

Changing of Condylar Fracture Approach in Cipto Mangunkusumo Hospital

Imam Susanto, Kristaninta Bangun, Siti Handayani, Prasetyanugrahni Kreshanti, Nathania Pudya Hapsari
Jakarta, Indonesia

Abstract: Management of condylar fracture draws controversy for over three decades. Previously, closed reduction with intermaxillary fixation (IMF) had been predominant for many surgeons, considering shorter length of procedure, ability to achieve preinjury occlusion with acceptable adjustment, and low cost of procedure. Introduction of osteosynthesis material rigid internal fixation (RIF) and adaptive miniplate fixation marked technology development in condylar fracture management and became popular in term of the applicability and outcome results. Over period time, several studies proposed vary classification system and selection patient criteria for surgical treatment on the basis of age, location of fracture, degree of comminution, direction of proximal fragment displacement, location of condylar head, concomitant medical illness or associated trauma, and patient's preferences to achieve optimum goal. This review focuses on the shifting of condylar fracture management at Cipto Mangunkusumo Hospital from 2004-2012.

Keywords: Management of condylar fracture, closed reduction vs intermaxillary fixation, open treatment

Abstrak: Tatalaksana fraktur kondilus menuai kontroversi selama lebih dari tiga dekade. Sebelumnya penanganan closed reduction dengan fiksasi intermaksila (IMF) telah banyak dilakukan oleh ahli bedah, mengingat waktu yang diperlukan untuk prosedur ini sangat singkat, pencapaian pre-trauma oklusi dengan hasil yang berkesan, dan minimum biaya prosedur. Pengenalan materi osteosintesis untuk fiksasi internal rigid (RIF) dan fiksasi miniplate adaptif menjadi awal dari perkembangan tatalaksana fraktur kondilus dan dikenal dalam hal penerapan dan hasil akhir prosedur. Seiring berjalannya waktu, beberapa studi mengajukan sistem klasifikasi dan kriteria seleksi pasien untuk tatalaksana operasi berdasarkan umur, lokasi fraktur, level kominutif, arah pergeseran fragment proksimal, lokasi kepala kondilus, keadaan medis tertentu atau trauma penyerta dan preferensi pasien untuk mencapai tujuan optimal dari tatalaksana. Artikel ini berfokus pada bergesernya tatalaksana fraktur kondilus pada RS Cipto Mangunkusumo sejak tahun 2004-2012.

Kata Kunci: Management of condylar fracture, closed reduction vs intermaxillary fixation, open treatment

Most condylar fracture usually associated with other mandible fracture, accounted for at least 48% of cases and half of these arise from blunt trauma to the anterior mandible, particularly parasymphysis and symphysis regions. The majority condylar process fractures are unilateral (84%), of these, 72% are subcondylar, 19% subcondylar neck, and 9% intracapsular. Unilateral condylar fractures commonly present with contralateral open bite and deviation to ipsilateral side upon opening. Bilateral condylar fractures may present with anterior open bite and premature posterior contact.

From Division of Plastic Reconstructive, and Aesthetic Surgery University of Indonesia Cipto Mangunkusumo Hospital, Jakarta, Indonesia.

Management of condylar fracture draws controversy for over three decades. In the early years, closed treatment with intermaxillary fixation (IMF) had been predominant for many surgeons. It was commonly applied in clinical setting regarding many advantages, including shorter length of procedure and ability to achieve preinjury occlusion with acceptable adjustment, and low cost.² Popularized as a result of the research conducted by several studies in 1970s, the osteosynthesis material for rigid internal fixation (RIF) and adaptive miniplate fixation had become ongoing discussion in terms of the application and outcome results.

