

## Case Report

# Bilateral basal ganglia hemorrhage in a 2-year-old child

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## ABSTRACT

**Background:** Basal ganglia hemorrhage (BGH) is an intracerebral subtype of hemorrhage located in the caudate nucleus, putamen, globus pallidus, or adjacent structures such as the thalamus or internal capsule. Bilateral involvement of both basal ganglia is exceedingly infrequent. Herein, we report a case of a 2-year-old female who was discovered to have spontaneous bilateral BGH with a unique hemorrhagic extension.

**Case Description:** A 2-year-old female child who presented with a decreased level of consciousness, seizure, and fever was discovered to have bilateral BGH during imaging evaluation that extended from the head of the caudate to involve the putamen, globus pallidus, and anterior limb of the internal capsule.

**Conclusion:** Bilateral BGH is extremely rare, and to the best of our knowledge, this is the first case report in pediatric age groups.

**Keywords:** Bilateral basal ganglia hemorrhage, Intracerebral hemorrhage, Pediatric, Spontaneous

## INTRODUCTION

Intracerebral hemorrhage (ICH) represents the second most common cause of stroke and is characterized by bleeding in the brain parenchyma with or without intraventricular extension. ICH comprises 10–15% of all strokes and has substantial mortality and morbidity associated with long-term disability.<sup>[13]</sup> Although ICH can occur in a single location that involves cerebral lobes, basal ganglia, thalamus, internal capsule, external capsule, cerebellum, ventricles, and brainstem, multiple site involvement can also occur.

Basal ganglia hemorrhage (BGH) constitutes 34.2% of all ICH subtypes and is located in the caudate nucleus, putamen, and globus pallidus. However, adjacent structures such as the thalamus or internal capsule can also be involved. Secondary to cerebral lobes, ICH, putamen, and thalamus are the most common sites, with 32.7% and 15%, respectively.<sup>[2,5]</sup>

Bilateral BGH is an outstandingly infrequent context, with only limited reports having been documented to date. The etiology can be either traumatic or spontaneous. However, spontaneous bilateral BGH has not been reported in the pediatric age group. Herein, we report a case of a

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2-year-old female who was discovered to have spontaneous bilateral BGH with a unique hemorrhagic extension.

## CASE PRESENTATION

A 2-year-old female child who had no obvious history of chronic disease or perinatal complications presented to the emergency department of the general hospital after developing a fever, generalized tonic-clonic seizures, and ataxia. The physical examination was unremarkable except for ataxic gait. After the family refused to consent to the lumbar puncture, the child was treated conservatively and discharged well according to the family will after symptomatic improvement with no complications.

A few days later, the child returned to the hospital due to a recurrence of the symptoms, including fever, status epilepticus, and decreased level of consciousness that required re-admission. Although the fever and seizure attacks were controlled, the conscious level remained the same without improvement. Furthermore, the child deteriorates and develops spasticity in both upper and lower limbs. A neurosurgical consultation was requested, and after obtaining a non-contrast brain computed tomography (CT) scan, it revealed bilateral hyperdense areas symmetrically involving both caudate and lentiform nuclei with bilateral perifocal edema without midline shift or bony lesions [Figure 1]. Brain CT angiography was also requested and showed no evidence of vascular abnormality. The neurosurgical recommendation is that no surgical intervention is indicated, and the patient is treated conservatively.

A 1-month follow-up brain magnetic resonance imaging (MRI) demonstrated a hemorrhage that involves both basal ganglia with 4.5 cm × 1.8 cm on the right side and 3.2 cm × 2 cm on the left side, which applies the mass effect on the frontal horn of both lateral ventricles [Figures 2 and 3]. Further evaluation shows that the child appears to be awake but lacks any sign of awareness of herself or the surrounding environment.

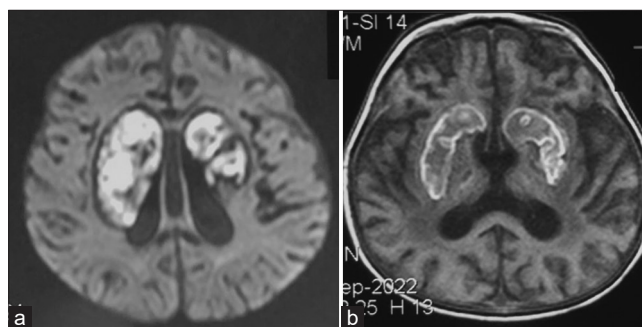
## DISCUSSION

BGH is a subtype of ICH and mainly occurs in the putamen or the nearby structure, such as the thalamus and internal capsule. Furthermore, BGH is classified into two main types: Traumatic and spontaneous. Although the incidence of spontaneous unilateral BGH is about 24.6/100,000 person-year, spontaneous bilateral BGH is exceedingly rare, with only 40 reported cases.<sup>[10]</sup>

