COMPLICATIONS ASSOCIATED WITH RETROMANDIBULAR TRANSPAROTID APPROACH FOR CONDYLAR FRACTURE PLATING AT MAXILLOFACIAL SURGERY UNIT HAYATABAD MEDICAL COMPLEX, PESHAWAR; A CLINICAL AUDIT

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ABSTRACT

Purpose: Although surgery using the retromandibular transparotid approach (RMA) provides excellent access to mandibular condyle fractures, it can increase the risk of complications. This study was designed to evaluate postoperative complications associated with open reduction and rigid internal fixation (ORIF) with RMA for fractures of the mandibular condyles.

Materials and Methods: This retrospective study was undertaken at the Department of Dental and Maxillofacial Surgery, Hayatabad Medical Complex, Peshawar, Pakistan for the period of January to December, 2021, of patients with condylar fractures requiring ORIF via RMA. The inclusion criteria were patients who presented with mandibular condylar fractures, underwent ORIF with retromandibular transparotid incision and minimum postoperative follow up of six months. The exclusion criteria included patients with preoperative facial nerve weakness, suffering from bomb blast, undergoing redo surgery or with previous history of parotid surgery. The predictive variables included age, gender, address, etiology, fracture side and location, temporomandibular joint (TMJ) Pain on visual analog scale (VAS), malocclusion and facial asymmetry.

Results: Of the total 68 medical records retrieved, only 27 cases met the inclusion criteria. The male to female ratio of the patients was 1.25: 1. The causes of the trauma for the patients were road accident for 13 (48%) cases, accidental falls in 8 (30%) cases and active physical violence in 6 (22%) cases. Isolated condylar fractures were noted in 15% (4 patients) cases, while 85% (23 patients) presented with other mandibular fractures. The postoperative complications assessed were facial nerve weakness, salivary (parotid) fistula, Frey's syndrome, scar formation and restriction of lateral movements of the jaw. It was observed that overall, the postoperative complications were temporary and resolve in a time dependent fashion. The improvement in postoperative mandibular movements were statistically significant ($p < 0.05$), as compared to preoperative status.

Conclusions: The RMA provides the ease of access to the condylar fracture site, sufficiently clear exposure and ease of fixation, while the associated postoperative complications resolve with time.

Keywords: condylar fractures, temporomandibular joint, ORIF, retromandibular transparotid approach, facial nerve weakness

INTRODUCTION

Although fractures of the mandibular condyle represent a common pathology in the maxillofacial clinics, its surgical management is still debatable. Depending on the anatomical location, a wide set of surgical interventions has been described in the management of condylar fractures; these interventions include preauricular incision, submandibular incision, periangular variant of submandibular incision, retromandibular incision, endoscopic-assisted method, etc. (1).

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Specifically, the preauricular incision is preferred for approaching the condylar fractures within the capsule of temporomandibular joint (TMJ), while the submandibular incision is opted to approach fractures of condylar base (2). The preauricular incision is typically too high for approaching subcondylar fractures, particularly for those below the sigmoid notch, where the submandibular incision is preferred. The so-called periangular variant of the submandibular approach is advocated to provide better view to safeguard the facial nerve (3). In addition, the retromandibular incision is typically employed to manage fractures at the condylar base and neck. The retromandibular incision is closer to the condylar process and thereby facilitate better exposure of the fractured ramus and the condylar process (4,5). Although the retromandibular incision is considered as the gold standard, it is challenging to approach a

condylar neck fracture with such incision, presumably due to the fact that the incision is marked below the level of Loukota line (6). Consequently, the exposure of sufficient intact cephalic condylar bone for 2-3 hole rigid fixation requires extreme upward stretching of the main trunk of facial nerve; such stretching may cause transient or permanent facial nerve injury (7–9). The intraoral access is speculated as advantageous in significantly reducing the risk of facial nerve injury and visible scar; nevertheless, this approach provide limited access to the fractures, is difficult, expensive, demanding more manpower and exhibit a long-term learning curve (10,11).

The retromandibular transparotid incision offers an excellent access to condylar neck and subcondylar fractures, and is particularly useful in treating complicated fractures such as those associated with angulation/ displacement enabling shortening of vertical ramus (12). This approach, however, is not free of post-surgical complications; the possible complications may include neurological injuries (i.e., facial nerve paralysis), Frey's syndrome, postoperative malocclusion, wound infections, seromas, hematoma, salivary fistulae, sialocele, and non-esthetic scars (13–17).

