EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 11
Issue: 10
Year: 2024

FACIAL NERVE INJURY RELATED WITH RETROMANDIBULAR TRANSPAROTID APPROACH AFTER OPEN REDUCTION AND FIXATION FOR MANDIBULAR CONDYLE FRACTURE

Sandhya Joshi[1]*, Ishfa Banu Haque[2], Dr. Kishor Bhandari[3], Gaurav Karna[4] and Bandana Khanal[5]

[1]Associate Professor, Department of Oral and Maxillofacial Surgery, National Trauma Center, National Academy of Medical Sciences, BIR Hospital Kathmandu, Nepal.
[2]Assistant Professor Dr. Ishfa Banu Haque, Oral and Maxillofacial Surgery Unit, National Academy of Medical Sciences, BIR Hospital.
[3]Assistant Professor Dr. Kishor Bhandari, Oral and Maxillofacial Surgery Unit, National Academy of Medical Sciences, BIR Hospital.
[4]Lecturer Dr. Gaurav Karna, Oral and Maxillofacial Surgery Unit, National Academy of Medical Sciences, BIR Hospital.
[5]Professor Dr. Bandana Khanal, Oral and Maxillofacial Surgery Unit, National Academy of Medical Sciences, BIR Hospital.

***Corresponding Author: Dr. Sandhya Joshi**
Associate Professor, Department of Oral and Maxillofacial Surgery, National Trauma Center, National Academy of Medical Sciences, BIR Hospital Kathmandu, Nepal.

Article Received on 21/08/2024 **Article Revised on 11/09/2024** **Article Accepted on 01/10/2024**

ABSTRACT
Background: Although mandibular condylar fractures are common, their management remains controversial. The retromandibular transparotid approach is widely used for its advantages but is associated with risks of facial nerve injury (FNI). This study evaluates FNI incidence following this approach for condylar neck and subcondylar fractures. **Methods:** A cross-sectional study was conducted on 20 patients undergoing open reduction and internal fixation with retromandibular transparotid approach during a three month period in the Department of Oral and maxillofacial surgery of National Trauma Center and Dental Department, Maxillofacial Unit of National Academy of Health Sciences, Bir Hospital.. Demographics, fracture details, surgical techniques, and postoperative outcomes were recorded. Facial nerve function was assessed using the House-Brackmann grading system at multiple intervals over three months. Appropriate statistics were computed. **Results:** The majority of patients were young males (90%) involved in road traffic accidents (55%). Most fractures were located in the subcondylar region (75%) and displaced medially (65%). Two patients (10%) experienced temporary buccal branch FNI, recovering fully within three months. One case of parotid sialocele was observed as a complication. **Conclusion:** Despite risks, the retromandibular transparotid approach remains effective for managing condylar fractures, emphasizing the importance of skilled surgical technique in minimizing complications.

KEYWORDS: *Facial nerve injury; Mandibular condyle; Maxillofacial.*

INTRODUCTION
The mandibular condylar fracture treatment has always been debatable. There are various approaches that can be used for open reduction and internal fixation of condylar fractures each having its own pros and cons.[1]

The retromandibular transparotid approach is widely used for its short distance from skin incision to fracture site, hidden scars, and good surgical exposure.[2-3] The retromandibular approach was first described by Hinds and Girroti in 1967 and modified by Koberg and Momma in 1978.[4] However, Temporary facial nerve injury (FNI) related to the operative procedure is a major limitation in open reduction and internal fixation of mandibular condyle fractures. Facial nerve damage has heavy consequences in social life because of the importance of facial expression.[5,6] Yet a general consensus on the surgical technique to avoid FNI has not been reached.[2-3]

Surgical indications for mandibular condyle fractures have evolved since the 1980s when Zide and Kent established initial guidelines. Advances have since modified these criteria, and we now follow the updated international guidelines proposed by the American Association of Oral and Maxillofacial Surgery (AAOMS) for open reduction of condylar fractures(Table 1).[5]

Table 1: The American Association of Oral and Maxillofacial Surgery (AAOMS).

