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Comparision of surgical complication associated with management of condylar fracture

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Abstract
Aim: The aim of the study is to compare the complications associated with two extra oral approaches to the TMJ viz preauricular and retromandibular approach in management of condylar fractures of mandible.
Methods and Materials: Patients with fractured dislocation and displacement of mandible condyle in medial direction were managed by preauricular approach. Patients with lateral displacement of mandibular condyle were managed by retromandibular approach. OPG, Reverse towne's, and C.T. scan were taken in all the cases prior to surgery to assess the pattern of displacement.
Results: In our study both approaches have given excellent access and visibility to the condylar fractures but with limitations in each technique. Minimal intraoperative and postoperative complications were encountered in both approaches. The duration of the procedure for preauricular approach was much longer when compared with retromandibular approach. Facial nerve weakness was common in patients treated with preauricular approach, which they improved over a period of time and had complete recovery. Postoperative scar was imperceptible in all cases and good cosmetic results were seen with both approaches. Mouth opening, mandibular movements and occlusion were more or less same in both the approaches while pain and clicking was common in preauricular approach. The retromandibular approach has less complications when compared with preauricular approach in the treatment of condylar process fractures.

Keywords: surgical, management, condylar fracture, complication

Introduction
Condylar fractures account for 25–35% of the mandibular fractures and deserves a special consideration apart from the rest of the mandible due to their anatomical differences and their healing potential [1]. There can be few aspects of the maxillofacial trauma management that generate more controversy than the fracture involving the condylar process of the mandible [2]. The major controversy has been between conservative and surgical management.
Traditionally condylar fractures were managed by conservative methods. Surgeons who prefer closed treatment claim that equally good results were produced with reduced overall morbidity and lack of surgical complication [3]. The goals of treatment of condylar fractures are pain free mandibular motion, good occlusion, and symmetry and have said that as long as these goals can be achieved, it is prudent that the easiest and the least invasive treatment method should be selected [4].
But the severity of condylar injuries is often underestimated and the clinical outcome can be suboptimal particularly with regard to occlusion following conservative treatment. Also there is reduced incisal opening, deviation of the mandible, impaired mastication, ankylosis, and internal derangement. Consequently the pendulum has swung towards accurate anatomical reduction in the hope that this will improve the outcome.
The rationale for open reduction and internal fixation in selected cases is that it allows accurate anatomical reduction of the fractured condylar process [5, 6], restoration of the ramal length, avoidance of long term sequelae like clicking and late arthritic changes and an earlier return to normal function without the need for inter maxillary fixation.
There are various approaches to the condyle as explained in the literature. When choosing between them the simplest approach among them, should be the treatment of choice provided all else is equal**.** Preauricular approach, the most commonly used is useful when treating high condylar fractures, but when it comes to treating low condylar fractures and exposure of the angle, it has its own limitations. The retromandibular approach was first described by Hinds and Girotti in 1967 and modified by Koberg and Momma in 1978. But when compared to the other methods the retromandibular approach offers greater advantage because of shorter working distance from the skin incisions to the condyle, great access to the posterior border of the mandible and sigmoid notch, less conspicuous facial scar and easy reduction. Recently this approach is studied more and has become a preferred approach for many oral and maxillofacial surgeons all over the world.
This evoked interest in us to do a study on these two approaches preauricular and retromandibular which are most commonly used.

Materials and Methods
Material
Twelve patients were selected randomly from the Outpatient Department of Kamineni Institute of Dental Sciences, Narketpally, Nalgonda, Andhra Pradesh.

Inclusion Criteria

All age groups irrespective of sex, caste, religion, and socioeconomic status, patients who were medically fit for surgery under general anesthesia, patients having displaced unilateral/bilateral condylar fractures with one or more of the following presentations: impossibility of obtaining adequate occlusion by closed reduction, displaced/dislocated condylar fractures, shortening of ramus height associated with molar premature contact, unilateral/bilateral condylar fractures in edentulous patients, unilateral/bilateral condylar fractures associated with other fractures, invasion by foreign body, unilateral/bilateral condylar fractures where maxillomandibular fixation is not recommended for medical reasons e.g., seizure disorders and alcoholism.

