e-GiGi 2024; Volume 12, Nomor 2: 246-252
DOI: https://doi.org/10.35790/eg.v12i2.53455
URL Homepage: https://ejournal.unsrat.ac.id/index.php/egigi

Dental Profiling and Findings of Multiple Jaw Fractures in Traffic Accident Victim: A Case Report

Aditia D. Yunus,[1] Ferry P. Gultom,[2] Ria Puspitawati,[2] Fitri A. Sari,[3] Eko Prastyo,[2] Ferdy Rijaldi,[2] Suripto[3]

[1]Master's Program in Dental Sciences, Forensic Dentistry Speciality, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia
[2]Forensic Odontology Specialist Program, Department of Oral Biology, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia
[3]Department of Forensic Medicine & Medicolegal Studies, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia
Email: gultomferryp@gmail.com
Received: December 26, 2023; Accepted: January 23, 2024; Published online: January 30, 2024

Abstract: Motorcycle riders have a high prevalence of accident risks. These accidents can result in severe injuries and can even lead to death. The death prevalence among motorcyclists is three times higher than that of car passengers, six times higher than that of pedestrians, and almost 50 times higher than that of bus occupants. Traffic accidents can cause blunt trauma. High-speed crashes are common in polytraumatized motorcycle crashes and often display facial injuries. In this case report, the authors present a case of an accident with findings of facial trauma to the forehead, nose, cheeks, and multiple fractures of the maxilla and mandible due to a hard object impact. Dental examination revealed post-mortem tooth loss, fractures of the teeth, attrition, root remains, and visible impaction. In conclusion, craniofacial blunt trauma presents with many clinical features. The authors recommend that the finding of such cases be performed further examinations such as X-rays to gain an idea of the possible location of the fracture and to do an autopsy.
Keywords: motorcycle accident; blunt trauma; maxillary fracture; mandibular fracture

INTRODUCTION

Based on a report from the Police Traffic Corps (Korlantas), the number of traffic accidents throughout Indonesia reached 94.6 thousand cases from January - September 13, 2022. This number bounced 34.6% from the previous year's period, around 70.2 thousand cases. All traffic accident cases from January - September 13, 2022, have resulted in 19,054 people perishing. The death toll from the accident increased by 683 people, up to 3.7% compared to the same period in 2021. The main factor in traffic accidents is caused by the distracted attention of road users, which can be caused by using cell phones while driving or high-speed driving.[1]

Motorcycle riders have a high prevalence of accident risks. These accidents can result in severe injuries and even lead to death. The death prevalence among motorcyclists is three times higher than that of car passengers, six times higher than that of pedestrians, and almost 50 times higher than that of bus occupants.[2]

By definition, blunt force trauma is a forced injury caused by a blunt object on the surface of the body and results in injury. This blunt trauma is caused by objects with a blunt surface, such as stone, wood, hammer, or fist, including falling from a high place, traffic accidents, gunshot wounds (with rubber bullets/round bullets).[3]

The most frequent injury seen in forensic pathology practice is blunt force trauma. Even though skin injuries are typically not lethal and seem unimportant, their documentation is useful as evidence in forensic trials. Blunt trauma injuries with patterns are uncommon. On the other hand, the distribution of internal and external injuries may follow a pattern that is appropriate for the specific injury scenario. There is a distinct pattern of injury in deaths involving motor vehicles. Most of the injuries that happened at the scene clearly show the reason and mechanism of death (e.g., bleeding, physical disruption). However, the cause of death of the person may not be known, especially with certain types of craniocerebral trauma (e.g., commotio cordis). Sometimes (fat emboli, for example), microscopy helps to determine death due to blunt trauma.[4]

An injury is caused when a localized quantity of mechanical energy is absorbed during an impact with a blunt surface, irreversibly changing the anatomical integrity of injured part. Pulling apart (tension), pressing down (compression), or applying a differential force (friction or shear) can all result in structural changes. Trauma that is both internally and externally sustained can be directly attributed to force. Still, interior problems can happen even when there are no outward symptoms. Internal trauma is indicative of a physiological problem that results in mortality and can be observed under a microscope or at an autopsy. Rarely does a fatal injury go unreported.[4]

In this case report, the authors present a case of an accident with findings of facial trauma to the forehead, nose, cheeks, and multiple fractures of the maxilla and mandible due to a hard object impact. The primary purpose of this case report is to understand the clinical picture of blunt trauma due to motor vehicle accident.

