Acute management of traumatic intracranial hematomas in Brazzaville (Congo): a study of 115 cases from 2016 to 2021

Acute Management of Traumatic Intracranial Hematomas in Brazzaville

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Highlights

- Traumatic brain injuries (TBI), particularly those leading to traumatic intracranial hematomas (TICH), represent a significant public health concern due to their impact on morbidity, mortality and economic burden.
- The study addresses a critical data gap by focusing on the management of acute TICH in a neurosurgical environment at the Brazzaville University Hospital, providing valuable insights for the region.
- The study employs a descriptive, cross-sectional, observational study design with six-year retrospective data collection, ensuring a robust and comprehensive analysis of TICH cases.
- The study identifies specific surgical indications and techniques for TICH, as well as outcomes such as favourable recovery in 95.7% of cases and an overall mortality rate of 2.6%, postoperative mortality of 6.4%.

Plain language summary

This article addresses a significant public health concern: traumatic brain injuries (TBI), particularly those resulting in intracranial bleeding (TICH). These injuries frequently result from vehicular collisions and can be particularly perilous, necessitating surgical intervention in some cases.

The study was conducted at a large hospital in Brazzaville, Congo, and aimed to examine the management of TICH during the initial critical phase following injury. He conducted a comprehensive review of six years' worth of patient records in order to gain a deeper understanding of the types of injuries sustained, the treatments employed, and the patient outcomes.

Abstract

Background and Aim: Traumatic brain injuries (TBI) are a significant global public health concern due to their impact on morbidity, mortality, and the economy. This study aims to describe the management of traumatic intracranial hematoma (TICH) during the acute phase in a neurosurgical environment at the University Hospital Center of Brazzaville.

Methods and Materials/Patients: This descriptive study was conducted for 6 years, from 2016 to 2021 in the Department of Multipurpose Surgery of the University Hospital Center of Brazzaville, Congo. The research included all patients hospitalized for TICH; we used a comprehensive sampling method. The variables studied were socio-demographic, clinical, radiological, therapeutic, and outcome-related.

Results: A total of 130 were identified as having TICH in the acute phase, representing a frequency of 12.4%. In the 115 cases retained, there were 78 cases (67.8%) of epidural hematoma (EDH), 24 cases (20.9%) of acute subdural hematoma (ASDH) and 13 cases (11.3%) of intracerebral hematoma (ICeH). The median age was 30 years and a sex ratio of 56.5. The trauma was because of a road traffic accident in 93.9% of the cases. The mean Glasgow coma scale on admission was 13 ± 1. Surgery was performed in 31 patients, 29 cases for EDH and the remaining two for ASDH. Craniotomy with flap replacement was the technique employed in all patients undergoing surgery. The median interval between the occurrence of trauma and surgical intervention was 36 hours. The evolution was favorable in 110 patients (95.7%), death occurred in three patients (2.6%). The postoperative mortality rate in our series was 6.4%.

Conclusion: Just over one in four patients (27%) with TICH require surgery. The latter is carried out within a period of more than 24 hours, in a context of insufficient social coverage (health insurance).

Keywords: Traumatic intracranial hematoma, Surgery, Brazzaville.

1. Introduction

Traumatic brain injuries (TBI) are a significant global public health concern due to their impact on morbidity, mortality, and the economy [1,2]. Road traffic accidents (RTA) are the main cause of these incidents and affect individuals of all ages, with a higher incidence among young adult males [3,4]. Traumatic intracranial hematoma (TICH) is a frequent and severe outcome of traumatic brain injury (TBI). Regardless of the severity of the head injury, 56% of victims experience at least one intracranial bleed. They can require surgical intervention and are associated with high morbidity and mortality [5,6]. The management of a head injury is a crucial medical procedure, given the significant potential for adverse outcomes. The management of a head injury involves several steps. Firstly, the signs and symptoms must be rapidly recognized, then an initial assessment and stabilization of vital functions must be carried out. Imaging is then used to determine the type of brain damage. The treatment may vary from surveillance, monitoring and management of secondary aggressions of systemic origin, to emergency surgery to evacuate hematomas or reduce intracranial pressure. The effective management of head trauma necessitates a multidisciplinary approach, involving anesthesiologists, neurosurgeons and radiologist. The prompt and appropriate management of these patients can significantly improve their prognosis [7].

