

CLINICAL PRACTICE GUIDELINES

December 2005

MOH/P/PAK/106.05(GU)

MANAGEMENT OF UNILATERAL CONDYLAR FRACTURE OF THE MANDIBLE



MINISTRY OF HEALTH MALAYSIA

Statement of Intent

This clinical practice guideline is meant to be a guide for clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not necessarily ensure the best outcome in every case. Every health care provider is responsible for the management of his/her unique patient based on the clinical picture presented by the patient and the management options available locally.

Review of the Guidelines

This guideline was issued in Mac 2005 and will be reviewed in Mac 2007 or sooner if new evidence becomes available.

CPG Secretariat
c/o Health Technology Assessment Unit
Medical Development Division
Ministry of Health Malaysia
Level 4, Block E1, Parcel E
Government Office Complex
62250 Putrajaya

Available on the following website : <http://www.moh.gov.my>
<http://www.acadmed.org.my>

ACKNOWLEDGEMENTS

The committee wishes to acknowledge all those who had provided valuable input and feedback on the draft guidelines.

GUIDELINE DEVELOPMENT AND OBJECTIVES

RATIONALE FOR GUIDELINE DEVELOPMENT

Mandibular fractures are the most commonly fractured facial bone, of which approximately 20% are condylar fractures. Unilateral fractures of the condyles are 3 times more common than bilateral. The earlier opinion that treatment of condylar fractures was free from complications (McLennan, 1952) was proven not accurate as there are not only diagnostic difficulties but there are also substantial management variations with suboptimal outcomes. In some cases, inappropriate or inadequate treatment results in severe/unacceptable residual complications.

OBJECTIVES OF THE GUIDELINE

The aim of this guideline is to provide evidence-based recommendations for best practice in the management of unilateral condylar fractures and to help achieve favourable outcomes as far as possible.

CLINICAL QUESTIONS

The clinical questions for these guidelines are:

- How is unilateral condylar fractures of the mandible diagnosed?
- What needs to be considered in the treatment decisions?
- What are the problems/complications associated with these fractures?
- How to rehabilitate the patient to normal function?

TARGET POPULATION

These guidelines are suitable for patients presenting with unilateral condylar fractures of the mandible.

TARGET GROUP

These guidelines are developed for all health care professionals involved in the diagnosis and management of unilateral condylar fractures of the mandible.

CLINICAL PRACTICE GUIDELINES DEVELOPMENT GROUP

Dr Wan Mahadzir Wan Mustafa

Senior Consultant & Head
Department of Oral Surgery
Kuala Lumpur Hospital

Chairperson

Panel Members

Professor Dr Ong Siew Tin

Department of Oral & Maxillofacial Surgery
Faculty of Dentistry
University of Malaya

Dr Norma Abdul Jalil

Consultant
Department of Oral Surgery
Queen Elizabeth Hospital, Sabah

Dato' Dr Khalid Mohd Sharif

Consultant
Department of Oral Surgery
Kangar Hospital

Dr Tay Keng Kiong

Consultant
Department of Oral Surgery
Sarawak General Hospital

Dr Abdul Latif Abdul Hamid

Consultant
Department of Oral Surgery
Seremban Hospital

Dr Norhayati Hassan

Consultant
Department of Oral Surgery
Putrajaya Hospital

Dr Sivakama Sunthari

Consultant
Department of Oral Surgery
Mentakab Hospital

Datin Dr Nooral Zeila Junid

Principal Assistant Director
Oral Health Division
Ministry of Health Malaysia

Dr Ganasalingam Sockalingam

Consultant Paediatric Dental Surgeon
Department of Paediatric Dental Surgery
Sultanah Aminah Hospital, Johor

Dr Mohd Noor Awang

Oral Surgical Specialist Clinic
No. SG 21-1, 1st Floor
Subang Square Shopping Gallery
Selangor

Major Dr S Nagarajan

Paediatric Dental Specialist
94 Armed Forces Hospital
Terendak Camp, Melaka

Coordinating and Editing by :

Dr Rusilawati Jaudin

Principal Assistant Director
Health Technology Assessment Unit
Medical Development Division
Ministry of Health Malaysia

Review and Final Editing By:

Dr S Sivalal

Deputy Director
Health Technology Assessment Unit
Medical Development Division
Ministry of Health Malaysia

Ms Jeya Devi Coomarasamy

Senior Nursing Officer
Health Technology Assessment Unit
Medical Development Division
Ministry of Health Malaysia

SPECIALIST REVIEWERS

This guideline was reviewed in a draft form by a panel of independent members, who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence base supporting the recommendations in the guidelines.