In this study, an evaluation of postoperative complications associated with RMA for condylar fracture plating at Maxillofacial Surgery unit Hayatabad Medical Complex is presented.

MATERIAL AND METHODS

The design of this study was retrospective. Patient who underwent surgical reduction for the management of mandibular condylar fractures at the Department of Dental and Maxillofacial Surgery, Hayatabad Medical Complex, Peshawar, Pakistan for the period of January to December 2021 were analyzed. The inclusion criteria for this study were patients who presented with mandibular condylar fractures, underwent open surgical reduction and internal fixation using retromandibular transparotid incision and minimum postoperative follow up of six months. The mandibular condylar fractures of the patients included in this study were confirmed on clinical presentation in tandem with radiological studies (i.e., computed tomography). The exclusion criteria included patients with preoperative facial nerve weakness, suffering from bomb blast, undergoing redo surgery or with previous history of parotid surgery. All patients fulfilling these criteria were considered for the subsequent analysis.

The surgical technique for management of the mandibular condylar fractures in this study was ORIF with retromandibular transparotid incision. One miniplate was inserted to fix the condylar fractures. Moreover, when required, orthodontic appliances were also applied to facilitate postsurgical use of elastics. Skin marking of the zygomatic arch, the mandibular angle, the articular fossa and the site of fracture were performed, followed by about 2 cm incision posterior and cranial to the mandibular angle), dissection of the parotid lobes and incision of the masseter muscle to expose the fracture.

The first postoperative evaluation was made for the static and dynamic occlusal function by measuring the overjet and overbite. Other variables assessed were the possible presence of precontacts, joint pain, joint clicks and occlusion abnormality (i.e., appropriate lateralization), maximal interincisal opening (MIO), protrusion movements, the state of TMJ, pain during chewing, hematoma and deviation during opening. The degree of damage to nerve dysfunction branch (i.e., marginal mandibular, cervical, buccal, zygomatic, frontal) was also evaluated. The TMJ pain was assessed on the visual analog scale from 0 (i.e., no pain) to 10 (i.e., worst pain). The Patient And Observer Scar Assessment Scale (POSAS) was used to examine the aesthetics of surgical scar. Finally, other surgical complications, such as the presence of sialocele, cutaneous salivary fistulae or Frey's syndrome. The assessment of postsurgical complications developed by the patients were carried out at three time points: 1 month, 3 months and 6 months after the surgery. In addition, demographic variables of these patients, including age, gender, address, etiology, fracture side and location, TMJ Pain on visual analog scale (VAS), malocclusion and facial asymmetry were also recorded. All the data were analyzed using the statistical package of SPSS.

RESULTS

In this study, medical records of 68 patients were retrieved; of these, only 27 cases met the inclusion criteria. The patients (n = 41) were excluded due to two reasons: because the patients either failed to appear for a follow-up of six months (29 cases) or because the patients were not managed by ORIF with retromandibular incision (12 cases).

The male to female ratio of the patients included in this study was 1.25: 1 (56 % versus 44 %), having a mean (standard deviation: SD) age of 36.6 (SD: 9.25) years, and range from

14 to 44 years. The demographic data of the patients are summarized in Table 1. The causes of the trauma for the patients included in this study were: road accident was the most frequent cause of condylar fracture accounting for 13 (48%) cases, accidental falls was the cause in 8 (30%) cases and active physical violence in 6 (22%) cases. Isolated condylar fractures were noted in 15% (4 patients) cases, while 85% (23 patients) presented with other mandibular fractures. The patient's trauma involved left side in 15 (56%) while right side in 12 (44 %) of the cases. For the ORIF procedure of isolated condylar fractures, the average length of the surgical intervention (i.e., from incision to suture) was 50 minutes (range: 35-70 minutes). No patient required intra- or post-operative blood transfusion.