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

³⁻⁵ Both RIF and miniplate fixation with minimum periods of IMF have advantages including early mobilization and restoration of jaw function, airway control, nutritional status, improved speech, better oral hygiene, patient comfort, and an earlier return to work.³ Over period studies, a manageable classification system of mandible condylar fractures has been formed on the fracture level, degree of dislocation, and position of the condylar head with respect to the articular fossa.⁶⁻⁸ In 1983, Mathes drew the importance of patient selection for surgical treatment on the basis of age, location of fracture, degree of comminution, direction of proximal fragment displacement, location of condylar head, concomitant medical illness or associate trauma and patient's preferences. Other study pointed out the current classification schemes regarding the likelihood postoperative outcome and complications.⁹ Through these studies, a suggested absolute and relative indications to perform open reduction and internal fixation on condylar fractures have been achieved. In this review, we try to show the shifting of condylar fracture management at our center from 2004-2012. The goal of condylar fracture management consists of 5 basic criteria i.e. pain-free jaw opening with 40 mm or more intrinsically opening, good excursion of jaw in all movement, restoration of pre-morbid occlusion, stable temporomandibular joint, and good symmetry of jaw dan face.

Closed Reduction Intermaxillary Fixation Treatment Versus Open Reduction

Closed Reduction Intermaxillary Fixation Treatment

Cleft and Craniofacial Center Cipto Mangunkusumo Hospital had managed 213 mandibular fracture cases in 6-year period. Thirty cases (14%), accounted for condylar fracture, consisted of 20 cases unilateral fracture and 10 cases of bilateral. From 2004-2006, the majority of condylar fracture management was done through closed reduction and the use of arch bar (interfragmental wires and bonded brackets), which was recorded in 12 cases.¹⁰

Non-surgical treatment had become preferable management in condylar fracture, particularly in children, high level of injury site, and intracapsular fracture. Closed reduction treatment then followed by IMF for a period of time. Patients were prepared for early mobilization to prevent the risk of fibrosis and temporomandibular (TMJ) ankylosing. To restore pre-morbid occlusion, IMF and non-rigid immobilization were applied for 7-10 days for unilateral condylar fracture and 3-4 weeks for bilateral condylar fracture. Then continued with employing intermittent intermaxillary elastic traction at night for 3 months. Thus, to maintain functional aspect of the mandible, passive movement and mouth opening exercise conducted as soon as possible.

In cases of failure and inadequate occlusion by non-surgical treatment (particularly postoperative malocclusion and limitation opening of the mouth), surgical treatment become option to avoid further complication.¹¹

Open Reduction Treatment

Ideal approach selection should include main goal i.e. maximize exposure for the specific procedure, avoid damage to the branches of the facial nerve, major vessels (e.g., internal maxillary artery, retromandibular vein) and the parotid gland, and maximize use of natural skin creases for cosmetic wound closure.¹²

Fatal morbidity from nerve injury may overshadow improvement in joint function and amelioration of painful symptoms. Major potential problems in open treatment are located in facial nerve and terminal branches of external carotid artery. Facial nerve injury can occur with excessive retraction, where an alternative approach would have been more suitable and provide more visualization. Critical point for measurement was at which the upper trunk crosses the zygomatic arch (range between 8-35 mm anterior to the most anterior portion of the bony external auditory canal).^{12, 15} Damage to the branch of the upper trunk can be prevented by incising the

