

Transbuccal Approach for Management of Linear Ramus Fractures of Mandible: A Clinical Technique

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ABSTRACT

Aim: To introduce the use of minimally invasive transbuccal approach in open reduction and internal fixation of linear vertical ramus fractures of the mandible and to discuss its various advantages, limitations and possible complications.

Materials and methods: Till date the use of transbuccal approach has been widely discussed in the management of mandibular angle fractures and mandibular osteotomy fixation. However, its application has not been mentioned in the management of more posterior mandibular fractures, such as mandibular ramus fractures. Various advantages of this approach have also been discussed with little mention of its limitations and involved complications.

Case report: Here, we discuss its use in the management of linear vertical ramus fractures by open reduction and internal fixation combined with the intraoral approach with a detailed description of the technique and 3 case reports where this technique was used. It involves the use of a combination of transbuccal and intraoral approach. Following reduction, fixation of linear vertical ramus fractures was done using trocar cannula for drilling and miniplate fixation transbuccally.

Results: In all the three cases adequate reduction and rigid fixation were achieved with this technique with reduced intraoperative time. All patients on follow-up reported with no complication and minimal scarring.

Conclusion: Use of transbuccal approach for rigid internal fixation of linear vertical ramus fractures is a minimally invasive, esthetic and a superior alternative to extraoral approach with a very low complication rate.

Clinical significance: Reduced operating time, Minimally invasive, superior esthetics, stable fixation, lower complication rates, easy to learn.

Keywords: Transbuccal approach, Trocar cannula, Vertical ramus fracture management.

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INTRODUCTION

Thirty to seventy percent of all maxillofacial fractures are mandibular fractures. This is due to the vulnerability of the mandible due to its relative prominence and lack of support.¹

Of these, ramus fractures are the second least common fractures with 3% incidence, coronoid fractures being the least common.²⁻⁵

In our hospital, amongst the total number of trauma cases (between January 2006–October 2011), 43.3% were mandibular fractures. Of these, the incidence of ramus fractures was 3.3 %.²

Trauma induced fractures more frequently involve the mandible due to its anatomical location in the human body. It also determines the mechanism of injury and the fracture patterns. Symphyseal, parasymphiseal, and condylar fractures are caused by motor vehicle accident or fall with an anterior impact. A lateral impact on the other hand results in angle, body, and contralateral condylar fracture.³

Ramus is surrounded by a thick muscle drape anatomically. These include masseter muscle placed buccally, medial pterygoid muscle medially and the pterygomasseteric sling present at the lower border. These muscles prevent the displacement of the fractured fragments of the ramus. This is the reason most surgeons prefer closed reduction or conservative approach for its management. However, there are certain disadvantages of closed reduction like prolonged maxillomandibular fixation (MMF), difficulty in maintaining oral hygiene, the risk of airway compromise, poor patient compliance, nutritional deprivation, and delayed recovery.^{3,6}

Ramus fractures are defined as those in which the fracture line either runs vertically from the sigmoid notch to the lower border of the mandible or angle of mandible, or horizontally from the anterior border of ramus of mandible to posterior border of ramus of mandible.² Apart from these linear fractures, ramus fractures could also be of a comminuted nature.

These fractures could be approached by various techniques described in the literature, which include the intraoral approach, external approach, combined intraoral with the transbuccal approach, or standard percutaneous approach.¹

Here, we discuss the use of transbuccal approach combined with the intraoral approach in the management

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of linear vertical ramus fractures by open reduction and internal fixation (Fig. 1.) with a detailed description of the technique and 3 case reports where it was used.

MATERIALS AND METHODS

Appropriate cases, displaced/undisplaced linear type of vertical ramus fractures of the mandible requiring open reduction and internal fixation were chosen. Maxillary and mandibular arch bars were placed under local anesthesia preoperatively.

Using a 15 number blade, traditional ward's incision was placed with distal release incision extending higher up along the anterior border of ramus till coronoid process. Subperiosteal dissection was done to achieve exposure till the coronoid process and the posterior border of ramus followed by placement of coronoid retractor for retraction (Fig. 1A). Reduction of the fragments was done intraorally using a periosteal elevator. Trocar cannula set was kept ready (Fig. 2A).

