ENDOSCOPIC ASSISTED APPROACH TO FACIAL FRACTURES

Clinical Paper

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ABSTRACT:

Endoscopic exploration and repair of sub-condylar and ramal fractures of the mandible is technically feasible, and, though there is a steep learning curve, once experience is gained, it can be performed in a reasonable amount of time. There have been no permanent facial nerve injuries to date, and the functional results seem to be satisfactory. Of the 5 sub-condylar and ramal fractures, plate fixation was achieved at primary endoscopic repair in all the patients. It remains for prospective studies to determine the relative safety and effectiveness of this procedure.

Key words:

Endoscope,
Facial Fractures,
Condyle, Sub Condylar

Source of support : Nil

Conflict of interest: None

INTRODUCTION : The occurrence of condylar, sub condylar and ramal fractures is very high, and there are numerous options available among surgeons regarding the best treatment. There is always a controversy for management of mandibular condylar fractures. Conservative management is favoured by some surgeons over open reduction due to the challenge of surgical access to the condyle and difficulty in positioning the proximal bone section and also posing the risk of damaging the facial nerves.[1]

Though, open reduction and internal fixation has been the standard treatment for low condylar fractures, subcondylar and ramal fractures usually provides good fracture alignment and functional restoration. The surgical methods include preauricular, submandibular, retromandibular, and intraoral approaches. Although the intraoral approach can avoid facial scar and possible facial nerve damage, it offers limited exposure and visual field. In recent years, endoscope-assisted transoral approach attracted much attention as it provides good visual field without the risk of facial scars or nerve damage. In our experience, endoscopic reduction and fixation of condylar, sub condylar and ramal fracture is technically challenging; the procedure requires specialized instruments and the surgeons experience a steep learning curve.

Therefore, the focus will be on the technique of endoscopic-assisted repair of condylar, sub condylar and ramus fractures of the mandible, with a limited discussion of indications and

outcomes. With the addition of this technique to the surgical armamentarium, it will provide the maxillofacial surgeon with another technical option as she or he decides whether or not to perform open reduction of these fractures.

ANATOMY & CLASSIFICATION : The endoscopic method of condylar, sub condylar and ramus fracture restoration relies on visual confirmation of fracture fragment reduction and satisfactory extent of the extra-capsular segment for the employment of fixation hardware.[2] Endoscopic approaches by their very fauna have a limited distorted perspective, geometric constraints, and optical cavity for instruments. Therefore, determination of the precise fracture geometry preoperatively is obligatory so that a decision can be made whether an endoscopic approach is achievable.

The fracture attributes that help to make the decision are:
location and displacement.

Fracture location.[2]

Condylar fractures are classified as [Fig. 1]

- Head (intra-capsular),
- Neck (below the head and above the sigmoid notch), and
- Subcondylar

High neck fractures and Intracapsular fractures are not treated using the endoscopic approach, because there is no

probability of applying fixation. Furthermore, surgical exposure may lead to decreased vascularization of the condylar head. Fractures of the condylar neck are suitable for endoscopic treatment if sufficient bone is present proximally so that two screws can accommodate for miniplate fixation. Endoscopic repair of subcondylar fractures is in general easy but technique sensitive.

Fig. 1. Classification of Condylar fracture as a. head (intracapsular), b. neck (below the capsular attachment and above the sigmoid notch), and c. subcondylar (passing through the sigmoid notch).[3]

FRACTURE DISPLACEMENT : Displacement refers to the location of the condylar fragment comparative to the ascending ramus. Fractures where the condylar segment is positioned medially are called medial override, those where it is lateral, is called lateral override[3] [Fig. 2]. Displacement is a significant variable directing the initial approach to endoscopic treatment. Lateral override fractures are particularly pliable to repair because of easier fragment visualization, handling, and plate fixation. In contrast, medial override injuries pose more challenges to reduce endoscopically, as the telescoped ascending ramus complicates visual access to the lateral surface of the condylar fragment and significantly blights manipulation because of physical impediment. To simplify the treatment of medial override injuries one should first reduce them to the lateral override type. Non-displace and non-dislocated fractures indicate the presence of adequate periosteal support for stability and do not require open treatment.[4]

Fig. 2. Coronal Section 0.625 mm slices (above) and three-

dimensional 0.625 mm slices (below) CT reconstructions of a patient.[3]

OPERATIVE TECHNIQUE

ENDOSCOPIC EQUIPMENT :

We used a 4 mm diameter 30° angle endoscope, (Karl Storz) that maintains the optical cavity, and a video system. Typical mandible fracture repair instruments set are used by Synthes, which offers many specialized instruments simplifying the endoscopic technique.

REPAIR SEQUENCE : If present, extra condylar fractures are dealt first using typical open reduction and internal fixation techniques to restore an intact mandibular arch. The rigid arch was helpful in manipulating fracture fragments to achieve adequate reduction. Injection at the intraoral incision site and along the lateral part of the ascending ramus with 1:200,000 epinephrine solution was administered to reduce bleeding into the optical cavity.