Table 1: Characteristics of patients included in this study

Operative variable	Value
Age (years) mean	36.6 (SD 9.25)
range	14-44
Sex (male: female)	15:12
Fracture site	Condylar head: 0
	Condylar neck: 27
Etiology	RTA: 13
	Fall: 8
	Assault: 6
Pre-op MIO (mm)	24.22 (SD 2.9)
	19-31
TMJ Pain on VAS	5-9
Malocclusion	Yes=25; No=2
Facial asymmetry	Yes=22; No=5

SD: standard deviation, MIO: maximum interincisal opening; TMJ; temporomandibular joint, VAS; visual analog scale

All findings after the surgical management of the mandibular condylar fractures were recorded at three different time intervals (1, 3 and 6 months postoperatively) on a standard proforma. These postoperative complications comprised of facial nerve weakness, salivary (parotid) fistula, Frey's syndrome, scar formation and restriction of lateral movements of the jaw; the frequency of these complications has been presented in Table 2. Moreover, the stability of condylar fracture fixation and the accuracy of reduction was assessed radiologically in all patients (Table 2), which revealed proper bone healing. Postoperative complications such as salivary fistulae, sialocele and Frey's syndrome was frequently observed on this first patient follow up (at 1 month); these complications, however, resolved with time, as observed on the subsequent follow ups (Table 2). The aesthetic outcomes of the surgical treatment were also evaluated, based on the absence of the scar mark. All patients (n = 27) complained of hypopigmented scar at the one month follow up. However, these scars gradually resolved with time, leaving 25 and 14 patients with scar marks at the 3 and 6 months follow up. Moreover, there was no evidence for loosening of screw and plate exposure.

Table 2: Assessment of post-op complications in patients included in this study

Sr. no.	Post-op surgical complications	Time interval (post-op)		
		1 month	3 months	6 months
	Clinical evaluation			
1	Facial nerve weakness	12	5	0
2	Salivary (parotid) fistula	0	0	0
3	Frey's syndrome	0	0	0
4	Perceptibility of scar	27	25	14
5	Restriction of lateral movements	16	6	1
	Radiological evaluation			
6	Fracture of miniplates	0	0	0
7	Loosening of screws	0	0	0

Pre- and post-surgical (at six month follow up) variables of all patients (n = 27) were assessed and compared, as summarized in Table 3. The status of mandibular movement was evaluated using the degree of opening (i.e., maximal interincisal distance) and the presence of opening deviation (i.e., protrusion and lateral excursion). Specifically, the maximal interincisal distance values for pre-op ranged between 19 and 31 mm (mean ~ 24.2 ±2.9 mm), while that of post-op were 36.3±4.4; the difference between the pre-op and post-op values was statistically significant at the level of p = 0.01. Similar significant differences were observed for the case of protrusion. The mean protrusion range for the pre-op patients was 1.69±1.11 compared with 5.98±1.82 in the post-op patients. Moreover, the mean mandibular deviation on opening from the midline was 5.12±1.2 mm and 1.7±1.0 mm in the pre- and post-op patients (Table 3). Likewise, the values of lateral excursive movements for the affected and contralateral sides and occlusal status have also been presented in Table 3. It is noteworthy that the differences for all these variables was statistically significant.

Table 3: Comparison of patient's data (n = 27) assessed before and after surgical treatment of condylar fractures (at six month follow up)

Patients variable	Pre-op mean ± SD	Post-op mean ± SD	Statistical significance	P value
Maximal interincisal distance (mm)	24.2±2.9	36.3±4.4	yes	0.01
Protrusive movements (mm)	1.69±1.11	5.98±1.82	yes	0.001
Deviation of mandible on opening (mm)	5.12±1.2	1.7±1.0	yes	0.001
Occlusal status	24.1±6.41	43.5±7.54	yes	0.01
Lateral excursive movements fractured side	5.2± 0.7	8.3±1.6	yes	0.05
Lateral excursive movements nonfractured side	4.4 ± 0.3	6.3±1.3	yes	0.01

DISCUSSION

The decision for open treatment of mandibular condylar fractures is typically based on the assessment of potential risks against the potential benefits of the surgical intervention. In general, adults with dislocated and displaced mandibular condylar fractures, malocclusion, ramal height shortening ≥ 5mm and fractures at non-condylar sites are treated by open reduction and internal fixation (ORIF). Moreover, with enhancing skills of the surgeon, refined surgical procedures, introduction of improved materials for fixation and innovative new designs for plate and screw, a paradigm shift has occurred towards the ORIF of mandibular condylar fractures.

