

Patterns of Fracture Site and Management of Maxillofacial Trauma Cases in The Department of Trauma and Acute Care Surgery in Sanglah General Hospital

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ABSTRACT

Aim: To know the patterns of fracture site and management of maxillofacial cases in the Department of Trauma and Acute Care Surgery in Sanglah General Hospital Denpasar Bali. **Methods:** this is a retrospective study, based on medical record were concluded, samples taken in Sanglah General Hospital from January 2012 to December 2018. All of maxillofacial trauma medical records were taken. The data of age, gender, patterns of fractures site and management were taken and described. **Results:** There were total of 257 cases of maxillofacial trauma managed in the Department of Trauma and Acute Care Surgery in Sanglah General Hospital. Two-hundred and forty-one medical records of maxillofacial trauma were included in this study. About 16 medical records were excluded due to incomplete medical records and could not be contacted. Mostly cases found in male, aged 18-40 years old. The site of fractures majorly located in the mandible (60.12%). About 48% fractures were identified at symphysis or parasymphysis of mandible, followed by the body and angular of mandible. Open reduction and internal fixation (ORIF) were the gold standard of the treatment (83,73%) followed by Archbarr (16,27%). **Conclusion:** The most common site of maxillofacial fracture was mandible, specifically at symphysis or parasymphysis part. ORIF miniplate, together with Archbarr and interdental wiring fixation were the most common modality of management.

Keywords: maxillofacial injury, diagnosis, ORIF, Archbarr, wiring.

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INTRODUCTION

Emergency and Trauma Acute Care Surgery has been established since 2001 at Bali where various trauma cases are expected to be seen. Maxillofacial injury is one of the major trauma, following the increased use of motorcycles in Bali. Maxillofacial injury can be divided into the upper part injury (the frontal bone and frontal sinus), the middle part injury (the nasal, ethmoid, zygomatic and maxillary bones), and the lower part injury (the mandible).¹

The etiology varies, either caused by motor vehicle accident, automobile accident, fall, and violence.²

In the United States, maxillofacial trauma was managed by plastic surgeon, maxillofacial surgeon, and otolaryngology surgeon. In Bali, maxillofacial cases were managed by either maxillofacial surgeon or plastic surgeon.³ However in the emergency condition that maxillofacial trauma that poses an immediate threat to life, the general surgeon should be able to manage the airway threatening.⁴

Treatment with osteosynthesis was the most preferred treatment option as it offers a stable and precise anatomical reduction of fragments. However, this option was limited by cost in developing countries. Nowadays, ORIF (open reduction and internal fixation)

miniplate was becoming popular, either placed along with Archbarr or IMF (intermaxillary fixation), and was said to be the gold standard in developing countries.^{5,6}

In Africa, MMF (mandibulomaxillary fixation) and intraosseous wiring dominated the preferred choice of treatment due to the cost problem.⁷ In Sanglah General Hospital, the standard management of maxillofacial fracture was using ORIF miniplate and screws.

The profile of subject suffering from maxillofacial injuries varies by countries, influenced by geographic zones, cultural background, and socioeconomic status.² Therefore, this study will analyzed the characteristics of subjects who suffered from maxillofacial trauma and the domination of the management in Indonesia, specifically in Bali. The descriptive study of maxillofacial trauma aimed to outline the risk condition in Indonesia, thus provide better understanding dan providing valuable information health actions planning.

METHODS

This study is a retrospective study performed in Sanglah General Hospital from January 2012 to November 2018. Authors took secondary data from medical records of maxillofacial injury subjects admitted to the Department of Trauma and Acute Care Surgery. All medical records from subjects who presented with maxillofacial injury and received treatment at the Department of Trauma and Acute Care Surgery were included. Incomplete medical records and subjects who could not be contacted were excluded from this study.

There were 241 medical records included in this study, yielding 11 incomplete medical records and five subjects that could not be contacted that were excluded from this study. The parameters taken were age, gender, cause

of injury (traffic accident, interpersonal violence, falls, others such as work accident and accident during the practice of sports), location of maxillofacial injury (based on radiology examination), and the treatment. For additional data on the cause of traffic accident, subjects were contacted by phone. Data were tabulated and presented in table and text. Frequency distribution was described in numbers and percentages.

