

Retromandibular transparotid approach compared to transmasseteric antroparotid approach for mandibular condylar neck fractures : Randomized controlled trial

Original
Article

Mona Samy Elhadidy, Nesrine Khairy, Nermeen Sorour, Mamdouh Sayed Ahmed

Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Cairo University, Egypt

ABSTRACT

Purpose: Comparing the transparotid approach versus the transmasseteric antroparotid approach in management of condylar neck fractures regarding the facial nerve affection, TMJ function, reduction angulation, duration of the surgery and patient satisfaction with the scar.

Materials and Methods: Twenty patients with condylar neck fracture were randomly divided into two equal groups. Retromandibular transparotid approach was used in the control group while transmasseteric antroparotid approach was used in the study group. Patients were carefully followed up 6 months.

Results: There was significant difference between the two groups regarding the incision time (*P-value 0.001*) however there was no significant difference between the two groups regarding the total intra-operative time (*P-value 0.123*). Immediate postoperative facial nerve affection was higher in the transparotid approach group (30%) however 6 months postoperative total recovery occurred and both groups showed no statistically significant difference. The transparotid approach group showed more patient satisfaction toward the scar with mean scale 4.2 ± 0.6 versus 3.9 ± 0.6 for transmasseteric approach group however there was no statistically significant difference between the two groups. 90% of patients in transmasseteric approach group showed reduction to the normal anatomical position versus 70% in the transparotid group but there was no statistically significant difference between both groups. Comparable results showed between the two groups regarding the TMJ function with no statistically significant difference.

Conclusion: The transmasseteric antroparotid approach showed to be a useful alternative to the transparotid approach in treating condylar neck fractures with very good accessibility and low complication rate.

Key Words: Transmasseteric antroparotid approach, transparotid approach, condylar neck fracture

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Corresponding Author: Mona Samy Elhadidy, Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Cairo University, Egypt, **Tel.:** 01141509857, **E-mail:** Monyelhadidy82@gmail.com, monaelhadidy@dentistry.cu.edu.eg

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INTRODUCTION

Mandibular condylar fractures contribute with a percentage of 20-35% of all mandibular fractures^[1,2]. Condylar fractures can be treated using either closed (conservative) or open (surgical) approach. For the conservative approach (closed reduction) the mandible is immobilized using maxillomandibular fixation for 10 to 14 days, this eliminates the surgical intervention morbidity and the risk of facial nerve injury. However this approach can result in malocclusion, asymmetry, facial height reduction, reduced mobility and chronic pain indicating the need of open reduction and internal fixation in various situations^[3].

To achieve a good reduction and adequate fixation of the condylar fracture, enough surgical exposure should be made. Many extraoral surgical approaches have been advocated however debate raised which is the ideal

regarding best exposure with least complications.⁴ Several factors affect the selection of the surgical approach for successful condylar fracture management including the fracture location, method of fixation, and the surgeon experience^[1,3,4].

Various classifications have been used to classify condylar fractures. Spiessl and Schroll *et al.* classify the condylar fracture to 6 types based on the level of fracture and the degree of displacement^[5]. Loukota *et al.* proposed a simpler classification based on the fracture level. They classify condylar fracture into 3 types : condylar head (diacapitular); condylar neck; condylar base^[3,6]. Several approaches have been used for condylar neck fracture including intraoral, preauricular, submandibular and retromandibular approaches. The selection of the appropriate surgical approach for condylar neck fracture represents a controversy^[3].

The retromandibular transparotid approach has been used for years as the gold standard approach to manage the condylar neck fractures. This approach depends mainly on deep blunt dissection through the parotid gland to reach the fracture line. However the high level of the neck fractures and tissue transferred during dissection made its reduction and fixation a challenging risky procedure. The distance between the incision line and the fracture line necessitates extreme upward stretching of the tissue to expose the fracture line and the proximal part of the condyle to receive the fixation screws, this stretching may cause stretching of the main trunk of the facial nerve^[7]. Also, this procedure carries high morbidity for tissues passed in the surgical field. Facial nerve branches injury, salivary fistulae, sialocele, and Frey's syndrome are common complication that may occur due to the blunt dissection through the parotid gland^[8].