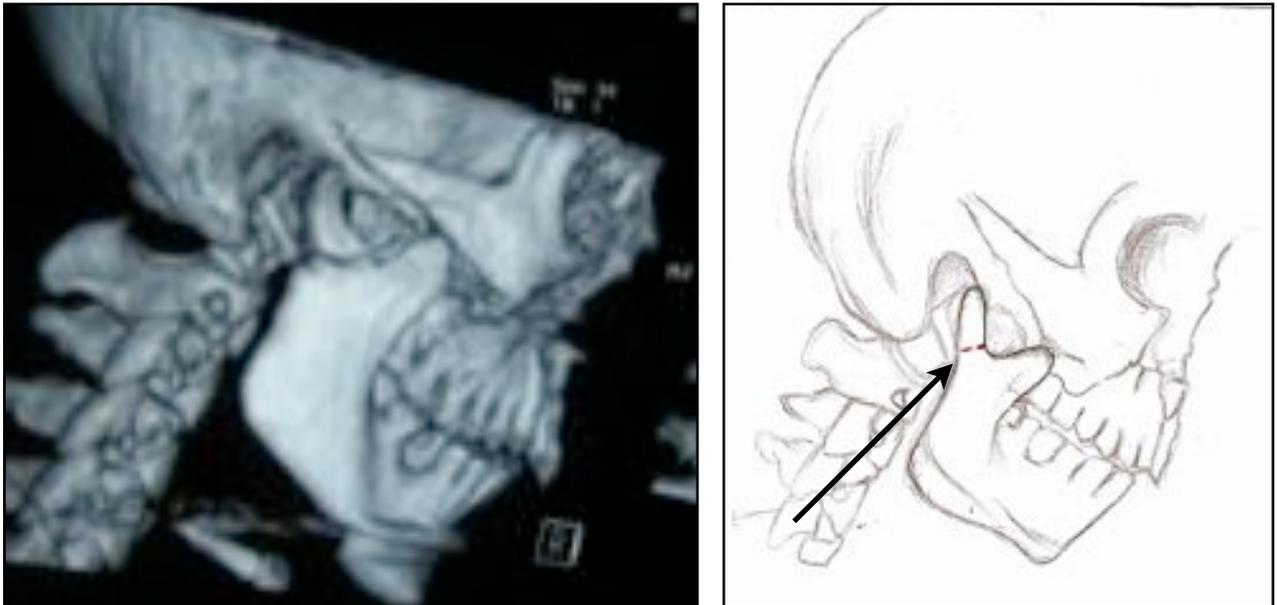


Figure 1. Pre-operative of a 34-year-old male computed tomography presented with right subcondylar fracture (arrow) due to traffic accident in 2004 and treated with conservative treatment. However, this treatment has many complication such as failure and inadequate occlusion postoperative and limitation opening of the mouth. Therefore, caution decision making for condylar fracture treatment is important.

superficial layer of temporalis fascia and the periosteum over the arch inside the 8 mm boundary. Possible post-surgical palsy can be manifested as inability to raise eyebrow and ptosis due to injury to the temporal branch of facial nerve. Facial palsy due to damage to the zygomatic branch results in temporary or permanent orbicularis oculi paresis. Temporary eye patch to prevent corneal desiccation and abrasion may be needed in this situation.^{12,13}

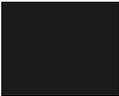
Blood flow disturbance by denudation during open treatment may potentially necrotize the proximal fragment of condylar head.¹³ In addition, patient should also understand the risk to develop visible scar resulted from open approaches, especially in dark-skinned individual.^{8,14}

Zide and Kent (1983) suggested absolute indications for open reduction of mandible condylar fracture should include any displacement into middle cranial fossa, inappropriate occlusal restoration by closed reduction, lateral extra-capsular displacement, and foreign material at the fracture site. A relative indication for open reduction internal fixation is in bilateral edentulous mandible

fracture, or bilateral condylar fracture associated with comminuted midface fracture, bilateral condylar fracture with jaw deformities and/or any contraindication for IMF application regarding medical condition. The location of the displaced mandibular condyle, fracture site, time delayed after fracture, patient's individual characteristics, edema severity, selection of incision line, and fixation type are factors that need to be considered in open reduction procedure.¹⁴

From 2007 to present time, encouraged by a few series of open treatments in worldwide literature, surgical approach for management of condylar trauma is more common in our center. Open reduction has advantages of reduction of the displaced bony fragment to the most ideal anatomical site by a direct approach to the fracture site, therefore allows for better visualization of injury site.

Eighteen cases of condylar trauma in our institution were done by open surgical treatments, consisted of pre-auricular and endaural approach. Pre-auricular is the standard and most basic approach for condylar trauma. This technique have been proposed



and used in the majority of clinical setting. Other approaches vary in term of placement of the skin incision and port d'entrée to the joint, for example, endaural incision. Endaural incision is the most preferable approach for condylar fracture management at present time. This is a modified technique developed from standard preauricular approach providing better access and greater visibility of the fracture site, as well as easier soft tissue manipulation toward temporomandibular joint, and relative ease for reduction and placement of fixation devices. This approach also prevents auricular temporal nerve injury.