This retrospective study was designed to assess the efficacy and safety of ORIF with retromandibular transparotid incision for the management of mandibular condylar fractures. The post-op complications were documented, both clinically and radiologically, for the follow up period of 1, 3 and 6 months. Injury of the facial nerve is considered as one of the serious complication. In this study, there was an injury to the facial nerve in 44.5% and 18.5% of the cases at 1 and 3 months follow up, while no was observed at 6 month follow up. It is believed that the facial nerve injury is affected by several factors, including experience of the attending surgeon, approach and location of the condylar fracture (18,19). Although the patients at our institute are operated by experienced surgeons, the region of the condylar fracture (i.e., head and neck regions) may have contributed towards the injuries of facial nerve (20). It is suspected that transient neuropraxia during the retromandibular transparotid incision may be triggered by the extra dissection and retraction of the soft tissue. Moreover, the technical difficulty to fix the bone plate also increases the possibility of facial nerve injury (21).

The deviation of mandible during mouth opening is considered as a sign of ramal height shortening, where the movement of the joint is compensated (22). Occlusion dysfunction, assessed with respect to teeth intercuspation, was determined and compared before and after the ORIF (23,24). In this study, the mandible movement, discrepancy in occlusion and lateral excursive movements improved significantly ($p < 0.05$) at the six month follow up. This observation is consistent with previous reports (25,26). It may be noted that the patients presenting with postoperative malocclusion were managed by elastic exercise. Specifically, at 6 months follow-up, the range of TMJ motion was satisfactory, with stable centric occlusion and no deviation.

Several studies have reported different complications of RMA. Haematomas and transient salivary fistulas were shown to be more common with RMA than with the submandibular approach, although permanent

facial palsy was found to be more common with the latter (27). A recent meta-analysis showed that 8 studies reported the presence of sialocele following the RMA, where the pooled incidence was 2% (95% CI: 0%-4%; I2 =45.8%). Likewise, 0 studies reported the rate of infection following the transparotid and the anteroparotid approach. 10 studies showed postoperative infection with an incidence of 1% (95% CI: 0%-4%; I2=63.1%) (15). Because RMA is related with low morbidity and appropriate exposure of the fracture site, Bindra *et al.* recommended it for open reduction of condylar fractures. (12). Other studies also concluded that RMA provides a direct view and an almost straight line access for the fixation of the condylar fracture (1,2,18,27). Temporary facial nerve weakening, persistent occlusion disorder, temporary preauricular hypesthesia, and protracted scarring were all reported in a sample of 19 patients who received RMA in 1%, 11%, 11%, and 5% of the cases, respectively (28). According to various studies, the facial nerve weakness is typically transient and goes away with time (5,29). In a cohort of 93 patients, 17.2% of the patients showed facial nerve weakness at 6 weeks follow up, which disappeared at 6 months follow up (23). Moreover, very low incidence rate for the postoperative onset of Frey's syndrome has been reported (17,30). Likewise the incidence of salivary fistulae or sialocele has been described by several authors (23,24,31). In 40 patients who underwent surgery using RMA, 5% had poor repositioning results and 5% had hypertrophic scarring (29). In another study of 48 patients, the following complications were reported: a self-limiting salivary fistula in 7.8% cases and temporary facial atony in 19.6% cases (32). Hematoma, Frey syndrome, wound infection, and miniplate fracture have been reported (13,33–35).

CONCLUSIONS

In this study, the postoperative complications associated with the retromandibular transparotid approach (RMA) for the treatment of condylar fractures of the mandible were evaluated. The RMA provides easy access to the condylar fracture site, sufficiently clear view field, and easy fixation. The improvement in postoperative mandibular movements was statistically significant compared to the preoperative condition. Careful retraction of the soft tissues during the procedure, particularly in displaced fractures, can reduce the risk of facial nerve damage. It was observed that overall the postoperative complication rate was low and transient, which resolved over time.

DECLARATIONS

Author Contributions:

Conceptualization: YRK, KS, MM
Data curation: YRK, MW
Formal analysis: SR, MW, MM
Investigation: YRK, SR, MM
Methodology: YRK, SR, MM
Project administration: YRK, MM
Resources: YRK, MM
Supervision: MM
Validation: SR, MW, KS
Visualization: MW. KS
Writing – original draft: YRK, KS
Writing – review & editing: YRK, KS, MM

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