With a better understanding of the facial nerve course, modifications in the surgical approach appeared to avoid the former complication and to facilitate access and exposure. Transmasseteric anteroparotid approach differs from the standard transparotid approach in that the dissection remain superficial to the platysma and the SMAS layer anterior to the parotid and the dissection done in the masseteric muscle down to the bone. Thus, this approach can represent an alternative for the standard transparotid approach for condylar neck fracture^[9].

In this study, we compared the incision and operation time, condylar neck reduction, facial nerve affection and the TMJ function (occlusion and mobility) and patient's satisfaction between the standard transparotid approach versus the transmasseteric anteroparotid approach in open reduction and internal fixation of the condylar neck fractures.

PATIENTS AND METHODS

This was a randomized clinical trial conducted on 20 patients with condylar neck fractures indicating the need of open reduction and internal fixation using miniplates and screws. Patients were randomly divided into two equal groups according to the surgical approach used to access the fracture. The transparotid approach was used for the control group, and the transmasseteric approach was used for the study group. The study was performed at Oral and Maxillofacial Surgery department, Faculty of Dentistry, Cairo University. All operations were performed by the same surgical team. The study followed the Declaration of Helsinki on medical research.

Patients were enrolled in the study according to the following criteria; adult patients with bilateral sub-condylar fractures indicating the need for open reduction and internal fixation of at least one side, or with unilateral with occlusal discrepancies, shortening of the ramus,

condylar displacement, or TMJ dislocation. The fractured fragment was single, and big enough for fixation. Neck condyle fractures. Edentulous patients and patients indicated for closed reduction were excluded. A brief medical and dental history was taken followed by clinical examination to assess occlusion, mouth opening, and facial nerve function. Radiographic examination was done using CT to assess the fracture level and angulation (Figure 1).

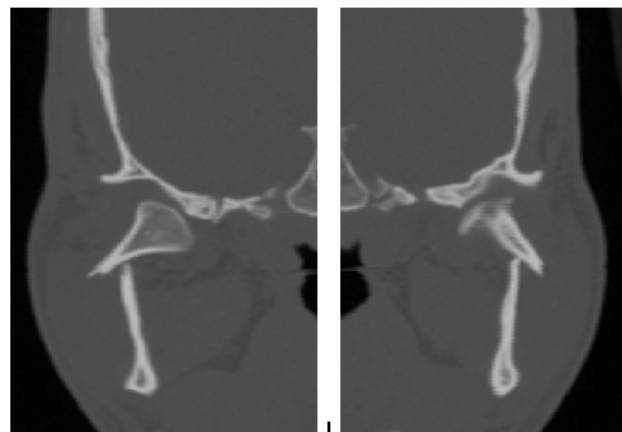


Fig. 1: Pre-operative coronal cuts showing the condylar angulation

All patients were operated under general anesthesia using nasotracheal tube. Maxillary mandibular fixation was done to put the patient in ideal occlusion. For the control group, the transparotid approach was used to access the fracture. A retromandibular incision was done in which a vertical incision was made through skin and subcutaneous tissue, extending from just below the ear lobe towards the mandibular angle parallel the posterior border of the mandible (Figure 2).



Fig. 2: Retromandibular skin incision (platysma*)

After undermining of the skin, the superficial musculoaponeurotic system (SMAS) was exposed and a vertical incision was made through the SMAS and the parotid capsule into the parotid gland (Figure 3). Blunt dissection of the parotid gland was done parallel to the direction of the facial nerve branches and towards the posterior border of the mandible. The pterygomandibular sling was released. A periosteal elevator was used to strip the masseter muscle from the ramus followed by further dissection superiorly along the posterior border to expose the condylar fracture (Figure 4).

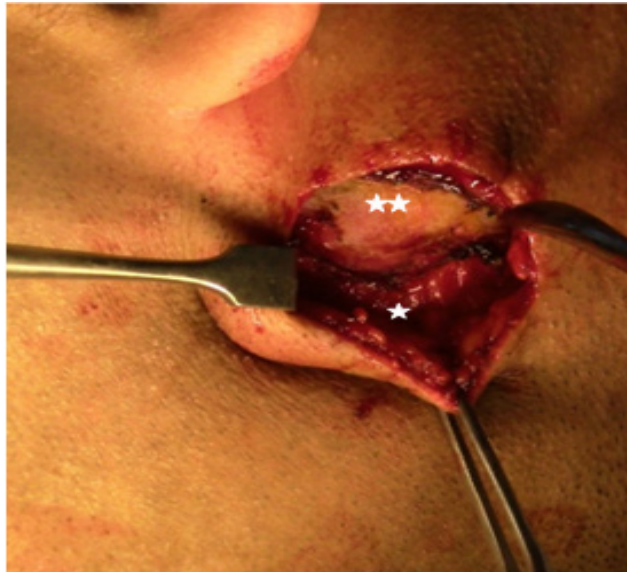


Fig. 3: Incision in the platysma and the SMAS layer* to expose the parotid capsule**

