J. Maxillofac. Oral Surg. (Oct–Dec 2023) 22(4):1052–1057
https://doi.org/10.1007/s12663-023-01962-z

CLINICAL PAPER

Retromandibular Approach and its Different Variations in the Management of Fracture Condyle: Surgical Experience

V. Gopal Krishnan[1] · **Deepak Shukla**[2] · **C. Senthil Kumar**[2]

Received: 6 November 2022 / Accepted: 19 June 2023 / Published online: 11 July 2023

Abstract The management of condylar fractures is a controversial topic in maxillofacial surgery. Surgical treatment is the preferred treatment choice nowadays and the article aims to describe different variations of the retromandibular approach with their surgical outcome based on experience. A total of 15 cases were managed with the retromandibular approach and its different variations. We advocate retromandibular approach for the management of condyle fractures, and among which retromandibular retroparotid and retromandibular anteroparotid provide best accessiblity with less bleeding and minimal risk of injury to the facial nerve.

Keywords Condylar fractures · Retromandibular approach · Facial nerve

Introduction

Management of condylar fractures is a controversial topic for the past two decades [1]. Condyle involvement is up to 25–50% in all mandibular fractures which causes malfunction of the joint, occlusal disturbance, post-traumatic pain and worst ankylosis [2]. Management involves closed or open treatment while selecting the treatment plan. Current literature states open treatment is a better choice due to anatomical reduction along with fixation of the fracture units, early mobilization, early return to function, healing and stable occlusion [3]. But it involves the potential risk of damaging facial nerve, scar, adequate skill to operate in a small surgical field without damaging the adjacent areas [4].

Various approaches exist in the literature which provide accessibility of condyle like preauricular, postauricular, endaural, retromandibular, submandibular, rhytidectomy and the latest intraoral endoscopic approaches. But the selection depends upon the treatment plan, the extent of the fracture and convenience of the surgeon as per the skills [5]. The retromandibular approach was initially defined by Hinds and Girotti in 1967 and modified as miniretromandibular by Biglioli and colletti in 2008 [6]. Advantage of this approach is to provide an excellent surgical field for direct admittance the subcondylar region via passing through parotid gland or via masseter, facilitating handling of the fracture, minimal unperceptive scar. The facial nerve, parotid gland and masseter muscle are the three important anatomical consideration structure that comes while surgery.

The aim of this article is to share the departmental surgical experience while using a different variation of the retromandibular approach while managing mandibular condylar fractures. The techniques which are discussed are retromandibular transparotid, retromandibular anteroparotid transmasseteric (APTM) and retromandibular retroparotid transmasseteric approach.

Material and Method

After ethical clearance and approval from the Institute. A total of 19 condylar fractures in 15 patients with the age group of 21–62 years were operated in the Dept of Oral and Maxillofacial surgery from April 2021 to July 2022. There were 12 males and 03 females in which 11 unilateral and 04 bilateral condylar fractures present. All the patients were

✉ Deepak Shukla
drdeepakshukla2010@gmail.com

[1] Oral and Maxillofacial Surgery, Army Dental Centre (R&R), Jammu, India

[2] Oral and Maxillofacial Surgery, 16 Corps Dental Unit, Department of Oral and Maxillofacial Surgery, Satwari, Jammu, Jammu and Kashmir 180003, India

assessed and diagnosed by a single team of Oral and Maxillofacial surgeon. Radiological evaluation was done by using orthopantomograms (OPG) and computed tomography (CT) and fractures were classified based on Lindhal classification-1977. Both method of treatment was explained to all the patients, i.e., closed and open treatment, approaches and complications related to the surgery. Informed consent for surgery was obtained from the patients willing for surgical intervention.

Inclusion criteria's were displaced unilateral condylar fractures with occlusal derangement, and displaced bilateral condylar fractures with anterior open bite, patients willing for open treatment. Exclusion criteria for the study were patient less than 18 years of age, undisplaced fracture condyle without occlusal derangements, previous surgery with the same approaches, injury to the facial nerve or parotid gland, patients on immunosuppressant drugs, uncontrolled systemic disease and patients unwilling for surgery.

Preoperative clinical evaluation includes TMJ assessment by preauricular and endaural method, ear examination for any bleed or clots, interincisal mouth opening in millimeters (mm), lateral excursive movements in mm, occlusal derangement, anterior or posterior open bite, facial nerve assessment was also done according to House and Brackmann's (HB) facial nerve grading system. Arch bars were placed prior to the surgery in all the patients planned for the surgical time to reduce intraoperative time.

