eISSN (Online): 2598-0580

Bioscientia Medicina: Journal of Biomedicine & Translational Research

Journal Homepage: www.bioscmed.com

The Incidence Rate of Cranii Base Fracture in Dr. Kariadi Hospital Semarang Period 2019

Nugroho Akhbar[1]*, Erie B. P. Setya Budi Andar [2]

[1]Department of Surgery, Faculty of Medicine, Unversitas Diponegoro, Dr Kariadi Hospital, Semarang, Indonesia
[2]Department of Neurosurgery, Faculty of Medicine, Unversitas Diponegoro, Dr Kariadi Hospital, Semarang, Indonesia

ARTICLE INFO

Keywords:
Fracture
Trauma
Cranii base

***Corresponding author:**
Nugroho Akbar

E-mail address:
dr.nunug@gmail.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.32539/bsm.v5i8.345

ABSTRACT

Background: Head injury is a major cause of death, especially in young adults and a major cause of disability. The incidence of head injuries is increasing due to the increasing use of motorized vehicles. As many as 4% of cases of head fracture occur in the base of the cranii **Methods:** This research used a descriptive observational method. The data used is secondary data taken from medical records. In this study, we wanted to know the incidence of cranii base fracture cases due to head trauma in patients treated at Dr. Kariadi period 2019 **Results:** From 29 samples of medical records obtained, 48.3% had mild head trauma, 27.6% had moderate head trauma, and 24.1% had severe head trauma. Symptoms of patients with the most clinical symptoms of cranii base fracture were raccoon eyes 51.7%, with the most fracture locations in the anterior fossa as much as 51.7% **Conclusion:** The incidence of cranii fracture due to head trauma at RSUP Dr. Kariadi in 2019 was found mostly over 40 years old and most of them were men. The type of injury is a minor head injury, with the largest location in the anterior fossa, and the most common clinical sign found in patients with cranii fracture is raccoon eyes.

1. Introduction

Head injury is a major cause of death, especially in young adults and a leading cause of disability.[1] The incidence of head injuries is increasing sharply worldwide, mainly due to the increasing use of motorized vehicles in developing countries. The incidence varies from 67 to 317 per 100.000 individuals and the mortality ratio ranges from 4% to 7% for moderate head injuries and about 50% for severe head injuries.[2] Approximately 6-12% of adult patients with head injuries have a head fracture. Of these head fractures, about 4% of fractures occurred in the base of the cranii. In contrast, the incidence of head trauma is the main cause (about 90%) of the incidence of fracture of the cranii base, and the remaining 10% is due to penetrating injuries.[3]

Cranii Base fracture is defined as a fracture that occurs at the base or base of the cranium, which may occur in the anterior, medium or posterior cranial fossa. The occurrence of fracture of the cranii base can be due to direct or indirect impact which is the effect of the "remote force mechanism" of the impact to the facial area.4 The reported prevalence of cranii base fracture

varies widely in the literature. In developed countries and studies in Asia, cranii base fracture has been reported to have a prevalence of 3.5% - 24%, whereas studies conducted in Nigeria showed a higher rate of 33% - 46%.[5,6,7,8]

The incidence of fracture of the cranii base can occur in the anterior, media, and posterior cranial fossae with 47%, 22-37% and 0.2-3%, respectively. The clinical presentation of patients with cranii base fractures varies, which is determined by the severity of the head injury and the presence or absence of other injuries. Some of the known clinical signs associated with cranii fracture are racoon's eyes, rhinorrhoea, rhinorrhagia, anosmia, visual disturbances, otorrhoea, otorrhagia, hearing loss, neurovascular injury, battle's sign, phonation disorders, vocal cord paralysis and / or aspiration.[5.9.10] A study conducted in Nigeria showed that clinical signs associated with cranii base fracture showed a sensitivity of 71% - 77% in predicting cranii base fracture.[5]

According to Pretto Flores et al., Battle's sign and unilateral periorbital ecchymosis have a 100% positive predictive value for detecting base fractures of the cranii whereas bilateral periorbital ecchymosis and otorrhagia have a 70% positive predictive value.[11] Savastio et al. reported that rhinorrhea, otorrhea, and battle's sign had a high predictive value (100%) for intracranial abnormalities.[12] Furthermore, Goh et al. found a statistically significant association between clinical signs of cranii base fracture and head CT findings.[13]

Research on the incidence rate and characteristics of fracture cranii base in RSUP Dr. Kariadi Semarang has not been widely researched. So that there is no definite data regarding the incidence of fracture cranii base in patients treated at RSUP Dr. Kariadi Semarang. Based on this background, the researcher thinks it is necessary to conduct research on the incidence of base crani fractures and their characteristics within 1 period of observation.

