Management of Mandibular Sub Condylar and Condylar Fractures Using Retromandibular Approach and Assessment of Associated Surgical Complications

Sukhvinder Bindra · Kirti Choudhary ·
Parveen Sharma · Anil Sheorain · C. B. Sharma

Received: 7 April 2010 / Accepted: 14 October 2010 / Published online: 29 January 2011
© Association of Oral and Maxillofacial Surgeons of India 2011

Abstract

Purpose To evaluate surgical complications associated with open reduction and internal fixation of condylar fractures using retromandibular approach in terms of intraoperative and postoperative complications.

Method Ten patients with displaced unilateral/bilateral condylar fractures were selected for the study. Intraoperative complications were evaluated in the form of haemorrhage due to damage to retromandibular vein and damage to marginal mandibular branch of facial nerve. Postoperative complications like presence of infection, signs of Frey's syndrome, parotid fistula formation, facial nerve palsy, and discrepancy in occlusion and functions of temporomandibular joint were evaluated at intervals of 24 h, one week, six weeks and three months postoperative. Radiographically, the approximation of fracture fragments, plate fracture and screw loosening on orthopantomograph and Reverse Towne's view were evaluated at intervals of 24 h, six weeks and three months postoperatively.

Results None of the patients suffered from any major complication intra and post operatively.

Conclusion Open reduction and internal fixation should be given due consideration in the management of displaced mandibular condylar fractures and is associated with minimal morbidity using retromandibular approach.

Keywords Condylar fractures · Retromandibular approach · Intra and postoperative complications

Introduction

Condylar and subcondylar fractures constitute 26–40% of all mandible fractures [1] and management of these fractures stimulates more controversy than any other area of maxillofacial trauma [2]. Management of condylar fractures with closed reduction has been very popular [3, 4] but results are not satisfactory in all cases. The rationale for open reduction and internal fixation in selected cases is that it allows accurate anatomical reduction of the fractured condylar process and earlier return to normal function without the need for intermaxillary fixation [5, 6].

Multiple approaches have been proposed and used in order to visualize and reduce condylar fractures which include the intra oral, coronal, preauricular, face-lift (Rhytidectomy), postauricular, endural, endoscopic, retromandibular, and submandibular [7], and often in combination.

Potential damage to facial nerve and its branches with some approaches and possibility of postoperative scar have drastically affected the choice of surgical approach. Retromandibular approach deserves special attention as it is ideally suited to the technique of miniplate osteosynthesis in the area of difficult access [8]. This approach seems to give the benefits of the good cosmesis and adequate exposure for manipulation and reduction of the fracture and for placement of fixation.

Although occlusal and functional outcomes are better with open reduction and internal fixation but potential complications such as hemorrhage, infection, facial nerve palsy, Frey's syndrome, unsightly scar, temporomandibular joint problems, condylar necrosis and resorption, flattening

S. Bindra (✉)
Kamineni Institute of Dental Sciences, House No 20, Radha
Regal Rows, Near Kalyan Gardens, Yaprall, Secuderabad
500011, Andhra Pradesh, India
e-mail: dr_sukhvinder@yahoo.com

K. Choudhary · P. Sharma · A. Sheorain · C. B. Sharma
D.A.V Dental College, Haryana, India

of mandibular fossa and implant rejection i.e. plate exposure, should be strongly considered [9].

The present study has been undertaken to treat the cases of condylar fractures by open reduction and internal fixation using retromandibular approach and to evaluate the morbidity associated with this procedure.

Patients and Method

Ten patients of age group 18–60 years with displaced and dislocated unilateral/bilateral condylar fractures were selected irrespective of sex, caste, religion and socioeconomic status. Patients with the following presentations were included in the study: Impossibility of obtaining adequate occlusion by closed reduction, displaced/dislocated condylar fractures, shortening of ramal height associated with molar premature contact, unilateral/bilateral condylar fractures in edentulous patients and associated with other fractures where maxillomandibular fixation for longer period is not recommended for medical reasons e.g. seizure disorders.

Out of the ten patients, 8 patients had (5 right and 3 left) subcondylar fractures among which 5 were moderately displaced and 3 were dislocated. One patient had displaced left side condylar neck fracture and one patient had bilateral condylar fracture; where on right side the condyle was dislocated. 8 patients had associated parasymphseal fracture and 2 patients had angle fracture of the mandible. Out of ten patients two patients were edentulous (one partially and the other was completely edentulous).

