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International Journal of Medical Science and Dental Health (ISSN: 2454-4191)
Volume 11, Issue 09, September 2025
Doi: https://doi.org/10.55640/ijmsdh-11-09-07

The Isolated Ramus Fracture of The Mandible: A Rare Entity

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Received: 14 August 2025, **accepted:** 22 August 2025, **Published Date:** 15 September 2025

Abstract

In the facial region, mandibular fractures are relatively prevalent. Ramus fractures rank as one of the least common fractures of the mandible, which account for about 1-3% of all mandibular fractures. Because of the mandible's robustness and anatomical structure in this area, oblique fractures of the mandibular ramus are comparatively rare. This case report describes the clinical presentation, diagnostic evaluation, and management of an oblique ramus fracture in a 28-year-old male following a trauma. Surgical intervention and fixation were performed using 3D miniplate, with favourable outcomes. The discussion highlights the challenges in diagnosis and fixation of oblique ramus fractures due to their anatomical and biomechanical considerations.

Keywords: *Oblique fracture, Ramus, Fixation, 3D miniplate.*

Introduction

The mandibular bone, is an important anatomical and functional structure, constitutes the lower height and width of the facial skeleton. Despite the fact that the mandible is the largest and strongest facial bone, it is very frequently fractured (second to nasal bone fractures) as a result of the prominent and exposed position of the head[1,9]. The mandibular ramus, a vertically oriented and robust region of the jaw, is less susceptible in fractures compared to other sites such as the condyle, body, and angle[3,6]. The incidence of ramus fractures is quite low among mandibular fractures and rank just above the least encountered fractures of the coronoid and alveolar processes accounting for around 3-5%[2,4]. When fractures do occur, oblique fractures are particularly rare due to the ramus' inherent strength and protection by surrounding musculature[3,5].

Oblique ramus fractures present unique diagnostic and therapeutic challenges. Their anatomical orientation and proximity to critical structures, such as the marginal mandibular nerve, pose risks of functional impairment[6,7]. Furthermore, maintaining reduction and achieving stable fixation can be difficult due to the oblique trajectory of the fracture and the biomechanical forces exerted on the ramus during mastication[8,9]. The purposes of the treatment of mandibular fractures are to restore the pre-trauma dental occlusion and normal mouth opening and to reduce the displaced fracture[7,10].

This report documents a case of an oblique ramus fracture managed successfully with open reduction and internal fixation (ORIF), offering insights into diagnostic and therapeutic strategies.

Case Presentation

A 28-year-old male presented to the emergency department following a motor vehicle accident. Clinical examination revealed swelling and tenderness over the left mandibular angle region. Limited mouth opening and sutured lacerated wound over same region measuring approximately 4-5 cm.X-ray films, including panoramic radiography, are usually limited to mild traumatic events. Computed tomography is the tool of choice for the assessment of mandibular fractures[8,9]. Orthopantomogram (OPG) demonstrated an oblique fracture extending from the posterior border of the mandibular ramus to the lower border of mandible. 3D Computed Tomography (CT) confirmed fracture displacement and detailed the oblique trajectory.

Treatment Approach

Antibiotics and analgesics initiated to manage infection risk and pain.Under general anesthesia, an extraoral Modified Submandibular incision was marked. Layerwise dissection was done exposing the mandible in following layers-subcutaneous tissue layer, superficial fascia, platysma, superficial layer of deep cervical fascia , pterygo-masseteric sling and lower border of mandible. Fracture segments were exposed, reduced, and stabilized using one 3D 2.0-mm rectangular miniplate placed along the angle region of mandible. Layerwise closure was done using 3-0 vicryl sutures followed by pressure dressing. Postoperative period was smooth and uneventful

Outcome and Follow-Up: At the 4-week follow-up, radiographs confirmed proper bone healing and fixation stability. The patient reported satisfactory functional and aesthetic outcomes.