Physical evidence of fracture	Imaging evidence of fracture
Malocclusion	Mandibular dysfunction
Abnormal relationship of jaw	Presence of foreign bodies
Lacerations and/ or hemorrhage of external auditory canal	Hemotmypanum
Cerebrospinal fluid otorrhea	Effusion
Hemarthrosis	

There are number of classifications in the literature for condylar fractures however we have used the most practical comprehensive classification on the basis of the site in condylar head (Over the polars connecting line), neck (Between bipolar and sigmoid notch line), and subcondylar (Under sigmoid notch line).[5]

In our study, we evaluate facial nerve injury with the retromandibular transparotid approach to treat condylar neck and subcondylar fracture.

METHODS

A cross-sectional study was done among the patients undergoing open reduction and fixation during a three month period in the Department of Oral and maxillofacial surgery of National Trauma Center and Dental Department, Maxillofacial Unit of National Academy of Health Sciences, Bir Hospital. The ethical approval was obtained from the Institutional review board of National academy of Medical Sciences. All the patients 18 years of age with mandibular extracapsular condylar fractures and without preoperative facial nerve injury were included in our study. However, patients with diacapitular mandibular condyle fracture, comminuted fractures, and who are medically unfit to undergo general anesthesia and reluctance for surgery were excluded from the study. Patients who did not complete a 3-month follow-up were excluded. Informed written consent was obtained from all the study participants.

Demographic details (age and gender), mechanism of injury, location and displacement of fractures, presence or absence of facial nerve injury and complication of the operative procedure were noted. Fracture location was divided into two categories as fracture located at the condylar neck and subcondylar fractures located below the sigmoid notch. Condylar head fractures are treated using the preauricular approach for its ease, so these fractures were not included in our study. Fracture displacement was categorized as undisplaced, medially displaced, or laterally displaced out of the glenoid fossa.

A group of maxillofacial surgeons, including consultants with at least 5 years of experience, provided the treatment. The surgical site was marked and infiltrated with a solution of epinephrine (1:80,000) diluted in normal saline. The standard retromandibular incision was initiated with a 2 to 3 cm cut starting 0.5 cm below the ear lobe, posterior and parallel to the posterior border of the ramus of the mandible. Subsequently, dissection proceeded in a superomedial direction through the skin, subcutaneous fat, platysma muscle, SMAS, parotid capsule, and the substance of the parotid gland. Blunt dissection was conducted once within the substance of the parotid gland, parallel to the branches of the facial nerve. The facial nerve was not routinely identified and isolated; however, if encountered during dissection, any branches were freed with underlying tissue 2 cm anteriorly and 1 cm posteriorly, allowing them to be retracted away from the surgical site. The fracture site was exposed subperiosteally. The pterygomasseteric sling was incised sharply. For a medially displaced fracture, an intermaxillary fixation (IMF) screw (2×8mm) with wire was inserted into the ramus of the mandible to pull the distal segment of the fracture downward, creating space and anatomically aligning the medially displaced fracture segment. Bone holding forceps were used to secure the displaced condylar fracture. The fractured portion was manipulated and repositioned into its anatomical position or lateral override.

Depending on the availability of bone for plating, either miniplates (1 or 2) or three-dimensional plates (delta or trapezoidal) were utilized. The incision was closed layer by layer using (3-0) vicryl, and the skin was sutured with (4-0) prolene. Surgical drain was not placed routinely. Elastic guidance intermaxillary fixation was applied to cases with occlusal discrepancies during the postoperative period.

Facial nerve assessment was done with the House-Brackmann grading system on postoperative Day 1, Day 7, at 1 month, and at 3 months. All patients were followed up for a period of three months.

The data were recorded and analyzed using SPSS, version 21 (International Business Machines Corporation, Armonk, New York, USA).

Table 2: House- Brackmann facial nerve grading system.