Nineteen condylar fractures in 15 patients, 05 in each group (group A—retromandibular transparotid approach, group B—retromandibular anteroparotid approach and group C—retromandibular retroparotid) were surgically managed under general anesthesia using nasotracheal intubation by the single team of the surgeon (Table 1).

Surgical Technique (Retromandibular Transparotid Approach)

Group A patients were treated with retromandibular transparotid approach. Aseptic scrubbing followed by draping was done for all the group patients and oral hygiene with using 2% chlorhexidine. The miniretromandibular incision was marked 0.5 cm below the earlobe with a length of 2 cm parallel to the posterior border of the mandible (Fig. 1). 2% lignocaine with 1:80,000 adrenaline infiltration was along the incision marking. An incision was placed using NO 10 BP blade for the skin followed by platysma, superficial musculoaponeurotic system (SMAS). Tissue undermining up to 1.5 cm was done is all the dimension adjacent to the incision. Parotid capsule was identified, sharp incision was placed with the help of tip of the periosteal elevator was inserted to palpate the underlying bone. Mosquito forceps was in position of periosteal elevator blunt dissection was carried out. Masseter muscle was divided in horizontal fashion using the Colorado tip of cautery in a direction parallel to the facial nerve between upper and lower division. A gauze piece was inserted to detach the periosteum and masseteric fibers to expose the fracture site.

Surgical Technique (Retromandibular Anterioparotid Approach)

Group B—In this technique more undermining was done in anterior direction. Identification of the parotid capsule along the milking of gland was performed to find the cleavage between the anterior border of parotid capsule and masseter muscle. In a similar fashion tip of the periosteal elevator was inserted at the junction and the underlying bone was palpated. Mosquito forceps placed in position of periosteal elevator blunt dissection was carried out in vertical direction. Masseter fibers were divided by using the Colorado tip and fracture site was exposed. MMF, fixation and closure were done in similar fashion (Fig. 2A & B).

Surgical Technique (Retromandibular Retroparotid Approach)

Group C—Initial technique till incision was similar to other groups, but undermining was performed in all the directions. The tail of the parotid gland along with junction between parotid capsule and masseter muscle was identified at the posterior border of mandible. Incision was placed using Colorado tip along the posterior border of mandible to divide pterygomassertic sling and subperiosteal elevation of masseter. Langenback retractors were inserted to retract parotid in antero-superior direction. Fractured condyle was exposed (Fig. 3A & B).

Fixation and Closure

Maxillomandibular fixation was placed using pre-stretched stainless steel wire. Fracture condyle was reduced with the help of reverse Langenback retractors and stabilized. Fixation was performed using titanium plates according to the Mayers principle [7]. Layerwise closure was done first to masseter muscle, followed by parotid capsule and SMAS using 3-0 Vicryl. Skin closure was done 5-0 Prolene in all the cases.

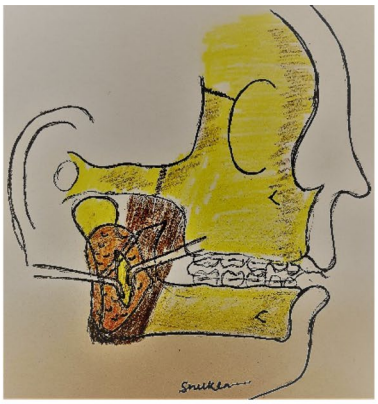
Results

A total of 19 condylar fractures in 15 patients (11 unilateral and 04 bilateral) managed with three different surgical approaches to achieve fixation of fractured condyle. There were 12 male and 03 female and main cause of the fracture was road traffic accident and fall (Table 1).