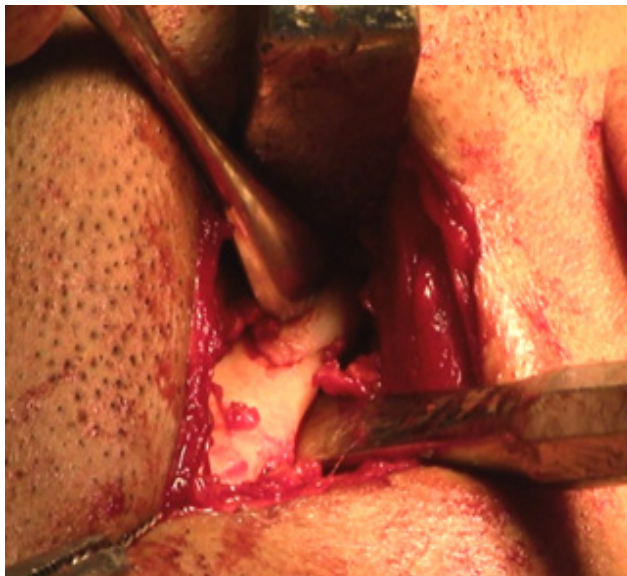


Fig. 4: Fracture exposure and reduction

For the study group, the transmasseteric approach was used to access the fracture. A retromandibular incision with preauricular extension was made (Figure 5). The subdermal fat plane was dissected superficial to the superficial musculoaponeurotic layer to access the masseter adjacent to the anteroinferior edge of the parotid gland (Figure 6). The anterior parotid margin was identified and retracted posteriorly, and the masseter was then identified and incised (Figure 7) followed by postrolateral subperiosteal dissection to expose the condylar fracture (Figure 8). In both groups, the fracture was reduced and fixed with plates and screws (Figure 9). Maximum mouth opening, TMJ mobility and occlusion were checked. Then the wound was closed in layers. Patients were advised to take a liquid diet for 2 weeks postoperatively followed by a soft diet for approximately 1 month. Jaw exercises were done at the outpatient clinic and self-rehabilitation was encouraged.



Fig. 5: Retromandibular skin incision with a preauricular extension



Fig. 6: Dissection superficial to the platysma and SMAS layers*

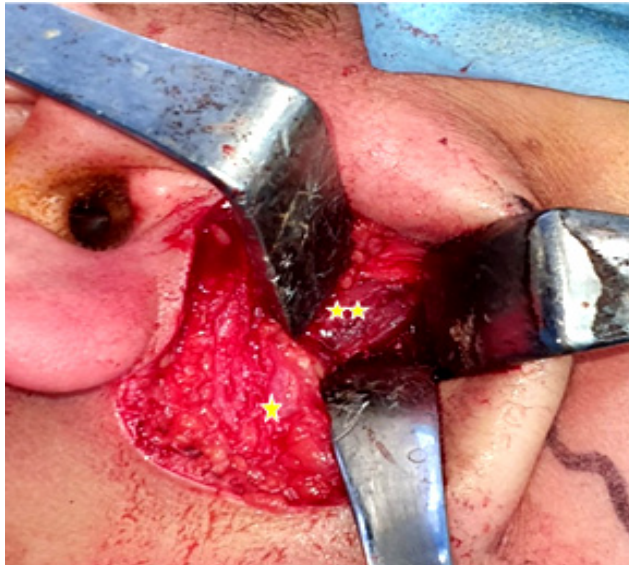


Fig. 7: Dissection anterior to tail of the parotid* (masseter muscle **)