Medically compromised patients who could not undergo general anaesthesia and the patients with undisplaced condylar fractures were excluded from the study.

Operative Technique

Arch bar fixation was done pre-operatively in all 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 [1] in all except one patient in whom this approach was combined with preauricular approach. Incision was given at 0.5 cm below the lobe of the ear of approximately 3–3.5 cm and not extending below the angle of the mandible (Fig. 1). Dissection was carried through the skin, subcutaneous fat to the level of scant platysma muscle. The scant platysma muscle was incised in the same plane as the skin. The parotid capsule was entered and blunt dissection was carried through the parotid gland (Fig. 2) in an anteromedial direction towards the posterior border of the mandible. A hemostat was repeatedly inserted and spread

Fig. 1 Incision in the retromandibular region

Fig. 2 Dissection through parotid

open—parallel to the anticipated direction of the branches of the facial nerve. Intraoperative nerve stimulator was used to avoid injury to facial nerve branches. After retraction of the dissected tissues anteriorly a broad retractor was placed posteriorly to retract the mandibular tissues medially. Pterygomasseteric sling was incised and tissues were stripped from the lateral surface of the mandible.

The fracture was reduced under direct vision (Fig. 3). The main method of retrieval of condylar fragment was retraction of ramus in downward direction by manual pressure as it gives an access to medial aspect of the condylar fragment and in two cases where retrieval of condyle was difficult, lateral pterygoid was stripped. Maxillomandibular fixation was done and fixed using two 2 mm mini plates in most of the cases except in 2 cases where one plate was used and 6–8 mm monocortical screws (Fig. 4). Maxillomandibular fixation was released and occlusion checked. Layer by layer closure of soft tissue was done by using vicryl 3–0 for subcutaneous tissues and prolene 5–0 for skin after proper irrigation with antiseptic

Fig. 3 Fracture reduction

Fig. 4 Fixation of fracture fragments

solution. Other associated fractures were exposed with suitable approaches and fixed.

Assessment of the patients was done clinically and radiographically in the form of intraoperative and post operative complications. Intraoperative Complications were assessed as haemorrhage due to damage to retromandibular vein and damage to marginal mandibular branch of facial nerve.

Post operatively all the patients were clinically assessed for presence of infection at operative site, signs of Frey's syndrome, salivary fistula formation, facial nerve palsy, post operative scar, discrepancy in occlusion, stability of fracture fragments, TMJ function in the form of maximum mouth opening, restriction in lateral movements, pain in preauricular region, clicking, crepitus or grating and deviation at the intervals of 24 h, one week, six weeks and three

months postoperatively. Radiographically, the approximation of fracture fragments, plate fracture and screw loosening were evaluated using orthopantomograph and Reverse Towne's view at intervals of 24 h, six weeks and three months postoperatively.

Results

The present study was conducted on ten patients with the age ranged between 19 and 52 years (mean age 31.6 years) and comprising all males; were assessed intraoperatively and postoperatively for various parameters clinically and radiographically at different time intervals.

Intraoperative complications of haemorrhage due to either retromandibular vein or internal maxillary artery and damage to facial nerve were not found in any patient intra operatively.

Postoperative infection, assessed in terms of pus discharge, sinus/fistula or dehiscence and salivary fistula i.e. clear discharge at surgical site and Sign of Frey's syndrome defined as 'perspiration of skin signs around the preauricular area while eating' was recorded at intervals of one week, six weeks and three months post operatively was not observed in any patient (Table 1).

Facial nerve functions assessed in terms of forehead wrinkling, eye closure, mouth blowing (Table 1) and facial symmetry while smiling (Fig. 5) There was no case of facial nerve palsy (Table 1). Surgical scar was imperceptible in all the cases (Table 1) and (Fig. 6) and there was gradual decrease in the width of scar (Graph 1).

Discrepancy in occlusion was seen in five patients (50%) after 24 h and one week postoperatively, which gradually reduced and after three months all patients showed satisfactory centric occlusion (Graph 2).

