



A New Technique of Combination Approach to Avoid Extracorporeal Plating in Medially Displaced Condyle Using Endoscopy

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Abstract

Introduction: Application of endoscopes in otolaryngology continues to expand, and recently being used in the field of maxillofacial trauma including orbital trauma, frontal sinus, arch, angle and subcondylar fractures have previously been described in literature. The purpose of this study was to assess the efficacy of endoscopic approach in medially displaced condylar fractures.

Methods and Findings: A prospective case study was done on 17 patients, study followed the Declaration of Helsinki on medical protocol and ethics and was approved by the regional Ethical Review Board of our hospital after all participants signed an informed consent agreement. 4 mm 30 degree endoscope (karl storz) was used to locate medially displaced condyle with transosseous wiring at angle region (in 2cases). statistical analysis by student t test, 50% reduction in operating time was noted. Mean Maximal mouth opening (MMO) was noted on post op 7th day and on last follow up.

Result: Post op 7th day Mean MMO = 31.18 mm with Standard Deviation (SD) = 5.76 & coefficient of variation = 0.18 and on last follow up Mean MMO = 41 mm with SD = 1.67 and coefficient of variation = .04 The mandibular movements like protrusion, retrusion and lateral excursion were satisfactory. 4 patients turned with wound dehiscence, temporary facial nerve palsy and soft tissue abscess which were managed by antibiotics and incisional drainage.

Conclusion: Based on our experience, endoscopes use is challenging, but worthwhile. It can be concluded that combination technique with endoscope gives significant results with reduced operating time, MMO and minimal/no complications.

Keywords: Condyle, Endoscope, Medially Displaced, Extracorporeal, Facial, Fractures.

Introduction

An important part of oral and maxillofacial surgery is the treatment of fractured facial bones. The treatment of such fractures has evolved from observation, closed reduction and invasive surgical procedures in the form of open reduction and internal fixation (ORIF). In contrast,

management of mandibular condylar fracture continues to be controversial.¹⁻⁴ although the published literature supports the increasing use of ORIF to treat selected condylar fractures. Due to the challenge of surgical approach to the bone, the displacement of fractured condylar segment into the glenoid fossa, difficulty in locating the

proximal bone segment, and the risk of damaging the facial nerve, leads to conservative treatment as preferred approach over to open reduction. Also, it is difficult to hold displaced fragments in a reduced position and fix with miniplates due to their proximity to important anatomical structures and muscle pull.⁵⁻⁹

In our experience, endoscopic reduction and fixation of medially displaced fractures are technically challenging requiring specialized instruments and the surgeon's expertise. The extraoral approach to temporomandibular joint combined with endoscope, decreases morbidity when compared with extracorporeal plating in which various methods such as vertical ramus osteotomy, vertical sub sigmoid osteotomy etc. are used.

17 cases of medially displaced mandibular condylar were treated with combination of preauricular approach, (Thoma's incision) and endoscope out of which in 15 cases, the condylar fragment was fixed with miniplates and screws whereas in 2 cases hind's incision to distract ramus for better access to the field was made along with pre auricular incision. The follow up period was 1 to 2 years. In our series of 17 cases, we observed that combination technique with endoscope carries low morbidity with satisfactory occlusal stability and functional benefit to patients.

Subjects and Methods

Thirteen cases who reported to our hospital following road traffic accident and four cases following failure of closed reduction for condylar fracture were included in our study (Table 1).13 of the 17 patients had unilateral fractures, while 4 had bilateral condylar fractures. Based on the anatomic location of fracture, out of the 13 unilateral condylar fractures, subcondylar fractures were noted in 5 individuals and intracapsular fractures were noted in 8 individuals. Nine patients had associated other mandibular fracture

In 15 cases, where pre auricular Thoma's incision was used, the condylar fragment was visualized with A 30-degree angle, 4-mm-diameter endoscope (Karl Storz, Tuttlingen, Germany) after maintaining the optical cavity, and held in place with a curved Kocher's forceps after visualization. The lateral pterygoid muscle was detached and condylar fragment freed. the condylar fragment was repositioned and fixed to ramus with Two mini plates of 4 hole without gap, 2mm and screws while maintaining the IMF.