Discussion

Anatomically the ramus is a region between subcondyle & angle of mandible. Anatomically, ramus is draped by masseter buccally, medial pterygoid muscle lingually, and pterygomasseteric sling at lower border, which facilitates minimum displacement of ramus after it gets fractured[1,6]. Oblique ramus fractures demand meticulous planning and surgical expertise due to the inherent difficulty in maintaining fracture alignment. According to Agrawal et al, type IV constituting the rest as, Type I: Vertical/oblique fracture line extending from the sigmoid notch to either the inferior border or angle of mandible. Type II: Vertical/ oblique fracture line extending from coronoid process to either the inferior border or angle of mandible. Type III: Horizontal fracture line extending from anterior border to posterior border of ramus of mandible. Type IV: Oblique fracture line extending from posterior border of ramus to inferior border of mandible (separating the angle segment). Type V: Comminuted fracture of ramus of mandible (may cause isolated fractures of the coronoid, condyle, and the angle of mandible). oblique ramus fractures are relatively stable and do not require intervention which is

contradictory to this case where overriding of fragments made it essential for the reduction to be done[6]. Also, Olson et al reported that the most common sites for fractures requiring open reduction are the angle, symphysis, and body, but the majority of mandibular fractures can be treated by closed reduction[9]. Thus, this case underscores the importance of advanced imaging for precise diagnosis, rigid fixation to withstand biomechanical forces in the ramus region and early rehabilitation to optimize functional recovery.

Due to the proximity of vital structures like marginal mandibular nerve, facial nerve and vessels, the extra-oral approach has been less frequently opted by the surgeons. Alternative to this was the trans-buccal approach where a minimal extraoral stab was given and then connected to the intraoral incision. But, few specialized instruments and clinical skills of the surgeon made it less popularized. Hence, the extraoral approach was preferred in this case which improved the accessibility for fracture reduction as well as efficient miniplate fixation which further provided adequate stabilization for oblique fracture geometry.

The use of open reduction internal fixation (ORIF) in the treatment of mandible fractures has revolutionised the field, reducing the need for rigid maxillomandibular fixation (MMF) after surgery. In cases of nondisplaced fractures, some individuals have advocated for treatment using IMF/MMF, albeit for a longer period of time (6 to 8 weeks); however, Koshy et al experienced this to be an inadequate form of fixation as the stabilization affects the portions of the mandible involving the alveolar arches and fails to fully stabilize the posterior portions of the mandible against the intrinsic forces of the pterygo-masseteric sling[7].Therefore ORIF should be considered as the treatment modality to ensure proper anatomic integrity of ramus.

Conclusion

Despite being uncommon, oblique fractures of the mandibular ramus necessitate customized treatment plans. In addition to highlighting the necessity of interdisciplinary care in handling such injuries, this case demonstrates the efficacy of ORIF employing 3D miniplate. Considering the constraints of the present investigation, we deduce that the application of 3D miniplates provides sufficient anatomical and functional reduction, including the length, alignment, and rotational axis of neighboring fracture fragments, as well as immobilization with favorable results and a comparatively early return to function. To further improve outcomes for this specific kind of fracture type, more study is necessary to standardize the classification, methods, and treatment protocols for the final care.

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Fig.1 – OPG depicting fracture line from posterior border of ramus till angle region.