CASE REPORT

An external examination was performed (including the condition of the oral cavity and teeth) on a female corpse in October 20, 2023 at 07.30 WIB, at the request of the West Jakarta Regional Head of Traffic Unit. The examination of the female corpse revealed fractures to the bones of the face and upper right arm, injuries accompanied by bruises on the left side of the forehead, upper and lower lids of the right and left eyes, and right and left cheeks (Figure 1). The blue arrows were wounds accompanied by bruising on the left side of the forehead located approximately 4.5 cm from the front midline, 3 cm from the front hair growth line, with a wound size of approximately 3x0.5 cm, and a wound appeared approximately 3.5 cm from the front midline, 1 cm above the eyebrows with two open wounds with uneven edges. Red arrows showed a wound on the upper lid of the right eye, which was approximately 2.5 cm from the front midline; purple bruises accompanied by two abrasions with a size of approximately 2x0.8 cm and 1x0.1 cm, then a wound on the lower eyelid of the right eye, approximately 3 cm from the front midline, and bluish-purple bruises accompanied by two abrasions measuring approximately 1.5x0.3 cm and 0.5x0.2 cm.

Green arrows showed a wound on the upper eyelid of the left eye, located approximately 4 cm from the front midline; there were two abrasions with a size of approximately 0.5x0.1 cm and 1.5x0.3 cm, accompanied by purple bruises bluish, then a wound on the left lower eyelid, approximately 4 cm from the front midline; and two abrasions with sizes of approximately 0.7x0.2 cm and 2x0.3 cm, accompanied by bluish-purple bruises. Yellow arrows showed a wound on the right cheek, located approximately 3.5 cm from the front midline, 4 cm below the outer corner of the eye; there was an open wound with uneven edges measuring 1x0.3 cm, accompanied by a bluish bruise; a wound on the left cheek, approximately 4.5 cm from the front midline, 3.5 cm below the outer corner of the eye; and an uneven edge wound with a size of approximately 1x0.2, accompanied by a reddish-purple bruise.

There were injuries to the upper lip on the right and left sides (Figure 2) and to the lower lip on the outer side on the right and left and chin (Figure 3) due to blunt trauma. Furthermore, signs of skull base fractures were found. In Figure 2, the blue arrows represented a wound on the upper lip on the right side, approximately 2 cm from the front midline; abrasions accompanied by bruising reddish purple and wounds on the upper lip on the left side. Approximately 1.5 cm from the front midline, there was an open wound with uneven edges with a size of approximately 2 x 0.5 cm.

Figure 3 showed the blue arrows representing a wound on the lower lip on the outside of the right side, approximately 2 cm from the front midline, with a size of approximately 0.3 x 0.2 cm, accompanied by black-purple bruises, and wounds on the lower lip on the outside of the left side approximately 1.5 cm from the mid-front line; there was an open wound with uneven edges measuring approximately 0.3x0.2 cm, accompanied by black-purple bruises. The red arrow showed wounds on the chin, which was precisely on the front midline; there were two open wounds with uneven edges, measuring approximately 2x1 cm and 1.5x0.5 cm, accompanied by bluish-purple bruises.

Figure 1. The results of the external examination uncovered wounds on the left side of the forehead (blue arrows), wounds on the right eye's top and bottom lids (red arrows), wounds on the left eye's top and bottom lids (green arrows), and wounds on the right and left cheeks (yellow arrows)

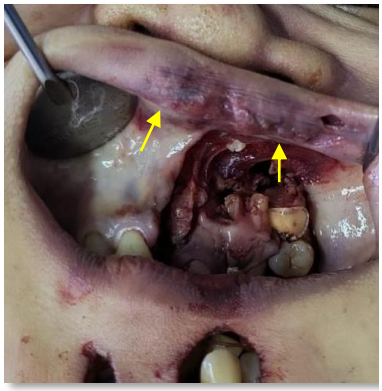

Figure 2. The external examination revealed wounds to the upper lip inside the right and left sides (yellow arrows)

Figure 3. The external examination revealed wounds to the lower lip outside the right and left sides (yellow arrows) and to the chin (red arrows)

From the dental examination performed on the victim, evidence was found in the form of four missing anterior teeth (loose from the tooth socket) due to the accident: 11, 22, 32, 42 (Figure 4 and Figure 5), fractures on teeth 21, 24 (Figure 6) accompanied by bleeding and laceration of the surrounding gingival tissue. Bleeding was also found in the oral cavity and nasal cavity. Fractures were palpated on the forehead, both cheeks, nose, and the presence of fractures of the upper and lower jaw (Figure 7 and Figure 8).

