CASE REPORT

The Use of Titanium Mesh in Oral and Maxillofacial Surgery (Multidisciplinary Collaborative): Case Series

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ABSTRACT

Introduction: The most common pathology detected and treated in oral and maxillofacial surgery is facial trauma, which is rising globally. The maxillofacial region uses titanium mesh for a variety of procedures, including osteosynthesis in traumatology, particularly for comminuted fractures, craniofacial reconstruction, mandibular reconstruction, augmentation of the atrophic maxilla, and mandibular and orthognathic surgery. This study aims to determine the use of titanium mesh in maxillofacial trauma. **Case Series:** We present three cases of maxillofacial trauma after the vehicle accident. The first instance involved the infraorbital and zygomatic region; the second involved the infraorbita; and the third involved the frontal region. The three cases were fixed and reconstructed with titanium mesh. **Conclusion:** Titanium mesh can be used to repair fractures in the maxillofacial region. It was a successful fixation technique with excellent physical and biomechanical properties which has not resulted in any functional impairment or morbidity.

Keywords: Maxillofacial fracture; Oral and maxillofacial surgery; Titanium mesh

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INTRODUCTION

The most common pathology detected and treated in oral and maxillofacial surgery is facial trauma, which is rising globally. (1,2) According to the severity of the trauma maxillofacial fractures can result in severe morbidity, facial deformity, and functional limitation. Early detection of maxillofacial fractures is crucial for planning the repair of functional systems (such as vision, mastication, and olfaction), as well as for directing physical, psychological, and social rehabilitation. (3)

The maxillofacial region uses titanium mesh for orthognathic surgery, craniofacial reconstruction, mandibular reconstruction, augmentation of atrophic maxilla and mandible, and osteosynthesis in traumatology, particularly for comminuted fractures. (4,5) This case series aims to describe the use of titanium mesh in maxillofacial trauma.

CASE REPORT

CASE 1

A 14-year male was assaulted and suffered n orbital fracture and multiple lacerations (Fig.1). On ophthalmic examination, he had exophthalmos. The fracture was approached through an existing laceration and fragmented orbital rim (Fig. 2). Spanned the floor defect with titanium mesh that was cut into defect size on the table based on CT scan measurements.

CASE 2

A 57-year male presented bilateral infraorbital laceration with fracture rima orbita sinistra (Fig. 4). The laceration was used to access the fracture,

Fig. 1 : Pre operative, (A,B) extra oral, (C) CT 3D examination.

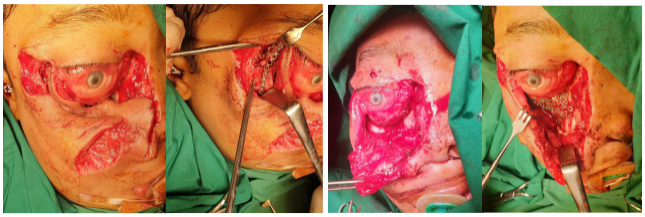

Fig. 2 : Intra Operative (A) post wound debridement vulnus laceration (B) application mini plate on zygomaticum dextra, (C) elevation laceration post wound debridement, (D) application mesh titanium plate on infra orbita dextra.

Fig. 3 : Post Operative.

and titanium mesh that was cut to fit the size of the fracture was used to form and fix the fractured medial orbital rim (Fig. 5).

CASE 3

A 29 year male presented with panfasial fracture of frontal bone, NOE fracture, maxilla and mandibula

Fig. 4 : Pre operative, (A) extra oral, (B) CT 3D examination.

Fig. 5 : (A) Intra Operative application mesh plate on infra orbita sinistra, and (B) and Post operative

fracture (Fig. 6A and B). He fracture was approached through coronal approach. (Fig. 7A) Based on measurements from the CT scan, titanium mesh was cut into the right defect size on the table and utilized to span the frontal and infraorbital defects. (Fig. 7B)

Fig. 6 : Pre operative, (A) extra oral, (B) CT 3D examination.