Open treatment using preauricular incision

From 2007 to present time, our institution adopt Ellis and Zide¹⁵ technique as described below:

1. Preparation and draping of surgical site should expose the entire ear and lateral canthus of the eyes, and if necessary, shaving the preauricular. Sterile plastic drape can be used to isolate the surgical field. Antibiotic ointment may be applied into the external auditory canal.
2. Mark incision at the junction of the facial skin with helix of the ear. Incision extends superiorly to the top of the helix, and may include an anterior (hockeystick) extension (Figure 2).
3. Regarding to its vascular site, infiltration of vasoconstrictor in subcutaneous of incision area will decrease hemorrhage. Caution, if local anesthetic is also being injected, it should not be injected deeply due to difficulty to identify facial nerve branches and using a nerve stimulator
4. Incision is made through skin and subcutaneous connective tissues to the depth of temporalis fascia (superficial layer).
5. Using a periosteal elevator, a blunt dissection is done to undermine the superior portion of the incision (above zygomatic arch) therefore a flap can then be retracted anteriorly by 1-1.5 cm. The superficial temporal arteries and auricular nerve may be retracted anteriorly in the flap.
6. This flap is dissected anteriorly at the level of the superficial (outer) layer of temporalis fascia. Below the zygomatic arch, dissection proceeds bluntly adjacent to the external auditory cartilage (anteromedial) in an avascular plane between it and the glenoid lobe of the parotid glands. The depth of the dissection should be at the same level to that above the zygomatic arch.
7. Above the zygomatic arch, incision is made through the superficial (outer) layer of temporalis fascia, beginning from the root of zygomatic arch in front of the tragus anteroposteriorly toward the upper corner of the retracted flap. After fat globules between superficial and deep layer of temporalis fascia is exposed, a periosteal elevator is inserted deep to the superficial layer of temporalis fascia and swept in the fascial incision. The incision can be through both the superficial layer of temporalis fascia and periosteum of zygomatic arch. The undermining proceeds inferiorly toward the zygomatic arch freeing the attachment of the periosteum at the junction of the lateral and superior surfaces of the zygomatic arch, freeing the periosteum from its lateral surface. Because of this dissection along the lateral surface, the temporal branches of the facial nerve are located the substance of the retracted flap.
8. The entire flap is then retracted anteriorly, and blunt dissection at this depth proceeds anteriorly until the entire TMJ capsule exposed.
9. Closing suture with resorbable suture in the subcutaneous continues with skin closure using subcuticular suture. Apply a pressure dressing to protect the post-surgical site.

An example of safe procedure using preauricular incision in left condylar fracture case and acceptable occlusion achieved presented.

Endaural Incision

Alternate incision is useful in young patients, who do not have a well demarcated preauricular skin fold. The incision down along