Mouth opening (Graph 3) and laterotrusion movements (Table 1) increased in all the patients with time. Preauricular tenderness was seen in four patients (40%) after one week, in two patients (20%) at six weeks and none of the patients had preauricular tenderness after 3 months (Graph 4). Out of ten, two patients (20%) had clicking in the operated joint one week postoperatively which resolved gradually (Graph 5). Four patients (40%) had deviation on mouth opening towards the operated joint side after one week but none had any deviation at six weeks or three months postoperatively (Graph 6).

In all cases, the radiographs revealed proper approximation of fracture fragments with good bone healing with no evidence of plate exposure and screw loosening (Table 1). All the findings of various parameters were recorded at different time intervals of 24 h, six weeks and three months postoperatively on a standard proforma.

Table 1 Assessment of surgical complications post operatively

Sl no	Post operative surgical complications evaluated	Time interval (post operative)			
		24 h	1 week	6 weeks	3 months
Clinical evaluation					
1	Signs of infection	NA	0	0	0
2	Frey’s syndrome	NA	NA	0	0
3	Salivary (parotid) fistula	NA	0	0	0
4	Facial nerve palsy	0	0	0	0
5	Perceptibility of scar	NA	0	0	0
6	Restriction of lateral movements	NA	1	0	0
Radiological evaluation					
7	Fracture of mini plates	0	0	0	0
8	Screw loosening	0	0	0	0

NA Not applicable

/ Present

0 Absent

Fig. 5 Smiling

Discussion

The open reduction and rigid fixation of condylar fractures has been met with enthusiasm. The first reports in the literature of open reduction of condylar neck fractures through use of an intra oral approach were by Silverman in 1925 [10]. Over the years, number of surgical approaches to temporomandibular joint has been developed to attain the goal of successful reduction, fixation and adequate function. Retromandibular approach was used in our study because it provides good access and allows direct visual

Fig. 6 Post operative scar

alignment of the fracture fragments [11], 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 [1]. The other advantages of this approach include reduced distance from skin incision to the area of interest [12], minimally invasive, useful for low subcondylar fractures, less conspicuous facial scar [13], good cosmetic result and 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 [1].

The retromandibular approach has been favored by many authors as this provides an excellent exposure of the fractured site. The entire fracture from posterior border to

Graph 1 Mean width of surgical scar in mm

Graph 4 Presence of preauricular tenderness

Graph 2 Discrepancy in Occlusion

Graph 5 Presence of clicking

Graph 3 Mean of maximum mouth opening in mm

Graph 6 Presence of Deviation

the coronoid process is visible. Moreover, the posterior border is completely exposed, allowing one to assess the mediolateral positioning of the condylar process. Anatomic reduction may be obtained using other surgical approaches, but the retromandibular approach also makes the plate and screw fixation easier [14]. This approach is associated with

low incidence of facial nerve damage as experienced by Hyde N [2].

Retromandibular approach can be combined with preauricular approach to improve access to high condylar neck

fractures [15]. In one patient we had to combine the two approaches as there was medially displaced high condylar fracture and retromandibular approach alone was not sufficient to provide adequate access and visibility for reduction and fixation [14].

There was no intraoperative haemorrhage seen in any of our cases as retromandibular vein was retracted in the flap and internal maxillary artery was never encountered [16].

Post operative absence of infection in present study can be attributed to use of aseptic treatment protocol and systemic antibiotics, which were given to all patients [17].

Salivary fistula formation is another anticipated complication with retromandibular approach. Ellis et al. [16] and Vesnaver et al. [18] experienced salivary fistula formation in 2.3 and 14% of cases respectively but was not seen in the study of Vogt et al. [19]. The absence of salivary fistula in our cases is attributed to watertight closure of the parotid capsule and in all patients no drain was placed postoperatively. Surgical scar was imperceptible in all the cases and there was no sign of Frey's syndrome [16, 20].

Facial nerve and its branches especially marginal mandibular branch are at risk while using retromandibular approach damage to which may cause weakness of facial muscles. Manisali et al. [21] in their study noticed temporary weakness of the facial nerve in 30%, and Ellis et al. [16] in 17.2% of the cases but this resolved in all cases within 3 months and there were no cases of permanent nerve injury. Delvin et al. [20] also recorded transient facial nerve weakness affecting the marginal mandibular branch in 7.1% of their cases however Hyde et al. [2] in their study found all patients with normally functioning facial nerve at 1-month review. Klatt Jan et al. [7] also observed 0% permanent facial nerve injury.