In Africa, there is a lack of data on the management of TICH in the acute phase [8]. Studies carried out in Congo on TBI have focused on epidemiological aspects and emergency treatment, but none have specifically addressed the management of TICH in the acute phase, taking into account the identified types of lesions [9,10,11]. With this in mind, we conducted a study to enhance the care of patients with TICH during the acute phase.

This study aims to describe the management of TICH during the acute phase in a neurosurgical environment at the University Hospital Center of Brazzaville.

2. Methods and Materials/Patients

Study Type, Period and Setting

This is a descriptive cross-sectional study. The data collection was retrospective, over six years from January 1st, 2016 to December 31st, 2021.

The study was carried out within the Department of Multipurpose Surgery of the University Hospital Center of Brazzaville, which is a tertiary-level hospital center, with an Emergency Department, Multipurpose Resuscitation, Pediatric Surgery, Orthopedics-traumatology, Medical Imaging, and Functional Rehabilitation.

Protocol for the management of TICH

It is standard practice for TICH cases to be admitted to the Emergency Department. Following reception and initial evaluation by the surgical unit team, the opinion of the neurosurgeon on-call duty is requested. In cases where the Glasgow Coma Scale score is below 8, or in instances of multiple trauma, the opinion of the anesthesia and intensive care team is also sought.

Once the diagnosis of TICH has been made, the type of lesion identified, and the patient is deemed to require further care, they are referred to either the multipurpose surgery department or the multipurpose intensive care unit. The application of general measures is systematic. The measures employed for resuscitation (ventilatory assistance, sedation, mannitol) and medication prescriptions (analgesics and prophylaxis anti-epileptic) vary depending on the surgeon and consultation with the anesthesiologist-resuscitator. In the event of an emergency surgical indication, an operating order is issued to the family. Prior to the administration of anaesthesia, a pre-anaesthetic visit is conducted, during which a prescription for anaesthesia is issued. The surgical procedure is billed at 99.75 USD.

All patients were administered general anaesthesia via orotracheal intubation. The surgical indications and surgical techniques agreed and used by the neurosurgical team are shown in table 1.

Selection Criteria and Sampling Method

The target population corresponded to all patients who were victims of TBI. The population source corresponded to all cases hospitalized. We included all patients hospitalized for TICH. We excluded all patients whose record was incomplete. We used a comprehensive sampling method.

Data Collection and Analysis

The data was collected from the registers of admissions and discharges and medical files, which were then collated in a survey sheet by case.

The variables under investigation were socio-demographic, clinical, paraclinical, therapeutic, and evolution-related. The Glasgow Coma Scale (GCS) was employed to categorize the severity of head trauma. The scale ranges from 13 to 15 for mild head trauma, 9 to 12 for moderate head trauma, and less than or equal to 8 for severe head trauma. The interval between the occurrence of the trauma and admission to the emergency room was deemed to be delayed when it exceeded three hours. Similarly, the interval between the occurrence of the trauma and the performance of the brain CT was considered to be delayed beyond eight hours. Similarly, the interval between the occurrence of the trauma and the surgical intervention was deemed to be delayed beyond 8 hours.

The Excel software version 2016 was employed for the purposes of patient registration, database construction, and graph generation. The statistical analysis was conducted using Epi Info software version 7.2.5.0. The qualitative variables were presented in numerical form and as proportions. Quantitative variables were expressed as means accompanied by their standard deviation (or median with quartiles).

3. Results

Frequency

A total of 1,045 patients were admitted for TBI. Among these patients, 130 were identified as having TICH in the acute phase, accounting for 12.4% of all TBI admissions. An additional 15 cases were excluded due to insufficient usable data. Thus, the study population included 115 cases, representing 11% of TBI admissions. Among these 115 cases, there were 78 cases (67.8%) of epidural hematoma (EDH), 24 cases (20.9%) of acute subdural hematoma (ASDH), and 13 cases (11.3%) of intracerebral hematoma (ICeH). No associations were found between these three types of lesions.