Using an 11 number blade, a stab incision was placed extraorally in the mid-ramal region overlying the fracture site (Fig. 2B). This was determined using a needle which was used to locate the fracture line by passing it intraorally over the fracture site percutaneously. This aided in corresponding the fracture line location extraorally to guide precise placement of the stab incision similar to a study done by Lübbers et al.⁷ where they used surgical forceps for the same. Trocar cannula was introduced through this stab incision after blunt dissection using artery forceps⁸ (Figs 2C and D) and secured with a U shaped buccal/cheek retractor. This provided hassle-free manipulation of the trocar cannula in both anteroposterior and superoinferior direction with minimal tissue tension or injury and operator fatigue. After reduction of the fractured segments, two mini plates were placed superiorly and inferiorly over the fracture line through the intraoral approach. The drill bits, as well as the screws, were introduced through the cannula perpendicular to

the ramus and rigid fixation of the fracture was achieved (Fig. 2A).

After achieving hemostasis, the closure was done using 3-0 Vicryl for intraoral suturing and 5-0 ethilon for extraoral stab incision.

CASE REPORTS

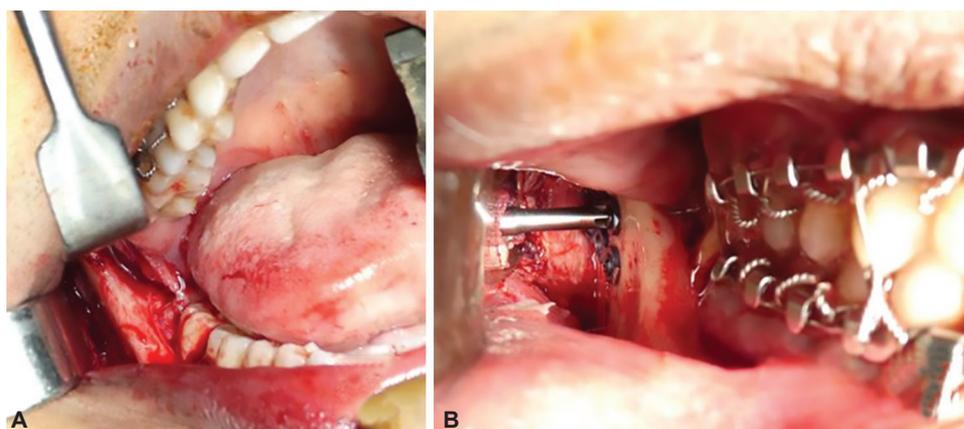
Case 1

A 19-year-old male patient reported to the department with a chief complaint of pain and swelling in the lower left front region of mouth and right back region of mouth and pain on chewing food (Fig. 3). He gave a history of a road traffic accident on the previous day with no history of loss of consciousness or vomiting or seizures or ear or nasal bleed. CT scan and OPG showed minimally displaced right vertical ramus fracture and left mandibular parasymphysis fracture (Figs 1A to 3A). No other comorbidities were found. Arch bar placement was done preoperatively under local anesthesia. Open reduction and internal fixation using the transbuccal and intraoral approach was done under general anesthesia. Total intraoperative time for ORIF of ramus site fracture was recorded as 15 minutes.

