

MANAGEMENT OF EXTENSIVELY COMMUNATED  
MANDIBULAR FRACTURE – A CASE REPORT

## ABSTRACT

Comminuted mandible fractures are generally the result of significant impact on a localized area of the oromandibular complex and are defined as multiple lines of fracture in one region of the mandible. Treatment modalities for management of comminuted mandibular fractures include closed reduction, external pin fixation, internal wire fixation and open reduction and internal fixation using miniplates, reconstruction plates, titanium mesh tray and screws. The following case report describes the open reduction and internal fixation of an extensive comminuted mandibular fracture in a 28-year-old male patient. CT findings revealed complete loss of integrity of mandibular bone in right body, angle and ramus region with fracture lines crossing each other. The patient underwent open reduction and internal fixation with a load bearing reconstruction plate, 3D mesh and a short period of maxillomandibular fixation.

Keywords : mandibular Fracture, Open reduction, internal fixation, 3D Titanium mesh

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## INTRODUCTION:

Comminuted fracture refers to multiple fracture lines that result in many pieces of bones within the same region of mandible. In extensive comminuted fracture, bone is splintered, crushed, pulverized or broken into several pieces.<sup>1</sup> Etiology behind these kind of fractures is high impact injuries such as gun shot, traffic accidents and falls.<sup>2</sup>

Prime consideration in the management of such trauma is securing airway firstly and then diagnosing malocclusion, lacerations and injuries to fifth and seventh nerve. The aim of management is to restore function, anatomy and aesthetics while managing comminuted fracture of mandible.<sup>3</sup>

Earlier, conservative treatment modality was preferred because of the view that any manipulation would lead to devitalization of soft tissues adherent to splintered bone leading to increased incidence of infection and necrosis. But nowadays, open reduction with stable internal fixation is

preferred because of the opinion that lack of stability of bony fragments lead to infection and necrosis. It is a better treatment modality with lower incidence of complications in case of moderately or severely displaced fractured bone fragments.<sup>4</sup>

The materials of choice for rigid internal fixation of mandibular comminuted fractures are plates and screws<sup>4</sup>, reconstruction plates<sup>2</sup> and 3D titanium mesh.<sup>5</sup> Compared with reconstruction plate, titanium mesh provides more satisfying 3D morphology and stability.<sup>5</sup> This article reports a case of extensive comminuted mandibular fracture, treated by open reduction and internal fixation using reconstruction plate and titanium mesh.

## CASE REPORT:

28 year old male patient reported to the department of Oral and Maxillofacial Surgery with the history of trauma to lower jaw. Patient had sustained occupational injury while working at borewell site, when a wood block got hit at the

inferior border of mandible. Clinical examination revealed extraoral laceration approximately 3cm in length in right submandibular region extending upto body and angle of mandible with fractured bone pieces coming out of lacerated wound. Intraoral examination revealed stable occlusion and there was slight mobility of right mandibular first and second molar. Active bleed was present from the site of laceration which was controlled by pressure and suturing. Radiological examination included Orthopantomograph and CT scan. CT findings revealed complete loss of integrity of mandibular bone in right body, angle and ramus region with fracture lines crossing each other. Complete blood and urine investigations were carried out and patient was found to be Hepatitis C virus reactive.

After 3 days, patient was taken up for open reduction and internal fixation under general anaesthesia. Fracture site was exposed through existing laceration, incision was further extended anteriorly till mandibular midline, and posteriorly behind ramus of mandible via retromandibular approach. Wound was thoroughly debrided mechanically using hydrogen peroxide and betadine solution for dead bone pieces and granulation tissue. Internal fixation was done after achieving intermaxillary fixation with ivy eyelet wiring. Firstly, ramal fracture fragments and other multiple bone fragments were reduced and fixed using 2mm titanium mesh and 2\*8mm screws (Orthomax Ind, Baroda). A 2.5mm locking reconstruction plate (Orthomax Ind, Baroda) was adapted to inferior border of mandible extending from right ramus till right mandibular canine region with bicortical screws. The cortical bone segment containing mental foramen and mental nerve was adjusted and fixed with the 4 hole 2.0mm titanium miniplate(Orthomax Ind, Baroda). After achieving complete haemostasis,wound closure was done in layers using 3-0 vicryl sutures for muscle and skin margins of wound were closed using skin staples. Intermaxillary fixation was done postoperatively for four weeks. The postoperative recovery was uneventful. Patient was followed up two months later. There were no signs of

inflammation and patient was satisfied with the appearance of face and proper function of mandible. Orthopantomograph revealed favourable morphology of mandible without signs of bone resorption or non-union.

