

Double Beveling on Imaging: A Characteristic Feature of Entry and Exit Penetrating Injury Wound

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Abstract

Keywords

- ▶ craniofacial injury
- ▶ penetrating craniofacial injury
- ▶ beveling

Beveling of the calvarial bone is reported in firearm exit wounds and stabbing injuries in forensic literature. Beveling in entry wounds is rare. We report a case of a 27-year-old man who sustained a nonfatal penetrating craniofacial injury due to motorbike brake handle, and completely recovered after conservative management. We describe the characteristic inward as well outward beveling on imaging due the penetrating trajectory of the motorbike break handle.

Introduction

Atypical cranial vault lesions are characteristically described in forensic literature as sustained due to firearm injuries.^{1–3} Beveling of the calvarial bone usually occurs in firearm exit wounds and stabbing injuries.^{1,3,4} Rarely beveling is described in firearm entry wounds^{1,3,4} and penetrating entry/exit wounds due to a sharp object.² We report a case of a nonfatal penetrating craniofacial injury due to motorbike brake handle, managed conservatively, and discuss the characteristic imaging findings of beveling on computed tomography (CT) scan.

Case Report

A 27-year-old man was brought to the emergency department with an alleged history of road traffic accident while he was driving a motorbike and collided into the rear side of a lorry, and sustained penetrating injuries to the face as the motorbike handle hit his face. He was unconscious since the time of the accident and had multiple episodes of vomiting. There was no history of seizures and ear or nasal bleed. His general and systemic examination was normal. His Glasgow coma scale (GCS) score was 3 (E1V1M1) and his pupils were bilateral, equal and reacting. In view of poor GCS score he was intubated and kept on mechanical ventilation. Local examination showed a large laceration over the left malar region with visible fracture of the

underlying bone. His blood investigations were normal. An urgent CT scan of the brain and face with bone window showed a small right basitemporal extradural hematoma with specks of pneumocephalus and small right temporal intracerebral hematoma (▶Fig. 1A–C). There was no mass effect due to hematoma. Bone window showed fracture of the zygomatic bone and fracture of the right temporal bone with inward as well outward beveling (▶Fig. 1D). The wound was thoroughly cleaned and sutured. In view of the small size of the hematoma, deep location, and no evidence of mass effect, it was decided to treat conservatively. The patient was continued with mechanical ventilation, antibiotics, antiepileptics, and antiedema measures. The patient responded well to conservative management and a follow-up CT scan suggested resolution in the size of hematoma. The patient made complete recovery and was doing well at follow-up.

Discussion

Penetrating craniofacial injuries are rare and account for approximately 0.4% of head injuries.^{5–9} A wide variety of mechanisms and objects can cause these penetrating craniofacial injuries.^{10–14} Apart from the injuries to facial skeleton, penetrating craniofacial injuries can lead to damage to orbit and its contents, cerebrospinal fluid (CSF) leak and its sequel (risk of meningitis or abscess), intracranial hematomas, injury to neurovascular structures, and retained foreign bodies.^{11,12,15–22}