Fig. 8: Exposure of the fractured segments

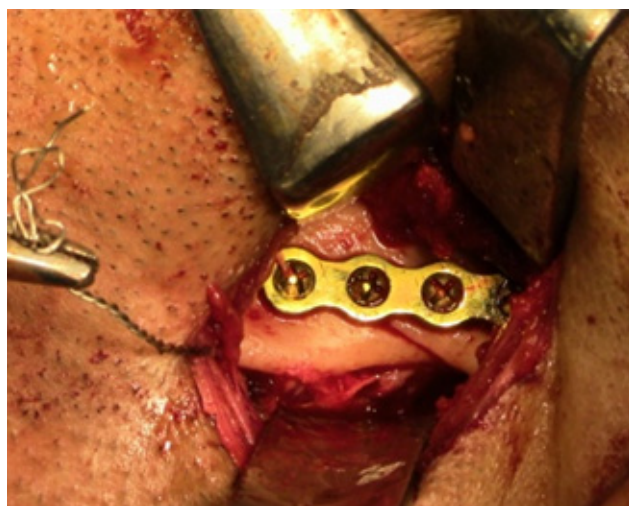


Fig. 9: Plate fixation of condylar neck fracture

Total intra-operative time was measured for each patient from the start of the incision till suturing. Immediate postoperative CT scans were done to assess proper reduction, and sutures were removed after 1 week. All patients were recalled for postoperative assessment 1 week, 1 month, 3 months and 6 months. Facial nerve affection was assessed immediately postoperative, and after 6 months using House and Brackmann facial nerve grading system (HBFNGS). It involves six point scales ranging from I normal facial function to VI total paralysis^[10]. Maximum mouth opening was measured after 1 month. Occlusion was assessed and categorized into three grades: recovery to pre-injury occlusion with intercuspation of teeth (grade I), mild malocclusion requiring correction using non surgical mean as spot grinding (grade II), and severe malocclusion requiring reoperation (grade III)^[7]. Postoperative condylar angulation (the angle between the long axis of the condylar head and the long axis of the ramus) was measured on the coronal CT scan and categorized into reduction to the normal anatomical position, mild angulation that didn't cause TMJ malfunction and sever angulation that cause TMJ malfunction^[7]. Additional assessment was performed using a Likert scale to measure the patient's satisfaction with the scar after 6 months. The scale ranging from 1 to 5 (1: very unsatisfied, 2: unsatisfied, 3: neutral, 4: satisfied and 5: very satisfied)^[11].

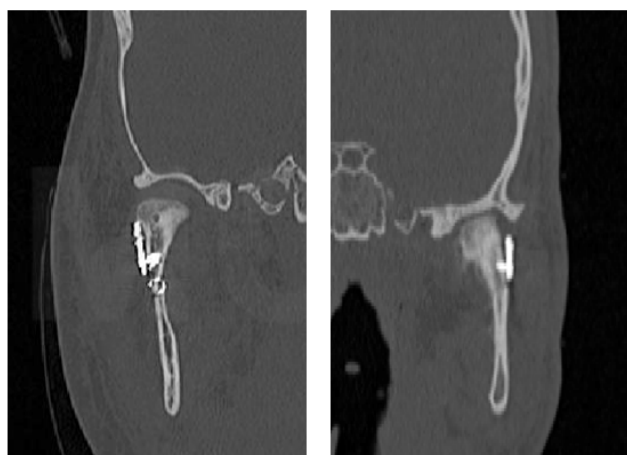
STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS (Statistical package for the social sciences- IBM® SPSS® Statistics Version 20 for Windows, IBM Corp., Armonk, NY, USA). Quantitative data will be represented as mean \pm standard deviation. Qualitative data will be represented as percentage and frequency. Mann-Whitney U test will used to compare quantitative variables between the two groups. Fisher's exact test will be used to compare qualitative variables between the two groups. The results were considered statistically significant if the *p* value was less than 0.05.

RESULTS

This study was conducted on 20 patients with mean age 37.4 ± 8.5 . The main cause of the fracture was road traffic accidents followed by interpersonal violence and fall (55 %, 40 % and 5 % respectively). Ten patients (seven male and three 3 female) underwent transparotid approach and 10 patients (8 male, 2 female) received transmasseteric approach for management of condylar fractures. The mean age was 36.7 ± 8.9 years for the transparotid group and 38.1 ± 8.5 years for the transmasseteric groups. There were no statistically significant differences between the two groups (*P*-value 0.68).