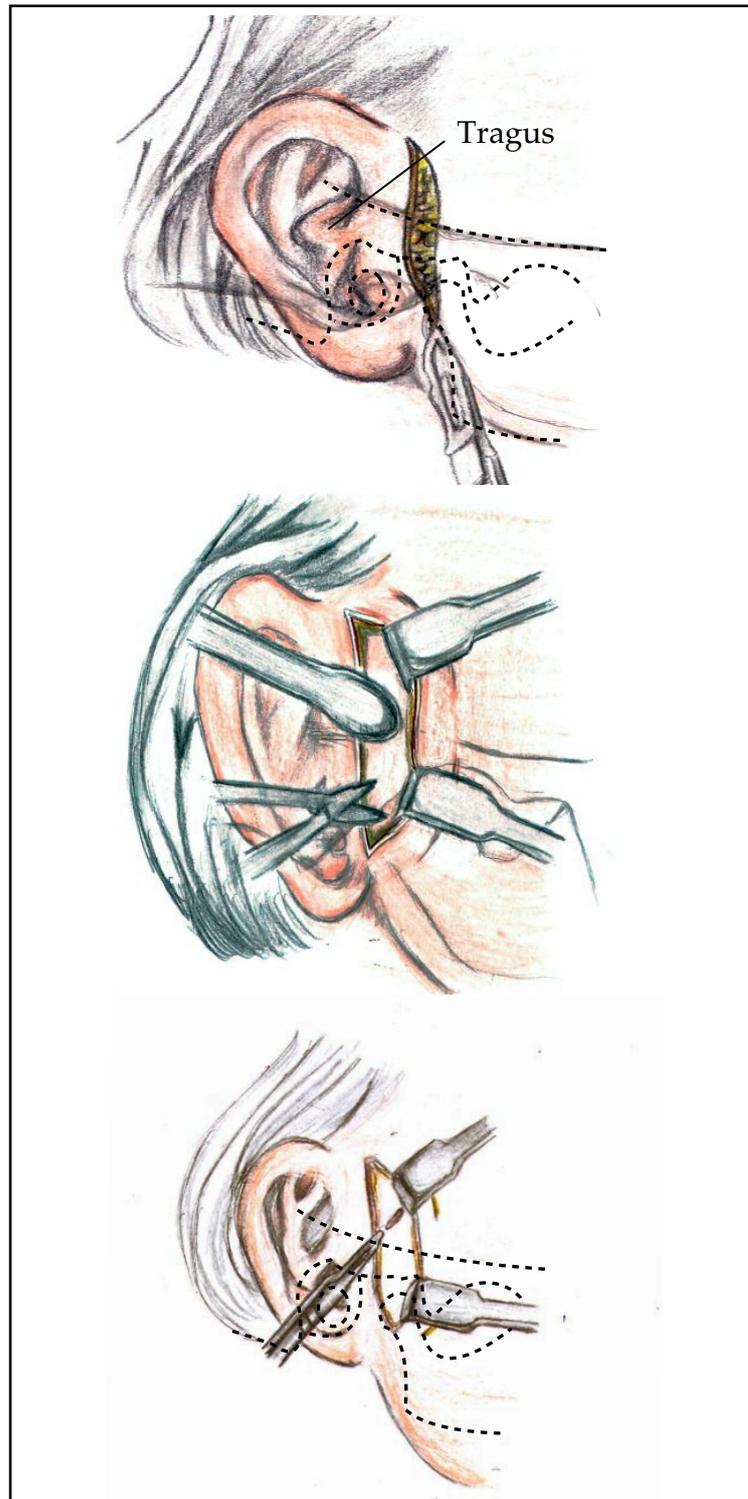


Figure 2. Above: Initial incision made in the preauricular skin fold. Middle: Above the zygomatic arch, dissection made to the level of the superficial layer of the temporalis. Below: Oblique incision through the superficial layer of the temporalis fascia. Fat is visible deep to the fascia.

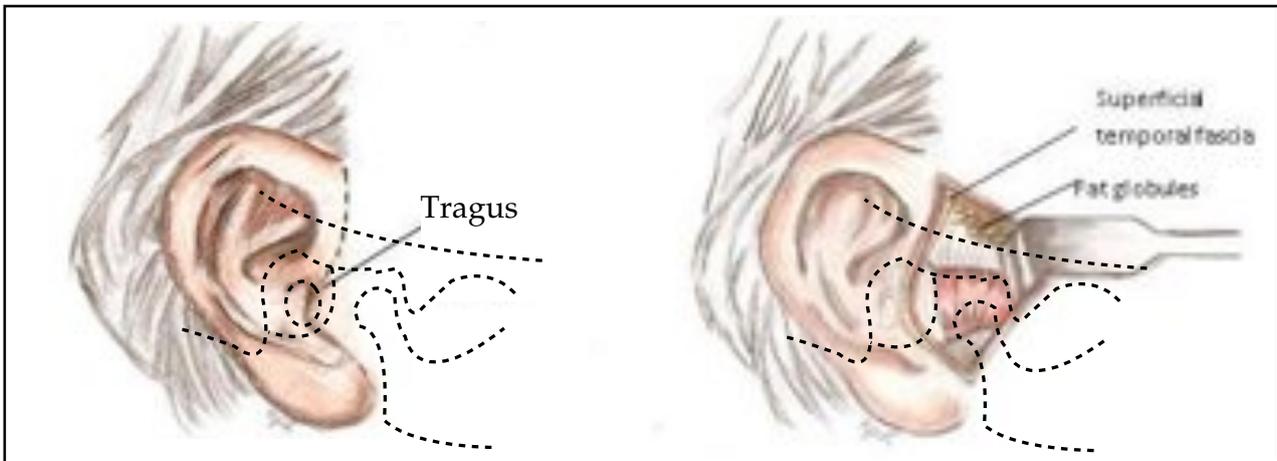


Figure 3. A safe procedure using endaural incision. (a) Outline of preauricular approach with retrotragal portion. (b) Incision created through the superficial layer of the deep temporal fascia. The superficial temporal vessels and auriculotemporal nerve may be retracted anteriorly in the flap.

