

CASE REPORTS OF MULTIPLE FACIAL BONE FRACTURE TREATED BY THE USE OF MINIPLATE OSTEOSYNTHESIS

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Abstract

There were increased number of maxillofacial trauma in recent years accompanied by the change in the type and the severity of the injury thus it was necessary to set up new therapeutic concepts.

Among many fixation methods, miniplate osteosynthesis, compression osteosynthesis, wire osteosynthesis and so forth were considered.

In this paper we are reporting case of the multiple facial bone fracture, which mainly treated with miniplate osteosynthesis and the additionally used craniofacial suspension wire and transpalatal wire. It was concluded that miniplate osteosynthesis was useful in multiple facial bone fractures.

INTRODUCTION

In treatment of the maxillofacial bone fracture, first consideration is determination of patterns of the fracture line, type, and severity, and the next is selection of osteosynthesis material^{1, 2, 3, 4, 5)}.

The choice of material is determined by the calculation of the bending and torsion forces (biomechanics) of available material, anatomical data, biological tolerance of body to the foreign body material, and the type and severity of the fracture^{2, 6, 7, 8)}.

Several osteosynthesis materials were compared according to healing mechanism. Rigid and nonrigid fixations were different from each other at the point of resorption of fragment end, callus formation, new bone formation process, and the need of IMF, as described on Table 1 (9, 10).

The biomechanical fundamentals of the miniplate osteosynthesis were experimentally studied during the past decade and influenced on the treatment concepts. The monocortical plate osteosynthesis techni-

que that was studied by Michlet et al (1973) was modified and developed into a practical and clinical method. Champy et al, (1975, 1976, 1977, 1978) and Strasbourg et al, (1975) did mathematical and experimental studies of the biomechanical principles of this method^{11, 12, 13, 14)}.

Miniplate osteosynthesis is indicated in many cases of the fracture including in edentulous jaw as well as in dentulous jaw through the intraoral approach. However external approach is used in compound fracture, multiple fracture, and other common fractures.

Table 1. Compare of rigid and nonrigid fixation.

nonrigid fixation	rigid fixation
Resorption of fragment end(+)	Resorption of fragment end (-)
Callus formation (+)	Callus formation (-)
Fibrous bone formation	Direct bone formation in the fragment end
Chondral ossification	Lamellar bone formation
IMF with 6 weeks	No IMF

Compression osteosynthesis has higher bending strength than internal rigid fixation even without the compression for two weeks of postoperative period. But miniplate osteosynthesis has comfortable bending forces to maxillofacial regions, and stable for early usage following surgery^{11, 12, 15}.

There are need for the correct positioning of the plate in operation to achieve above principles. Miniplate must be positioned on ideal osteosynthesis line, which is defined by the course of the lines of tension registered under standardized action of bending forces. Plate was fixed to the ideal osteosynthesis line with monocortical screw, and another plate was added if necessary. Ideal osteosynthesis line in mandible is on the course of a tension line at the base of the alveolar process, behind the mental foramen, below the dental roots and above the inferior alveolar nerve, broad surface of the external oblique line, and another plate near the lower border of the mandible (Fig. 1). In maxillae, ideal osteosynthesis line is not clear as in mandible but generally considered to be located on the thick bony mass of the lower orbital margin, lateral margins of the piriform aperture, at the zygomaticomaxillary buttress, on the lower margin of the piriform aperture, at the zygomaticofrontal buttress, on the median orbital margins, periorbital and subnasal region (Fig. 2)^{11, 16}.

Miniplate osteosynthesis is considered as the rigid fixation. Sometimes craniofacial suspension may be combined with miniplate osteosynthesis. This combination may be considered when postoperative fixation cannot be granted.

In this cases, miniplate osteosynthesis allows early removal of the intermaxillary fixation and of the suspension wires. Advantage of the combined procedure in the treatment of extensive periorbital fractures are reliable stabilization of the orbital margin, and easy reduction and approximation of the multiple facial bone fracture segments^{11, 17, 18, 19, 20, 21}.

Miniplate osteosynthesis is more comfortable in treatment of the maxillofacial bone fracture. This procedure has several minor complications. The serious

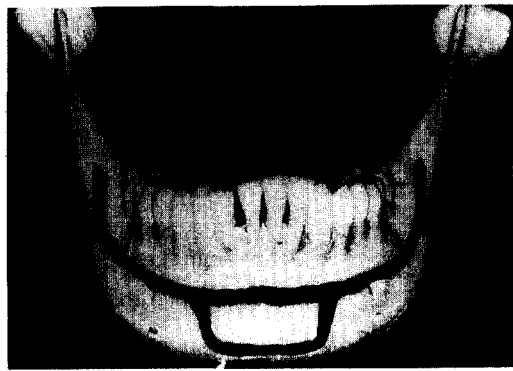


Fig. 1. Ideal osteosynthesis line on mandible.