RESULTS

There were 241 subjects included in this study (**Table 1**). The maxillofacial injury was more common suffered by male (Male 84%, female 16%) and aged 18 to 40 years old (49.25%). The mandible was the most prone fracture to be found, thus happening in 60.12% of total cases, followed by zygoma fracture (30.22%), and maxillary fracture (9.66%). Mandible fracture could be divided based on the part of mandibular. About 48% fractures were identified at symphysis or parasymphysis of mandible, followed by 29.43% at the body of mandible, 12.86% at the angular mandibular, 5% at the condyle mandible, 2.34% at the mandibular ramus, 1.88% at the dentoalveolar part of mandibular, and 0.49% at the coronoid process.

Road traffic accident (92%) was dominated as the cause for maxillofacial injury. Further history taking from the subjects by phone showed that lack of skill (44.45%) was the most common cause of traffic accident. This was followed by the cause of abiding traffic law (16.93%), and under the influence of alcohol (8%). Most subjects were managed with the gold standard, single open reduction and internal fixation (83.73%) followed by Archbarr placement, either in combination with interdental wiring (IDW) or MMF

(mandibulomaxillary fixation) (16.27%) (Table 1).

Table 1. Demographics data of maxillofacial subjects in Sanglah General hospital

Demographics	Frequency (%)
Gender	
Male	84
Female	16
Age	
0-18 years old	26.75
18-40 years old	49.25
40-60 years old	24
Mechanism of injury	
Traffic accident	92.0
Violent activity	8.0
Fractures	
Mandible	60.12
Zygoma	30.22
Maxillary	9.66
Treatment	
Conservative	22.0
Surgery	78.0
ORIF miniplate	70.12
Archbarr + IDW	6.00
Archbarr + MMF	10.27
ORIF miniplate + Archbarr	13.61

DISCUSSION

Maxillofacial is the prominent site of the human body and this makes the region is prone to be suffered from trauma.² The common cause of maxillofacial injury is due to a traffic accident.² In Bali, the most common mechanism of injury was a road traffic accident. It was in concordance with many studies since 1990 that traffic accident was the most common culprit, followed by assault.^{8,9}

Maxillofacial trauma happened more frequent in young adult patients, who was more productive, has more energy to explore, which in agreement with findings in many demographic studies. Male gender is a predominant victim in our study due to their greater participation in high risk activity which increases their exposure to the risk factor such as driving vehicles at high speeds and their social life involving alcohol and violent activity.¹⁰ The age related to a high

prevalence of maxillofacial injuries was in 18-40 years old, attributed to the fact that subject in this period of life is more active regarding their activities.

In this study, mandible fracture was the most common variation, followed by zygoma and maxillary fracture. This concurs with results from many other studies from either local, regional, and international studies. The reason for the preponderance of mandible was due to its prominence, mobility and its selection as a target of intentional violence.^{11,12} However, looking specifically to the part of mandible fracture, this study has a different prevalence of mandible condyle fracture (5% of cases) while other studies tend to show higher prevalence.¹³ In Table 2, we showed that the most common prevalence site of maxillofacial fracture were difference among studies. Still, the mandible fracture dominated to be the most prevalence site of fracture, as in Brazil, Australia, Pakistan, Nigeria, India, Europe, and Bandung.¹⁴⁻²⁵

In this study, lack of skill (44.45%) was the most common cause of traffic accident, which has to be taken in action by the government that the standard for motorcycle riding license should be strictly regulated. Besides that, from the observational study in the emergency room whilst doing study, authors found that low level of awareness among the population to wear full face helmet did impact the number of maxillofacial injuries at Indonesia, especially at Bali.

The maxillofacial trauma diagnosis in our hospital was standardized based on regular practice although no guideline has been made. Physical examination leads to the decision to do further radiology examination. Plain radiograph of skull anteroposterior or lateral aspect and panoramic were the first modalities to be carried out. If the radiograph was not representative, more sophisticated

