

Letter to the Editor

## Careening intracranial bullets: An existing entity?

Samer S. Hoz<sup>1</sup>, Zahraa F. Al-Sharshahi<sup>1</sup>, Abdullah Husain AlRamadan<sup>2</sup>, Bahaeddin Muhsen<sup>3</sup>, Salih O. Al-Ani<sup>4</sup>

<sup>1</sup>Department of Neurosurgery, Neurosurgery Teaching Hospital, Baghdad, Iraq, <sup>2</sup>Department of Specialized Surgery, Pediatric Neurosurgery Section, Maternity and Children Hospital - Dammam, Saudi Arabia, <sup>3</sup>Department of Neurosurgery, Rose Ella Burkhardt Brain Tumor and Neuro-Oncology Center, Neurological Institute, Cleveland Clinic, Cleveland, Ohio, United States, <sup>4</sup>Medical Student, College of Medicine, The Hashemite University, Zarqa, Jordan.

E-mail: Samer S. Hoz - hozsamer2055@gmail.com; \*Zahraa F. Al-Sharshahi - zahraaalsharshahi@rcsi.com; Abdullah Husain AlRamadan - alramadanah@hotmail.com; Bahaeddin Muhsen - bmuhsen08@gmail.com; Salih O. Al-Ani - alani.salih@yahoo.com



**\*Corresponding author:**

Zahraa F. Al-Sharshahi,  
Department of Neurosurgery,  
Neurosurgery Teaching  
Hospital, Baghdad, Iraq.  
zahraaalsharshahi@rcsi.com

Received : 12 May 2021

Accepted : 31 May 2021

Published : 21 June 2021

**DOI**

10.25259/SNI\_470\_2021

**Quick Response Code:**



To the editor – Surgical Neurology International

The word “careen” originates from Latin Carina “keel of a ship.” A careening ship is a ship out of water turned on its side for maintenance. In neurosurgery, a careening bullet is one that, after penetrating the outer and inner tables of the skull, changes direction abruptly to travel along the periphery of the cortex without traversing the brain parenchyma, an admittedly rare type of cranial gunshot wounds. Although careening intracranial bullets (CIBs) represent an existing definition, there is a controversy. Some authorities specify that only those bullets that lodge in the epidural space without lacerating the dura are considered careening while others include those that travel in the subdural space in the definition.<sup>[3,5,7,8]</sup>

To better understand this form of injury, we searched the English literature using all common health science databases from the time of their inception for the term “careening” with alternating combinations of a list of related keywords and MESH terms. While our search did retrieve articles defining the careening bullets and providing depicted illustrations of them, not a single case of such injuries has so far been published in the literature. Besides, larger series of intracranial gunshot injuries were analyzed individually to distinguish cases of careening bullets. Once again, no cases were identified. The persistence in recognizing and separately identifying CIBs in the related literature along with the striking absence of confirmed cases prompted us to question the true existence of these injuries as a separate entity.<sup>[3,5,7,8]</sup>

This paper seeks to bring to light the obscurities surrounding CIBs, with the ultimate aim of bringing accuracy and consistency to the current terminology used to characterize and classify intracranial gunshot wounds.

To unravel the reasons behind the lack of case reports on CIBs, it is essential to determine whether such injuries are possible from a ballistic point of view or whether they represent only a theoretical concept. In this respect, further studies are needed to examine variables such as the mechanism of injury, the type of firearm, the angle at which the bullet impacts the brain, the speed, and shape of the bullet, the age of the patient with implications for the thickness of the skull bone and the degree of brain atrophy, as well as the shape of the bullet tip and the factors that impart the steerability required for them to change direction, having penetrated the bone at a different trajectory. As these injuries may seem ballistically inexplicable, studies on the parameters described above may help to provide valuable proof of concept.

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2021 Published by Scientific Scholar on behalf of Surgical Neurology International

In addition, to truly understand whether we can lend credence to CIBs as a group, a retrospective examination of the existing registries of cranial gunshot wounds is required with two key objectives. The first is to ascertain the existence or absence of CIBs to check if such injuries still occur and are simply not available in the literature due to misreporting, overlapping with other types of injuries, or inter-institutional classification variability. For example, these injuries may be referred to as ricocheted type B, which, by definition, is a bullet reflecting from the inside table in a trajectory parallel to the cortex.<sup>[1]</sup> The second objective is to consider whether intracranial bullet wounds with concomitant dural venous sinus injury located outside the direct bullet trajectory should be labeled as careening or as having a careening component, taking into account the theoretical risk of CIBs involving dural venous sinuses, and, most importantly, whether this relabeling will have management and/or prognostic implications.

If we take, for example, existing categories of cranial gunshot wounds, we note that cranial tangential gunshot wounds, which include high-velocity bullets passing through tissues adjacent to the brain without entering the brain's parenchyma, classify as a distinct entity as it does with its ballistics, management, and outcomes.<sup>[4]</sup> Similarly, perforating or through-and-through intracranial gunshot wounds are well known to have worse outcomes than the other forms of intracranial bullets, such as penetrating and ricocheted.<sup>[2,6]</sup> It is, therefore, worth investigating whether the CIBs meet the requirements that would qualify them as a stand-alone group.

Finally, proving the existence and significance of CIBs or the lack of thereof will not only help enrich the literature or define a term but also by delving into the intricate details of cranial gunshot wounds, it may heighten a need toward a better understanding and a more precise classification of intracranial gunshot wounds.

### Declaration of patient consent

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

### Financial support and sponsorship

Publication of this article was made possible by the James I. and Carolyn R. Ausman Educational Foundation.

### Conflicts of interest

There are no conflicts of interest.

### REFERENCES

1. AbdulAzeem M, Dolachee A, Huber PZ, Romario MF, Obaid H, Arakwazi A, *et al.* Intracranial ricocheted-bullet injuries: An overview and illustrative case. *J Acute Dis* 2018;7:186-90.
2. Alvis-Miranda HR, Rubiano AM, Agrawal A, Rojas A, Moscote-Salazar LR, Satyarthee GD, *et al.* Craniocerebral gunshot injuries; a review of the current literature. *Bull Emerg Trauma* 2016;4:65-74.
3. Barnett JC, Meierowsky AM. Intracranial hematomas associated with penetrating wounds of the brain. *J Neurosurg* 1955;12:34-38.
4. Copley IB. Cranial tangential gunshot wounds. *Br J Neurosurg* 1991;5:43-53.
5. Ellenbogen RG. *Principles of Neurosurgery*. Amsterdam: Elsevier; 2005.
6. Fackler ML, Malinowski JA. The wound profile: A visual method for quantifying gunshot wound components. *J Trauma* 1985;25:522-9.
7. Vakil MT, Singh AK. A review of penetrating brain trauma: Epidemiology, pathophysiology, imaging assessment, complications, and treatment. *Emerg Radiol* 2017;24:301-9.
8. van Wyck D, Grant G. Penetrating traumatic brain injury: A review of current evaluation and management concepts. *J Neurol Neurophysiol* 2015;6:1-7.

**How to cite this article:** Hoz SS, Al-Sharshahi ZF, AlRamadan AH, Muhsen B, Al-Ani SO. Careening intracranial bullets: An existing entity? *Surg Neurol Int* 2021;12: 291.