2. Method

Research design

The research was conducted with a descriptive observational method. The data used are secondary data taken from medical records. In this study, we wanted to know the incidence of cranii base fracture cases due to head trauma in patients treated at Dr. Kariadi period 2019.

Place and time of research

Sampling was carried out at the medical record installation Dr. Kariadi. The research and report writing were carried out in August 2020. Dr. Kariadi was chosen as the research location because it is the central hospital and referral hospital in Central Java Province.

Population and research sample

Research population

The population of this study were all medical records of patients with head trauma who were hospitalized at Dr. Kariadi period 2019.

Research Samples

The sample in this study was the medical record data of patients with head trauma who were hospitalized at Dr. Kariadi period 2019. which meet the following inclusion criteria:

Inclusion criteria

All data were medical records of head trauma patients whose clinical and radiological features showed signs of cranii fracture.

Exclusion criteria

Medical records of head trauma patients whose radiological features do not show fracture of the cranii base.

Method of collecting data

This study used secondary data in the form of media records of patients with cranii base fractures (cranii base) due to head trauma who were hospitalized at Dr. Kariadi period 2019. Data are grouped based on the determined variables.

Statistic analysis

The data that had been collected and grouped based

on variables were then processed and analyzed using SPSS software. Furthermore, the data is presented in tabular form and described.

3. Result

Description of sample characteristics

Based on age, there are 2 samples (6.9%) aged under 10 years, 6 samples (20.7%) aged between 10-20 years, 7 samples (24.1%) aged between 21-30 years, 6 samples (20.7%) aged between 31 -40 years, 8 samples (27.6%) were over 40 years old. In this study, it was found that the majority of patients who experienced cranii fracture due to head trauma were over 40 years of age.

Based on table 2, it can be seen that of the 29 research samples, 23 samples (79.3%) were male and 6 (20.7%) were female.

Based on the severity of head trauma, 14 samples (48.3%) experienced mild head trauma, 8 samples (27.6%) experienced moderate head trauma, and 7 samples (24.1%) experienced severe head trauma.

Based on the clinical symptoms of 15 samples, there were raccoon eyes (51.7%), 2 samples showed otorrhea (6.9%), otorrhagia 4 samples (13.8%), battle sign 2 patients (6.9%), which showed more than 1 clinical symptom in 3 samples (10.3%) and those accompanied by neurological abnormalities were found in 3 samples (10.3%).

Based on the fracture area of the cranii base of the anterior fossa as many as 15 samples (51.7%), the middle fossa 9 samples (31.0%), the posterior fossa 2 samples (6.9%) and involving more than one fracture area as many as 3 samples (10.3%).

Based on the length of treatment less than 5 days as many as 15 samples (15%), 5-10 days as many as 11 samples (37.9%), 11-15 days as many as 2 samples (6.9%), and> 15 days as many as 1 sample (3.4%).

Table 1 Sample age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 10 years	2	6.9	6.9	6.9
	10 – 20 years	6	20.7	20.7	27.6
	21 – 30 years	7	24.1	24.1	51.7
	31 – 40 years	6	20.7	20.7	72.4
	> 40 years	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

Table 2 Gender of sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	23	79.3	79.3	79.3
	Female	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

Table 3 Degree of head injury

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Weight	7	24.1	24.1	valid
	Light	14	48.3	48.3	
	Moderate	8	27.6	27.6	
	Total	29	100.0	100.0	

Table 4 Clinical patients with cranii base fractures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 1 Clinical Symptoms	3	10.3	10.3	10.3
	Battle Sign	2	6.9	6.9	17.2
	Clinical Symptoms + Neurological Disorders	3	10.3	10.3	27.6
	Otorrhagia	4	13.8	13.8	41.4
	Otorrhea	2	6.9	6.9	48.3
	Racoon Eyes	15	51.7	51.7	100
	Total	29	100.0	100.0	

Table 5 Cranii base fracture locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	> 1 Fracture Line	3	10.3	10.3	10.3
	Anterior	15	51.7	51.7	62.1
	Media	9	31.0	31.0	93.1
	Posterior	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

Table 6 Length of treatment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 5 day	15	51.7	51.7	51.7
	5 – 10 day	11	37.9	37.9	89.7
	11 - 15 day	2	6.9	6.9	96.6
	> 15 day	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