Table 2. Site and management of maxillofacial fractures in others studies¹⁴⁻²⁵

Authors	Country	Methods	Site of fracture	Management of fracture
Germar et al. (2009)	Philippine	Retrospective 3 years	Maxillary (32%) Frontal (30%) Orbital (24%)	Conservative (85%) Surgical (15%) - ORIF with and without IDW-MMF (20%) - IDW-MMF only (2.1%) - Close reduction (2%)
Carvalho et al. (2010)	Brazil	Retrospective 6 years	Mandible (44%) Nasal (18%) Zygomatic (10%)	
Tomich et al. (2011)	Argentina	Retrospective 2 years	Orbital (18%) Maxilla (16%) Nasal (15%)	
Lee et al. (2012)	Australia	Retrospective	Mandible (35%) Zygoma (31%) Orbital (22%)	Conservative (46%) Surgical (64%) - ORIF (38%) - Open reduction (8.6%) - Closed reduction 4.4%)
Haq et al. (2014)	Pakistan	Retrospective 2 years	Mandible (49.5%) Zygomaticomaxillary complex (18%) Nasal (1.4%)	Conservative (not mentioned) Surgical - ORIF (44%) - MMF (39%) - ORIF + MMF (14%) - Archbarr (3%)
Latifi et al. (2014)	Iran	Cross-sectional 1 year	Nasal (66%) Mandible (7%) Orbital (3.6%)	
Udeabor et al. (2014)	Nigeria	Retrospective 6 years	Mandible (59%) Maxilla (13%) Zygomaticomaxillary complex (18%)	Conservative (11.7%) Surgical (88.3%) - Closed reduction + IMF (40%) - ORIF + IMF (31%) - Closed reduction + suspension (4.3%)
Boffano et al. (2015)	Europe	Retrospective 2 years	Mandible (42%) Zygomaticomaxillary complex (15%) Orbital (16%)	
Shah et al. (2016)	Pakistan	Retrospective 3 years	Mandibula (62%) Zygomaticomaxillary complex (17%) Maxillary (4%)	Conservative (9%) Surgical (89%) - MMF (40%) - MMF + Archbarr (24%) - ORIF + IDW (8%)
Caesario et al. (2017)	Indonesia (Bandung)	Retrospective 2 years	Mandible (15%) Maxilla (14%) Nasal (11%)	
Padmanaban et al. (2017)	India	Retrospective 2 years	Mandible (27%) Zygomaticomaxillary complex (24%) Dentoalveolar (16%)	
Pungrasmi et al. (2018)	Thailand	Retrospective 9 years	Zygomaticomaxillary complex (38%) Mandible (22%) Nasal (18%)	

examination such as CT Scan should be taken in giving the more detail of fractures.¹¹ For the treatment, there are many options, which might differ depending on the cost of treatment, the feasibility of hospital, doctor's decision, and patient's willingness to obey the treatment advised.¹⁴ In our hospital, prior to the new agreement between hospital and insurance provider agreed to cover the cost of ORIF miniplate, majority of the patients were treated with closed reduction with arch bar fixation. Since the insurance cover the cost of miniplate in 2001, open reduction and internal fixation become the first choice. The surgical approach carried out was intraoral sublabial, coronal, transcutaneous, transconjunctival, and subciliary approach.

The sky high of traffic accidents resulting the high prevalence of maxillofacial injury at Sanglah General Hospital Denpasar Bali. Complete diagnoses and precise treatment lead to optimal occlusion, integrity of nervous system, both internal fixation and Archbarr were an effective treatment. Maintenance of proper oral hygiene was also an important adjunct therapy in the management of mandible fractures. Loss of tissue barriers to bacterial invasion due to compound fractures intraorally increased the risk of secondary infection. Symptomatically, steroids and the use of ice compresses were suggested to reduce edema.²⁶

CONCLUSION

Maxillofacial injuries were usually suffered by males in productive ages, in which the most susceptible segment of injury was mandible. Management varies, with the gold standard of ORIF miniplate, together with Archbarr and interdental wiring fixation.

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DISCLOSURE

Authors declare no conflict of interest of this report.

REFERENCES

1. Cothren CC, Biffi WL, Moore EE. Trauma. In: Brunickardi FC, Andersen DK, Billiar TR, et al, editors. *Schwartz's Principal of Surgery, 9th edition*. USA: McGraw-Hill Companies, Inc; 2010. p.169-70.
2. Ribeiro M, Marcenes W, Croucher R, et al. The prevalence and causes of maxillofacial fractures in patients attending Accident and Emergency Departments in Recife-Brazil. *Int Dent J*. 2004;54:47-51.
3. Tuckett JW, Lynham A, Perry UH. Maxillofacial trauma in the emergency department: A review. *Surgeon*. 2014;12:106-14.
4. Jose A, Nagori SA, Agarwal B, et al. Management of maxillofacial injury. *J Emerg Trauma Shock*. 2016;9:73-80.
5. Bali R, Sharma P, Jindal S, et al. Bone resorption after bioresorbable fixation of a fractured paediatric mandible - a case report. *Oral Surg*. 2010;4:48-50
6. Al Ahmed HE, Jaber MA, Abu Fanas SH, et al. The pattern of maxillofacial fractures in Sharjah, United Arab Emirates: a review of 230 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2004;98:166-70.
7. Kamulegeya A, Lakor F, Kabenge K. Oral maxillofacial fractures seen at a Ugandan tertiary hospital: a six-month prospective study. *Clinics (Sao Paulo)*. 2009;64:843-8.
8. Haug RH, Prather J, Indresano AT. An epidemiologic survey of facial fractures and concomitant injuries. *J Oral Maxillofac Surg*. 1990;48:926-8.