Socio-demographic aspects

The median age for the entire series was 30 years (1st quartile = 24 years; 3rd quartile = 36 years), with the extremes of 3 and 64 years. Table 2 presents the distribution of all patients with HICPT according to age groups. A total of 113 male cases and two female cases were recorded, resulting in a sex ratio of 56.5.

Among the TICH cases, 111 patients (96.5%) originated from Brazzaville, while the remaining four (3.4%) were geographically distant from Brazzaville, with the furthest patients residing in Djambala (361.6 kilometers), Oyo (407 kilometers), Kindamba (140 kilometers) and Gamboma (250 kilometers).

Diagnostic

The majority of cases (93.9%) were attributed to head trauma resulting from a road traffic accident. Assault was the second most common cause (5.2%), followed by falls (5.2%). Among the 115 patients included in the study, three (2.6%) cases were insured. It was not observed that any of the cases had benefited from medical pick-up and transport.

The median time between the occurrence of trauma and admission of all patients with TICH was 4 hours (1st quartile = 3 hours; 3rd quartile = 4 hours), with the extremes of 1 and 48 hours. The notion of initial loss of consciousness followed by a return to normal consciousness was reported in 87 cases (75.6%), while that of lasting disturbances of consciousness was identified in 28 cases (24.3%). Furthermore, intracranial hypertension syndrome was identified during questioning in 37 cases (32.1%).

The mean Glasgow Coma Scale (GCS) score on admission was 13 ± 1, with a range of 7 to 15. The trauma was classified as mild in 78 cases (67.8%), moderate in 34 cases (29.6%) and severe in three cases (2.6%). During the physical examination, anisocoria was reported in seven cases (6.1%), while respiratory distress was observed in three cases (2.6%). A scalp wound was reported in 75 cases (65.2%), epistaxis in 9 cases (7.8%), otorrhagia in 2 cases (1.7%), and lower limb trauma in 2 cases (1.7%).

All patients underwent a brain CT and a standard cervical spine X-ray. The median time between the occurrence of the trauma and the completion of the brain CT was 36 hours (1st quartile = 23 hours; 3rd quartile = 48 hours), with the extremes of 6 and 144 hours. In 76 cases (66%), this CT was performed with a delay greater than or equal to 24 hours. One percent of the lesions associated with intracranial hematoma were skull fractures, cerebral contusions, an embolism, a tibia fracture, and subarachnoid hemorrhage.

Treatment and outcome

In all cases, analgesics were administered as a form of medicinal intervention, while anti-epileptic prophylaxis was also employed. Ventilatory assistance was required in the intensive care unit in three cases, representing a prevalence of 2.6%. Mannitol was administered in a total of seven cases (6.1%), while 31 patients (26.9%) underwent surgical intervention. craniotomy with flap replacement was the technique employed in all patients. Among the 31 operated patients, 29 cases were operated for EDH and the remaining two were operated for ASDH. Figure 1 depicts the operational steps involved in the management of an EDH in our context. These include a pre-operative CT scan, the illustration of the craniotomy obtained with a manual trephine and craniotomy saw, the intraoperative view of the hematoma, and the postoperative CT scan, which demonstrates a satisfactory evolution with the hematoma's disappearance and the absence of brain lesions.

The median time between the occurrence of trauma and surgery was 36 hours (1st quartile = 24 hours; 3rd quartile = 48 hours), with extremes of 16 and 168 hours.

In the entire series (operated as well as non-operated), the evolution during hospitalization was favorable in 110 patients (95.7%), with cognitive recovery and discharge for home care and/or continued convalescence. Two patients (1.7%) experienced complications, including one case of meningitis and one case of rhabdomyolysis. Three patients (2.6%) died.

Among the 31 patients who underwent surgery, postoperative complications were recorded in two patients (6.4%), including the case of meningitis and that of rhabdomyolysis. These complications only concerned patients who had undergone surgery for EDH.

The two patients (6.4%) who had undergone surgery for ASDH were admitted to the multi-purpose intensive care unit immediately after their operation due to impaired consciousness. One patient was admitted for five days and the other for seven days, with the death occurring in these two cases.

The mean length of hospitalization was 6.5 days ± 2.5 (with extremes of 4 and 27 days).