MAXILLOMANDIBULAR FIXATION : If MMF was used for repair of an extracondylar fracture, it is removed. The use of tight wire maxillomandibular fixation will prevent distraction of the fracture and lock the displaced condyle in a malreduced position. Rubber band anterior MMF was employed that enables fracture repair by sustaining occlusion but letting realignment of fracture fragments. Reduction of the fracture is a visual reduction and is not based on the occlusion.

EXPOSURE : An intraoral incision at the oblique line of the mandible is made. The endoscopic cavity is created by uplifting the periosteum off the lateral facet of the ascending ramus. The assistant should embrace the endoscope when the surgeon routines the periosteal elevator and suction to linger the dissection proximally to expose the condylar fragment. A common error is to accidentally dissect below (or medial to) the proximal fragment. This occurs because of a failure to escalate the degree of lateral override and coronal plane angulation of the proximal fragment. When the proximal fragment is recognized, the subperiosteal dissection is carried out on the lateral surface up to the joint capsule, or an adequate distance to fix the fixation hard-ware. Transcutaneous stab incision for screw placement is made straight over the palpated fracture line at the posterior border of the mandible. Gentle, blunt hemostat dissection through the parotid gland

and masseter muscle is done to avoid injury to the facial nerve.

REDUCTION : To facilitate repair, medial override injuries are reduced initially into lateral override by placing a curved elevator medial to the proximal fragment while strongly distracting the fracture so as to allow the proximal fragment to be expatriate to the lateral surface of the ascending ramus. If the fracture is a lateral override, then inter-fragmentary repositioning is achieved by distracting the distal segment through manual traction at the mandibular angle or settlement of a 3 mm posterior occlusal spacer. The proximal segment can be abridged by bringing the condylar fragment out if it is in flexed position and applying medially directed pressure using a trocar introduced through the stab incision. Removal of traction or posterior occlusal wedge will permit the rubber band fixation to provisionally impact the fracture inter-faces together and also maintain reduction while fixation is smeared.

FIXATION : Screws are introduced through the transcutaneous trocar. A miniplate is fixated along the posterior border of the ascending ramus, taking advantage of its thick cortical bone and flat surface .

In broad, the fixation plate is fixed to the condylar fragment first. This permits the plate to act as a handle so that condylar fragment can be reduced. Once reduction is achieved, the screws are placed into the mandibular portion. Some groups have found that fixation of a plate near the sigmoid notch or anterior portion of the fracture first simplifies placement of the posterior border plate.⁵ No matter the technique, a thorough review of the visual landmarks for anatomic reduction is imperative. The sigmoid notch and posterior border of the mandible must be envisioned to confirm that reduction has occurred. If the reduction is not precise, then the distal screws are to be removed and the condylar fragment is repositioned. Once hardware placement is done, intermaxillary fixation is released and the mandible is moved in all excursions to ensure reproducible pre-injury occlusion and stability of fixation.

All patients leave the operating room without MMF and were kept on a soft diet for 6 weeks.

OPERATIVE DETAILS : Of the 5 sub-condylar and ramal fractures, plate fixation was achieved at primary endoscopic repair in all the patients.

In 5 patients presenting with sub-condylar and ramal fractures, in 2 of the patients, the mean time required to accomplish endoscopic repair was less than 2 hours. The average duration for the last 3 cases was approximately 70 minutes.

Case 1. Preoperative radiograph showing left subcondylar fracture which was treated with endoscopic approach showing intraoperative pictures and satisfactory post-operative radiograph.

Case 2. Preoperative radiograph showing right ramal-angle fracture which was treated with endoscopic approach showing intraoperative pictures and satisfactory post-operative radiograph.

Case 3. Preoperative radiograph showing right subcondylar fracture which was treated with endoscopic approach showing intraoperative pictures and right parasymphysis fracture operated with standard intraoral vestibular degloving incision and satisfactory post-operative radiograph.

Post-Operative Assessment:

1. Mandibular function
Postoperative dental occlusion and interincisal jaw opening were documented in all the 5 patients. No malocclusion was found in any of the patients. Interincisal jaw opening exceeded 37 mm in all the patients.
2. Anatomic Reduction
Post op Orthopantomograph shows satisfactory reduction of proximal and distal fragments and reveals acceptable continuity of anterior border of ramus, sigmoid notch and posterior border of the mandible
3. Aesthetic appearance
Scarring from endoscopic access portals was minimal in all cases. Facial height, chin projection, and a symmetrical appearance of the jaw line were restored in cases where fracture reduction was achieved successfully.
4. Soft tissue complications
There were no permanent facial nerve palsies. Two temporary palsies (one full and one involving the frontal branch only) occurred; both resolved completely and spontaneously. Post op there was soft tissue abscess at a trocar portal and it was treated uneventfully by incisional drainage.

SUMMARY : In summary, endoscopic exploration and repair of sub-condylar and ramal fractures of the mandible is technically feasible, and, though there is a steep learning curve, once experience is gained, it can be performed in a reasonable amount of time. There have been no permanent facial nerve injuries to date, and the functional results seem to be satisfactory. It remains for prospective studies to determine the relative safety and effectiveness of this procedure.

Conflicts Of Interest/ Competing Interests

The authors declare no conflicts of interest/Competing Interests.

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