neuroleptic malignant syndrome was ruled out in the absence of other clinical signs.

## Temperature chart with Baclofen administration



Malignant hyperthermia and serotonin syndrome were ruled out in view of **absence of causative medication history**.

**On day 19**, the patient was started on Tab. **Baclofen** at a dose of 5mg twice daily, based on a previous case report. There was an immediate reduction in the body temperature on **day 1**. After 2 days, dosage was increased to 10 mg twice daily. Incidental reduction in temperature coinciding with baclofen administration was suspected and thus baclofen was tapered and stopped over days, 23 and 24. The patient remained afebrile on day 25, but spiked a fever of 100° F the following day. Total leukocyte counts were found to remain normal. Other features of prior hyperthermia such as absence of sweating and relative bradycardia was noted during this febrile episode as well.

Once baclofen was resumed, he continued to remain afebrile until discharge. Serial neurological examinations during the last week of hospital stay showed presence of spasticity in the left upper limb (elbow flexors and wrist flexors – Modified Ashworth Scale 1+) for which Baclofen was continued at discharge, at a dose of 10 mg twice daily.

Dr. IJAZ N PILLAI ; [ijaz.pillai.n@gmail.com](mailto:ijaz.pillai.n@gmail.com)

## DISCUSSION

This case brings to light the possible efficacy of baclofen in the management of fever of central origin. It also highlights the unusual presentation of fever of non-infective etiology in the sub-acute stage after TBI.

Compression of hypothalamic and brainstem thermoregulatory centers has been proposed as the cause for central hyperthermia. In our patient, the contusions in the midbrain may have caused damage to the hypothalamus. In addition to external and internal cooling systems, studies have shown efficacy of drugs such as Bromocriptine and Baclofen in treating fever of central origin. The patient described here received antipyretics, external cooling devices and low dose baclofen.

**Baclofen** being a GABA agonist acts at raphe nuclei and inhibits brown adipose thermogenesis. This could be helpful in suppressing rising core body temperatures. However, in an acute setting, side effect such as drowsiness or tiredness can limit its usage. Another drug showing promise in the management of central hyperthermia is **Bromocriptine**, which is a D<sub>2</sub> agonist that acts on the corpus striatum and hypothalamus.

## CONCLUSION

The case report elucidates the successful use of baclofen as an effective and rapid treatment for central hyperthermia in a patient with traumatic brain injury. Therefore, future studies to evaluate the efficacy and side effects of Baclofen in the management of central hyperthermia is warranted and holds promise. Further controlled trials with adequate sample sizes are recommended to evaluate and standardize the use of baclofen and other such novel drugs in the management of central hyperthermia.

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