Grade I - Normal	Appearance
Grade II – Slight dysfunction	Motion: Forehead- moderate to good function
	Eye: complete closure with minimum effort
	Mouth: slight Asymmetry
Grade III - moderate dysfunction	Motion: Forehead- slight to moderate movement

	Eye: complete closure with effort;
	Mouth: slightly weak with maximum effort
Grade IV- moderate severe dysfunction	Motion: Forehead- none
	Eye: incomplete closure
	Mouth: asymmetric with maximum effort
Grade V – severe dysfunction	Motion: Forehead ‐ none
	Eye ‐ incomplete closure
	Mouth ‐ slight movement mouth
Grade VI – Total Paralysis	No movement

RESULTS

Throughout the study period, 20 patients with mandibular extracapsular condyle fractures who underwent open reduction and fixation were assessed for potential enrolment in the study. Among them, 18 (90%) were males and 2 (10%) were females with the mean age of 26.65$\pm$6.523, the age ranging from 13 to 37 years of age (Median:26, IQR:11) (Table 3).

Table 3: Demographic details of patients undergoing open Reduction and Fixation for mandibular condyle fracture (n=20).

Variables	n(%)
Age group	
18-20	3 (15)
21-25	6 (30)
26-30	5 (25)
31-35	4 (20)
36 and older	2 (10)
Gender	
Male	18 (90)
Female	2 (10)

Among them, 11 (55%) patients sustained fractures due to road traffic accident (RTA), 8 (40%) had fall injury and the remaining one (5%) had a history of physical assault (Table 4).

Table 4: Mechanism of injury (n=20).

Variables	n (%)
Road Traffic Accident	11 (55)
Fall injury	8 (40)
Physical assault	1 (5)

Fifteen fractures (75%) were located in the subcondylar region of the mandible with the majority being on the right side (9,45%), 5(25%) on the left and remaining one (5%) was bilateral subcondylar fracture with associated right sided retromandibular fracture. Five fractures (25%) were located in the condylar neck with three (15%) on the low neck region and two (10%) on the high neck region. However, there was associated right parasymphysis fracture in each of the left sided subcondylar fracture and low condylar fracture.Majority of the fractures were displaced medially (13,65%), while six (30%) were displaced laterally. The subcondylar segment was undisplaced in one case (Table 5).

Table 5: Description of fracture (n=20).

Variables	n (%)
Location of fracture	
Subcondylar region	15 (75)
• Right	9 (45)
• Left	5 (25)
• Bilateral	1 (5)
Condylar neck region	5 (25)
• Low	3 (15)
• High	2 (10)
Displacement of fracture	

Medial	13 (65%)
Lateral	6 (30%)
No displacement	1 (5%)

Out of the 20 patients who underwent surgery, two (10%) experienced facial nerve injury, with the buccal branch being affected in both cases on the first postoperative day (Table 6). Both patients fully recovered within three months.

However, among the patients who underwent surgery, parotid sialocele was observed in only one case as postoperative complication. There were no surgical site infections postoperatively. No case of Frey syndrome was encountered during follow-up.

Table 6: Facial nerve injury (n=20).

Variables	n (%)
Facial nerve injury absent	18 (90)
Facial nerve injury present	2 (10)

DISCUSSION

Mandibular condyle fractures are the most common fracture of the mandible, accounting for 20-50% of all maxillofacial fractures.[7,8] Despite the high incidence, the management is still controversial between the conservative and surgical management.[4,9] Conservative management is used only for condylar neck fractures with minimal or no dislocation, fractures occurring in children up to the age of 10 to 12 years, and intracapsular fractures (depending on the fracture line). But the surgical treatment aims to restore the original anatomy, early mobilization and complete functional recovery.[10]

However, the treatment of patients often depends on the surgeon's experience and preferences.[7] There are several approaches to the mandibular condyle fracture management which is broadly classified into intraoral and extraoral approaches. Intraoral approaches, performed with or without endoscopic assistance, are used alongside the most common extraoral approaches, which include submandibular, Risdon, preauricular, retroauricular, and retromandibular transparotid or transmasseteric methods.[2] Some surgeon prefer extraoral over intraoral approaches since they provide good visualization and a better surgical field while some support intraoral access to avoid the risk of facial nerve injury and facial incision scars.[2,9] However, the intraoral procedure can be time consuming, and need of intensive training in endoscopic techniques and handling of instruments are mandatory.[10]