In nine of our cases retromandibular incision was given very close to the posterior border of ramus and parotid gland was entered at a point away from the origin of marginal mandibular branch and the direction of dissection through the parotid was in upward direction.. Intraoperative nerve stimulator was used from time to time and dissection was kept away from the nerve. Therefore marginal mandibular branch was not encountered in any of the patient. In one patient where retromandibular incision was combined with preauricular incision, buccal branch was retracted with the flap and no postoperative weakness was observed. Another contributing factor may be the small sample size of the present study.

Transient malocclusion in the form of open bite is not uncommon finding [17] and was seen in 5 patients after 24 h and, one week postoperatively which may be due to concomitant fractures and transient spasm of masticatory muscles. In these patients elastic traction was given for one week immediate post operatively and later all patients showed satisfactory centric occlusion. Mouth opening

increased in all the patients with time [2]. Patients may have less mouth opening initially because surgery induces some hypomobility due to joint and incisional pain or possibly because scarring occurred during healing of the surgical site [22].

Initially, preauricular tenderness and restricted laterotrusive movements of the mandible was observed in some patients for a few days, owing to stripping of the tissues during surgery and the swelling and edema after surgery but all patients were symptom free after six weeks [23, 24].

Clicking in TMJ was present in only two cases in the operated joint one week postoperatively [25]. In one patient clicking was already present preoperatively [9], and in the other, clicking could be due to rotation of the condylar fragment while plating as condylar fragment was medially displaced but gradually due to remodeling clicking disappeared after three months. Deviation on mouth opening towards the operated joint side after one week was seen in four cases but none had any deviation at six weeks or three months postoperatively [26, 27] (Fig. 7).

Plate exposure and screw loosening at fracture site has been reported by many authors. Choi Yi and Yoo [28] found that immediate postoperative radiographs showed excellent reduction but plate fracture was seen in two cases and screw loosening was seen in three cases. The absence of plate fracture and screw loosening in our study may be due to the fact that most screws could be placed vertically against the plate (Figs. 8, 9, 10).

Fig. 7 OPG of case 1

Fig. 8 OPG of case 2

Fig. 9 OPG of case 3

Fig. 10 OPG of case 4

It is very interesting to note that even in incomplete reduction of the condylar fragment in the fossa in one case (Fig. 7), it did not result in any functional problems in patient in terms of mouth opening, occlusion and lateral movements.

In the present study no major complications has been encountered and small sample size could be a contributory factor for the same.

Conclusion

Hence wherever indicated open reduction and internal fixation of condylar fractures using retromandibular approach should be carried out as it is associated with very low morbidity and sufficient exposure of the fracture site.