The adult population represents nearly all the documented cases of the bilateral involvement of spontaneous BGH. On the other hand, one case of a 13-year-old female with unusual dengue viral hemorrhagic encephalitis has been reported by Nadarajah *et al.*<sup>[6]</sup> Nonetheless, the mean age of spontaneous



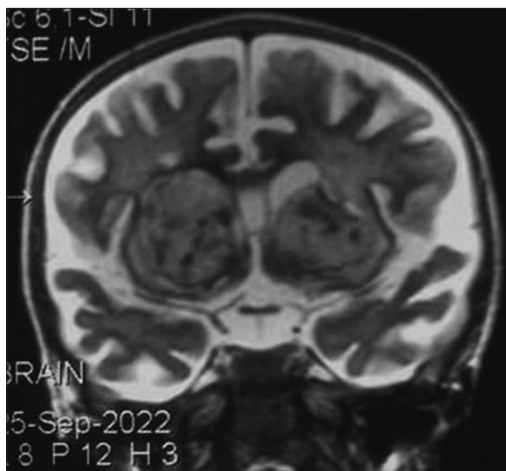
**Figure 1:** Non-contrast brain computed tomography scan (axial view) shows bilateral hyperdense areas symmetrically involving both caudate and lentiform nuclei with bilateral perifocal edema.



**Figure 2:** (a) Axial view of brain magnetic resonance imaging (MRI) demonstrates bilateral basal ganglia hemorrhage (BGH) with 4.5 cm × 1.8 cm on the right side and 3.2 cm × 2 cm on the left side, the hemorrhage extended from the head of the caudate nucleus bilaterally to involve globus pallidus, putamen, and anterior limb of the internal capsule; moreover, the hematoma compresses the anterior horn of both lateral ventricles. (b) Axial view of brain MRI demonstrates bilateral BGH, which extended from the head of the caudate nucleus bilaterally to involve globus pallidus, putamen, and anterior limb of the internal capsule; furthermore, the hematoma compresses the anterior horn of both lateral ventricles.

bilateral BGH is  $51.86 \pm 15.69$  years.<sup>[1,6]</sup> In this report, the patient was a 2-year-old female child, making it the first case of spontaneous bilateral BGH at this age.

There is no consensus regarding the pathophysiological events that lead to the development of spontaneous bilateral BGH; however, the findings of the Alhashim *et al.* review attribute the causes of spontaneous bilateral BGH to uncontrolled hypertension (50%), intoxication, and metabolic (18.33%), vascular anomalies (16.66%), and infectious agents (10%).<sup>[1]</sup> In the pediatric age group, there is no data concerning the causes, but it is thought to be



**Figure 3:** Coronal view of the brain magnetic resonance imaging (MRI) showing bilateral basal ganglia hemorrhage involving the lentiform nucleus and the caudate nucleus that compress lateral ventricle bilaterally.

mainly due to metabolic, intoxication, or infectious reasons. However, the biochemical laboratory investigations and complete blood count of this patient were clear and did not show any signs of infectious etiology. Furthermore, hematological assessment and coagulation studies, including prothrombin time and partial thromboplastin time, were within normal limits. CT angiography was also normal and did not show any signs of vascular anomalies. Therefore, the primary cause of this condition has not been identified.

The presentation of spontaneous ICH in children mostly included headaches, vomiting, impaired consciousness, convulsions, and focal neurological deficits,<sup>[7]</sup> while the presentation of bilateral BGH depends on the location of the hematoma represented by an altered level of consciousness, focal neurological deficit, headache, and coma as the most common symptoms.<sup>[1]</sup> Seizure is also reported but far less than the preceding symptoms. In this patient, a decreased level of consciousness, seizure, fever, and spastic paralysis were the main issues.

The most reported site that is involved in bilateral BGH is the bilateral putamen (71.70%), followed by bilateral pallidum (15.09%).<sup>[5]</sup> In our case, the hemorrhage extended from the head of the caudate nucleus bilaterally to involve globus pallidus, putamen, and anterior limb of the internal capsule; furthermore, the hematoma compresses the anterior horn of both lateral ventricles [Figure 2].

Because spontaneous bilateral BGH is an extremely rare condition, we could not find similar pediatric cases in the literature to compare with and could not obtain any information about the hospital course and treatment. However, in this case, the reported child had a progressive

course that was highlighted by seizure attacks, fever, and all limb spasticity until, finally, the child developed a lack of awareness.