Figure 4. Intra-oral clinical picture, results of dental examination showed missing post-mortem on teeth 11, 22 (yellow arrows).

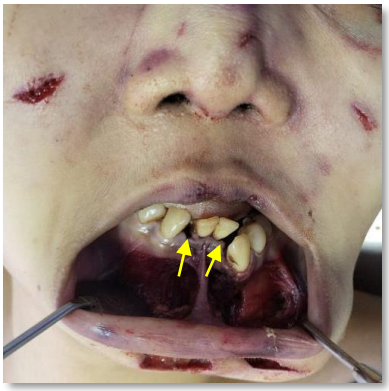

Figure 5. Intra-oral clinical picture, results of dental examination discovered missing post-mortem on teeth 32, 42 (yellow arrows).

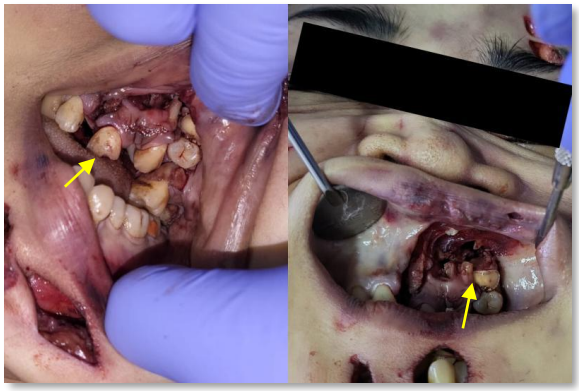

Figure 6. Intra-oral clinical picture, results of dental examination discovered fractures on teeth 11, 24 (yellow arrows).

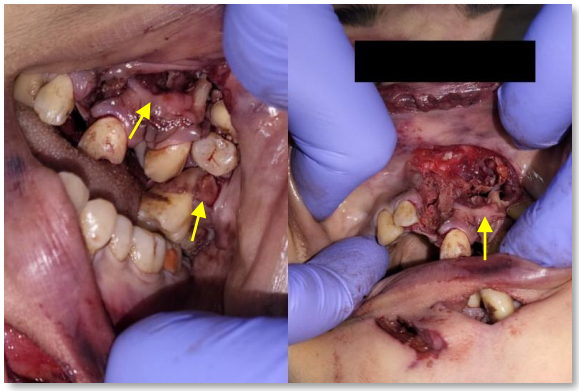

Figure 7. Intra-oral clinical picture, presence of maxillary fracture (yellow arrows)

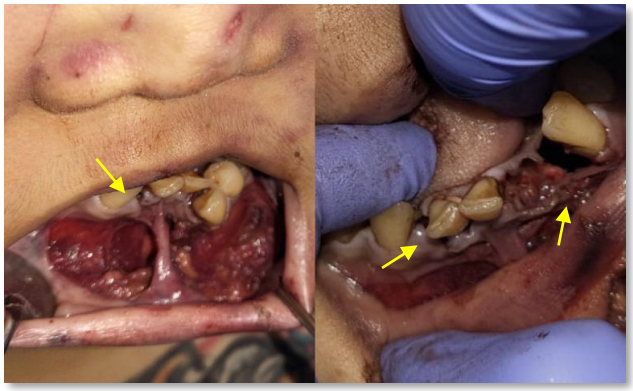

Figure 8. Intra-oral clinical picture, presence of mandibular fracture (yellow arrows)

DISCUSSION

One of the most vulnerable victim groups in traffic accidents are motorcyclists. The frequency of traffic incidents involving these road users has increased due to the intrinsic riskiness of these vehicles and the growing use of them by young people.[5] This is due to overconfidence, inexperience in the young age group, and even the relatively low price of motorcycles compared to cars in low-income countries, leading to increased motor vehicle use by the young generation.[6] According to WHO data gathered in 2014, motorbike deaths usually made up 12% of all traffic deaths in high-

income nations; in middle-income countries, however, this percentage increased to 26%.[7]