References

- Ellis E 3rd, Dean J (1993) Rigid fixation of mandibular condyle fractures. *Oral Surg Oral Med Oral Pathol.* 76(1):6–15
- Hyde N, Manisali M, Aghabeigi B, Sneddon K, Newman L (2002) The role of open reduction and internal fixation in unilateral fractures of the mandibular condyle: a prospective study. *Br J Oral Maxillofac Surg* 40(1):19–22
- Blevins G, Gores RJ (1961) Fractures of the mandibular condyloid process: results of conservative treatment in 140 patients. *J Oral Surg Anesth Hosp Dent Serv* 19:28–30
- Amaratunga NA (1987) A study of condylar fractures in Sri Lankan patients with special reference to the recent views on treatment, healing and sequelae. *Br J Oral Maxillofac Surg* 25(5):391–397
- Zide MF, Kent JN (1983) Indications for open reduction of mandibular condyle fractures. *J Oral Maxillofac Surg* 41(2):89–98
- Fernandez JA, Mathog RH (1987) Open treatment of condylar fractures with biphasic technique. *Arch Otolaryngol Head Neck Surg* 113(3):262–266
- Klatt J, Pohlenz P, Blessmann M, Blake F, Eichhorn W, Schmelzle R, Heiland M (2010) Clinical follow-up examination of surgically treated fractures of the condylar process using the transparotid approach. *J Oral Maxillofac Surg.* 68(3):611–617
- Newman L (1998) A clinical evaluation of the long-term outcome of patients treated for bilateral fracture of the mandibular condyles. *Br J Oral Maxillofac Surg* 36(3):176–179
- Lachner J, Clanton JT, Waite PD (1991) Open reduction and internal rigid fixation of subcondylar fractures via an intraoral approach. *Oral Surg Oral Med Oral Pathol* 71(3):257–261
- Silverman SL (1925) New operation for displaced fractures at the neck of the condyle. *Int J Orthod* 67:876
- Chossegros C, Cheynet F, Blanc JL, Bourezak Z (1996) Short retromandibular approach of subcondylar fractures. Clinical and radiologic long term evaluation. *Oral Surg Oral Med Oral Pathol Oral Radiol, Oral Endod* 82(3):248–252
- Wu CY, Shi XJ, Li Y (2004) Retromandibular incision, miniplate rigid fixation for condylar, subcondylar fractures. *Shanghai Kou Qiang Yi Xue* 13(1):20–22
- Narayanan V, Kannan R, Sreekumar K (2009) Retromandibular approach for reduction and fixation of mandibular condylar fractures: a clinical experience. *Int J Oral Maxillofac Surg* 38(8):835–839
- Ellis E, Throckmorton G, Palmieri C (2000) Open treatment of condylar process fractures: assessment of adequacy of repositioning and maintenance of stability. *J Oral Maxillofac Surg* 58(1):27–34
- Downie JJ, Devlin MF, Carton AT, Hislop WS (2009) Prospective study of morbidity associated with open reduction and internal fixation of the fractured condyle by the transparotid approach. *Br J Oral Maxillofac Surg* 47(5):370–373
- Ellis E 3rd, McFadden D, Simon P, Throckmorton G (2000) Surgical complications with open treatment of mandibular condylar process fractures. *J Oral Maxillofac Surg* 58(9):950–958
- Undt G, Kermer C, Rasse M, Sinko K, Ewers R (1999) Transoral miniplate osteosynthesis of condylar neck fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 88(5):534–543
- Vesnaver A, Gorjanc M, Eberlinc A, Dovsak DA, Kansky AA (2005) The periauricular transparotid approach for open reduction and internal fixation of condylar fractures. *J Cranio Maxillofac Surg* 33(3):169–179
- Vogt A, Roser M, Weingart D (2005) Transparotid approach to surgical management of condylar neck fractures. A prospective study. *Mund Kiefer Gesichtschir* 9(4):246–250
- Devlin MF, Hislop WS, Carton AT (2002) Open reduction and internal fixation of fractured mandibular condyles by a retromandibular approach: surgical morbidity and informed consent. *Br J Oral Maxillofac Surg* 40(1):23–25
- Manisali M, Amin M, Aghabeigi B, Newman L (2003) Retromandibular approach to the mandibular condyle: a clinical, cadaveric study. *Int J Oral Maxillofac Surg* 32(3):253–256

22. Palmieri C, Ellis E 3rd, Throckmorton G (1999) Mandibular motion after closed and open treatment of unilateral mandibular condylar process fractures. *J Oral Maxillofac Surg* 57(7):764–775
23. Iannetti G, Cascone P (1995) Use of rigid external fixation in fractures of the mandibular condyle. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 80(4):394–397
24. Widmark G, Bagenholm T, Kahnberg KE, Lindahl L (1996) Open reduction of subcondylar fractures: a study of functional rehabilitation. *Int J Oral Maxillofac Surg* 25(2):107–111
25. De Riu G, Gamba U, Anghinoni M, Sesanna E (2001) A comparison of open and closed treatment of condylar fractures: a change in philosophy. *Int J Oral Maxillofac Surg* 30(5):384–389
26. Sugiura T, Yamamoto K, Murakami K, Sugimura M (2001) A comparative evaluation of osteosynthesis with lag screws, mini-plates, or Kirschner wires for mandibular condylar process fractures. *J Oral Maxillofac Surg* 59(10):1161–1168
27. Villarreal PM, Monje F, Junquera LM, Mateo J, Morillo AJ, Gonzalez C (2004) Mandibular condyle fractures: determinants of treatment and outcome. *J Oral Maxillofac Surg* 62(2):155–163
28. Choi BH, Yi CK, Yoo JH (2001) Clinical evaluation of 3 types of plate osteosynthesis for fixation of condylar neck fractures. *J Oral Maxillofac Surg* 59(7):734–737