Almost all patients with bilateral BGH have a poorer outcome than solitary ICH, mainly due to the destruction of crossing and non-crossing fibers, bilateral diaschisis phenomenon, severely disturbed consciousness, quadriplegia, and pseudobulbar palsy.<sup>[11,12]</sup>

The complications encountered with bilateral BGH were aspiration pneumonia, quadriplegia, hemiparesis, recurrent stroke, and death.<sup>[8,9]</sup> However, this child unfortunately develops a lack of awareness and enters a vegetative state. Most of the reported cases of spontaneous bilateral BGH were managed conservatively; however, they ended up with a poor prognosis.<sup>[4]</sup> Many survivor children with ICH have persistent short-term and long-standing neurological, cognitive, functional, and adaptive behavior impairments, which can have a major impact on their independent activities of daily living, as well as their school achievement, social integration, and later overall independence as adults.<sup>[3]</sup>

In summary, to the best of the authors' knowledge, this is the first case report of spontaneous bilateral BGH in the pediatric group. The patient was a 2-year-old female child who presented with fever, decreased level of consciousness, and seizures. The radiological imaging of the brain revealed a bilateral hemorrhage that involved the head of the caudate nucleus, putamen, globus pallidus, and anterior limb of the internal capsule.

## CONCLUSION

Spontaneous bilateral BGH is an extremely rare finding, and this is the first case report in the pediatric age group. The brain radiological imaging of the reported 2-year-old child confirms bilateral ICH that extends from the head of the caudate nucleus to involve the putamen, globus pallidus, and anterior limb of the internal capsule.

## Ethical approval

Not applicable.

## Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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## Conflicts of interest

There are no conflicts of interest

### Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

### REFERENCES

1. Alhashim A, Hadhiah K, Al-Dandan H, Aljaman M, Alabdali M, Alshurem M, *et al.* Spontaneous bilateral basal ganglia hemorrhage (SSBBGH): Systematic review and data analysis on epidemiology, clinical feature, location of bleeding, etiology, therapeutic intervention and outcome. *Vasc Health Risk Manag* 2022;18:267-76.
2. Bahrami M, Keyhanifard M, Afzali M. Spontaneous intracerebral hemorrhage, initial computed tomography (CT) scan findings, clinical manifestations and possible risk factors. *Am J Nucl Med Mol Imaging* 2022;12:106-12.
3. Boulouis G, Blauwblomme T, Hak JF, Benichi S, Kirton A, Meyer P, *et al.* Nontraumatic pediatric intracerebral hemorrhage. *Stroke* 2019;50:3654-61.
4. Hassan MS, Mohamed Ali A, Farah Osman M, Ahmed A. Spontaneous bilateral basal ganglia hemorrhage due to severe hypertension. *Vasc Health Risk Manag* 2022;18:473-7.
5. Hu YZ, Wang JW, Luo BY. Epidemiological and clinical characteristics of 266 cases of intracerebral hemorrhage in Hangzhou, China. *J Zhejiang Univ Sci B* 2013;14:496-504.
6. Nadarajah J, Madhusudhan KS, Yadav AK, Gupta AK, Vikram NK. Acute hemorrhagic encephalitis: An unusual presentation of dengue viral infection. *Indian J Radiol Imaging* 2015;25:52-5.
7. Piastra M, De Luca D, Genovese O, Tosi F, Caliandro F, Zorzi G, *et al.* Clinical outcomes and prognostic factors for spontaneous intracerebral hemorrhage in pediatric ICU: A 12-year experience. *J Intensive Care Med* 2019;34:1003-9.
8. Seo JS, Nam TK, Kwon JT, Park YS. Multiple spontaneous simultaneous intracerebral hemorrhages. *J Cerebrovasc Endovasc Neurosurg* 2014;16:104-11.
9. Shaheed TA, Glover N, Alboiny S. Nontraumatic spontaneous bilateral basal ganglia hemorrhage: A rare case report. *Cureus* 2020;12:e11299.
10. Yang Z, Chen J, Mu J. Simultaneous bilateral basal ganglia hemorrhage. *Curr Drug Deliv* 2017;14:807-15.
11. Yen CP, Lin CL, Kwan AL, Lieu AS, Hwang SL, Lin CN, *et al.* Simultaneous multiple hypertensive intracerebral haemorrhages. *Acta Neurochir (Wien)* 2005;147:393-9.
12. Zhao J, Chen Z, Wang Z, Yu Q, Yang W. Simultaneous bilateral hypertensive basal ganglia hemorrhage. *Neurol Neurochir Pol* 2016;50:275-9.
13. Ziai WC, Carhuapoma JR. Intracerebral hemorrhage. *Continuum (Minneapolis)* 2018;24:1603-22.

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