The transparotid group showed shorter incision time (15.5 ± 2.5 minutes) compared to the transmaseteric group (26.1 ± 3.2 minutes) and there was statistically significant difference between the 2 groups (P -value < 0.001). While the total intra-operative time was slightly longer for the transparotid group (83.2 ± 7.2 minutes) compared to the transmaseteric group (77.7 ± 5.8 minutes). But there was no statistically significant difference between the 2 groups (P -value 0.123). All patients in the transmaseteric group showed normal facial function (HBFNGS grade I normal). While for the transparotid group, 3 patients (30 %) showed mild facial nerve paralysis (HBFNGS grade II mild dysfunction) immediately postoperative but the patient was totally recovered at 6 months follow up visit. There were no statistically significant differences between the two groups at both immediately and after 6 months follow up periods (P -value 0.21 , 1 respectively). Reduction to the normal anatomical position was achieved in 70% of the transparotid group, meanwhile 30 % showed mild angulation after reduction that didn't cause any TMJ malfunction. The transmaseteric group showed 90% reduction to the normal anatomical position and 10% mild angulation that didn't cause any TMJ malfunction (Figure 10). There were no statistically significant differences between the two groups (P -value 1).



Normal anatomical reduction Mild condylar angulation

Fig. 10: Postoperative coronal cuts showing the condylar angulation

The mean maximal mouth opening was 37.3 ± 1.9 mm in transparotid approach group and 37.4 ± 1.7 mm in the transmaseteric approach group at postoperative 1 months follow up visit. There were no statistically significant differences between the two groups (P -value 0.68). None of the patients suffered from major malocclusion that necessitates any surgical intervention (grade III). Transparotid group showed recovery to pre-injury occlusion with intercuspatation of teeth (grade I) in 9 patients (90%), and 1 patient showed grade II malocclusion that was treated conservatively. While for

the transmaseteric group all patients recovered to pre-injury occlusion with intercuspatation of teeth (grade I). There were no statistically significant differences between the two groups (P -value 0.47) (Figure 11).



Preoperative occlusion

Postoperative occlusion

Fig. 11: Preoperative and postoperative occlusion

Patient satisfaction with the scar was acceptable in both groups. For the transparotid group, 60 % of the patients were satisfied (Likert scale 4), 30 % very satisfied (Likert scale 5), 10 % neutral (Likert scale 3). The mean scale of all patients was 4.2 ± 0.6 . For the transmaseteric group, 70 % of the patients were satisfied (Likert scale 4), 20 % neutral (Likert scale 3), 10 % very satisfied (Likert scale 5). The mean scale of all patients was 3.9 ± 0.6 . The transparotid group showed slightly higher patient satisfaction but there was no statistically significant difference between the 2 groups (P -value 0.35).

DISCUSSION

Level of condylar fracture is known to be a critical point in taking the decision of which is the most appropriate surgical approach to be used for condylar reduction and fixation. Loukota *et al.* described a subclassification of condylar fractures into diacapitular fractures, condylar neck fractures and fractures of the condylar base. They classified the fractures according their position in relation to line A, line A is the perpendicular line through the sigmoid notch to the tangent of the ramus. They described the condylar neck fractures as the fractures in which more than half of the fracture line in the lateral view runs above line A while the condylar base fractures as fractures mostly located below line A and runs behind the mandibular foramen and the diacapitular fracture as a fracture through the head of the condyle^[6]. The high level of condylar neck fractures encounter many complications that should be considered in choosing the route of dissection that we should follow and the skin incision that we should do. The aim of this study was to compare the transparotid approach versus the transmaseteric anteroparotid approach in management

of high condylar neck fractures regarding the incision and operation time, condylar neck reduction, facial nerve affection and the TMJ function (occlusion and mobility), and patient's satisfaction with the scar.

The transparotid approach was the most commonly used approach for treating the condylar neck fractures for years. This technique has advantages of direct insight of the fracture field, easy technique that don't require special training or equipments and proper postoperative TMJ function as the articular disc and capsule could be repositioned properly^[12,13]. However the two main complications that appeared to be associated with this technique are; first, the high incidence of transient facial nerve injury which was estimated to range from 14-48% in the literatures^[14-18]. Second, the salivary fistula and sialoceles occurrence due to dissection through the parotid capsule and parotid gland substance which was estimated to happen with a percentage of 7.3%- 10.7%^[8,19].