Methods

Patients were operated under general anesthesia via preauricular and retromandibular approaches. Patients with fractured dislocation and displacement of mandible condyle in medial direction were managed by preauricular approach. Patients with lateral displacement of mandibular condyle were managed by retromandibular approach. Reverse towne's and C.T. scan (Figss. 1 and 3) were taken in all the cases prior to surgery to assess the pattern of displacement. Titanium mini plate system was used in all cases for fixation of condylar fracture (Fig. 2).

Fig 1: 3D CT showing medially displaced left condylar fracture

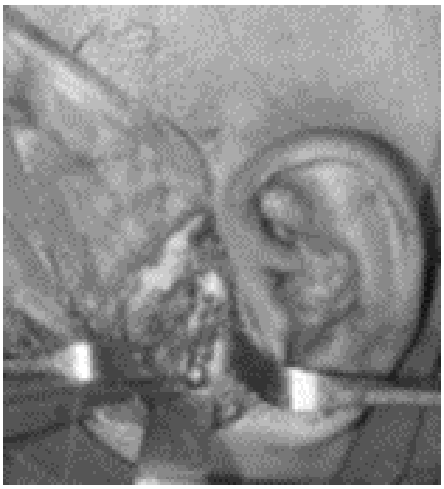

Fig 2: Miniplate fixation done

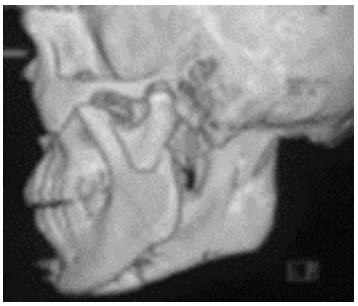

Fig 3: 3D CT showing medially displaced left condylar fracture

Operative Technique

Arch bar fixation was done pre-operatively in dentulous patients. All the patients were operated under general anesthesia with nasotracheal intubation. The fracture site was exposed via extraoral retromandibular approach given by Ellis (1993) [7] in six cases (Fig. 4) and preauricular Rowe (1972) in five cases (Fig. 3) and Alkayat and Bramley (1979) in one case in whom this approach was combined with retromandibular approach.

Fig 4: Retromandibular incision line

Parameters used for evaluation

Clinical evaluation in terms of intraoperative (Time, Accessibility, Hemorrhage, and Occlusion) and Postoperative presence of infection, sinus/fistula or dehiscence was noted at the surgical site, signs of Frey's syndrome, parotid fistula formation, facial nerve palsy, surgical scar, discrepancy in occlusion, and radiological evaluation of the reduction of fractured bone fragments and inadequate stability was checked in terms of fractures of miniplates, loosening of screws, and resorption by taking ortho-pantomograph, reverse towne's view of skull at the following intervals of time. Immediate, 1 week, 3 months, 6 months post operatively.

The present study was conducted on 12 patients, who sustained mandibular condylar fractures and were treated by open reduction and internal fixation using preauricular approach in six patients and retromandibular approach in six patients and were assessed clinically and radiographically. The cause of trauma was RTA in ten patients and fall in fall patients, out of which ten were male and two were female with mean age group of 30.7 years, eight were diagnosed with unilateral fractures and four were with bilateral fractures. 11 had condylar fracture associated with other fractures mainly

parasymphysis and one had isolated condylar fracture. In the study three patients had condylar head, eight had condylar neck, and five had subcondylar fractures, seven had medial dislocation and six had lateral displacement, and three were undisplaced (Table 1). Mean average time for preauricular approach taken was 95 min and for retromandibular was 70 min. None of the patient suffered from Hemorrhage intraoperatively. Postoperatively sign of infection was observed in two patients (preauricular approach) at 1 month and one patient (preauricular approach) at 3 months in the follow up period.

Table 1

Table 1

Direction and displacement of fracture and approach used

Sl no	Case no	Age	Sex	Cause	Level of fracture and associated condylar fractures	Direction of displacement	Time lap between ti and surg
1	Case 1	21	M	RTA	Unilateral Left condylar neck fracture	Anteromedial	25 days
2	Case 2	28	F	RTA	Unilateral Left condylar neck and right parasymphysis fracture	Anteromedial	7 days
3	Case 3	45	M	Fall	Bilateral Condylar neck and left parasymphysis fracture	Left side-posteromedial	5 days
						Right side-posteromedial	5 days
4	Case 4	32	M	RTA	Unilateral Right condylar neck and left parasymphysis	Anteromedial	15 days

Direction and displacement of fracture and approach used

Facial nerve functions were assessed in terms of forehead wrinkling, eye closure, facial symmetry while smiling, and mouth blowing. In preauricular approach loss of forehead wrinkling was seen in five cases which got recovered after 6 month except in one case; Ptosis was seen in five cases which got recovered after 3 months; In one patient facial symmetry while smiling and mouth blowing was absent even after 6 months. Branches of facial nerve were found to be intact in all the cases in retromandibular approach. Surgical scar was imperceptible in all the cases.