Of all the extraoral approaches, the retromandibular transparotid approach is the most commonly used.[8] Its reported advantages include a minimal working distance from the incision to the fracture site, reduced facial nerve morbidity due to direct identification and retraction, excellent exposure, less noticeable scarring, and ease of fracture reduction and fixation.[8] But when the retromandibular transparotid approach is used, the incidence of transient facial nerve damage ranges between 12% and 48%.[2,8] Some metaanalysis determined that the risk of permanent facial nerve injury is 1.4% for retromandibular transparotid approach.[2] The other potential complications associated with retromandibular approach include salivary fistula, sialocele, Frey syndrome, and unaesthetic scars, among which FN injury is one of the most severe complication.[7] A better understanding of the complications that may be associated with this approach could help in the decision making process regarding its use to surgically treat maxillofacial trauma.

In our study, the sample predominantly consisted of young males (90%), which is similar to the findings of Felix et al. (90%), Kanno T et al. (70%), and Shi et al. (72%). Additionally, the mean age of our patients is nearly identical to that reported by Shi et al.[3,7,8] The majority of the cases resulted from road traffic accidents (55%) followed by fall injury and assault which is similar to the findings of Kanno T et al. and Bhutia et al.[4,7]

Shi et. al reported the majority of the fracture being subcondylar (69%) similar to our finding (75%).[8] Likewise in both studies, the fractures were mostly displaced medially. Bhutia et al. also reported the majority medially displaced fracture, likely due to the pull of lateral pterygoid muscle.[4] The finding contrasts to the finding of Felix et al. where 70% of the patients had condylar neck fractures.[3] Two patients had associated fractures of the mandible, of which both had parasymphysis fracture. The associated parasymphysis fracture was also seen in the study of Felix et al.[3]

There was injury to FN in 10% of the cases which is similar to the finding of Chossegros et al.(10.52%) but lower than the findings of Al-Moraissi et al.(14.4%), Bhutia et al. (20%), Shi et al(18%), Kanno T et al.(14%) and Kim et al (32.14%)[2,4,7,8,10,11] Similarly, Ellis et al., Manisali et al. and Bouchard et al. identified temporary weakness of the facial nerve in 17.2%, 30% and 22% of the patients respectively.[12,13,14] The higher incidence of FNI may be attributed to to the surgical approach passing through the parotid gland, where the retraction of soft tissues and branches of the facial nerve can result in transient neuropraxia and subsequent facial palsy.[8] In our study, all patients were operated by skilled surgeons from our maxillofacial trauma team, which likely contributed to the lower occurrence of FNI. Likewise, Kshirsagar et al. reported no incidence of transient

FNI.[15] Similarly, Devlin et al and Narayan et al. reported temporary FNI in 7.14% and 3% of the patients respectively.[16,17] Nevertheless, the significant variation in FNI rates suggests that the transparotid approach may be particularly sensitive to technique, potentially influenced by the surgeon's level of experience. No case of permanent facial nerve injury was reported in our study, which is itself a rare complication. Bouchard et al. documented just one instance of permanent FNI over a span of five years.[14]

In both of our cases (100%), the buccal branch of the facial nerve was affected. This corresponds with earlier research highlighting the buccal branch as the most frequently affected.[4,8,18] The dissection area lies between the buccal branch and marginal mandibular branches. Greater retraction of the superior incision margin is necessary for plating or to locate the medially overlapping condyle, which may contribute to the higher occurrence of neuropraxia in the buccal branch. However Ellis et al. and Manisali et al. found the marginal mandibular nerve to be commonly affected in their studies.[12,13] To decrease the occurrence of buccal nerve palsy, it is advisable to dissect the nerve carefully and shield it from retraction using an appropriate instrument.[4] In our study, we couldn't find the involvement of other branches of the facial nerve.