The head, neck, chest, and limbs are the most often wounded body parts mentioned in the literature, with head trauma being the most lethal.[8] More than 80% of patients who died in motorbike accidents had brain injuries, according to research by Hadi et al.[6] High-speed crashes are common in motorcycle collisions. They frequently cause inevitable injuries such major crushing, skull fractures with brainstem lacerations, and transections of the upper cervical spine.[2]

Petit et al research indicates that when an accident starts with a head hit, there is a possibility of stress-related skull fractures as well as soft tissue injuries to the face. Because there is a strong association between brain trauma and spinal injuries, motorcyclists who sustain head injuries also need to have a high degree of examination of spine injuries.[9]

Victims with polytrauma often exhibit facial injuries. These wounds can range in severity from minor ones like cuts to the soft tissues or teeth to potentially fatal ones like bleeding from a major artery, such the maxillary artery. Comparing bicycle to motorcycle accidents, cyclists tend to sustain more facial injuries, on the other hand, facial injuries among motorcycle riders are less common. These findings suggest that full-coverage helmets offer superior facial skull protection compared to open-face or cycling helmets.[10]

Pietzka et al [11] said that in 20% of all victims exhibiting injuries in the maxillofacial region, most lesions were in the mid-face, lower jaw, and nose. The numerous additional injuries indicate that high-energy forces are required to fracture the palate. It has been suggested that the enormous energy required to fracture the midline palate is a selective mechanism for the most severe fractures with the highest injury rates.[12]

The mandible is the primary or second most frequently fractured face bone in blunt force trauma situations. Every impact causes a fracture at the impact site or close by. These results indicate that if there is one mandibular fracture, the fracture's location reflects the impact's location, such as an impact on the left mandible resulting in a fracture in the left mandible. More fractures are typically caused by strikes to the ramus and midline than by impacts to the mandibular body.[13]

Depending on the sort of collision, the driver may be propelled forward, sideways, or in both directions when the motorcycle abruptly decelerates after making impact with other vehicles or stationary obstacles like guardrails or trees. Individuals who perish in motorcycle accidents are usually caused by head or neck injuries. Large-scale skull fractures are frequently seen, particularly basal ones. The injury occurrs due to impacts on the ground or other objects, such as a curb or a lamp post. Even if the person is wearing protective garments, sliding on the concrete will result in significant abrasions like scratches. Wearing a motorcycle helmet can lower the risk of brain injury in low-speed collisions. But when travelling at medium and high speeds, the helmet's primary purpose is to keep brain matter from scattering across the road.[14–17]

In cases of living victims, the authors recommends performing a radiographic examination. Occasionally, errors may occur when recording postmortem tooth data, especially in cases where an adjacent tooth has moved into a socket space, due to a previous tooth falling out of the socket. This can be known by using radiography.[18]

Moreover, in cases of unidentified victims, the authors recommend to perform a radiographic examination. Radiographs can help the forensic dentistry team to determine a person's age by assessing the stage of tooth eruption. Skull radiographs can be used in identification by superimposing them on ante-mortem radiographs or facial photographs. The frontal sinus is known to have the largest normal variation in each individual. It can be seen with frontal radiography or posteroanterior cephalometry. Computed tomography (CT) scanning can be used as an aid in matching post-mortem and ante-mortem.[18]

CONCLUSION

Craniofacial blunt trauma presents with many clinical features. In this case, the female victim was involved in a motorbike accident with her face directly hit by a blunt object. From the

examination, fractures were found in the upper and lower jaws. Furthermore, there are signs of fractures on the forehead, cheeks, and nose. Dental examination revealed post-mortem loss, fracture, attrition, root remains, and visible impaction. The cause of death could not be determined, because an autopsy examination was not performed. The authors recommend the finding of such cases be performed further examinations such as X-rays to gain an idea of the possible location of the fracture and to do an autopsy.

Conflict of Interest

The authors affirm no conflict of interest in this study.