Mouth opening increased in all the patients with time. No patient had restricted lateral movements after 6 months, mandibular deviation was seen in one patient in each approach.

Radiographic examination revealed proper approximation of fracture fragments with good bone healing (Figs. 7 and and 11), no evidence of plate exposure and screw loosening except in one case in preauricular approach. Sign of condylar resorption was seen in two cases after 3 months and complete resorption after 6 months in preauricular approach, whereas none in retromandibular approach (Figs. 5, 8, and and 9).

Fig 5: Deranged occlusion

Fig 6: 6 month post-operative occlusion

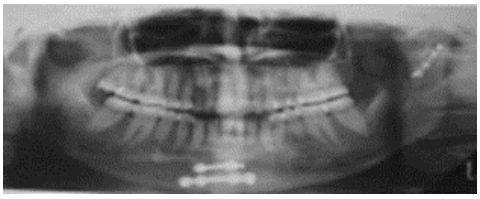

Fig 7: 6 month post-operative OPG

Fig 8: Deranged occlusion

Fig 9: 6 month post-operative occlusion

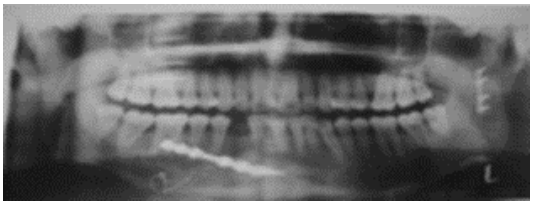

Fig 11: 6 month post-operative OPG

Discussion

In the past, condylar fractures have been treated solely by closed reduction for various reasons like; surgical procedures in the TMJ area were associated with complications involving the facial nerve, technical problems in manipulating the fracture fragments into good anatomical reduction and scar on the face and reasonably good results have been achieved with conservative treatment [5]. Where on one hand, use of closed treatment methods have not been able to provide good, satisfactory, and uncomplicated results for all types of

condylar fractures; simultaneously, on the other hand, with advancement of radiographic techniques, anesthesia and use of antibiotics to control infection, surgical techniques have also been continuously refined thereby overcoming most of the potential complications of surgery and providing solutions where closed treatment failed and also when the surgical treatment is the only option in indicated cases.

The open reduction and rigid internal fixation allows for good anatomic repositioning, restoration of the ramal length, avoidance of long term sequelae like clicking and late arthritic changes and an earlier return to normal function without the need for inter maxillary fixation [5]. Because of this early return to function the chances for ankylosis is greatly reduced. Due to all these reasons and advantages there is an increase in the interest among majority of the surgeon to manage condylar fracture by ORIF.

Over the years, number of surgical approaches to TMJ has been developed to attain the goal of successful reduction and fixation, and attainment of adequate function. The Various surgical approaches for exploration of the TMJ used for management of condylar fractures are: intraoral, preauricular, endaural, retroauricular, submandibular, retromandibular, rhytidectomy, and endoscopic approach.

Each approach has its own advantages, disadvantages, and complications. These approaches are preferred from each other on grounds of better access, greater visibility of the fracture site, ease of manipulation of the soft tissues within the joint and relative ease for placement of fixation devices.

Preauricular Approach has been the mainstay for many years for approaching the TMJ and has been constantly modified for not only to have better access and visibility but also to protect facial nerve branches. Among modifications of preauricular approach, Rowe (1972) modification and Alkayat and Bramley (1979) modification has been very popular and is now also most widely used. This protects branches of facial nerve and provides good access to the condylar process but the area of ramal exposure is extremely limited, which makes the plate fixation technically difficult. Retromandibular approach provides better access as it exposes the entire ramus from behind and is therefore useful for procedures involving the area on or near the condylar neck/head, or the ramus itself [7].

Preauricular approach was preferred because of the following advantages: The high condylar fractures can be visualized and aligned [7]. This approach is also useful for reducing a condylar segment that has been distracted Anteromedially from the pull of the lateral pterygoid muscle [7]. The disadvantages being scarring, sensory loss, Frey's syndrome, etc.

