Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2017/384

Original Article

A Study on Open Versus Closed Reduction of Mandibular Condyle Fractures and Their Management

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Abstract

Introduction: Each type of condylar fracture, the treatment method must be chosen taking into consideration the presence of teeth, fracture height, patient's adaptation, patient's masticatory system, disturbance of occlusal function, and deviation of the mandible.

Aim: To study the incidence etiology and various types of mandible fractures esp. condylar and subcondylar fractures, indications and techniques for closed and open treatment of condylar and subcondylar fractures.

Materials and Methods: A prospective study conducted. During the study period, 175 cases of Faciomaxillary injuries reported. Among them, 43 were condylar and subcondylar fracture. Cases were chosen for open reduction and closed reduction according to the clinical and radiological criteria.

Results: Among 43 cases, 13 cases unilateral condylar fracture, 11 cases bilateral condylar fracture, 16 cases unilateral subcondylar fracture, and 5 cases bilateral subcondylar fracture. Among the 43 cases, 26 cases underwent open reduction and internal fixation (ORIF), and 17 cases underwent CRMF. Occlusion is normal in all ORIF cases. In ORIF, the most common approach used is combined approach. In ORIF group complications such as temporary facial nerve palsy (2 cases) severe painful mouth opening (3 cases) hematoma (1 case) infected implant, 1 case loosening, and displacement of screw recorded. In CRMF group restricted mouth opening (6 cases) malocclusion (4 cases), shortening of the vertical height of mandible 4 cases recorded.

Conclusion: Treatment type should be selected considering patient's age, fracture type, patient's systemic status, other fracture, teeth, and possibility of occlusal restoration by intermaxillary fixation, and existence of foreign materials.

Key words: Closed approach, Condylar fracture, Faciomaxillary, Occlusion, Open approach

INTRODUCTION

The incidence of Faciomaxillary injuries is very high due to road traffic accidents (RTA). Among the Faciomaxillary injuries, the mandible fracture is the most common type. Among the mandible fractures, the incidence of condylar and subcondylar type is on the rise.[1-4] Management of condylar and subcondylar fracture of mandible remains a controversy so far it is managed by closed method (maxillomandibular fixation [MMF]). Open reduction is rarely attempted. In recent years, open treatment of condylar fractures with rigid internal fixation (RIF) has become more common.[5] Open reduction of condylar fractures needs high technical skill and expertise. It needs thorough knowledge of anatomy as it needs meticulous planning dissection and execution. Hence, open reduction of condylar fractures is not routinely done. However, there are definite indications for open reduction of condylar fracture. Management of condylar fracture varies from case to case.[6,7]

Access this article online

www.ijss-sn.com

Month of Submission : 06-2017
Month of Peer Review : 07-2017
Month of Acceptance : 08-2017
Month of Publishing : 08-2017

Aim

To study the incidence etiology and various types of mandible fractures esp. condylar and subcondylar fractures,

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indications and techniques for closed and open treatment of condylar and subcondylar fractures.

MATERIALS AND METHODS

A prospective study conducted in the Department of Plastic Surgery, Government Rajaji Medical College hospital, who was diagnosed, as patients with fracture of mandibular condyle were included in the study. Patients admitted with Faciomaxillary injury diagnosed to have condylar and subcondylar fracture with the help of relevant history, clinical examination, radiological evaluation, and their management and outcome.

Inclusion Criteria

Patients admitted in faciomaxillary unit with fracture mandible, age more than 14 years, both male and female.

Exclusion Criteria

Patients admitted in Faciomaxillary unit without fracture mandible. All these necessary date were recorded in a pro forma. 175 patients of mandibular fractures were registered in the Plastic Surgery Department, among them, 43 condylar fractures were registered during the study period. Detailed history regarding nature of injury and symptoms were obtained. A thorough physical examination was done to assess the general status of the patient. Assess other major and minor injuries, site and number of fractures of the mandible and the type of condylar fracture; unilateral or bilateral and intra articular or extra articular. Investigations were done which included X-ray skull anteroposterior/ lateral view, X-ray mandible posteroanterior view and lateral view, orthopantomogram, computed tomography (CT)-scan with three-dimensional (3D) reconstruction as required. After thorough clinical and radiological evaluation, stabilization of the patient and ruling out other injuries. Patients were randomly selected based on surgeon's availability and surgeon's performance at the time. For instance, cases with adequate mouth opening, with normal occlusion, vertical height of ramus maintained, with comminuted fracture, who fall under geriatric or pediatric age group and all intracapsular un displaced fractures can be managed conservatively by closed reduction with MMF-arch bars or IMF done. Likewise, cases with reduced mouth opening, with malocclusion or with any occlusal derangement, with reduced vertical height of the ramus, with gross displacement of fractured fragments, associated with other injuries are managed surgically by open reduction and internal fixation with mini plates and screws, followed by MMF in some cases. When the associated fracture needs open reduction and internal fixation (ORIF), after completing the ORIF for associated fracture condyle fracture is assessed intra operatively. Closed reduction of condylar fracture done and case assessed if after closed reduction occlusion is maintained mouth opening is adequate then proceeded with MMF patient managed by CRMF for condylar fracture. Even after closed reduction stable occlusion and adequate mouth opening are not achieve then open reduction condylar/subcondylar fracture is done. Management of condylar fracture was done either by open or closed method according to indications and contraindications as discussed above and earlier.