Table 1 Group Comparision

	Unilateral/bilateral	Level of condylar fracture	Location of additional fracture	Gender	Surgical exposure time	Blood loss in (ml)	Facial nerve damage (HB score)		Postoperative occlusion (functional/non functional)	
							Immediate after surgery	After 06 months	Immediate after surgery	After 06 months
	Group A									
1	Unilateral	(R) Subcondylar	(L) Parasymhysis	Male	23 Min	25 ml	HB I	HB I	Functional	Functional
2	Unilateral	(R) Neck	–	Male	23 Min	30 ml	HB I	HB I	Functional	Functional
3	Unilateral	(L) Subcondylar	–	Male	20 Min	32 ml	HB I	HB I	Functional	Functional
4	Unilateral	(L) Subcondylar	–	Male	25 Min	40 ml	HB IV	HB I	Functional (with elastics)	Functional
5	Bilateral*	B/L Neck	Symphysis	Female	23 Min	35 ml	HB I	HB I	Functional	Functional
	Group B									
1	Unilateral	(R) Subcondylar	(L) Parasymhysis	Male	25 Min	20 ml	HB I	HB I	Functional	Functional
2	Unilateral	(L) Neck	–	Male	27 Min	25 ml	HB I	HB I	Functional	Functional
3	Unilateral	(R) Subcondylar	(L) Parasymhysis	Female	22 Min	30 ml	HB I	HB I	Functional (with elastics)	Functional
4	Bilateral*	(R) Subcondylar/(L) Neck	Symphysis	Male	23 Min	30 ml	HB I	HB I	Functional	Functional
5	Bilateral*	(R) Neck	–	Female	28 Min	25 ml	HB IV	HB I	Functional	Functional
	Group C									
1	Unilateral	(R) Subcondylar	(L) Parasymphysis	Female	23 Min	25 ml	HB I	HB I	Functional	Functional
2	Unilateral	(R) Neck	–	Male	22 Min	30 ml	HB I	HB I	Functional	Functional
3	Unilateral	(L) Subcondylar	(R) Parasymphysis	Male	23 Min	35 ml	HB I	HB I	Functional	Functional
4	Unilateral	(L) Subcondylar	–	Male	25 Min	30 ml	HB I	HB I	Functional	Functional
5	Bilateral*	B/L Neck	–	Male	25 Min	25 ml	HB I	HB I	Functional	Functional

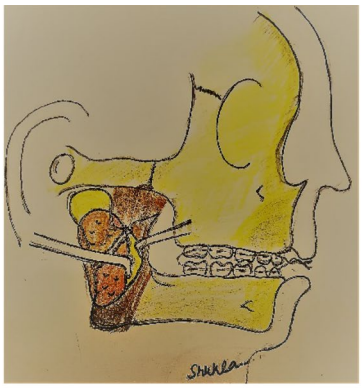
*One side exposure time



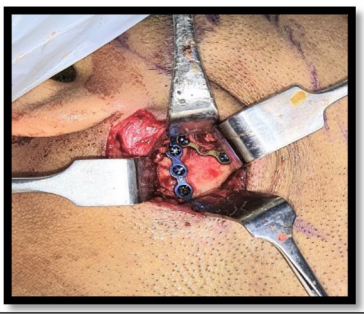
(a) Retromandibular Transparotid

(b) Retromandibular Transparotid

Fig. 1 **A** and **B** Retromandibular transparotid



(a) Retromandibular Anteroparotid



(b) Retromandibular Anteroparotid

Fig. 2 **A** and **B** Retromandibular anteroparotid

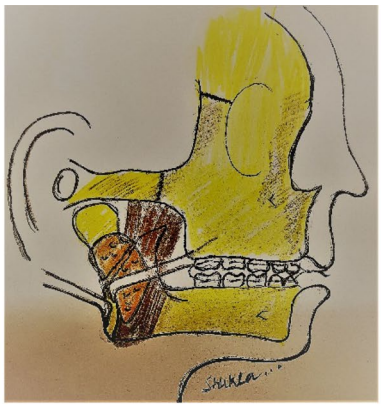
In all the cases the main approach was miniretromandibular. But in two of the transparotid cases, incision length was increased by 0.5 cm after the initial incision. Mean surgical exposure time in transparotid was 23 min, 25 min in APTM and 23.5 min in RPTM which was calculated from incision to the exposure of fracture site. The main reason of increased surgical time in APTM was due the increased undermining and identification of junction between parotid and masseter.

Blood loss calculation determined by subtracting the amount of saline irrigation solution used during surgery from the volume of the suction bottle. Increased blood loss was seen in the transparotid approach because of vessel bleed which was passing through the parotid gland. Incidences of facial nerve injury were seen in two patients with transparotid approach in marginal mandibular with a score of HB IV, in APTM one patient with HB IV in marginal mandibular but no facial nerve injuries were noticed in the retromandibular retroparotid. All nerve injuries were transient and resolved within a period six months. None of the patients developed sialocele or frey syndrome the reason was layerwise water tight closure performed in all the cases.

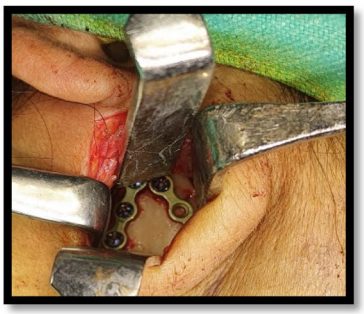
Postoperative haematoma was seen in one patient of group A who was managed with only pressure dressing and further resolved in 05 days.