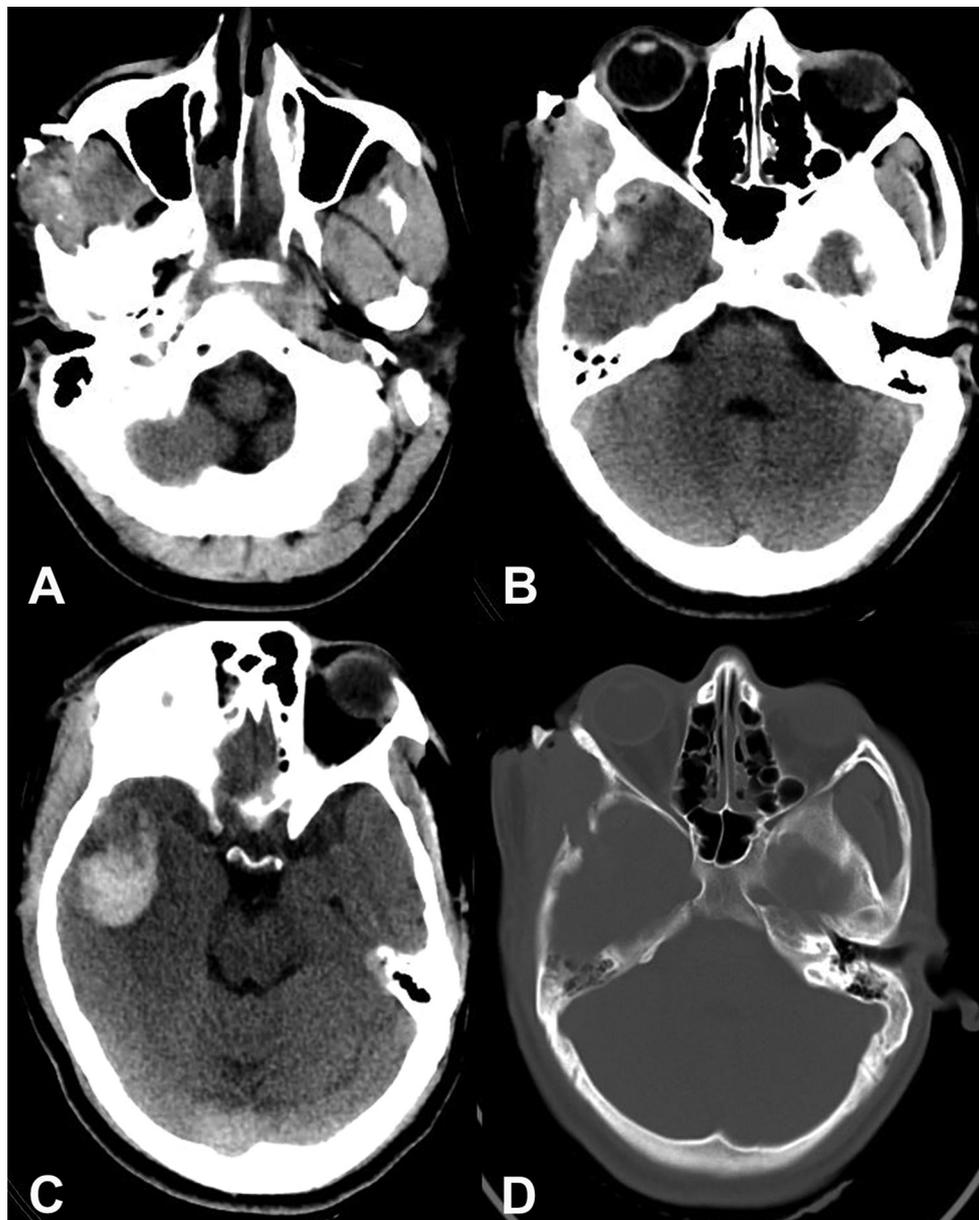


Fig. 1 Computed tomography scan with bone window showing (A) fracture of zygomatic arch, (B) a small right basitemporal extradural hematoma with specks of pneumocephalus, (C) small right temporal intracerebral hematoma, and (D) fracture of the zygomatic bone and fracture of the right temporal bone with inward as well outward beveling fracture margins.

CT scan of the brain and face is the initial investigation of choice as it will provide the details of injuries, presence of intracranial injuries, trajectory of the penetrating object, and the presence of any retained foreign bodies.^{21,23,24} If necessary, a CT angiography can be useful to investigate the integrity of cerebral vasculature.²⁴ The objectives of management of penetrating craniofacial injuries are safe and complete removal of penetrating objects, removal of any necrotic debris, repair of cranial defect to avoid CSF leak and its complications, evacuation of significant intracranial mass hematomas, and repair of vascular damage.^{10,21,25-28} The outcome of craniofacial penetrating injuries depends on the mechanism of injury and the underlying damage to neurovascular structures.^{10,17,22,24}

If there is no major damage to these structures, the patients with penetrating craniofacial trauma have favorable outcome.^{10,17,22}

Conclusion

Penetrating craniofacial injuries warrant a careful clinical and imaging evaluation of the wound and object trajectory. Characteristic on imaging are important to understand the type and trajectory of penetrating objects. Deep-seated lesions with smaller intracranial hematoma can be managed conservatively but need careful clinical and imaging follow-up.

Conflict of Interest

None declared.