Dr Rusdi Abdul Rahman Consultant Department of Oral Surgery
Kota Bahru Hospital, Kelantan

Assoc Prof Dr Zainal Ariff Ab Rahman Department of Oral & Maxillofacial
Surgery
Faculty of Dentistry,
University of Malaya

METHODOLOGY

Literature search for this CPG was made mainly through bibliographic databases found in PubMed, Medline, Md Consult and Embase. "Hand searches" were carried out in books, non-indexed journals and "grey literature". Extensive use was made of recent review articles, bibliographies and existing guidelines on the websites. The experience and knowledge of the CPG development group were also considered. Search was limited to literatures in English only. Assessment of abstracts and papers retrieved was conducted independently by the members of the CPG development group and any disagreements were resolved by discussion as a group. In each area considered, the best evidences available was given importance and synthesised before using it as a basis for recommendations.

EVALUATION OF GUIDELINES

This draft guideline was also posted on the Ministry of Health Malaysia and Academy of Medicine Malaysia websites for feedback, opinions and contributions towards the improvement of the guideline.

TABLE OF CONTENTS

<i>Acknowledgements</i>	<i>i</i>
<i>Guideline Development and Objectives</i>	<i>ii</i>
<i>Clinical Practice Guidelines Development Group</i>	<i>iii</i>
<i>Specialist Reviewers</i>	<i>iv</i>
<i>Methodology</i>	<i>v</i>
<i>Evaluation of Guidelines</i>	<i>v</i>
<i>Table of Contents</i>	<i>vii</i>
1. INTRODUCTION	1
2. DIAGNOSIS	1
2.1 Diagnostic Criteria	1
2.2 Investigations	2
3. MANAGEMENT	2
3.1 Age 0 - 11 years	3
3.2 Age 12-20 years	3
3.3 Age 20 years and above	4
3.4 Surgical Management	4
3.5 Methods of Immobilisation	6
4. REHABILITATION	7
5. FOLLOW-UP	7
6. REFERENCES	8
<i>Appendix 1</i>	<i>12</i>
<i>Appendix 2</i>	<i>13</i>

1. INTRODUCTION

Fractures of the condylar process of the mandible are common and has been reported to account for from 17.2% (Al-Zubi, 2004 *Level II-3*) to 25% (Ramanathan, 1974 *Level II-3*), and 21-52% of all mandibular fractures (Silvennoinen, 1992 *Level III*), with it being lower in children (from 1-5%) depending on the age (Remi, 2003 *Level II-2*, Iida & Matsuya, 2002 *Level II-2*, Posnick, 1993 *Level II-2*). It is important in children that fractures of the condylar processes are diagnosed and managed appropriately, as damage to growth centres can cause altered growth and deformity of the facial skeleton (Defabianis 2001 *Level III*). However, it is not possible to predict which type of fracture is at risk of facial asymmetry (Hovinga, 1999 *Level II-3*).

The appropriate treatment for mandibular condylar fractures, especially in patients over the age of 12 years, is still debatable (Walker, 1994, *Level III*; Mitchell, 1997, *Level II-2*). Most condylar fractures are treated non-surgically (closed reduction/conservative treatment), with generally favourable results (Mac Lennan, 1952 *Level III*; Lindahl & Hollender, 1977 *Level III*; Zide & Kent, 1983 *Level III*; Ellis, 2000 *Level I*) although failures of treatment have been reported (Zide & Kent, 1983 *Level III*; Mitchell, 1997 *Level II-2*; Hyde et al 2002 *Level II-2*). More accurate anatomical relocation of the fractured segments by open reduction and internal fixation has been advocated (Hyde, 2002 *Level II-2*; Martin & Lee, 2003 *Level III*), but its superiority to non-surgical treatment has not been established, while there are many potential complications as well.

The purpose of treatment either by open or closed reduction is to achieve the patient's pre-trauma appearance, occlusion and mandibular and oral functions as far as possible (Bos et al, 1999, *Level III*).

2. DIAGNOSIS

All patients showing signs and symptoms of fractures of the mandibular condyle need to be investigated, and preferably referred to specialists for further management, since a multi-centre audit of unilateral fractures revealed that accurate clinical and radiographic diagnosis is more difficult than is commonly supposed (Mitchell, 1997 *Level II-2*). In children, it is important to suspect possible injury to the condyle of the mandible in cases involving blunt trauma to the chin (Lee, 1993 *Level III*).