Discussion

Management of condylar fractures remains controversial because of wide variety of opinions and different treatment modalities [8]. Current literature and publications support that ORIF provides better clinical outcomes when it is compared with closed treatment [9]. Surgically treated condylar fractures have better results in terms of occlusion, masticatory function, mouth opening and bone morphology. Successful treatment depends on accurate diagnostic imaging, an appropriate surgical procedure, anatomical reduction of the fractured condyle, rigid osteosynthesis and careful postoperative management [10]. Various percutaneous approaches exist in the literature for open reduction and internal fixation like submandibular approach, retromandibular approach, preauricular approach, rhytidectomy, etc., and each of these approaches has its own



(a) Retromandibular Retroparotid



(b) Retromandibular Retroparotid

Fig. 3 **A** and **B** Retromandibular retroparotid

advantages and disadvantages [11]. The anatomical level of condylar fracture, fixation method, presence of other fractures, surgical skills, cosmetic outcome influence the selection of approach [12]. The retromandibular approach provides adequate visibility, access to carry reduction along fixation and better aesthetic outcomes [13]. The [retromandibular approach was first described by Hinds and Girroti to carry out vertical subcondylar over 500 cases via transparotid route 14]. The original approach mentioned dissection of the parotid capsule and parenchyma of the parotid to reach the fracture site. Transparotid provides a short distance from the skin incision to the fracture site [15].

Study done by Ellis et al. [16] on 93 patients operated on through a retromandibular approach 17.2% developed temporary atony of the facial nerve, and they all recovered within 6 months. Manisali et al. [17] treated fractures of the condylar process in 20 patients using the retromandibular access route, and visualized the facial nerve during the operation in 6 cases which developed temporary palsy for 06 months later recovered completely.

Wilson later came up with anteroparotid transmasseteric approach to reduce the complications and improve the accessibility in the management of condylar fractures [18]. Narayan et al. used a combined preauricular with retromandibular approach via APTM for the management of 163 condylar fracture in 129 patient and stated that TMAP approach avoids the complications of incision of the parotid gland, minimizes the risk of facial nerve palsy and offers excellent access to the fractured condyle [2]. Parihar et utilized the retromandibular approach on 30 patients with condylar fractures and mentioned that there was no significant difference in complications between the two approaches, but the retromandibular transparotid approach provided straight line access in fractures of the condylar neck, with fewer incidences of nerve injury [6].

Tomar et al. [19] shared institutional experience for retroparotid transmasseteric using modified retromandibular approach for subcondylar fractures and mentioned that it effective in surgical management of subcondylar fractures by ORIF with minimal complications. Shah et al. [20] utilized retroparotid transmasseteric approach for 52 condylar fracture via miniretromandibular found transient facial nerve injury only in 4 patients which was completely resolved in 6 to 8 weeks.

Facial nerve function evaluation was performed in the immediate postoperative phase using forehead wrinkling, eye closure, facial symmetry while smiling and mouth blowing. The House–Brackman score was recorded in postoperative phase. Transient facial palsy was noticed in one patient only which got resolved in 6 months and the results were similar to the previous studies conducted by Wilson et al.

Al-Moraissi et al. [21] performed systematic review and metanalysis to evaluate various surgical approach and rate of facial nerve injury and found the retromandibular transparotid approach results in the maximum level of transient facial compared to other approaches. Reason for facial nerve injury is due to close proximity to the parotid gland substance, and when they emerge out of the parotid gland gives a "nerve-free" window which is available more in transmasseteric. In our study, none of the patients developed parotid fistula or sialocele in any of the approaches due to proper incision planning and meticulous dissection along with watertight closure including parotid capsule in transparotid approach.

Conclusion

The retromandibular approach is commonly used for the management of condylar fixation. Retromandibular retroparotid along with the anteroparotid approach as described in this article provides favorable accessibility without violating the parotid gland and structure passing underneath. In our surgical experience, both these approaches cause minimal

complications when compared with the retromandibular transparotid approach. The limitation of the present article is less sample size in each group to precisely determine which approach is better as it is purely based on the surgical experience.

Acknowledgements No acknowledgment.

Funding None.

Declarations

Conflict of interest No known conflict of interest to declare.

Ethical Approval Institutional ethical clearance obtained prior to study.

Informed Consent Informed written consent was obtained for the treatment.