4. Discussion

A hospital frequency of 12.4% was identified. In a study conducted in Pakistan by Shoaib et al. [12], the frequency of TICH in association with skull fracture was reported to be 16.3% over a six-month period. In a multicenter study conducted in England, Perel et al. [5] reported a frequency of 46% over a period of eight years. The discrepancy between these findings is likely attributable to the differing inclusion criteria employed.

The most prevalent type of TICH was EDH, representing 67.8% of cases. This result is comparable to that of the study by Kithikii et al. [13], which found EDH to be the most prevalent type in 47.7% of cases. The results of this study differ from those of Shoaib et al. [12], who found ASDH to be the most common. The discrepancy with the aforementioned study is also attributable to the selection criteria, as the majority of patients in this study had suffered severe head trauma. In a study conducted in Singapore by Han et al. [14], and in a study conducted in Japan by Shibahasi et al. [15], a higher frequency of ASDH was reported compared to EDH in severe TBI.

The sex ratio in our study was 56.5, which is considerably higher than that of a previous study focusing on head trauma patients in general, with a ratio of 9.4 [9]. Male predominance has been reported by several authors [5,12,16], which is consistent with the findings of our study. This discrepancy can be attributed to the fact that the present study exclusively focused on cases of TICH, and that men are more susceptible to TBI, with a higher risk of developing TICH than women due to the circumstances and the intensity of the trauma.

The mean GCS at admission was 13±1, with extremes of 7 and 15. This result is comparable to that of Wu et al. [17] in the USA, who found an average GCS of 12.3. However, it is higher than that of the Fujii et al. study [16] reported a GCS of 9.2, which may be attributed to the fact that the patients included in their study predominantly presented with a severe TBI. In contrast, the majority (67.8%) of patients in our study had a mild TBI (GCS 13 to 15). This result is comparable to that observed by Kiboi et al. [8] and Wu et al. [17], who demonstrated that 40.4% and 73.7% of patients, respectively, exhibited mild TBI. Consequently, a favourable GCS does not appear to be correlated with the absence of TICH.

In our series, craniotomy with flap replacement was the technique employed in all patients undergoing surgery for EDH as well as ASDH. Djientcheu et al. [18] in Cameroon and Gaye et al. [19] in Senegal, in their respective studies on EDH, also utilized this technique in the majority of their patients at respective rates of 81.1% and 57.5%. According to the literature, craniotomy with flap replacement is the optimal surgical technique for evacuating EHDs [20]. Fontaine et al. [21] in England, in a study on ASDH, also employed craniotomy in all patients undergoing surgery for ASDH. Igbokwe et al. [22] in Nigeria, in a study on ASDH, used craniotomy and decompressive craniectomy (without replacing the flap). Decompressive craniectomy was indicated in cases of GCS considered low and in the presence of intraoperative edema. Karnjanasavitree et al. [23] in Thailand used decompressive craniectomy in the majority of cases (71.7%). This could be explained by the fact that the majority of patients in their studies presented pupillary abnormalities and had obliteration of the basal cisterns on brain CT. Indeed, according to the available literature, these two techniques appear to be effective, but the superiority of each has yet to be established. The choice of surgical technique depends on the expertise of the surgeon, the neurological status of the patient, the duration of deterioration, the preoperative radiological findings and the degree of intraoperative brain tumescence [24].

The median interval between the occurrence of trauma and surgical intervention was 36 hours, with extremes of 16 and 168 hours. In a study conducted in Kenya by Kithikii et al. [13], a time limit of 72 hours was identified. In contrast, Taussky et al. [25] in Switzerland reported a delay of three hours. In developing countries, the processing times are lengthy, which is attributable to the lack of comprehensive social security coverage. In the context of our study, the supply of essential surgical products was the responsibility of the patient and/or their entourage. Even when the support is covered by the insurance of a vehicle in the event of a road traffic accident, the financing procedures are lengthy.