Transmasseteric anteroparotid approach was introduced as an alternative technique used to eliminate these two main complications. This approach benefits the nerve free area anterior to the parotid gland and above the masseter muscle. The dissection is carried superficial to the parotid capsule till anterior to the gland then dissection is done through the masseter until reaching the periosteum. Avoidance of parotid structure dissection, high incidence of buccal nerve anastomosis (which is the only branch that may be encountered in the dissection area) 9 and less traction force exerted upon the retracted tissue due to the preauricular extension that facilitates better accessibility; decreased the incidence of the facial nerve injury and eliminated the formation of any salivary fistulas or sialoceles^[20,21].

This was observed in this study as the transparotid approach group showed transient mild facial nerve injury in 30% of cases and resolved after 6 months while none of the patients in the transmasseteric anteroparotid approach group showed any facial nerve injury. These results are similar to a recent meta-analysis that showed higher transient facial nerve injury in the transparotid approach compared to transmasseteric approach^[15].

In our study the transparotid approach showed significantly shorter incision time compared to the transmasseteric approach. This is attributed to the preauricular extension and the anterior dissection performed with the transmasseteric approach to expose the masseter anterior to the parotid gland. However, the overall operative time was comparable in both groups as the transmasseteric approach significantly improves the accessibility to the field, facilitating the fracture reduction and fixation.

The transmasseteric approach showed slightly superior results regarding the condylar angulation compared to the transparotid approach. This could be referred to the more

accessibility gained through the perpendicular dissection over the fracture line which allowed for precise anatomical reduction in 3D than that gained through the oblique one gained in transparotid approach.

Temporomandibular joint function was found to be within the reference range in both groups, there was not a significant difference between the two groups regarding the maximum mouth opening or the occlusion. Several studies have evidenced, comparing functional results achieved through both the transparotid approach^[1,2,17] and the transmasseteric anteroparotid approach^[22,23]. The only finding regarding the TMJ function was that one case in the transparotid group showed grade II malocclusion. The patient was treated conservatively and there weren't any obvious TMJ disorders during the follow up period.

The transmasseteric approach showed promising results regarding facial nerve affection and accessibility in condylar neck fractures. It can be considered as an alternative for the transparotid approach especially with high condylar neck fractures, subjected to further studies with larger sample size.

CONFLICT OF INTEREST

There are no conflicts of interests.

RESULTS

1. D'Agoſtino A, Trevisiol L, Procacci P, Favero V, Odorizzi S, Nocini PF. Is the Retromandibular Transparotid Approach a Reliable Option for the Surgical Treatment of Condylar Fractures? *J Oral Maxillofac Surg.* 2017;75(2):348-356. doi:10.1016/j.joms.2016.10.003
2. Croce A, Moretti A, Vitullo F, Caſtriotta A, Rosa DM, Citraro L. Transparotid approach for mandibular condylar neck and subcondylar fractures. *Acta Otorhinolaryngol Ital.* 2010;30(6):303-309. <http://www.ncbi.nlm.nih.gov/pubmed/21808452> <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC3146322>.
3. Emam HA, Jatana CA, Ness GM. Matching Surgical Approach to Condylar Fracture Type. *Atlas Oral Maxillofac Surg Clin North Am.* 2017;25(1):55-61. doi:10.1016/j.cxom.2016.10.004
4. Imai T, Fujita Y, Motoki A, et al. Surgical approaches for condylar fractures related to facial nerve injury: deep versus superficial dissection. *Int J Oral Maxillofac Surg.* 2019;48(9):1227-1234. doi:10.1016/j.ijom.2019.02.003
5. Rai A. Comparison of single vs double noncompression miniplates in the management