Out of 20 patients, parotid sialocele occurred in just one case, possibly due to inadequate closure of the parotid capsule. Gupta et al. observed sialocele formation in 20% of cases initially. Subsequently, they implemented meticulous closure of the parotid capsule during dissection, resulting in no further instances of sialocele.[19] In contrast to this, Felix et al. reported no incidence of sialocele.[3] However, we could not find any case of surgical site infection or Frey syndrome which is similar to the finding of Gupta et al and Van et al.[19,20] The lack of postoperative surgical site infections could be attributed to adherence to aseptic protocols, systemic antibiotic administration, and efficient, coordinated procedures. Contrary, Bouchard et al. documented 11.9% of the cases of infection and one patient was diagnosed with Frey syndrome in their study.[14] No instances of hemorrhage, a significant intraoperative complication, occurred in any patients due to posterior retraction of the retromandibular vein and avoidance of the maxillary artery. Like Gupta et al., none of the patients in our study expressed concerns about scar aesthetics.[19] However, Ellis et al. and Patihar et al. noted unesthetic scars in 7.5% and hypertrophic scar formation in 17% of cases, respectively.[12,21]

In neuropraxia functional recovery takes place within 0-12 weeks.[4] But increase in edema during postoperative period may decrease the inflow of the nutrient to the nerve resulting in axonal death and retrograde degeneration. Both patients recovered fully within 3 months duration which is similar to the finding of Bhutia et al., Shi et al, Ellis et al., Manisali et al. and Gupta et al.[4,8,12,13,19] In contrast to this, Kanno T reported the complete recovery at 6 months postoperatively.[7] Ellis et al. in a prospective study of 93 cases found that all cases had resolved after six months.[12]

This study's strength lies in surgeries performed by experienced maxillofacial trauma surgeons from a single team, ensuring full patient compliance with follow-up. The decision to apply retromandibular transparotid approach was primarily motivated by the direct visualization of the condylar region through parotid gland exposure, a consistent feature in our clinical investigation. This approach facilitated straightforward plate application. While direct parotid gland exposure may increase the risk of facial nerve injury, it minimizes skin excision, reduces scar formation, and enables precise alignment of bone fragments, emphasizing occlusion recovery. However, the study's weakness includes its single-center design with a limited number of patients.

CONCLUSION

Our study highlights the effectiveness of the retromandibular transparotid approach for managing mandibular condyle fractures, offering advantages such as direct visualization and ease of plate application. Despite the potential for facial nerve injury, careful surgical technique by experienced surgeons can mitigate complications. Further research with larger cohorts is needed to validate these findings and refine surgical approaches for optimal patient outcomes.

REFERENCES

1. Parhiz A, Parvin M, Sanjari Pirayvatlou S. Clinical Assessment of Retromandibular Anteroparotid Approach for reduction of mandibular subcondylar fractures: Report of 60m cases and review of the literature. Front Dent, 2020; 17: 17.
2. Al-Moraissi EA, Louvrier A, Colletti G, Wolford LM, Biglioli F, Ragaey M, Meyer C, Ellis III E. Does the surgical approach for treating mandibular condylar fractures affect the rate of seventh cranial nerve injuries? A systematic review and meta-analysis based on a new classification for surgical approaches. Journal of Cranio-Maxillofacial Surgery, 2018; 1, 46(3): 398-412.
3. Felix K, Singh M. The retromandibular transparotid approach for reduction and internal fixation of mandibular condylar fractures. Ann Maxillofac Surg, 2020; 10: 168-77.
4. Bhutia O, Kumar L, Jose A, Roychoudhary A,Trikha A. Evaluation of facial nerve following open reduction and internal fixation of subcondylar fracture through retromandibular transparotid approach. Br J Oral Maxillofac Surg, 2014; 52: 236-240.
5. Cortese A, Borri A, Bergaminelli M, Bergaminelli F, Claudio PP. Condylar neck and sub- condylar fractures: surgical consideration and evolution of the