In 2 cases, the mandibular ramus was exposed by 1 cm small hind's approach to gain access to medially displaced condyle using transosseous wiring through the angle of the mandible which was pulled inferiorly for proper reduction of displaced condylar segment into glenoid fossa.

In all the cases, surgical wound was closed in multiple layers after attaining haemostasis and aseptic dressing. Active jaw exercises was advised after one week in all cases.

The procedures followed were in accordance with the ethical standards of the Mahatma Gandhi University of Medical Sciences ethical committee and with the Helsinki Declaration of 1975, as revised in 2000.

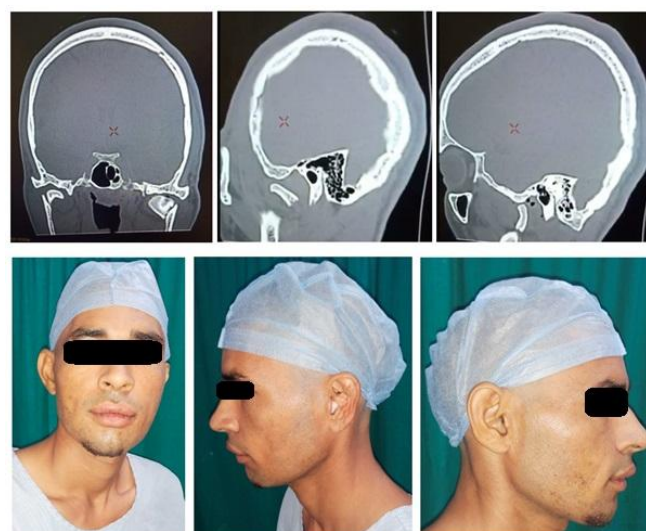


Figure 1- Pre-operative Images



Figure 2- Intraoperative Images



Figure 3- Post Operative Images

Table 1

Age	Diagnosis (Medially Displaced Condylar fracture)	Follow up (Years)	Interincisal Opening (in mm)		Soft tissue Complication
			(at 1 Week)	(at last follow up)	
22	Right	1 Year 6 Months	35	42	None
24	Left	1 Year 8 Months	37	43	None
28	Right	1 Year	40	43	None
38	B/L	2 Years	20	39	Wound Dehiscence
19	Right	1 Year 5 Months	36	40	None
22	Right	1 Year 9 Months	37	41	None
27	Left	1 Year 3 Months	34	42	Temporary Facial Palsy
32	Right	1 Year 6 Months	28	40	None
12	B/L	1 Year 8 Months	25	39	Abscess
28	B/L	2 Years	22	39	None
25	Left	1 Year 2 Months	30	41	None
24	Left	1 Year 6 Months	33	43	None
35	Right	1 Year 4 Months	37	44	None
37	Left	1 Year 5 Months	27	42	None
30	B/L	1 Year 9 Months	29	40	None
23	Right	1 Year 1 Month	33	39	None
25	Left	2 Years	31	41	Temporary Facial Palsy

Results

The follow up period was from 1 to 2 years. Postoperatively, functional outcomes that included occlusion, any deviation, maximal interincisal opening as Mandibular function¹⁰, anatomic reduction¹⁰ and postsurgical infection as soft tissue complications¹⁰, were observed as shown in (Table 1).