RESULTS

In our study, 43 patients of condylar fracture registered. Majority of patients fall in the 21-30 groups. Majority of injuries occurring in male population. RTA constitutes majority cause of mandibular fractures. Radiological diagnosis shown 48.8% of cases are left side, 25.6% are right side followed by 14% symphysis (Table 1).

Among 43 cases, 13 cases are unilateral condylar fracture and 11 cases bilateral condylar fracture, 16 cases unilateral subcondylar fracture, 5 cases bilateral subcondylar fracture. Among them, isolated condyle fracture is 7 - unilateral 4 and bilateral 3. The most common associated site of fracture - para symphysis 37%, pan facial 16.3%, and symphysis 14% (Tables 2-4). In 43 condyle fracture, 51% were intracapsular fracture, and 49% were extracapsular fracture (Table 5).

Malocclusion is significantly higher in CRMF (4 cases 10%) but in ORIF no occlusion ($P = 0.045$) significant.

Table 1: Distribution of radiological diagnosis

Radiological diagnosis	Number of cases (%)
Left	21 (48.8)
Right	11 (25.6)
Bilateral	5 (11.6)
Symphysis	6 (14.0)
Total	43 (100.0)

Table 2: Distribution of pattern of injury

Pattern of injury	Number of cases (%)
Segmented	28 (65.1)
Isolated	7 (16.3)
Combined	7 (16.3)
Pan facial	1 (2.3)
Total	43 (100.0)

Table 3: Distribution of isolated condyle

Isolated	Number of cases (%)
Bilateral condyle	3 (7.0)
Unilateral condyle	4 (9.3)

Restricted cases significantly higher CRMF cases 1 in ORIF and 5 in CRMF it is statistically significant $P = 0.039$. In CRMF group, 5 patient developed severe restricted mouth opening 4 cases developed malocclusion and vertical height of ramus is shortened in 4 cases (Tables 6 and 7).

Among the 26 cases, who underwent ORIF most common approach used is combined approach (preauricular + risden/modified sub mandibular). Risden approach is single most common approach used for subcondylar fractures (Table 8).

All ORIF cases developed post-operative facial edema which subsided gradually with head end elevation and appropriate analgesics in 3-5 days. One case developed hematoma, which was evacuated and managed conservatively. Three cases developed temporary facial nerve palsy commonly frontal branch, which recovered spontaneously in few weeks. Three cases developed transient mouth opening restriction due to severe pain and muscle spasm, which recovered subsequently. One case developed implant migration, which was managed by implant exit. In one another, case implant exit was done to remove the infected implant after 3 months (Tables 9 and 10).

DISCUSSION

Mandibular condyle fracture is very common fracture among mandibular fractures; the treatment methods for mandibular condyle fracture have been controversial. However, regardless of the treatment option, the purpose of the treatment of mandibular condyle fracture is to recover normal TMJ function via the reconstruction of appropriate anatomical position. Thus, assessment of treatment success, as well as the outcomes of an early treatment, should be constructed based on complications such as TMJ derangement, ankyloses of TMJ, or growth disorder via long-term follow-up. Therefore, it is important to control functional complications and aesthetic problems from a long-term perspective. The final goal of the treatment lies in the achievement of occlusal stability, normal mouth opening, normal TMJ movement, prevention of temporomandibular joint derangement and joint pain, and prevention of growth disorder in patients with mandibular fracture by selecting an appropriate treatment method between closed and open reductions. Based on the guidance-formulated management of each case decided. Based on certain important criteria such as mouth opening, occlusion, vertical height of ramus of the mandible, age with associated injuries, type of fracture unilateral or bilateral, intracapsular or extracapsular, simple or comminuted fracture, and medially displaced or laterally displaced we have planned all condylar fracture management. For instance, cases with adequate mouth opening, with normal

Table 4: Distribution of associated fractures

Associated fractures	Number of cases (%)
Pan facial	7 (16.3)
Ramus	2 (4.7)
Para symphysis	16 (37.2)
Symphysis	6 (14.0)
Angle	3 (7.0)
Coronoid	2 (4.7)