References

- 1 Quatrehomme G, Işcan MY. Beveling in exit gunshot wounds in bones. *Forensic Sci Int* 1997;89(1-2):93–101
- 2 Delannoy Y, Colard T, Becart A, Tournel G, Gosset D, Hedouin V. Typical external skull beveling wound unlinked with a gunshot. *Forensic Sci Int* 2013;226(1-3):e4–e8
- 3 Quatrehomme G, Işcan MY. Analysis of beveling in gunshot entrance wounds. *Forensic Sci Int* 1998;93(1):45–60
- 4 Baik SO, Uku JM, Sikirica M. A case of external beveling with an entrance gunshot wound to the skull made by a small caliber rifle bullet. *Am J Forensic Med Pathol* 1991;12(4):334–336
- 5 Gennarelli TA, Champion HR, Sacco WJ, Copes WS, Alves WM. Mortality of patients with head injury and extracranial injury treated in trauma centers. *J Trauma* 1989;29(9):1193–1201, discussion 1201–1202
- 6 Hayashi Y, Fujisawa H, Tohma Y, Yamashita J, Inaba H. Penetrating head injury caused by bear claws: case report. *J Trauma* 2003;55(6):1178–1180
- 7 Anderson SA, Story PG. Case study of an orbital screwdriver injury. *J Ophthalmic Nurs Technol* 1996;15(3):103–104
- 8 Evans RJ, Richmond JM. An unusual death due to screwdriver impalement: a case report. *Am J Forensic Med Pathol* 1996;17(1):70–72
- 9 Ishikawa E, Meguro K, Yanaka K, et al. Intracerebellar penetrating injury and abscess due to a wooden foreign body—case report. *Neurol Med Chir (Tokyo)* 2000;40(9):458–462
- 10 Srinivas S, Agrawal A, Sandeep Y, Shrikhande NN. Massive penetrating craniofacial trauma due to polyvinyl chloride pipe. *IJNS* 2018;07:142–146
- 11 Agrawal A, Vijay M, Harsha J, Umamaheshwar Reddy V. Management of craniofacial injuries: a primer for residents. *Romanian Neurosurgery* 2014;21:341–347
- 12 Dubhashi SP, Choudhary K. Penetrating facial injury. *Indian J Surg* 2014;76(3):237–238
- 13 Salar G, Costella GB, Mottaran R, Mattana M, Gazzola L, Munari M. Multiple craniocerebral injuries from penetrating nails. Case illustration. *J Neurosurg* 2004;100(5):963
- 14 Zhang D, Chen J, Han K, Yu M, Hou L. Management of penetrating skull base injury: a single institutional experience and review of the literature. *BioMed Res Int* 2017;2017:2838167
- 15 Onyekwe LO, Ohaegbulam SC. Penetrating orbito-cranial and ocular cow-horn injuries. *Niger J Clin Pract* 2007;10(2):177–179
- 16 Park SH, Cho KH, Shin YS, et al. Penetrating craniofacial injuries in children with wooden and metal chopsticks. *Pediatr Neurosurg* 2006;42(3):138–146
- 17 Karim T, Topno M. An unusual case of penetrating head injury in a child. *J Emerg Trauma Shock* 2010;3(2):197–198
- 18 Jain D, Aggarwal G, Lubana P, Moses S. Penetrating craniofacial arrow injury. *J Neurosci Rural Pract* 2010;1(1):17–19
- 19 Agarwal S, Gupta S. Hypohidrotic ectodermal dysplasia. *Indian J Ophthalmol* 1993;41:125–127
- 20 Demetriades AK, Papadopoulos MC. Penetrating head injury in planned and repetitive deliberate self-harm. *Mayo Clin Proc* 2007;82(5):536
- 21 Agrawal A, Pratap A, Agrawal CS, Kumar A, Rupakheti S. Transorbital orbitocranial penetrating injury due to bicycle brake handle in a child. *Pediatr Neurosurg* 2007;43(6):498–500
- 22 Agrawal A, Reddy VU, Kumar SS, Hegde KV, Rao GM. Transorbital orbitocranial penetrating injury with an iron rod. *Craniofacial Trauma Reconstr* 2016;9(2):145–148
- 23 Walid MS, Yelverton JC, Robinson JS Jr. Penetrating orbital trauma with internal carotid injury. *South Med J* 2009;102(1):116–117
- 24 Lan Z, Richard SA, Ma L, Yang C. Nonmissile anterior skull-base penetrating brain injury: experience with 22 patients. *Asian J Neurosurg* 2018;13(3):742–748
- 25 Bunevicius A, Bareikis K, Kalasauskas L, Tamasauskas A. Penetrating anterior skull base fracture inflicted by a cow's horn. *J Neurosci Rural Pract* 2016;7(Suppl 1):S106–S108
- 26 De Tommasi A, Cascardi P, De Tommasi C, Luzzi S, Ciappetta P. Emergency surgery in a severe penetrating skull base injury by a screwdriver: case report and literature review. *World J Emerg Surg* 2006;1:36
- 27 Chowdhury FH, Haque MR, Hossain Z, Chowdhury NK, Alam SM, Sarker MH. Nonmissile penetrating injury to the head: experience with 17 cases. *World Neurosurg* 2016;94:529–543
- 28 Schreckinger M, Orringer D, Thompson BG, La Marca F, Sagher O. Transorbital penetrating injury: case series, review of the literature, and proposed management algorithm. *J Neurosurg* 2011;114(1):53–61