REFERENCES

1. Kusnandar VB. Kecelakaan lalu lintas meningkat, capai 94 ribu kasus sampai September 2022. Katadata Media Network. 2022. Available from: https:// databoks.katadata.co.id/datapublish/2022/11/22/ kecelakaan-lalu-lintas-meningkat-capai-94-ribu-kasus-sampai-september-2022
2. Ramli R, Oxley J, Noor FM, Abdullah NK, Mahmood MS, Tajuddin AK, et al. Fatal injuries among motorcyclists in Klang Valley, Malaysia. J Forensic Leg Med. 2014;26:39–45. Available from: https://doi.org/10.1016/j.jflm.2014.06.007
3. Parinduri AG. Asmadi E, editor. Buku Ajar Kedokteran Forensik dan Medikolegal [Internet]. Medan: UMSU Press; 2020. Available from: http://umsupress.umsu.ac.id
4. Shkrum MJ, Ramsay DA. Forensic Pathology of Trauma. Common Problems for the Pathologist. Totowa, New Jersey: Humana Press; 2007. p. 405.
5. Ainy E, Khorshidi A, Monfared AB, Soori H, Haddadi M. Epidemiological pattern of road traffic injuries among occupants' vehicles in 2012. J Transp Technol. 2016;06(05):277–85. Available from: http://dx.doi.org/10.4236/jtts.2016.65025
6. Hadi S, Hoseinian S, Ebrahimzadeh MH, Peivandi MT, Bagheri F, Hasani J, et al. Injury patterns among motorcyclist trauma patients: a cross sectional study on 4200 patients [Internet]. Arch Bone Jt Surg. 2019;7(4):367-72. Available from: http://abjs.mums.ac.irtheonlineversionofthisarticleabjs.mums.ac.ir
7. Nyameino S, Butt F, Guthua SW, Macigo F, Akama M. Occurrence and pattern of maxillofacial injuries caused by motorcycle crashes presenting at two major referral hospitals in Nairobi, Kenya. Craniomaxillofacial Trauma & Reconstruction Open. 2018;2(1):e9-e14. Doi:10.1055/s-0038-1660434
8. Granieri SS, Reitano EE, Bindi FF, Renzi FF, Sammartano FF, Cimbanassi SS, et al. Motorcycle-related trauma: effects of age and site of injuries on mortality. A single-center, retrospective study. World Journal of Emergency Surgery. 2020;15(1):18. Available from: https://doi.org/10.1186/s13017-020-00297-1
9. Petit L, Zaki T, Hsiang W, Leslie MP, Wiznia DH. A review of common motorcycle collision mechanisms of injury. EFORT Open Rev. 2020;5(9):544–8. Doi: 10.1302/2058-5241.5.190090.
10. Rothweiler R, Bayer J, Zwingmann J, Suedkamp NP, Kalbhenn J, Schmelzeisen R, et al. Outcome and complications after treatment of facial fractures at different times in polytrauma patients. Journal of Cranio-Maxillofacial Surgery. 2018;46(2):283–7. Doi: 10.1016/j.jcms.2017.11.027
11. Pietzka S, Kämmerer PW, Pietzka S, Schramm A, Lampl L, Lefering R, et al. Maxillofacial injuries in severely injured patients after road traffic accidents—a retrospective evaluation of the TraumaRegister DGU® 1993–2014. Clin Oral Investig. 2020;24(1):503–13. Doi: 10.1007/s00784-019-03024-6
12. Hoppe IC, Halsey JN, Ciminello FS, Lee ES, Granick MS. A single-center review of palatal fractures: etiology, patterns, concomitant injuries, and management. Eplasty. 2017:17:e20.
13. Goots A, Isa MI, Fenton TW, Wei F. Blunt force trauma in the human mandible: An experimental investigation. Forensic Sci Int: Reports. 2022;5:100252.
14. DiMaio VJM, Molina KD. DiMaio's Forensic Pathology (3rd ed). Boca Raton: CRC press; 2021. Available from: https://doi.org/10.4324/9780429318764
15. Dettmeyer RB, Verhoff MA, Schütz HF. Forensic Medicine. Berlin, Heidelberg: Springer: 2014.
16. Pelletti G, Cecchetto G, Viero A, De Matteis M, Viel G, Montisci M. Traumatic fatal aortic rupture in motorcycle drivers. Forensic Sci Int. 2017;281:121–6. Available from: https://doi.org/10.1016/ j.forsciint.2017.10.038

17. de la Cruz RAR, Tuazon RS. Motorcycle related cranio maxillofacial injuries at a tertiary hospital in the Philippines. Philippine Journal of Otolaryngology - Head And Neck Surgery. 2016;31(2):27–30. Doi:10.32412/pjohns.v31i2.231
18. Manigandan T, Sumathy C, Elumalai M, Sathasivasubramanian S, Kannan A. Forensic radiology in dentistry. J Pharm Bioallied Sci. 2015;7(Suppl 1):S260-4. Doi: 10.4103/0975-7406.155944.