References

1. Ellis E III, Dean J (1993) Rigid fixation of mandibular condyle fractures. Oral Surg Oral Med Oral Pathol 76(1):6–15
2. Narayanan V, Ramadorai A, Ravi P, Nirvikalpa N (2012) Transmasseteric anterior parotid approach for condylar fractures: experience of 129 cases. Br J Oral Maxillofac Surg 50(5):420–424
3. Biglioli F, Colleti G (2008) Mini-retromandibular approach to condylar fractures. J Craniomaxillofac Surg 36(7):378–383
4. Güerrissi JO (2002) A Transparotid transcutaneous approach for internal rigid fixation in condylar fractures. J Craniofac Surg 13(4):568–571
5. Aslan C, Hoşnuter M, Baş S, Tan O, Işık D, Durgun M (2016) Retromandibular transparotid approach to mandibular subcondylar and high ramus fractures: two-point fixation. Ulus Travma Acil Cerrahi Derg 22(1):40–45
6. Parihar V, Bandyopadhyay TK, Chattopadhyay PK, Jacob SM (2019) Retromandibular transparotid approach compared with transmasseteric anterior parotid approach for the management of fractures of the mandibular condylar process: a prospective randomized study. Br J Oral Maxillofac Surg 57(9):880–885
7. Meyer C, Serhir L, Kahn JL, Boutemi P, Wilk A (2006) Experimental evaluation of 3 osteosynthesis devices used for stabilising of condylar fractures of the mandible. J Cranio Maxillofac Surg 34:173–181
8. Yang WG, Chen CT, Tsay PK, Chen YR (2002) Functional results of unilateral mandibular condylar process fractures after open and closed treatment. J Trauma 52(3):498–503
9. Moraissi EA, Ellis E (2015) Surgical treatment of adult mandibular condylar fractures provides better outcomes than closed treatment: a systematic review and meta-analysis. J Oral Maxillofac Surg 73(3):482–493
10. Al-Moraissi EA, Louvrier A, Colletti G, Wolford LM, Biglioli F, Ragaey M, Meyer C, Ellis E (2018) 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. J Craniomaxillofac Surg 46:398–412
11. Rozeboom AVJ, Dubois L, Bos RRM, Spijker R, de Lange J (2018) Open treatment of condylar fractures via extraoral approaches: a review of complications. J Craniomaxillofac Surg 46:1232–1240
12. Kempers KG, Quinn PD, Silverstein K (1999) Surgical approaches to mandibular condylar fractures: a review. J Craniomaxillofac Trauma 5(4):25–30
13. Wilson AW, Ethunandan M, Brennan PA (2005) Transmasseteric antero-parotid approach for open reduction and internal fixation of condylar fractures. Br J Oral Maxillofac Surg 43:57–60
14. Hinds EC, Girotti WJ (1967) Vertical subcondylar osteotomy: a reappraisal. J Oral Surg 24:164–170
15. Tang W, Gao C, Long J, Lin Y, Wang H, Liu L et al (2009) Application of modified retromandibular approach indirectly from the anterior edge of the parotid gland in the surgical treatment of condylar fracture. J Oral Maxillofac Surg 67:552–558
16. Ellis E III, McFadden D, Simon P, Throckmorton G (2000) Surgical complications with open treatment of mandibular condylar process fractures. J Oral Maxillofac Surg 58:950–958
17. Manisali M, Amin M, Aghabeigi B, Newman L (2003) Retromandibular approach to the mandibular condyle: a clinical and cadaveric study. Int J Oral Maxillofac Surg 32:253–256
18. Wilson AW, Ethunandan M, Brennan PA (2005) Transmasseteric anteroparotid approach for open reduction and internal fixation of condylar fractures. Br J Oral Maxillofac Surg 43:57–60
19. Tomar K (2018) Efficacy of the retroparotid trans-masseteric approach via retromandibular incision in ORIF of subcondylar fractures: our institution experience. J Maxillofac Oral Surg 17(3):332–338
20. Shah S, Ali S, Mirza A (2011) Retroparotid transmasseteric approach to condylar fracture through miniretromandibular access. J Oral Maxillofac Surg 69(9):e37
21. Al-Moraissi EA, Louvrier A, Colletti G, Wolford LM, Biglioli F, Ragaey M (2018) Does the surgical approach for treating mandibular condylar fractures affect the rate of seventh cranial nerve injuries? A systematic review and metaanalysis based on a new classification for surgical approaches. J Craniomaxillofac Surg 46(3):398–441