The treatment can sometimes be medical. In intensive care unit, treatment is aimed at preventing/limiting secondary brain damage of intracerebral (intracranial hypertension, cerebral ischemia, non-convulsive epilepsy) and systemic (hyperthermia, hyperglycemia) origin, using a standardized algorithm [26]

The evolution during hospitalization was favorable in 110 patients (95.7%). Death occurred in three patients (2.6%). This mortality rate is lower than that found by Kithikii et al. [13] and Perel et al. [5], who found respective frequencies of 18.4 and 22%. The difference between these results is probably related to the severity of TBI, which was not the same between these studies. The presence of a TICH represents a significant mortality factor in cases of TBI [27, 28, 29]. The postoperative mortality rate in our series was 6.4%. These deaths occurred in patients who had undergone surgery for ASDH. Tallon et al. [30] and Taussky et al. [25]

reported higher postoperative mortality rates in patients who had undergone surgery for ASDH, at rates of 17.1% and 41% respectively. This can be attributed to the fact that ASDH is predominantly associated with severe TBI, which is associated with a poor prognosis.

While this study provides valuable insights into the management of traumatic intracranial hematomas (TICH) in the acute phase, it is not without limitations. The retrospective nature of the study may introduce biases related to data accuracy and completeness, as we relied on existing medical records. Additionally, the single-center design limits the generalizability of the findings to other settings or populations. However, it is important to note that the study was conducted at the University Hospital Center of Brazzaville, the national referral center for neurosurgical conditions, which adds significant value to the findings. Despite these limitations, the study offers a comprehensive overview of TICH cases, highlighting critical aspects of patient management and outcomes in a resource-limited context. These findings can serve as a foundation for future research and improvements in clinical practice, contributing to better care for TBI patients globally.

5. Conclusion

TICH is present in 12% of TBI cases. EDH is the most common lesion. In our context, pre-hospital care is not medicalized. The majority of victims present with a TBI that is judged to be mild, taking into account the GCS. Just over one in four patients (27%) with TICH require surgery. In the majority of cases, the latter is carried out within a period of more than 24 hours, in a context of insufficient social coverage (health insurance). The overall mortality of TICH is 2.6%. Postoperative complications and mortality are around 6%.

Table 1. Indications for surgery and surgical techniques in case of TICH

Lesion	Surgical indications	Surgical technique
EDH	1) Isolated and symptomatic 2) Thickness of haematoma exceeding that of adjacent bone 3) Mass effect with midline shift greater than 5 mm	1) Bone flap centred on the hematoma 2) Evacuation by aspiration 3) Suspension of the dura mater 4) Drainage in the epidural space or subcutaneously is optional 5) Craniectomy in the case of posterior fossa EDH
ASDH	Thickness greater than 5 mm, with midline shift greater than 5 mm	1) Size of large hemicranial flap completed by a subtemporal craniectomy or flap centred on the hematoma 2) Opening of the dura mater followed by evacuation of the haematoma by aspiration. 3) Depending on the operator, there is either no dural closure or a dural closure with plasty 4) Suspension of the dura 5) Repositioning of the closure is systematic, without tension 6) Drainage is subcutaneous or epidural
ICeH	1) Worsening of the initial clinical picture 2) Scalability of images on CT 3) Superficial location with volume ≥ 30 mL and/or diameter ≥ 3 cm	1) Flap next to the hematoma 2) Dural opening, at least corticotomy 3) Passive evacuation of the hematoma, assisted by its pressure and to a lesser extent by superficial suction. 4) The aim is not complete evacuation, but rather cerebral relaxation. 5) The bleeding site is covered with Surgicel.

EDH: epidural hematoma

ASDH: acute subdural hematoma

ICeH: intracerebral hematoma

Table 2. Distribution of patients by age in years.

Age	No. (%)
0-15	8(6.9)
16-30	54(46.9)
31-45	40(34.8)
46-60	10(8.7)
> **60**	3(2.7)
Total	115(100)