**DISCUSSION:**

Management of comminuted fractures is a challenge for even most experienced surgeons because of difficulty in reducing fractured fragments. Various treatment modalities include closed reduction, external pin fixation, internal wire fixation and open reduction and internal fixation. Closed reduction was used for management of comminuted fractures previously to preserve the periosteal blood supply of fractured fragments. However, Ellis et al in their study on treatment considerations for comminuted fractures reported complication rate in fractures managed with external pin fixation as 35.2%, 17.1% with maxillomandibular fixation and 10.3% with open reduction and internal fixation. Authors concluded open reduction with internal fixation as a better treatment modality for fixation of comminuted fractures , whenever possible.<sup>6</sup> Its advantages are stable internal fixation of bone fragments, early return of function and shorter maxillomandibular fixation period. It can be done in patients with extensively displaced fractured fragments, epileptic patients, alcoholics, drug users, chronic respiratory obstruction or any other ventilator obstruction.

Materials usually used for internal fixation include titanium plates and screws<sup>4</sup>, reconstruction plate<sup>3</sup>, titanium mesh and bioabsorbable mesh<sup>5</sup>. Most of the studies show usage of 2.7mm or 2.4mm reconstruction plates for fixation of comminuted fractures.<sup>7</sup> Firstly, rigid fixation of the teeth is done with arch bars. Smaller fragments of fractured bone are fixed together with miniplates and then bridged with a locking reconstruction plate and three or four screws on either side of the fracture. Use of compression plates is contraindicated in management of comminuted fractures as compression could lead to degeneration and then loss of bone contour.<sup>8</sup>



Fig 1 Extraoral Laceration



Fig 2 Preoperative CT revealing loss of integrity in right mandibular body, angle and ramus region.



Fig 3 Preoperative Orthopantomogram



Fig 4 Exposure of fractured fragments of mandibular bone



Fig 5 Open reduction and internal fixation of fractured fragments using 3D mesh and reconstruction plate



Fig 6 Postoperative Orthopantomogram

Usage of titanium mesh is also advocated for the management of comminuted fractures as it provides better stability and 3D morphology as compared to reconstruction plate and miniplates. Customized titanium mesh can be printed by rapid prototyping or can be contoured by adapting onto stereolithographic model. Perforations of titanium mesh allow revascularization of bone graft site where bone graft is given for treating bone defect in comminuted fracture.<sup>9</sup> Recently, biodegradable materials are also used for fabrication of 3D mesh tray for stable internal fixation of fractured bony segments in case of comminuted mandibular fractures. The main shortcoming of 3D mesh tray is that it is expensive. In a study conducted by J Dai et al, it was found that there were no complications when internal fixation was done with titanium mesh tray for comminuted mandibular fractures.<sup>10</sup>

There are many disadvantages associated with open reduction and internal fixation of comminuted mandibular fractures which include infection, devitalization of associated dentoalveolar segment, scars, non-union of bone fragments, injury to facial nerve, roots of teeth and stripping of mucoperiosteum.

Open reduction and internal fixation was preferred over closed reduction in this case because of severely displaced fractured bone fragments and discontinuity of fractured mandible, to achieve greater stability of fractured fragments and proper bone contour. Open reduction and internal fixation with a load bearing reconstruction plate, 3D mesh and a short period of maxillomandibular fixation was the treatment of choice in this patient. Patient exhibited drooping of lower lip on right side while smiling when he reported to the department indicating marginal mandibular nerve paresis due to injury which persisted postoperatively also, for which 2.5 units Botox was injected into the depressor labii muscle of the normal side. Based upon the postoperative follow-up findings, it can be concluded that open reduction and internal fixation is a satisfactory treatment modality for managing comminuted mandibular fractures.

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