2.1. Diagnostic Criteria

Signs and symptoms

Patients with unilateral condylar fracture may present with the following:

- pain on mandibular movement, with or without soft tissue swelling in the peri-auricular region
- restriction of mandibular movement, due to reflex sensory inhibition resulting in muscle spasm

- deviation of mandible towards the ipsilateral side upon opening, and deviation to the contralateral side in children below the age of 5 years, due to the under-developed condylar neck
- disharmony/alteration of occlusion, especially in patients with shortening of the ramus, leading to gagging of the ipsilateral molar teeth
- cerebrospinal fluid otorrhea or bleeding from acoustic meatus in patients with severe trauma
- neurological signs, especially in the rare occurrence of displacement of condylar head into the middle cranial fossa

2.2 Investigations

2.2.1 Plain film radiographs

Plain film radiographs such as Reverse Townes View, postero-anterior view, oblique lateral and dental panoramic view (orthopantomograph) of the mandible (Puig et al, 2001 *Level III*) are useful to confirm diagnosis. They may miss intra-capsular fractures and fractures in sagittal planes (Yamaoka et al, 1994 *Level III*).

2.2.2 Advanced imaging techniques

Computed Tomography (CT), especially with 3D reconstruction views show more accurately the extent of the fracture (Wu et al, 2000 *Level III*), the position of the condyle and any changes to surrounding bony structures (Puig et al 2001 *Level III*; Raustia et al, 1990 *Level III*). CT imaging may be required in children with mandibular trauma, especially with chin laceration, to determine intracapsular involvement (Regey et al, 2002, *Level III*; Graziani et al, 1995 *Level III*). CT is also indicated in severe injuries such as complex maxillo-facial and cranial traumas, cerebrospinal fluid otorrhea or bleeding from the acoustic meatus (Huet et al, 1996 *Level III*; Spanio et al, 2002 *Level III*; Avrahami & Katz 1998 *Level III*; Avrahami et al, 1994 *Level III*).

Magnetic resonance imaging is occasionally indicated, since it shows soft tissue changes within the condyle (Sullivan et al, 1995 *Level III*), especially the position and damage to the articular disc (Eckelt & Rasse, 1995 *Level III*; Choi 1997 *Level III*), more accurately compared to other imaging techniques (Takaku et al, 1996 *Level III*; Sullivan et al, 1995 *Level III*; Eckelt, 1995 *Level III*).

Sonography has a low sensitivity and specificity, but may be useful for mentally handicapped patients, pregnant women and others like fidgety patients who cannot be put through the normal imaging procedures.

3. MANAGEMENT

The choice of treatment depends on various factors as follows:

- Level of fracture
- Degree and direction of displacement of the fractured segments

- Age of patient
- Medical status of patient
- Concomitant facial fractures
- Presence and status of dentition
(Villarreal et al, 2004 *Level III*; Hayward & Scott, 1993 *Level III*).

As long as the goals can be achieved the easiest and least invasive treatment should be chosen. Treatment options vary according to age and type of fracture.

3.1 Age 0 to 11 years

3.1.1 Conservative Management

Conservative management comprise of jaw exercise, soft diet, analgesics and anti-inflammatory (refer Appendix 1).

3.1.2 Closed reduction/non-surgical treatment

Closed reduction/non-surgical treatment is preferred in children as good results are achieved in most patients after such procedures. Surgical procedures in the TMJ area may result in complications involving the facial nerve and a scar on the face.

3.2 Age 12 to 20 years

Depending upon the type of fracture and severity of derangement of the occlusion, patients may require conservative or surgical management (Thoren et al 1997 *Level II-2*; Smet et al, 2003 *Level III*; Defabianis 2001 *Level III*; Defabianis 2003 *Level III*).

3.2.1 Undisplaced/minimally displaced fractured unilateral condyle with no / minimal altered occlusion restriction and/or deviation of mandibular movement and painful movement

- Conservative treatment with analgesics
- Soft diet for 6 weeks with early mobilization is the mainstay of treatment (Dimitroulis, 1997 *Level III*; Hyde 2002, *Level II-3*)
- If pain and restricted mouth opening persist, a short period of intermaxillary fixation for about 7-10 days with liquid diet should be considered (Dimitroulis, 1997 *Level III*)
- Follow-up for 3 months before discharge (Mitchell, 1997 *Level III*)

3.2.2 Undisplaced/minimally displaced fractured unilateral condyle with altered occlusion, restriction and/or deviation of mandibular movement and painful movement

- Conservative treatment with analgesics and soft diet (Hyde et al 2002, *Level II-3*)
- If pain and restricted mouth opening persist, intermaxillary fixation for about 2 to 4 weeks with liquid diet should be considered (Dimitroulis, 1997 *Level II-3*)
- If the altered occlusion does not improve, a further period of intermaxillary guiding elastic therapy with mouth opening exercises in front

of a mirror for 1 to 6 weeks, to minimize the deviation and to enable occlusion may be useful (Zicardi, 1995 *Level II-3*)

- If the condition still does not improve, the diagnosis needs to be verified before instituting surgical treatment (Zide & Kent, 1983 *Level III*)
- Once the treatment goals are achieved, the patients are discharged (Mitchell, 1997 *Level III*).