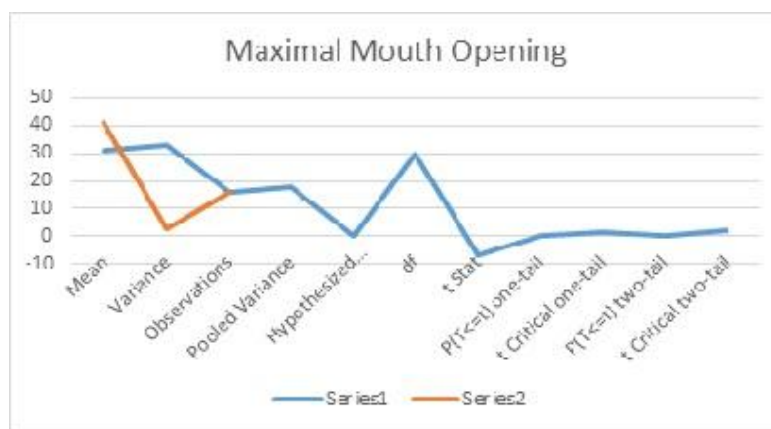
All cases were subjected to physiotherapy one week post operatively. After six months, the

mouth opening was between 35-40 mm and the mandibular movements like protrusion, retrusion and lateral excursion were satisfactory with stable occlusion achieved.

4 patients out of 17 developed wound dehiscence, temporary facial nerve palsy and soft tissue abscess, managed with antibiotics and incisional drainage. All the complications were resolved by the end of follow up period.

Table 2

	Post-Op 7 th Day	At last follow up
Mean	31.1875	41
Variance	33.22916667	2.8
Observations	16	16
Pooled Variance	18.01458333	
Hypothesized Mean Difference	0	
Df	30	
t Stat	-6.539018295	
P(T<=t) one-tail	1.56179E-07	
t Critical one-tail	1.697260887	
P(T<=t) two-tail	3.12358E-07	
t Critical two-tail	2.042272456	



Graph 1

Interpretation

With this technique, it was noted that there was 50% reduction in operating time (for an experienced surgeon) as compared to extracorporeal plating technique (involving osteotomy).

Mean Maximal mouth opening was noted on post op 7th day and on last follow up. Mean MMO on post-operative 7th day was 31.18 mm with Standard Deviation (SD) - 5.76 and coefficient of variation to be 0.18 and on last follow up Mean MMO was 41 mm with SD – 1.67 and coefficient of variation to be .04 as shown in Table 2. On using student t test for equal variance we found that, t Stat to be 6.5 which is higher than t Critical 2.04 so we can reject hypotheses.

Therefore, it can be concluded that combination technique in medially displaced condyle with endoscope gives significant results in view of reduced operating time, MMO and minimal or no complications.

Discussion

Past decision-making, philosophy, anecdotal experience and retrospective case series and short-term follow-up control measures for determining condylar fracture management.¹¹ This fracture caused a lot of controversy, leading to a lack of consensus, making these fractures significantly different. Management is also specific to the situation. Many surgeons are satisfied with the results of closed treatment of condylar fractures. Non-surgical management provides simple treatment, reduce morbidity, and prevents facial nerve damage with no facial scar. You et al.¹² specifically listed the complications of non-surgical treatment, including: occlusion deformity, deviation in mouth opening, disc displacement, contralateral TMJ habitual dislocation, and malocclusion due to reduced mandibular height. Mueller et al.¹³ mentioned that a large proportion of conservatively managed adults suffer from long-term aesthetic and functional problems. The