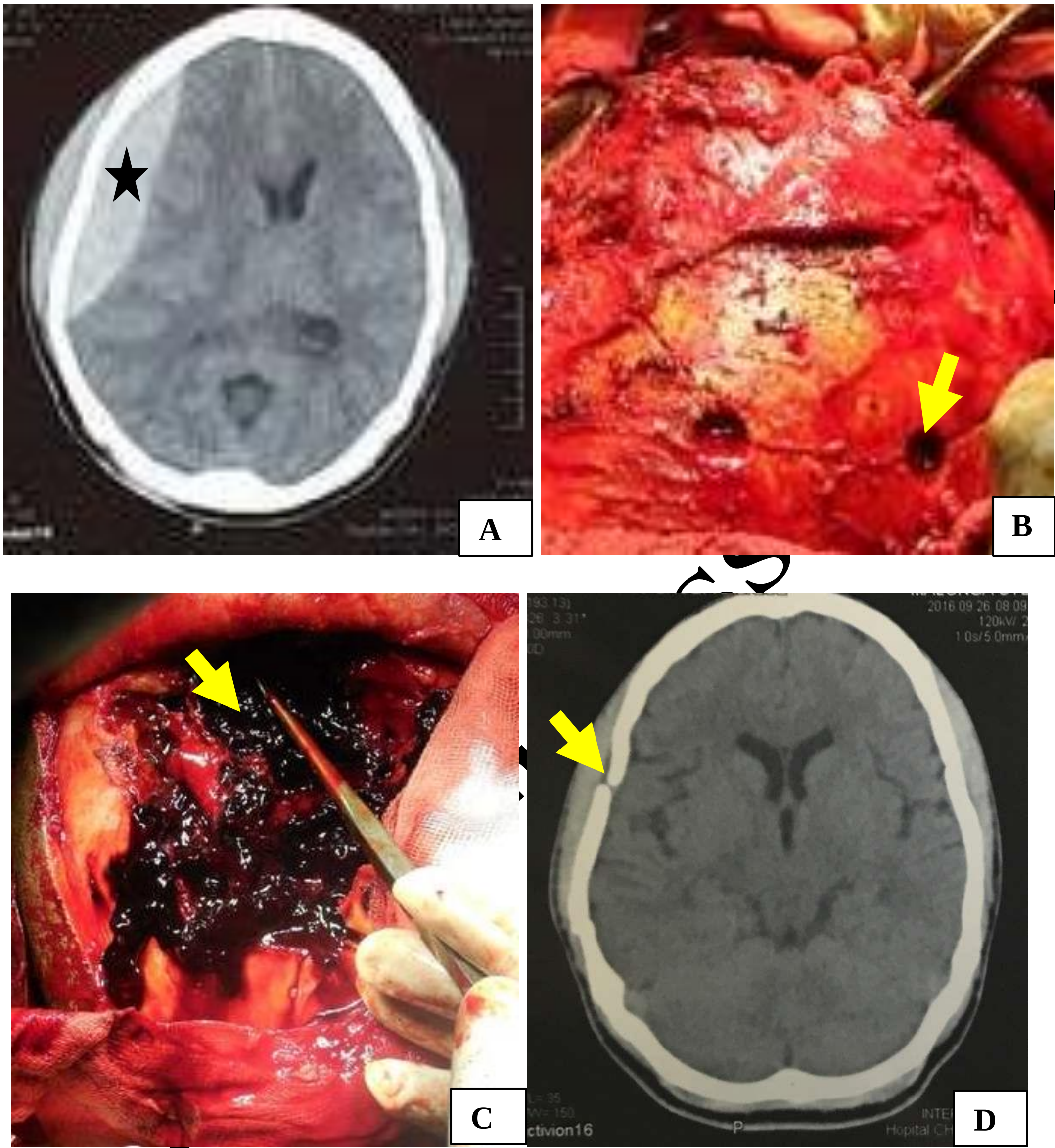

Figure 1.

A. Brain CT demonstrating an extra-axial lesion in the right frontal region, suggestive of an epidural hematoma (star).
B. Intraoperative view of the craniotomy stage, with the yellow arrow indicating a trephine hole on the path of the Gigli saw, which was used due to the lack of an electric craniotome.
C. Intraoperative view of the hematoma (yellow arrow) during evacuation aided by a curette.
D. Post-operative remote brain CT, demonstrating the absence of the hematoma and a residual trace of the craniotomy (yellow arrow).

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Faculty of Health Sciences of Marien Ngouabi University, Brazzaville, Congo, and by the health sciences research ethics committee (Code: 0029/MESRSIT/DGRST/CERSSA/22). The confidentiality of information was guaranteed, and participants were permitted to withdraw from the study at any time. Furthermore, if they wished, the research results would be made available to them.

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Author's contributions

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Drafting the article, Reviewing submitted version of manuscript, Approving the final version of the manuscript: all authors.

Conflict of interest

The authors declared no conflict of interest.

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