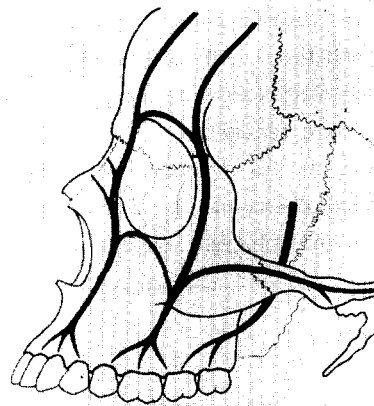


Fig. 2. Miniplate position on maxilla consider stress pillar and bone thickness.

complications of osteomyelitis and non - union are relatively rare. There was none of these severe complications in our study of 66 cases. They are also relatively low in other studies, Strasbourg reported 0%, Colonge reported 2.0% (16/787 osteosynthesis). Minor complications are suture dehiscence, abscess formation, pseudoarthrosis etc. Suture dehiscences were commonly found if there had been delay of time between trauma and operation. This complication also occur independantly of the timing of treatment following on inappropriate incision in the region of the adjacent gingiva. This complications sometimes lead to delayed infection, osteomyelitis, pseudoarthrosis,

Table 2. complication of the miniplate osteosynthesis

	Number of osteosynthesis	Suture dehiscence	Abscess formation	Pseudoarthrosis	Osteomyelitis at Fx. site
Strasbourg	642	17 (2.6%)	7 (1.1%)	-	-
Colonge	767	52 (6.6%)	16 (2.0%)	3 (0.3%)	16 (2.0%)
Lee. et al.	66	-	3 (4.5%)	-	-

postoperative disturbance of occlusion and displacement of fragments. This complications are detailed in Table 2^(11, 12, 13, 22, 23, 24, 25).

CASE REPORTS

1) Name : Kim S.O. F/25

Imp. : Mandible Symphysis fracture
 : LeFort I fracture (both)
 : LeFort II fracture (Left)
 : Mid - palatal open fracture
 : Nasal bone fracture

Etiology : T.A.

Treatment : Open reduction with combination of miniplate osteosynthesis and suspension wire.

Closed reduction on nasal bone fracture (Fig. 3, 4).

2) Name : Bang W. M/30

Imp. : Mandible Symphysis fracture.
 : LeFort II, III fracture (both)

Etiology : T.A.

Treatment : Open reduction with miniplate osteosynthesis (Fig. 5, 6)



Fig. 3. Case 1) Water's view



Fig. 4. Case 1) Lateral view



Fig. 5. Case 2) Skull P-4 (Pre & Postop.)

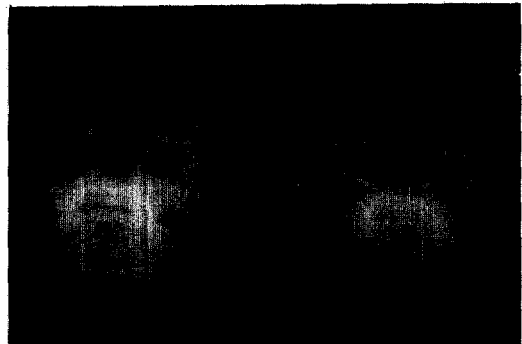


Fig. 6. Case 2) Water's view



Fig. 7,8,(cases 3) preop skull P-A and postoperative view.

3) Name : Kim. C.C. M/27

Imp. : Mandible Symphysis fracture.

: LeFort II fracture (both)

: LeFort III fracture (Left)

Etiology : T.A.

Treatment : Open reduction with combined method of miniplate osteosynthesis and cranio - facial suspension wire (Fig. 7,8,9)

cases on the fractured lateral wall of the maxillae need the suspension wire. Suspension wire attached to the maxillary arch bar splint provided earlier mouth opening, and was removed at 2 weeks postoperatively then replaced with the arch bar splint. All 3 cases were evaluated postoperatively for 6 months. The result would be beneficial to the multiple facial bone fracture cases that are treated by miniplate osteosynthesis and additionally used craniofacial suspension wire for the purpose of less complicated better healing procedure.

DISCUSSION

We have discussed 3 cases of multiple facial bone fractures with more than 8 fracture lines. Cases all have severe malocclusion and a facial asymmetry. They were all needed to have preoperative intermaxillary fixation to correct the malocclusion. In cases of palatal bone fracture transpalatal wiring was applied preoperatively. Multiple facial bone fracture is reduced with miniplate osteosynthesis. But severe deviation cases of the orbital area and severe defect

REFERENCES

1. Dingman R.O. and Natvig P. : Surgery of Facial Fractures, W.B. Saunders Co., pp. 245 - 266, 295 - 310, 1973.
2. Kruger, E., and Schilli, W. : Oral and Maxillofacial Traumatology. Vol. 1. 1st Ed. Quintessence Publishing Co., 1982.