benefits of ORIF include immediate function, restoration of the vertical size of the mandible, facial symmetry, and improved mandibular movement with immediate anatomical restoration. Complications include facial scars, bleeding from ruptured maxillary arteries, vascular necrosis of the proximal segment, and related morbidity.¹² The biggest concern is still facial nerve damage. The reported incidence of facial nerve injury caused by different extraoral approaches is 0% to 24%, while the incidence of long-term injury is 0% to 4%.^{14,15} In the temporary and permanent facial nerve palsy, temporary paresis is more.^{15,16} In our experience, the endoscopic reduction and fixation of medially displaced condylar fracture is technically challenging; the procedure requires specialized instruments and the surgeons experience and it poses advantages like faster location of medially displaced condyle with almost 50 % reduction in operating time than the extra morbidity caused by extracorporeal plating in which various methods like vertical ramus osteotomy, vertical sub sigmoid osteotomy etc. is to be done to locate and fix condyle and the segment outside the body and reposition, this compromises the vascularity of the osteotomized segment, fixing the fractured head to the free ramal graft without detaching the lateral pterigoid will be difficult to reposition due to intervening soft tissues and explanted fractured segment act as free graft which shows condylar resorption. Troulis and Kaban¹⁷ and Miloro¹⁸ approached the fracture through the Risdon's incision and used an endoscope to reduce and fix the condyle. A 1.5 cm extraoral incision was placed higher towards the angle, thereby minimizing the risk of damage to the facial nerve. Aboelatta et al.¹⁹ comprehensively reviewed the surgeon's preference for these methods. These authors point out that most surgeons tend to use endoscope-assisted extraoral approach of ORIF or combined intraoral / extraoral approaches. In our experience, in addition to the pre auricular method, a small 1 cm hind's incision can be used to introduce the transosseous wire, while allowing

the endoscope to facilitate reduction and maintenance until the application of miniplates and screws. This also reduces the morbidity caused by osteotomy done in extracorporeal plating taking much more time for the fixation.

Schön et al.²⁰ rationalized this debate by providing sufficient evidence for each debate. The authors point out that endoscopes can infer excellent visibility from limited incisions. The intraoral approach is more suitable for condylar process fractures with lateral override and no or minimally displaced fractures. Severely comminuted or condylar fractures with medial override are best treated with extraoral approaches.

Haug et al.⁸ pointed out in 2004, "In order to gain universal acceptance, endoscopic surgery must be cost-effective, faster than standard techniques, and reduce patient morbidity."

Furthermore, extracorporeal plating hold additional morbidity to the patient as the plating system is done outside the body to find medially displaced condyle after osteotomy, whereas endoscope when introduced in the procedure allows increase visibility and access to the medially displaced condyle without osteotomy.

Knowledge or skills are learned in specific ways based on their difficulty and repetitiveness. The learning curve provides us with a model to master specific skills. Endoscopy has a steep learning curve in the reduction and fixation of displaced fractures, which means that it is difficult to use the EAORIF technique for the first time, but with the increase of experience, the operation time is reduced, and it can be compared with the traditional extracorporeal ORIF of condyle. As mentioned earlier, the concept of teamwork will reduce operating time and make the learning curve steeper.

Conclusion

Based on our experience, we found the use of endoscopes to be challenging, but also worthwhile. Technically, the endoscope-assisted ORIF is complex and requires training. The prerequisites for success are a steep learning

curve, patience, coordination of hands and eyes, and coordination with assistants. The difficulty increases with the degree of displacement of fractures, which is worth noting because it shows that new technologies can be successfully introduced into the emerging health care system. We intend to continue research and understand the biological behaviour, anatomical variations and usage of small preauricular incisions as the surgeon gets well versed with the newer technique optimising the aesthetics.

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Conflicts of Interest: None

References

1. Abdel-Galil K, Loukota R. Fractures of the mandibular condyle: evidence base and current concepts of management. *Br J Oral Maxillofac Surg* 2010;48:520–6.
2. Park JM, Jang YW, Kim SG, Park YW, Rotaru H, Baciut G, Hurrubeanu. Comparative study of the prognosis of an extracorporeal reduction and a closed treatment in mandibular condyle head and/or neck fractures. *J Oral Maxillofac Surg* 2010;68: 2986–93.
3. Danda AK, Muthusekhar MR, Narayan V, Baig MF, Siddareddi A. Open versus closed treatment of unilateral subcondylar and condylar neck fractures: a prospective, randomized clinical study. *J Oral Maxillofac Surg* 2010;68:1238–41.
4. Schneider M, Erasmus F, Gerlach KL, Kuhlisch E, Loukota RA, Rasse M, Schubert J, Terheyden H, Uwe E. Open reduction and internal fixation versus closed treatment and mandibulomaxillary

fixation of fractures of the mandibular condylar process: a randomized, prospective, multicenter study with special evaluation of fracture level. *J Oral Maxillofac Surg* 2008;66:2537–44.