technique with short follow – up on five cases. Dent J, 2020; 8: 125.
6. Kuang SJ, He YQ, Zheng YH, Zhang ZG. Open reduction and internal fixation of mandibular condylar fractures. Medicine, 2019; 98: 37 (e16814)
7. Kanno T, Sukegawa S, Tatsumi H, Karino M, Nariai Y, Nakatani E, Furuki Y, Sekine J. Does a retromandibular transparotid approach for the open treatment of condylar fractures result in facial nerve injury?. Journal of Oral and Maxillofacial Surgery, 2016; 1, 74(10): 2019-32.
8. Shi D, Patil PM, Gupta R. Facial nerve injuries associated with the retromandibular transparotid approach for reduction and fixation of mandibular condyle fractures. Journal of Cranio-Maxillofacial Surgery, 2015; 1, 43(3): 402-7.
9. Shi J, Yuan H, Xu B. Treatment of mandibular condyle fractures using a modified transparotid approach via the parotid mini-incision: experience with 31 cases. PLoS One, 2013; 26, 8(12): e83525.
10. Kim BK, Kwon YD, Ohe JY, Choi YH, Choi BJ. Usefulness of the retromandibular transparotid approach for condylar neck and condylar base fractures. Journal of Craniofacial Surgery, 2012; 1, 23(3): 712-5.
11. Chossegros C, Cheynet F, Blanc JL, Bourezak Z. Short retromandibular approach of subcondylar fractures: clinical and radiologic long-term evaluation. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 1996; 1, 82(3): 248-52.
12. Ellis III E, Dean J. Rigid fixation of mandibular condyle fractures. Oral surgery, oral medicine, oral pathology, 1993; 1, 76(1): 6-15.
13. Manisali M, Amin M, Aghabeigi B, Newman L. Retromandibular approach to the mandibular condyle: a clinical and cadaveric study. International journal of oral and maxillofacial surgery, 2003; 1, 32(3): 253-6.
14. Bouchard C, Perreault MH. Postoperative complications associated with the retromandibular approach: a retrospective analysis of 118 subcondylar fractures. Journal of Oral and Maxillofacial Surgery, 2014; 1, 72(2): 370-5.
15. Kshirsagar R, Singh V, Pawar S, Shah R. Retromandibular approach in the management of condylar fractures by open reduction and internal fixation, a prospective study. National Journal of Maxillofacial Surgery, 2015; 1, 6(2): 180-4.
16. Devlin MF, Hislop WS, Carton AT. Open reduction and internal fixation of fractured mandibular condyles bya retromandibular approach: surgical morbidity and informed consent. British journal of oral and maxillofacial surgery, 2002; 1, 40(1): 23-5.
17. Narayanan VI, Kannan R, Sreekumar K. Retromandibular approach for reduction and fixation of mandibular condylar fractures: a clinical experience. International journal of oral and maxillofacial surgery, 2009; 1, 38(8): 835-9.
18. Hyde N, Manisali M, Aghabeigi B, Sneddon K, Newman L. The role of open reduction and internal fixation in unilateral fractures of the mandibular condyle: a prospective study. British journal of oral and maxillofacial surgery, 2002; 1, 40(1): 19-22.
19. Gupta S, Bansal V, Mowar A, Purohit J, Bindal M. Analysis between Retromandibular and Periangular Transmasseteric Approach for Fixation of Condylar Fracture-A Prospective Study. Annals of Maxillofacial Surgery, 2020; 1, 10(2): 353-60.
20. Van Hevele J, Nout E. Complications of the retromandibular transparotid approach for low condylar neck and subcondylar fractures: a retrospective study. Journal of the Korean Association of Oral and Maxillofacial Surgeons, 2018; 44(2): 73.
21. Parihar VS, Bandyopadhyay TK, Chattopadhyay PK, Jacob SM. Retromandibular transparotid approach compared with transmasseteric anterior parotid approach for the management of fractures of the mandibular condylar process: a prospective randomised study. British Journal of Oral and Maxillofacial Surgery, 2019; 1, 57(9): 880-5.