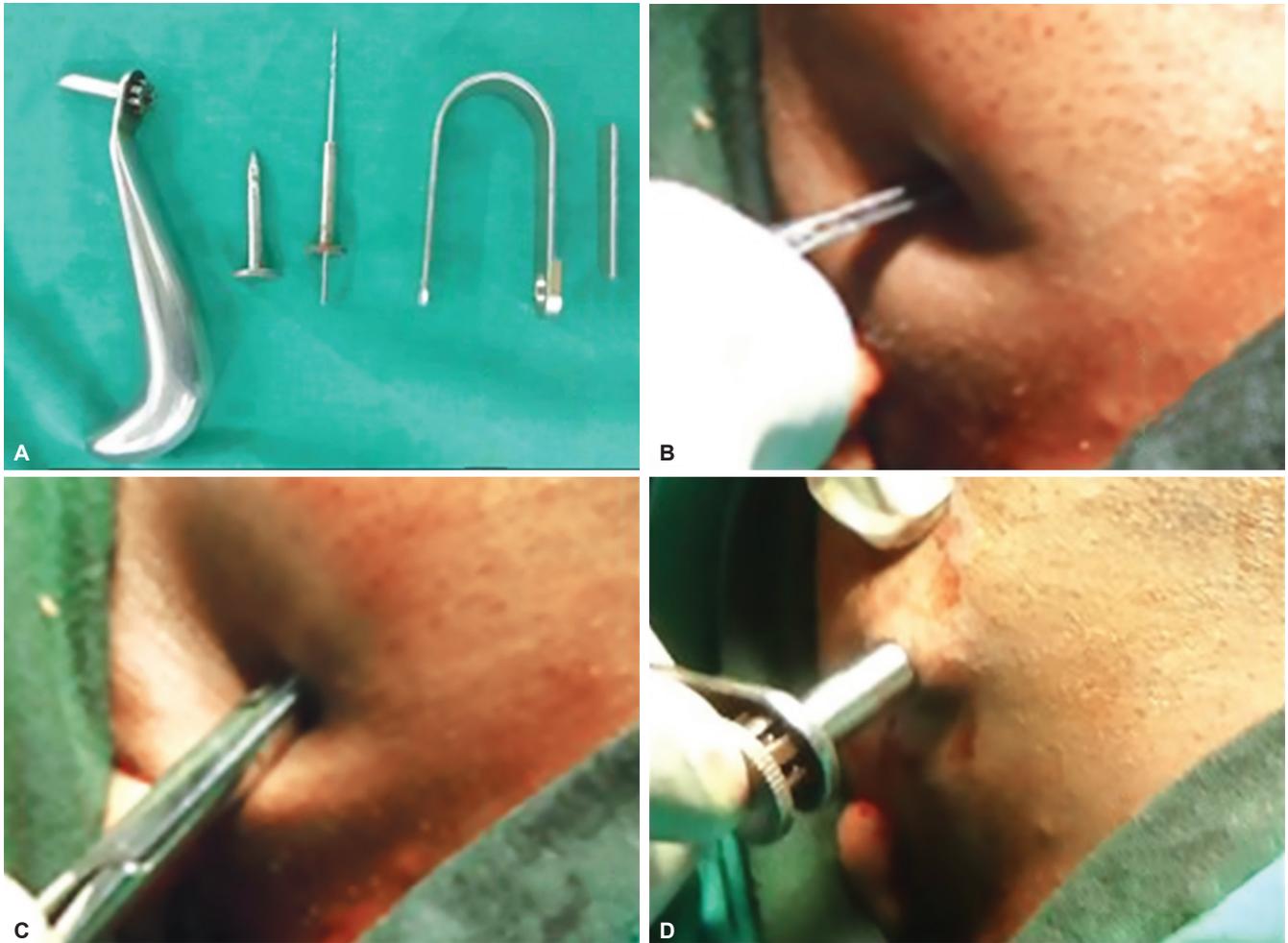
Postoperative MMF was not indicated. Postoperative OPG (Fig. 3B) showed accurate reduction and fixation of the fractured segments. Patient on follow-up after 4 months reported with maximum intercuspation and stable fixation without any fresh complaints.

Case 2

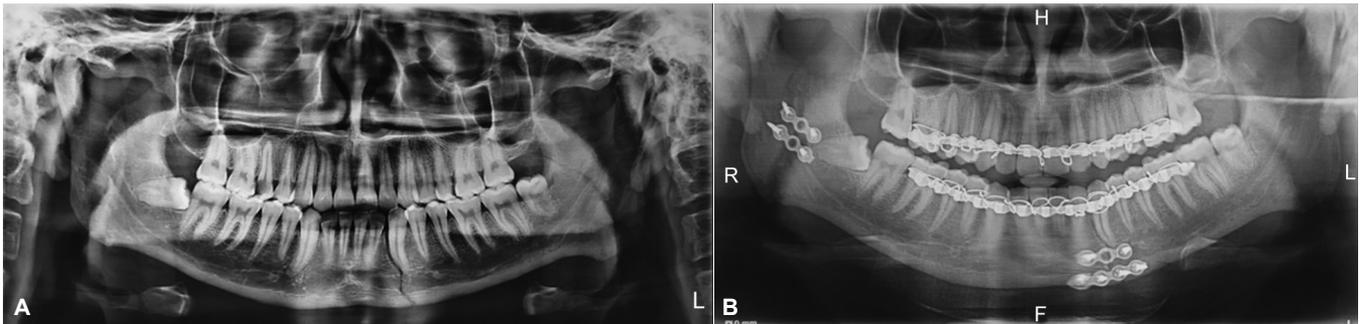
A 25-year-old male patient with a history of fall from height at a construction site reported to the emergency department with a chief complaint of pain on chewing and swelling on left side of the face following the fall (Fig. 4). Diagnosis of minimally displaced right parasymphysis and left vertical ramus fracture was given. Following preoperative workup and arch bar placement,



Figs 1A and: (A) vertical fracture of ramus as seen intraorally; (B) Miniplate fixation after fracture reduction through transbuccal approach using trocar cannula set.