DISCUSSION

The maxillofacial area is conspicuous on the human body and therefore susceptible to injury. (6) The

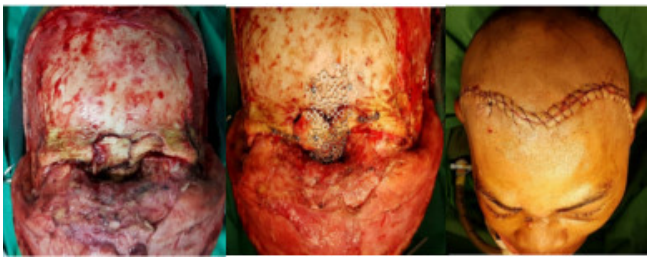

Fig. 7 : (A) Fracture frontalis and NOE with accessed coronal approach (B) application mini plate on frontal (C) post operative.

prominent head position causes a considerable fraction of trauma victims to sustain maxillofacial fractures. As a result, treating complex maxillofacial fractures remains difficult for oral and maxillofacial surgeons and requires skill and a great deal of experience. (7).

In maxillofacial region, titanium mesh is used for osteosynthesis in traumatology, particularly for comminuted fractures, augmentation of the atrophic maxilla, mandibular reconstruction, craniofacial reconstruction, and mandibular and orthognathic surgery (stabilization of LeFort I and ramal osteotomies).(8-10) This study aimed to describe the use of titanium mesh in maxillofacial trauma.

In the first cases, the exploration was performed through post-traumatic scars because bone fragments were found and adequate access to the orbital and maxillary floor area and the titanium mesh used to close the fracture defect was smaller than the size of the fracture defect. then ends with hecting the laceration area on the face (Fig 3). In the second cases, an infraorbital exploration was also performed through the wound defect, then sutured in the infra orbital laceration (Fig 5B). Al-Anezi suggested that the mesh size should not be larger than the fracture defect because it could affect the movement of the eyeball. (10) In the third case, we used a coronal approach to access frontal fractures, NOE fractures (Fig. 7A) for maxillary and mandibular fractures and an intraoral approach for fracture fixation. The use of mesh for this case is placed in the frontal area (Fig. 8B), and hecting was done on the coronal approach (7C). The three previous cases used titanium mesh to correct and fixation of the fracture. Treatment involves collaborative disciplines of oral and maxillofacial surgery, general surgery, ophthalmology, and neurosurgery.

Maxillofacial fracture repair using titanium mesh has proven to be a highly adaptable and flexible solution. It was an efficient fixation method fixing with great physical and biomechanical characteristics. (11,12) It moved rapidly and had good physical and biomechanical attributes. We chose it above other conventional plating methods because it was more malleable and permitted more excellent contouring at the fracture site—the numerous screw placement holes allowed for comminuted fractures stable healing. (8,13,14) Because it is semi-rigid, it also provides the additional benefits of lessening the stress shielding effect and facilitating functional bone healing. (5,15,16,17) In our study, widely used titanium mesh in patients with comminuted fractures, and its price was comparable to other titanium implants. (9) Also, titanium mesh's complication rate was acceptable. As a result, titanium mesh was found to help regain the form and function of the craniofacial region (9,10)

More implants would have been needed in these patients to achieve stability and fixation, increasing the patient's costs.(18-20) Furthermore, the acceptable complication rate of the titanium mesh was demonstrated. Thus, it was found that titanium mesh can assist restore the shape and function of the craniofacial region without endangering the patient's functional ability or causing any morbidity. (13,19)

CONCLUSION

Titanium mesh can be used to repair fractures in the maxillofacial region. It was a successful fixation technique with excellent physical and biomechanical properties which has not resulted in any functional impairment or morbidity.

ACKNOWLEDGEMENT

The authors would like to thank the surgical nurses at Undata Hospital for all of their assistance and support in the management of these cases.

REFERENCES

1. Wusiman P. Epidemiology and Pattern of Oral and Maxillofacial Trauma. J Craniofac Surg. 2020;31(5):517–20. doi: 10.1097/SCS.0000000000006719
2. Xiao-dong L, Qiu-xu W, Wei-xian L. Epidemiological pattern of maxillofacial fractures in northern China. www.md-journal.com. : 1–7. doi: 10.1097/MD.0000000000019299
3. Abosadegh MM, Saddki N, Al-tayar B, Rahman SA. Epidemiology of Maxillofacial Fractures at a Teaching Hospital in Malaysia : A Retrospective Study. 2019; doi: 10.1155/2019/9024763.
4. Madaree A, Eng F, Sa FCSP, Moyeni ГN, Ukzn M. Use of Stock Titanium Mesh Plates in Cranioplasty. J Craniofac Surg. 2019;30(8):2341–4. doi: 10.1097/scs.0000000000005778
5. Kaur N, Kaur T, Kaur J, Kaur Y. Efficacy of Titanium