9. Jamal BT, Diecidue R, Qutuo A, et al. The pattern of combined maxillofacial and cervical spine fractures. *J Oral Maxillofac Surg.* 2009;67:559-63.
10. Singh JK, Lateef M, Khan MA, et al. Clinical study of maxillofacial trauma in Kashmir. *Indian J Otolaryngol Head Neck Surg.* 2005;57:24-7.
11. Desai J, Lownie JF, Cleanton-Jones PE. Prospective audit of mandibular fractures at the Charlotte Maxeke Johannesburg Academic Hospital. *S Afr J Surg.* 2010;48:122-6.
12. Adeyemo WL, Ladeinde AL, Ogunlewe MO, et al. Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head Face Med.* 2005;1:7.
13. Shayyab M, Alsoleihat F, Ryalat S, et al. Trends in the pattern of facial fractures in different countries of the world. *Int J Morphol.* 2012;30:745-56.
14. Germar GG, Cruz MAY. A Four-Year Study of the Demographic Distribution and Treatment of Maxillofacial Fractures Admitted at the Philippine General Hospital. *Acta Medica Philippina.* 2009;43:16-25.
15. Carvalho TB, Cancian LR, Marques CG, et al. Six years of facial trauma care: an epidemiological analysis of 355 cases. *Braz J Otorhinolaryngol.* 2010;76:565-74.
16. Tomich G, Baigorria P, Orlando N, et al. Frequency and types of fractures in maxillofacial traumas. *Head and Neck.* 2011;25:1-13.
17. Lee K. Global trends in maxillofacial fractures. *Cranio-maxillofac Trauma Reconstr.* 2012;5:213-22.
18. Haq EU, Liaquat A, Aftab A, et al. Etiology, pattern, and management of maxillofacial fractures in patients seen at Mayo Hospital, Lahore, Pakistan. *Pakistan Oral & Dental Journal.* 2014;34:417-21.
19. Latifi H. Prevalence of different kinds of maxillofacial fractures and their associated factors are surveyed in patients. *Glob J Health Sci.* 2014;6:66-73.
20. Udeabor S, Akinmoladum VI, Obiechina AE, et al. Pattern of midface trauma with associated concomitant injuries in a Nigerian referral centre. *Niger J Surg.* 2014;20:26-9.
21. Boffano P, Rocchia F, Zavatiero E, et al. European Maxillofacial Trauma (EURMAT) project: A multicentre and prospective study. *J cranio-maxillo-facial surgery.* 2015;43:62-70.
22. Shah SA, Bangash Q, Khan TU, et al. The pattern of maxillofacial trauma and its management. *Symbiosis* 2016;1:1-7.
23. Caesario O, Boesoirie SF, Tahid A. Characteristics of Maxillofacial Fractures Resulting from Road Traffic Accidents at Dr. Hasan Sadikin General Hospital. *Althea Medical Journal.* 2017;4:345-52.
24. Padmanaban SA, Suresh D, Saravanan R, et al. Incidence and Prevalence of Maxillofacial Injury in Government Theni Medical College - Two Years of Retrospective Study. *Int J Sci Stud.* 2017;4:137-42.
25. Pungrasmi P, Haetanurak S. Incidence and etiology of maxillofacial trauma: a retrospective analysis of King Chulalongkorn Memorial Hospital in the past decade. *Sciendo.* 2018;11:1-5.
26. Greenberg AM, Prein J. *Cranio-maxillofacial reconstructive and corrective bone surgery: Principles of Internal Fixation Using the AO/ASIF Technique.* New York: Springer-Verlag; 2002.