Figs 2A to D: (A) Trocar cannula set; (B) Stab incision over the skin; (C) Blunt dissection; (D) Insertion of trocar through the stab incision.



Figs 3A and B: Preoperative OPG of case 1 showing right linear vertical ramus fracture with left parasymphysis fracture; (B) Postoperative OPG of case 1 showing rigid internal fixation using miniplates



Fig. 4: Postoperative OPG of case 2 showing left linear vertical ramus fracture with right parasymphysis fracture fixed using miniplates patient was taken up for ORIF under general anesthesia. Same technique as described earlier was used to fix the fracture fragments (Fig. 2). Intraoperative time for

fixation of ramus fracture was recorded as 12 minutes. Postoperatively, satisfactory occlusion, as well as function, was achieved and maintained as seen at 6 months follow-up visit.

Case 3

A 23-year-old male patient with a history of road traffic accident due to skid from 2 wheeler, reported to the emergency with a chief complaint of pain and swelling on left side of the face (Fig. 5). Diagnosed with undisplaced left parasymphysis and left vertical ramus fracture. Similarly treated using combined intraoral and transbuccal approach. In this case, only one miniplate was

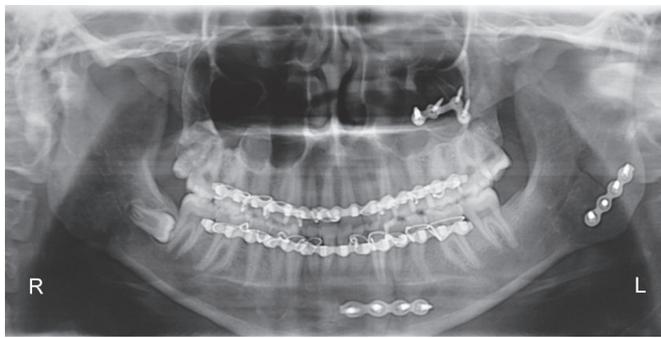


Fig. 5: Postoperative OPG of case 3 showing left linear vertical ramus fracture with left parasymphysis fracture fixed using miniplates.

used as it was found that the fractured fragments were rigidly fixed. Total intraoperative time was found to be 14 minutes for ORIF of ramus site fracture. Patient reported for follow-up after 4 months with satisfactory occlusion and healing of fracture site.

In all the cases patients were administered intravenous antibiotics that is amoxicillin, and clavulanic acid combination 1.2 g BD and metronidazole 100 mL TID along with analgesic, antacid and mouthwash immediately after admission and 3 days postoperatively and converted orally as per the requirement. All the patients were advised liquid diet preoperatively followed by soft diet postoperatively for 1 month.

DISCUSSION

Fracture line that either runs vertically from the sigmoid notch to lower border of the mandible or angle of the mandible or horizontally from the anterior border of the ramus of the mandible to posterior border of the ramus of the mandible can be termed as ramus fractures.² The comminuted variant of fractures could also occur in ramus but are not indicated for this type of approach due to its complicated nature.

Vertical linear ramus fractures are those that run perpendicularly down from the sigmoid notch to the lower border or the angle of the mandible and are a clear indication for this approach.

Closed reduction is generally the treatment of choice for ramus fractures. This is because of poor accessibility to these fracture sites and also because derangement of occlusion is rarely seen in such fractures. However, treatment by open reduction and rigid internal fixation (ORIF) provides a number of advantages. These include faster functional rehabilitation, easier maintenance of oral hygiene, improved nutritional provision, and reduced risk of airway compromise. Also, functional as well as anatomical reduction of the fracture can be achieved by ORIF.²

Traditionally, these fractures are treated using extraoral approaches. These include submandibular, retro-

mandibular, preauricular, retromandibular transparotid or anteroparotid transmasseteric and rhytidectomy approaches which require careful dissection to expose the mandibular ramus fracture site. At the same time, the extraoral approaches often pose a threat to the branches of facial nerve. They may also cause damage to the parotid gland causing postoperative complications such as salivary leak or sialocele. Extraoral approaches also require skilled surgeons with a thorough knowledge of anatomy to avoid any complications. Most commonly they cause unsightly looking scars which might require revision surgeries.