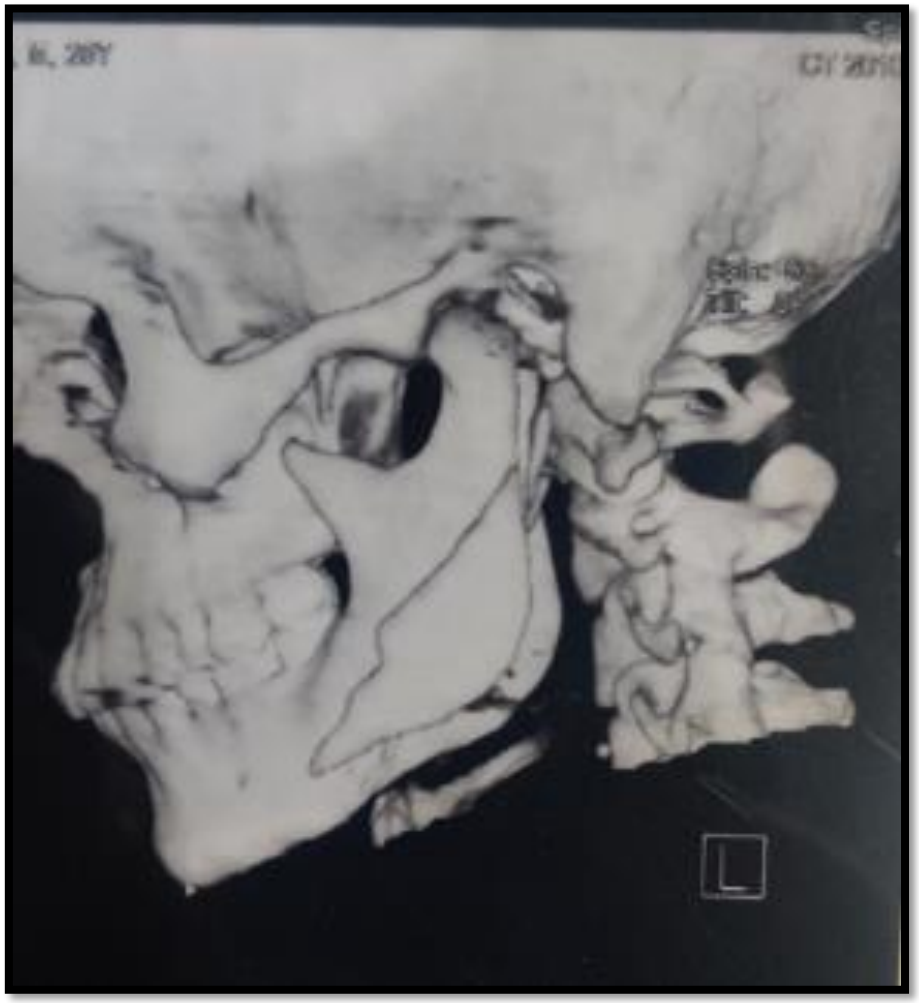

Fig.2 –3DCT showing overriding and displaced fracture segment.

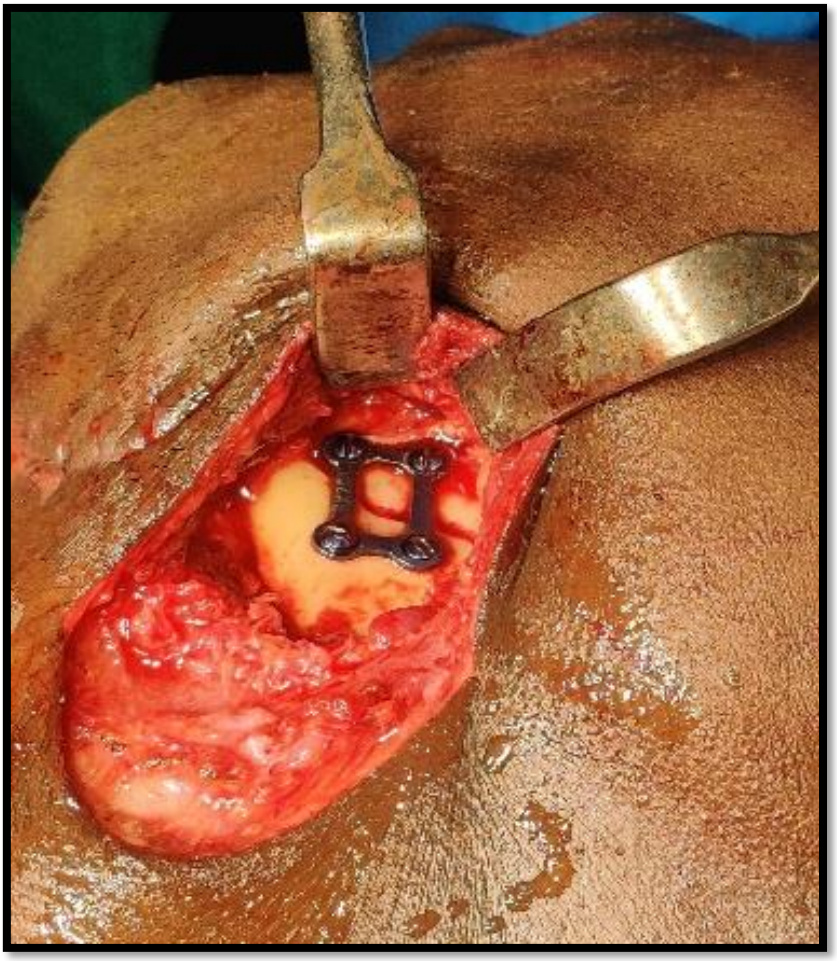

Fig.3 – Fixation done with 3D miniplate of 2mm with 4 screws.

Fig.4 – Layer wise closure with 3-0 vicryl

Fig.5 – Final closure with subcuticular suturing.

Covering Letter

As we are reporting a rare case of solitary ramus fracture. Oblique ramus fracture leading to continuous dull pain and difficulty in closing mouth. To manage such cases, we performed a thorough clinical and radiographical work up which helped us to completely reduce the fracture and stabilize it. So hopefully, it will be helpful for the fellow colleagues. We are waiting for your kind appraisal.