4. Discussion

Cranii base fractures usually occur in the context of significant head trauma. The reported prevalence of cranii base fracture varies widely in the literature. Cranii base fracture has been reported to occur in 3.5% - 45.4% of all patients with head trauma.15 In developed countries and studies in Asia, cranii base fracture has been reported to have a prevalence of 3.5% - 24%.[5]

In a previous study by Pandhika, it was found that head trauma cases were treated at Dr. Kariadi in the

period of 2019 there were 333 patients, where in the study 211 people (63.3%) were male and 122 (36.7%) female.[20] Referring to this study we found a total of 29 head trauma patients who clinically and based on head MSCT showed a diagnosis of cranii base fracture. The majority of patients who experienced cranii fracture due to head trauma in this study were in the age group over 40 years (27.6%) and the majority were men (79.3%). Where the sample with the youngest age at 3 years and the oldest at the age of 78 years.

This contradicts the previous study by Pandhika where the incidence of head trauma cases in the same year period was mostly suffered by late adolescents aged 17-25 years, namely 88 people (26.4%).[20] Of our study population, we found that most cases presented with mild head trauma with cranii base fractures of the anterior fossa constituting (51.7%) of these cases. This differs from a study conducted by Makolene et al, where it was found that the cranii base fracture of the middle fossa was the most common cranii base compartment followed by the cranii base fracture of the anterior fossa, with base fractures of the posterior cranii recording the least number of fractures.[21]

This can be explained by referring to a previous study by Pandhika, where based on the cause, 92% of the head trauma was caused by traffic accidents.[20] Furthermore, the location of the impact in cases of head injury tended to be from the side or the front. In addition, the anatomical basis of the anterior cranial fossa contains a thin bone of the cribriform plate and the roof of the orbit. The predominance of the cranii base fracture is thought to be due to the presence of neurovascular foramina (which is considered a structural weakness) and thin bone in the middle cranious fossa, which makes it more susceptible to fracture compared to the anterior and posterior compartments.[15] These are the same reasons why cranii base fractures of the anterior fossa and fossa media is to some extent more common. Fractures of the posterior cranial fossa are rare because of the thick occipital bone and the tendency to fall forward in traffic accidents.[5]

This study specifically demonstrated that the single most common clinical sign found in cranii base fractures of the anterior fossa was raccoon eyes, which was observed in 15 patients. In contrast, the most common clinical signs of middle fossa cranii fracture are otorrhoea and otorrhagia. Battle sign is the clinical sign observed for cranii base fracture of the posterior fossa. The higher prevalence of raccoon eyes compared to other signs in our study may be due to the fact that most of the cranii base fracture sites are in the anterior fossa.

In this study, 3 patients were accompanied by neurological disorders. The most common neurological disorders in this study were N. VII parese. This is related to os fractures. temporal, where in some literature, fractures of the temporal bone that cause facial nerve injury are 6 to 7%, a quarter of which are complete.[22] Facial nerve injuries occur in about 20% in longitudinal fractures and 50% in transverse fractures. with fracture of the cranii base is less than 5 days, this is due to the fact that most of the patients have mild head trauma.

Further research needs to be carried out in a longer time period in order to obtain a much larger sample size so that the reflection of the incidence of cranii base fractures and data characteristics can be better.

5. Conclusion

In this study, patients who experienced fracture of the cranii base due to head trauma were admitted to Dr. Kariadi Semarang in the period of 2019 was found mostly at over 40 years and most of them were men and in the minor head injury group. The cranii base fracture of the anterior fossa is the most common cranii base fracture with raccoon eyes as the most common clinical sign found in patients treated at RSUP Dr. Kariadi Semarang for the period 2019.

6. References

1. Rowland, J.C., Jones, C.E., Altmann, G., Bryan, R., Crosby, B.T., Geernaert, G.L., Hinzman, L.D., Kane, D.L., Lawrence, D.M., Mancino, A., Marsh, P., McNamara, J.P., Romanovsky, V.E., Toniolo, H., Travis, B.J., Trochim, E. and Wilson, C.J. (2010). Arctic

Landscapes in Transition: Responses to Thawing Permafrost. Eos, Transactions American Geophysical Union 91: doi: 10.1029/2010EO260001. issn: 0096-3941.