Table 5: Distribution of condyle fracture

Condyle fracture	Number of cases (%)
Intracapsular	22 (51.2)
Extracapsular	21 (48.8)
Total	43 (100.0)

Table 6: Distribution of associated fractures

Associated fractures	Number of cases (%)
ORIF	37 (86.0)
ORIF+MMF	5 (11.6)
MMF	1 (2.3)
Total	43 (100.0)

Table 7: Distribution of condyle

Condyle	Number of cases (%)
CRMF	17 (39.5)
ORIF	26 (60.5)
Total	43 (100.0)

Table 8: Distribution of management

Approach	Number of cases (%)
Combined	13 (30.2)
Risden	10 (23.3)
Preauricular	2 (4.7)
Intra paratotid retro	1 (2.3)

Table 9: Distribution of complications

Complications	Number of cases
Hematoma	1
PMO	3
Temp, facial nerve	2

Table 10: Distribution of late complications

Late complication	Number of cases
Infected implant and implant exit	1
Facial nerve palsy	1
Loosening and displacement of screw	1

occlusion, vertical height of ramus maintained, with comminuted fracture, who fall under geriatric or pediatric age group and all intracapsular undisplaced fractures can be managed conservatively by closed reduction with MMF-arch bars or IMF done. Likewise, cases with reduced mouth opening, with malocclusion or with any occlusal derangement, with reduced vertical height of the ramus, with gross displacement of fractured fragments, associated with other injuries are managed surgically by open reduction and internal fixation with mini plates and screws, followed by MMF in some cases. When the associated fracture needs ORIF, after completing the ORIF for associated fracture condyle fracture is assessed intra operatively. Closed reduction of condylar fracture done and case assessed if after closed reduction occlusion is maintained mouth opening is adequate then proceeded with MMF patient managed by CRMF for condylar fracture. Even after closed reduction stable occlusion and adequate mouth opening are not achieve then open reduction condylar/subcondylar fracture is done. As high-velocity injury as common cause (RTA), combined and severely displaced fracture is on the rise. Hence, there is increased need for ORIF.

Ellis *et al.*[8] reports that at 6 weeks 17.2% had facial nerve weakness, (2.3%) had developed salivary fistulae, in 50% a visible scar was seen. 2% of the surgical scar were hypertrophied.

Zide and Kent,[9] Klotch and Lundy,[10] and various other authors have all suggested various indication for ORIF in mandibular condyle fracture which includes condyle displacement into middle crania fossa or lateral extracapsular displacement, edentulous patients with bilateral condylar fracture, condyle fracture with comminuted midface fracture, gap between fracture segment more than 5 mm without any contact between the segment, and angulation more than 30° between fracture segment. Considering newer fixation techniques American Association of Oral and Maxillofacial Surgeons[11] suggested an international guideline on the treatment of mandibular condyle fracture.

De Riu *et al.*[12] noticed a ramus height reduction of >3 mm in 9% of the closed group patients while no reduction was seen in the surgically treated group. The mean vertical heights were similar in both groups as reported by Carneiro *et al.*[13] Between 1 month and 1 year we found CRMF group had the significant reduction in ramus height than in the ORIF group.

Approach for mandibular condyle fracture depends on fracture site and degree of bone fragment displacement. In general, they include preauricular approach, postauricular approach, submandibular approach, Risdon approach, combined approach, and retromandibular transparotid approach. Among the various surgical approaches reported in literature, the retromandibular transparotid and submandibular approaches emerge as the most commonly used procedures to expose the condylar fracture, and the intraoral approach has been suggested only for low condylar fractures.

CONCLUSION

The incidence of condyle and subcondyle fracture is 7.9%. Physical examination will often identify the location of fracture, which can then be verified radio graphically. Increasing vehicular traffic and urban violence, accidents and assaults are forming the majority of causes of mandibular fractures. CT scan with 3D reconstruction and good orthopantomogram has given us an accurate way of detecting even small fractures. Newer developments in the allied specialties of medicine, patients with concomitant injuries can be managed efficiently, simultaneously treating the mandibular fractures. Intraoral incisions, which avoids an external scar, it provides the necessary access caters to the aesthetic expectations of the patient. Using mini plates and screws have significantly reduced the post-operative morbidity of the patient to a great extent, allowing for an early mobilization. Adhering to road traffic rules will prevent the RTA, mandible fractures.

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How to cite this article: Kumar PS, Kumar CR, Anandan H. A Study on Open Versus Closed Reduction of Mandibular Condyle Fractures and Their Management. Int J Sci Stud 2017;5(5):9-13.

Source of Support: Nil, **Conflict of Interest:** None declared.