5. Alkan A, Metin M, Muglali M, Ozden B, Celebi N. Biomechanical comparison of plating techniques for fractures of the mandibular condyle. *Br J Oral Maxillofac Surg* 2007;45:145–9.
6. Choi BH, Kim KN, Kim HJ, Kim MK. Evaluation of condylar neck fracture plating techniques. *J Craniomaxillofac Surg* 1999;27: 109–12.
7. Pilling E, Eckelt U, Loukota R, Schneider K, Stadlinger B. Comparative evaluation of ten different condylar base fracture osteosynthesis techniques. *Br J Oral Maxillofac Surg* 2010;48:527–31.
8. Haug RH, Peterson GP, Goltz M. A biomechanical evaluation of mandibular condyle fracture plating techniques. *J Oral Maxillofac Surg* 2002;60:73–80.
9. Hyde N, Manisali M, Aghabeigi, et al. The role of open reduction and internal fixation in unilateral fractures of the mandibular condyle : a prospective study. *British Journal of Oral & Maxillofacial Surgery* 2002;40: 19-22.
10. Vikas KS, Ruchika et al. Endoscopic assisted approach to facial fractures. *University J Dent Scie* 2020; Vol. 6, Issue 1
11. Martin M, Lee C. Endoscopic mandibular condyle fracture repair. *Atlas Oral Maxillofac Surg Clin North Am.* 2003;11(02):169–178.
12. You H J, Moon K C, Yoon E S, Lee B I, Park S H. Clinical and radiological outcomes of transoral endoscope-assisted treatment of mandibular condylar fractures. *Int J Oral Maxillofac Surg.* 2016;45(03):284–291.
13. Mueller R V, Czerwinski M, Lee C, Kellman R M. Condylar fracture repair:

use of the endoscope to advance traditional treatment philosophy. *Facial Plast Surg Clin North Am.* 2006;14(01):1–9.

14. Colletti G, Battista V M, Allevi F, Giovanditto F, Rabbiosi D, Biglioli F. Extraoral approach to mandibular condylar fractures: our experience with 100 cases. *J Craniomaxillofac Surg.* 2014;42(05):e186–e194.
15. Boehle A P, Herrmann E, Ghanaati S, Ballon A, Landes C A. Transoral vs. extraoral approach in the treatment of condylar neck fractures. *J Craniomaxillofac Surg.* 2015;43(02):224–231.
16. Ellis E, III, McFadden D, Simon P, Throckmorton G. Surgical complications with open treatment of mandibular condylar process fractures. *J Oral Maxillofac Surg.* 2000;58(09):950–958.
17. Troulis M J, Kaban L B. Endoscopic approach to the ramus/condyle unit: clinical applications. *J Oral Maxillofac Surg.* 2001;59(05):503–509.
18. Miloro M. Endoscopic-assisted repair of subcondylar fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003;96(04):387–391.
19. Aboelatta Y A, Elbarbary A S, Abdelazeem S, Massoud K S, Safe I I. Minimizing the submandibular incision in endoscopic subcondylar fracture repair. *Craniomaxillofac Trauma Reconstr.* 2015; 8(04):315–320.
20. Schön R, Gutwald R, Schramm A, Gellrich N C, Schmelzeisen R. Endoscopy-assisted open treatment of condylar fractures of the mandible: extraoral vs intraoral approach. *Int J Oral Maxillofac Surg.* 2002;31(03):237–243.