2. John Bruns, Jr. and W. Allen Hauser, the Epidemiology of Traumatic Brain Injury: A Review Epilepsia, 44(Suppl. 10): 2–10, 2003.
3. Phang, S. Y., Whitehouse, K., Lee, L., Khalil, H., McArdle, P., Whitfield, P. C., 2016, 'Management of CSF leak in base of cranii fractures in adults', British Journal of Neurosurgery, vol. 30, no. 6, pp. 596-604.
4. McElhaney JH, Hopper RH Jr., Nightingale RW, Myers BS. Mechanisms of basilar cranii fracture. J Neurotrauma. 1995;12(4):669–678. 10.1089/neu.1995.12.669
5. Olabinri EO, Ogbole GI, Adeyele AO, Dairo DM, Malomo AO, Ogunseyinde AO. Comparative analysis of clinical and computed tomography features of basal cranii fractures in head injury in southwestern Nigeria. J Neurosci Rural Pract. 2015;6(2):139–144. 10.4103/0976-3147.153215
6. Connor SEJ, Flis C. The contribution of high-resolution multiplanar reformats of the cranii base to the detection of cranii-base fractures. Clin Radiol. 2005;60:878–885. 10.1016/j.crad.2005.04.003
7. Goh KYC, Ahuja A, Walkden SB, Poon WS. Is routine computed tomographic (CT) necessary in suspected basal cranii fractures? Injury. 1997;28(5–6):353–357
8. Johnson F, Semaan MT, Megerian CA. Temporal bone fracture: Evaluation and management in the modern era. Otolaryngol Clin North Am. 2008;41:597–618. 10.1016/j.otc.2008.01.006
9. Sivanandapanicker J, Nagar M, Kutty R, et al. . Analysis and clinical importance of cranii base fractures in adult patients with traumatic brain injury. J Neurosci Rural Pract. 2018;9(3):370–375.
10. Collins JM, Krishnamoorthy AK, Kubal WS, Johnson MH, Poon CS. Multidetector CT of temporal bone fractures. Semin Ultrasound CT MR. 2012;33:418–431. 10.1053/j.sult.2012.06.006
11. Pretto Flores L, De Almeida CS, Casulari LA. Positive predictive values of selected clinical signs associated with cranii base fractures. J Neurosurg Sci. 2000;44:77–82.
12. Savastio G, Golfieri R, Pastore Trossello M, Venturoli L. Cranial trauma: The predictability of the presentation symptoms as a screening for radiologic study. Radiol Med. 1991;82:769–75.
13. Goh KY, Ahuja A, Walkden SB, Poon WS. Is routine computed tomographic (CT) scanning necessary in suspected basal cranii fractures? Injury. 1997;28:353–7.
14. Greenberg MS. Handbook of neurosurgery 7th edition. Canada: Thieme; 2010. 297-306
15. Yellinek, S., Cohen, A., Merkin, V., Shelef I., Benifla, M., 2015, 'Clinical significance of cranii base fracture in patients after traumatic brain injury', Journal of Clinical Neuroscience, vol. 25, pp. 111-15
16. Baugnon, K. L., Hudgins P. A. 2014, 'Cranii base fracture and their complication', Neuroimaging Clinics of North America, vol. 24, no. 3, pp. 439-65.
17. Stranding, S., Borley, N. R., Gray, H. (eds) 2008, Gray's Anatomy: The Anatomical Basis of Clinical Practice, 40th edn, Churchill Livingstone/Elsevier, Edinburgh.
18. Bobinski, M., Shen, P. Y., Dublin, A. B., 2016, 'Basic imaging of cranii base trauma', Journal of Neurosurgical Surgery. Part B, Cranii Base, vol. 77, no. 5, pp. 381-7.
19. Wani, A. A., Ramzan, A. U., Raina, T., Malik, N. K., Nizami, F. A., Qayoom, A., Singh, G., 'Cranii base fractures: an institutional experience with review of literature', The Indian Journal of Neurotrauma. 2013; 10: 120-6.

20. Pandhika, P., Karakteristik Pasien Cedera Kepala di RSUP DR. Kariadi Semarang Periode 1 Januari 2019 – Desember 2019., 2020
21. Mokolane, Ntjeke S., et al. "Prevalence and pattern of basal cranii fracture in head injury patients in an academic hospital." *South African Journal of Radiology*, vol. 23, no. 1, 2019. *Gale Academic OneFile*, Accessed 17 Sept. 2020.
22. Diaz R, Brodie HA. Middle ear and temporal bone trauma. In : Bailey JB, Johnson JT, Newland SD, eds. Head and Neck Surgery – Otolaryngology. 4th. Philadelphia: Lippincot Williams and Wilkins, 2006:2057-76.
23. March AR, Conneli S, Belafsky PC, Belafsky M. Temporal bone fractures. Available from: http://emedicine.medscape.com Accessed September 3, 2009.