Mesh Osteosynthesis in Maxillofacial Fractures. J Maxillofac Oral Surg. 2018;17(4):417–24. doi: 10.1007/s12663-017-1043-6
6. Lida N, Watanabe A. Patient-specific titanium mesh plate for the reconstruction of complex nasoethmoid-orbital and midfacial bone fractures due to bear injury. 2019;21(2):157–8. doi. org/10.1177/1460408617741152
7. Sun Xu, Tong Shuang, Yang Shude, Guo Shu. Multidisciplinary Treatment for a Young Patient With Severe Maxillofacial Trauma From a Snowmobile Accident: A Case Report. doi: 10.1563/AAID-JOI-D-09-00058R1
8. Lazaridis N. The use of titanium mesh sheet in the fronto- zygomatico-orbital region . Case repor t s. Aust Dent J 1998. doi: 10.1111/j.1834-7819.1998. tb00168.x
9. Nitin J. MS Mokal, FmMahinoor F. Desai, M.S. Titanium Mesh Reconstruction of Orbital Roof Fracture with Traumatic Encephalocele: A Case Report and Review of Literature. Craniomaxillofacial Trauma and Reconstruction Vol. 5 No. 1/2012. doi: 10.1055/s-0031-1300958
10. Al-Anezi M, Mahran H, Alomaym M, Salma Albati S, Alharbi M. Role of Titanium Mesh as a Reconstruction Material for Orbital Floor Defects in Cases of Orbital Blowout Trauma, OHDM- 2018:17.Available from: https://www. walshmedicalmedia.com
11. Gallinetti S. Tensile behaviors of three-dimensionally free- formable titanium mesh plates for bone graft applications Tensile behaviors of three-dimensionally free-formable titanium mesh plates for bone graft applications. 2017; doi: 10.1088/1757899X/269/1/012093
12. Xie Y, Li S, Zhang T, Wang C, Cai X. Titanium mesh for bone augmentation in oral implantology : current application and progress. Int J Oral Sci [Internet]. 2020;(October): 12. Available from: http://dx.doi.org/10.1038/s41368-020-00107-z
13. Ashutosh Kumar Singh, Safal Dhungel, Sanad Dulal, Manish Yadav. "Shaping of comminuted midface fractures with stock Titanium mesh: a technical note", Journal of Oral Medicine and Oral Surgery, 2021. doi.org/10.1051/mbcb/2021024
14. Zhang SL, Lee H, Cai EZ, Yap YL, Yeo TT, Lim TC, et al. Dermointegration in the exposed titanium cranioplasty : a possible protective phenomenon. 2021;1–4. doi: 10.1093/jscr/rjaa551. eCollection 2021 Jan.
15. Wang Y, Huang S, Fang Y, Huang S, Cheng H, Chen C, et al. Anatomical Thin Titanium Mesh Plate Structural Optimization for Zygomatic-Maxillary Complex Fracture under Fatigue Testing. 2018. doi:10.1155/2018/9398647
16. Baek W, Koo H, Seob W, Hui T. Comparison of Absorbable Mesh Plate versus Titanium-Dynamic Mesh Plate in Reconstruction of Blow-Out Fracture: An Analysis of Long-Term Outcomes. Archives of Plastic Surgery. Vol. 41 / No. 4 / July 2014. doi:10.5999/aps.2014.41.4.355
17. Ling-Xiao Ye, Xiao-Ming Sun, Yu-Guang Zhang, Ying Zhang. Materials to facilitate orbital reconstruction and soft tissue filling in posttraumatic orbital deformities, Plast Aesthet Res 2016; 3:86-91. doi:10.20517/2347-9264.2015.122
18. Mesa J. Atlas of Operative Craniofacial Surgery. 2019
19. Vallefuoco, F. Bird, I. Gordo, H. Brissot, C. Fina. "Titanium mesh osteosynthesis for the treatment of severely comminuted maxillofacial fractures in four dogs", Journal of Small Animal Practice, 2021. Doi :10.1111/jsap.13390
20. Lalloo R, Lydia L, Catherine B, Castle C, Dingels Z, et al. (2020) Epidemiology of facial fractures: incidence, prevalence and years lived with disability estimates from the Global Burden of Disease 2017 study. Inj Prev Pg no: 1–9. doi: 10.1136/injuryprev-2019-043297