- of subcondylar fracture of the mandible. *Ann Maxillofac Surg.* 2012;2(2):141. doi:10.4103/2231-0746.101339
6. Loukota RA, Eckelt U, De Bont L, Rasse M. Subclassification of fractures of the condylar process of the mandible. *Br J Oral Maxillofac Surg.* 2005;43(1):72-73. doi:10.1016/j.bjoms.2004.08.018
 7. Liao HT, Wang PF, Chen CT. Experience with the transparotid approach via a mini-preauricular incision for surgical management of condylar neck fractures. *J Cranio-Maxillofacial Surg.* 2015;43(8):1595-1601. doi:10.1016/j.jcms.2015.07.023
 8. Van Hevele J, Nout E. Complications of the retromandibular transparotid approach for low condylar neck and subcondylar fractures: A retrospective study. *J Korean Assoc Oral Maxillofac Surg.* 2018;44(2):73-78. doi:10.5125/jkaoms.2018.44.2.73
 9. Wilson AW, Ethunandan M, Brennan PA. Transmasseteric antero-parotid approach for open reduction and internal fixation of condylar fractures. *Br J Oral Maxillofac Surg.* 2005;43(1):57-60. doi:10.1016/j.bjoms.2004.09.011
 10. House JW, Brackmann DE. Facial nerve grading system. *Otolaryngol - Head Neck Surg.* 1985;93(2):146-147. doi:10.1177/019459988509300202
 11. Likert R. A technique for the measurement of attitudes. *Arch Psychol.* 1932;22(140):1-55.
 12. Sikora M, Olszowski T, Sielski M, Stapor A, Janiszewska-Olszowska J, Chlubek D. The use of the transparotid approach for surgical treatment of condylar fractures - Own experience. *J Cranio-Maxillofacial Surg.* 2015;43(10):1961-1965. doi:10.1016/j.jcms.2015.10.001
 13. Shi D, Manohar P, Gupta R. Facial nerve injuries associated with the retromandibular transparotid approach for reduction and fixation of mandibular condyle fractures. *J Cranio-Maxillofacial Surg.* 2015;34(3):402-407. doi:10.1016/j.jcms.2014.12.009
 14. Downie JJ, Devlin MF, Carton ATM, Hislop WS. Prospective study of morbidity associated with open reduction and internal fixation of the fractured condyle by the transparotid approach. *Br J Oral Maxillofac Surg.* 2009;47(5):370-373. doi:10.1016/j.bjoms.2008.11.002
 15. Al-Moraissi EA, Louvrier A, Colletti G, et al. 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 Cranio-Maxillofacial Surg.* 2018;46(3):398-412. doi:10.1016/j.jcms.2017.10.024
 16. Yang L, Patil PM. The retromandibular transparotid approach to mandibular subcondylar fractures. *Int J Oral Maxillofac Surg.* 2012;41(4):494-499. doi:10.1016/j.ijom.2011.09.023
 17. Bhutia O, Kumar L, Jose A, Roychoudhury 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(3):236-240. doi:10.1016/j.bjoms.2013.12.002
 18. Ellis E, Dean J. Igid fixation of mandibular condyle fractures. *Oral Surg Oral Med Oral Pathol.* 1993;76:6-15. doi:org/10.1016/0030-4220(93)90285-C
 19. Kim BK, Kwon YD, Ohe JY, Choi YH, Choi BJ. Usefulness of the retromandibular transparotid approach for condylar neck and condylar base fractures. *J Craniofac Surg.* 2012;23(3):712-715. doi:10.1097/SCS.0b013e31824dbb35
 20. Salgarelli AC, Anesi A, Bellini P, et al. How to improve retromandibular transmasseteric anteroparotid approach for mandibular condylar fractures: Our clinical experience. *Int J Oral Maxillofac Surg.* 2013;42(4):464-469. doi:10.1016/j.ijom.2012.12.012
 21. Tang W, Gao C, Long J, et al. 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.* 2009;67(3):552-558. doi:10.1016/j.joms.2008.06.066
 22. Narayanan V, Ramadorai A, Ravi P, Nirvikalpa N. Transmasseteric anterior parotid approach for condylar fractures: Experience of 129 cases. *Br J Oral Maxillofac Surg.* 2012;50(5):420-424. doi:10.1016/j.bjoms.2011.09.008
 23. Gali R, Devireddy SK, Venkata KKR, Kanubaddy SR, Nemaly C, Dasari M. Preauricular transmasseteric anteroparotid approach for extracorporeal fixation of mandibular condyle fractures. *Indian J Plast Surg.* 2016;49(1):59-65. doi:10.4103/0970-0358.182254