3. 남일우. : 악안면구강외과학. 고문사. 1987.
4. Kruger, G.O. : Textbook of Oral and Maxillofacial Surgery. 5th. Ed. C.V. Mosby Co. 1979.
5. Daniel E. Waite. : Textbook of Practical Oral and Maxillofacial Surgery. 3rd Ed. LEA & FEBIGER. 1987. Philadelphia. p. 343 - 362.
6. Borns, R. and G.Boering. : Fractures of the mandibular body treated by stable internal fixation. J. Oral Surg. 28 : 407, 1970.
7. E. Hjorting-Hansen. : I.A.O.M.S. Oral and Maxillofacial Surgery. : Herbert Nieder dellman. ; Methods of Osteosynthesis. Quintessence books. pp. 108 - 114.
8. Wheelock, R.W. : Open Reduction of Fractured Mandible. J. Oral Surg. 37 : 892, 1950.
9. Kruger. E., and Schilli, W. : Oral and Maxillofacial Traumatology. vol. 1. 1st Ed. Quintessence. 1982. pp.134 - 144.
10. Yamada, H. : Strength of biological materials. Baltimore, Williams. 1970.
11. Kruger, E., and Schilli, W. : Oral and Maxillofacial Traumatology. vol. 2. 1st Ed. Quintessence. 1982. pp.19 - 43.
12. E. Hjorting-Hansen. : I.A.O.M.S. ; Hans-Georg Luhr. : Basic Research, Surgical Technique and Results of Fracture Treatment with the LUHR-Mandibular Compression Serew System. (HCS-system), p.124.
13. E. Hjorting-Hansen. : I.A.O.M.S. ; Klaus Louis Gerlach, M. Khouri, Hans-Dieter. Pape and Maxime Champy : The Strasbourg Miniplate Osteosynthesis. P.138.
14. Michelet, F.X., J. Deymes, and B. Dessus. : Osteosynthesis with miniaturized screwed plates in maxillofacial surgery. J. Max. Surg. 1 : 79, 1973.
15. Champy. M., J.P. Lodde, R. Sehmitt, J.H, Jaeger, and D. Muster. : Mandibular osteosynthesis by miniaturized serewed plates via a buccal approach. J. Max. Fac. Surg. 6 : 14, 1978.
16. Kruger, E., and Schilli, W. : Oral and Maxillofacial Traumatology. Vol. 2. 1st Ed. Quintessence. 1982. pp.107 - 222.
17. E. Hjorting-Hansen. : I.A.O.M.S. ; Masaharu Morishita, Rinzoh Watanabe, Toshiki Kataoka, Muneo Ohta and Mikio Sasoh. : A New Craniomaxillary Suspension. Quintessence book. p.221.
18. Hardin, Jr., J.C. : Frontomaxillary suspension of comminuted type III facial fractures. Plast. & Reconstr. Surg. 40. 450 - 452.
19. Kufner, J.C. : A method of craniofacial suspension. J. Oral Surg. 28. 260 - 262.
20. Mektubjian, S.R. : Technique of the middle third of the face. J. Oral Surg. 39. 301 - 304.
21. Lesney, T.A. : A method of immobilisation. J. Oral Surg. 11 : 452, 1958.
22. E. Hjorting-hansen. : I.A.O.M.S. ; U. Joos and W. Schilli. : Complications after Osteosynthesis of the Mandible.
23. Lee. D.K., Yim. C.J. : The Clinical Study of Mandibular Fracture. The J. of Korean Academy of Maxillofacial and Plastic Surgery. Vol. 11. No. 1. 1989.
24. Lee, D.K., Yim, C.J., Yang, H.C. : The Clinical Study of Facial Bone Fracture. The J. of Korean Academy of Max. Facial Plas. Surg. Vol. 11. No. 1. 1989.
25. E. Jorting-Hansen. : I.A.O.M.S. Oral and Maxillofacial Surgery. ; Hans-Georg Luhr. : Comparative Studies between the Extraoral and Intraoral Approach in Compression-osteosynthesis of Mandibular Fractures. Quintessence books. pp.133 - 137.

MINIPLATE 를 이용한 다발성 안면골 골절의 치험례

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국문초록

현대문명의 발달과 더불어 안면골 골절의 형태는 다양해지고 그 손상 정도와 치료개념도 새로운 변천을 하게 되었다. 안면골 골절의 치료개념은 점차 소강판 또는 압박골판과 나사 고정등의 안정된 고정들의 수술방법으로 발전되고 있는 추세에 있다.

본 증례보고는 최소한 8개소 이상의 골절선을 가진 다발성 안면골 골절을 Miniplate osteosynthesis 을 주로 이용한 치험례로, 필요시 Craniofacial suspension wire 등의 겸용으로 아주 양호한 결과를 얻었기에 보고하는 바이다.