A study done by Cobb et al.⁹ described the use of a transbuccal trocar and a modified retractor for increased stability and easier soft tissue control to fix mini plates in mandibular angle fracture management. Khandeparker et al.¹⁰ compared the transbuccal and transoral approaches for management of mandibular angle fractures and concluded that the transbuccal approach was superior to the transoral approach with respect to radiographic reduction of fracture, minimal scarring and complications. Similar results were obtained by Laverick et al.¹¹ who assessed the difference between postoperative infection rate, occlusion, and reduction of mandibular angle fractures on using intraoral and transbuccal approaches. Sugar¹² conducted a randomized controlled trial to compare the fixation of mandibular angle fractures using single miniplate by transbuccal and intraoral approach or intraoral approach alone. A comparative study conducted by Kale et al.¹³ to assess transbuccal and extraoral approaches for the management of mandibular fractures also showed similar results with a transbuccal approach showing superior results. All these studies showed that use of transbuccal approach with trocar cannula set is majorly preferred in the management of mandibular angle fractures over other approaches. It is also preferred in the fixation of mandibular osteotomies.¹⁴ Literature search, however, showed that this approach has never been used in the management of more posterior mandibular fractures, such as vertical ramus fractures.

The use of transbuccal approach in combination with an intraoral approach for fixation of linear vertical ramus fractures described in this article showed similar results, thus emphasizing the superiority of this approach in comparison to intraoral approach alone or extraoral approach alone.

In this technique, exposure of the fracture site and reduction of fracture was done predominantly via an intra-oral approach. The titanium mini-plates were also introduced over the fracture site using the intraoral approach. Based on an anatomical study conducted by

Gulses et al.⁸ to determine a safety zone for trocar placement, a percutaneous stab incision is given extra-orally in the cheek to facilitate the insertion of the transbuccal trocar. A novel technique used in this method was the use of a needle to correspond the fracture site extraorally. Lateral plating was achieved in which titanium screws were fixed perpendicular to the bone through the transbuccal cannula. None of the patients required intermaxillary fixation postoperatively as no discrepancy was noted in the occlusion on followup visits. Arch bars placed preoperatively were thus useful for achieving occlusion intraoperatively alone. Similar antibiotic regimen and diet regimen was followed in all the patients preoperatively and postoperatively.

The various indications for this technique include minimally displaced or undisplaced vertical mandibular ramus fractures, isolated mandibular ramus or angle fractures, young adults who require higher aesthetic results, patients in whom closed reduction is contraindicated such as epileptic or neurologically compromised patients or those with nutritional deficiencies.

While the contraindications include patients with severely displaced or comminuted type of fractures, inadequate mouth opening intraoperatively, untrained surgeons or beginners, the presence of concomitant condylar or coronoid fractures that hinder adequate reduction intraorally.

The transbuccal approach is superior to the traditional extraoral approaches in many ways. Being minimally invasive it provides superior aesthetic results with minimal postoperative scarring,¹⁵ reduced postoperative infection rate¹⁶ and reduced chances of nerve injury.¹⁷ It also reduces the total intraoperative duration with average time noted as 13 minutes.

Despite all the advantages of this approach, this technique had certain limitations. This approach can be undertaken if complete armamentarium is available, and it is technique sensitive. Also, the surgeon has to be familiar with the armamentarium and skilled to know how to use trocar cannula.¹³ Subcondylar or high-level ramus fractures necessitates the use of endoscope¹⁸ for adequate visualization and anatomical reduction either intraorally or through a stab incision extraorally.

CONCLUSION

In conclusion, it could be said that the use of transbuccal approach is a very minimally invasive approach. It can be adapted for open reduction and internal fixation of more posteriorly placed vertical linear ramus fracture to obtain comparable functional and aesthetic rehabilitation of patients. Although for more posterior fractures, use of endoscope might be indicated.

CLINICAL SIGNIFICANCE

Transbuccal approach till date has been reported to be used in the mandibular angle fractures alone. This technique allows us to adequately reduce and fix the vertical ramus fractures which are more posteriorly placed and often require more invasive extraoral approaches. It is a minimally invasive technique requiring reduced intra-operative time with superior aesthetic results and comparatively less complication rate.

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