Table 1. Summary of comparison of condylar fracture management features.

	Conservative Approach	Pre-auricular Approach	Endaural Approach
Length of Stay	Short period	Longer period	Longer period
Cost	Low cost	Higher Cost	Higher Cost
Function	Possible failure of reposition causing inadequate function	Risk of nerve injury	Low risk on facial nerve injury
Benefit	Blind reduction	Easy reduction and fixation	Easy reduction and fixation

anterior tragal cartilage curvature (arc-shaped), created through skin, subcutaneous tissue and temporoparietal fascia until exposing superficial layer of the deep temporal fascia. The dissection proceeds at the same depth anterior to the tragal cartilage along to the inferior limb of incision (Figure 3).

SUMMARY

Over 6 years, management of condylar fracture has developed from conventional treatment to new approaches of surgical

reduction and fixation through studies of world literature. During early years, conventional method was considered as common preference for treating condylar fracture. However, through learning curve and case trials, open treatment technique has given superior results. Possibility of nerve and major vessel injury can be prevented with knowledge of reliable anatomic landmark position and precise incision

In addition, determination of treatment plan, the advantage, disadvantage, risk of each

treatments, and risk of complications should be sufficiently discussed with patients and patients' guardians.

Imam Susanto, MD

Plastic Surgery Division

Cipto Mangunkusumo General National Hospital

santo0350@yahoo.com

REFERENCES

1. Silvennoinen U, Iizuka T, Lindqvist C, et al: Different patterns of condylar fracture : an analysis of 382 patients in 3 year-period. *J Oral Maxillofac Surg.* 1992;50:1032
2. Stacey D H, Doyle J F, Mount D L, Snyder M C, Gutowski K A. Management of mandible fractures. *Plast Reconstr Surg.* 2006;117:48e-60e.
3. Lazow S K, Tarlo I. Mandible Fracture: Transoral 2.0-mm Locking Miniplate plus 1 Week Maxillomandibular Fixation. *Surgery Clinic*
4. Michelet FX, Deymes J, Dessus B, et al. Osteosynthesis with miniaturized screwed plates in maxillo-facial surgery. *J Maxillofac Surg.* 1973;1(2):79-84.
5. Champy M, Kahn JL. Fracture line stability as a function of the internal fixation system: an in vitro comparison using a mandibular angle fracture model-discussion. *J Oral Maxillofac Surg.* 1995;53:791-802.
6. Zide M F, Kent J N. Indication for open reduction of mandibular condyle fractures. *J Oral Maxillofacial Surg.* 41: 89-98.1983.
7. Wassouf A, R Verdeja, K.W. Gratz. Conservative treatment of condyle fractures: Radiological and clinical evaluation. *Int J Oral Maxillofac Surg.* 1999 Apr;28(2):95-8.
8. Haug R H, Assael L A. Outcomes of open versus closed treatment of mandibular subcondylar fractures. *J Oral Maxillofac Surg.* 2001;59:370
9. Valiati R, Ibrahim D, et al. The treatment of condylar fractures: to open or not to open? A critical review of this controversy. *Int J Med Sci.* 2008: 5(6):313-318.
10. Clinical database of Craniomaxillofacial Center. Ciptomangun kusumo Hospital Jakarta . 2006-2012.
11. Choi KY, Yang JD, et al. Current concepts in mandibular condyle fracture management part II: Open reduction versus closed reduction. *Arch Plast Surg.* 2012;39(4):301-8.
12. Quinn PD. *Color Atlas of Temporomandibular Joint Surgery.* Mosby. 1997 (3):31-32
13. Montazem A H, Anastassov G. Management of condylar fractures. *Atlas Oral Maxillofac Surg Clin North Am.* 2009 Mar;17(1):55-69.
14. Mueller RV. Endoscopic mandible fracture management : techniques. Mathes SJ. *Plastic Surgery.* Second Edition. Saunders Elsevier USA. 2006(6): 511-533.
15. Ellis E III, Zide MF, Manson PN. Preauricular approach. *Surgical approaches to the facial skeleton.* Baltimore: Williams & Wilkins. 1995(12):177-180.