Retromandibular approach was preferred because of the following advantages: This approach exposes the entire ramus from behind the posterior border. The distance from skin incision to the area of interest is reduced [8]. It is found to be minimally invasive, provided good access and allowed direct visual alignment of the fracture fragments [9]. Facial scar produced is in less conspicuous location. There is no need to use transcutaneous trocar because the tissues can be retracted superiorly and anteriorly to the level of the sigmoid notch with this approach [10]. The disadvantages being reduced accessibility to medially displaced condyles, and damage to retromandibular vessels.

In our study both approaches have given excellent access and visibility to the condylar fractures but with limitations in each technique. Preauricular approach gives excellent access to anteromedially displaced and dislocated fractures. While the same is impossible to approach through retromandibular approach as the condyles are medial to the ramus. While retromandibular approach gives excellent accessibility to the entire lateral aspect of ramus, hence laterally and posteriorly or undisplaced fracture can be safely approached through this technique. Therefore, in our study all those which are displaced anteromedially we have treated them through preauricular approach. All said and done the retromandibular approach also is not ideal in those cases where there is delay in treatment with resultant excessive scarring in the tissue, as this approach does not give adequate access to larger area. Hence in all those cases where there was delay in management in case no 5 and 6 we have preferred preauricular over retromandibular approach.

Fixation of fragments to each other, i.e., reduction of the condyle to its correct position and fixation to the ramus is always a daunting task to the surgeon. Though preauricular approach gives adequate access and visibility to the TMJ to retrieve and reduce the displaced and dislocated condyle, fixation of the condyle to the ramus through this approach is always a difficult task. Because excessive retraction of the soft tissue has to be applied inferiorly for the fixation of corner screws, particularly in low sub-condylar fractures. This may be one of the reasons for facial nerve weakness, whereas the same is not at all difficult in retromandibular approach. That is the reason why we have done dual approach technique in case no 6. This patient was operated after 21/2 months following injury, with excessive scarring in the Anteromedially displaced condyle. Preauricular was the only option to treat condyle but again since the fixation became so difficult that we have to approach the lateral aspect of the ramus via retromandibular approach and then only correct fixation could be carried out.

In two cases, case no 2 and 6 we have to do extracorporeal fixation. This was done to facilitate reduction and fixation of the condylar fragment. Reducing the condyle in situ was near impossible because of excessive contraction of lateral pterygoid muscle attachment. Therefore, we had detached condyle of all the attachments and did extracorporeal fixation and then replace in its correct anatomical position and did remaining fixation i.e., condyle was virtually used as free graft. Again for this kind of surgery preauricular approach is the only choice. Extracorporeal fixation again has the disadvantage of causing condylar resorption sometimes. In our study we found this phenomenon in two cases, this finding is similar to that of Davis *et al.* [11], he had clinical success in 70% of patients, where we had 60% success rate in free grafting.

Morbidity of facial nerve literally should be more via retromandibular approach as anatomically the facial nerve is close to the dissection area and virtually the dissection goes through the part of parotid gland and through parotido-massetric fascia. The facial nerve and its branches are vulnerable but due to careful surgical planning, meticulous technique added by our experience in the technique and

surgical practice, there was no facial nerve damage, while cases showed facial nerve weakness in the group treated by preauricular incision. Again this was not attributable to surgical technique. The weakness was more or less due to excessive retraction causing neuropraxia. That is the reason why none of the patient needed any active intervention. They improved over a period of time and had complete recovery. Mouth opening and mandibular movements were more or less same in both the approaches while pain and clicking was common in preauricular approach. Again this may be due to direct intervention in joint space during the surgery.

Conclusion

In our study both approaches have given excellent access and visibility to the condylar fractures but with limitations in each technique. Minimal intraoperative and postoperative complications were encountered in both approaches. The duration of the procedure for preauricular approach was much longer when compared with retromandibular approach. Facial nerve weakness was common in patients treated with preauricular approach, which they improved over a period of time and had complete recovery. Postoperative scar was imperceptible in all cases and good cosmetic results were seen with both approaches. Mouth opening, mandibular movements and occlusion were more or less same in both the approaches while pain and clicking was common in preauricular approach. The retromandibular approach has less complications when compared with preauricular approach in the treatment of condylar process fractures.

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