3.2.3 *Severely displaced and/or dislocation of fractured unilateral condyle with no altered occlusion*

- Conservative treatment with analgesics, soft diet for 6 weeks and early mobilization (Hyde et al 2002 *Level II-3*)
- Alternatively, a short period of intermaxillary fixation for about 7-10 days with liquid diet may be considered (Dimitroulis, 1997 *Level III*)
- Once the treatment goals are achieved, the patients are discharged
- If the condition still does not improve, the diagnosis needs to be verified before instituting surgical treatment (Zide & Kent 1983 *Level III*)

3.2.4 *Severely displaced and/or dislocation of fractured unilateral condyle with minimal altered occlusion*

- Conservative treatment with analgesics and soft diet initially (Dimitroulis, 1997 *Level III*)
- Inter-maxillary fixation for about 2 to 4 weeks with liquid diet may be considered (Dimitroulis, 1997 *Level III*)
- If altered occlusion does not improve, a further period of inter-maxillary guiding elastic therapy and mouth opening exercises in front of a mirror for 1 to 6 weeks to minimize deviation and reproduce occlusion may be useful (Zicardi et al 1995 *Level II-3*)
- If the condition still does not improve, the diagnosis needs to be verified before instituting surgical treatment (Zide & Kent 1983 *Level III*)
- Once the treatment goals are achieved, the patients are discharged

3.2.5 *Severely displaced/dislocation of fractured unilateral condyle with severe altered occlusion*

- Open reduction should be considered (Zide & Kent 1983 *Level III*).

3.3 **Age 20 years and above**

- Undisplaced/minimally displaced fractures heal to produce excellent functional outcomes with either conservative management or minimally invasive closed reduction and functional elastic intermaxillary fixation
- Severely displaced, dislocated and severely telescoped fractures require open reduction and fixation to achieve optimal outcome.

3.4 **Surgical Management**

3.4.1 *Indications*

- The absolute indications for open reduction in children and adults are as follows:
- displacement into middle cranial fossa

- inability to obtain adequate occlusion
- lateral extracapsular displacement of the condyle
- presence of a foreign body (e.g. gunshot wound) (Zide & Kent, 1983; *Level III*)

The relative indications (primarily in adults) are as follows:

- when splinting is not recommended for medical reasons
- where adequate physiotherapy is not possible (patients with seizure disorders, psychiatric problems, alcoholism, refractory behavior, mental retardation or retardation secondary to neurologic injury)

Other indications:

- failed conservative treatment
- failed closed reduction treatment
- medial dislocation of condyle $>30^\circ$; displaced fractures with $>5\text{mm}$ bone overlap; or complete loss of bone contact (Eckelt & Rasse, 1995 *Level III*)
- shortening of the ascending ramus of $> 8\text{mm}$; or when considerable displacement or angulation in a coronal and/or sagittal plane is present
- displacement $< 37^\circ$ (based on mathematical model) from the sagittal axis of the ascending ramus (Kleinheinz, 1999 *Level II-1*)

3.4.2 Surgical approaches

Access must be clearly tailored to meet the demand of individual case.

- Pre or post-auricular approaches are indicated for intracapsular and high condylar neck fractures where open reduction and internal fixation is indicated. However, a separate submandibular incision may be needed to gain access to the mandibular angle to place a wire to distract the mandible downward.
- Submandibular, retromandibular and rhytidectomy modified approaches are preferred for low condylar neck fractures.
 - **Retromandibular approach**
Provides superior access due to the short distance from the incision to the condyle, and adequate exposure for reduction and fixation, as well as good cosmetic results
 - **Submandibular approach**
Reduction of the condylar fracture and placement of a bone plate are difficult especially in medially displaced condyles, due to the distance of the fracture site from the skin incision
 - **Rhytidectomy or facelift**
Has the same advantage as the retromandibular approach although it results in a less conspicuous facial scar, but requires a longer time for closure

- **The intraoral approach and its endoscopically assisted modification**

The endoscopic approach for the repair of subcondylar fractures of the mandible is a feasible but challenging technique, but instrumentation and training are required (Kellman, 2003 *Level II*). The advantages of this approach are that a visible scar can be avoided, the risk to the facial nerve could be minimised, and maxillofacial surgeons are familiar with this technique. However, a major disadvantage is limited access and difficulty in visualization as well as the difficulty in reducing and applying plates to the fracture. Thus, this approach is reserved for lower condylar fractures where dislocation with lateral override is present (Hyde, et al 2002 *Level II*).

(Manisali et al 2003 *Level III*; Ellis & Dean, 1993 *Level III*; Zide & Kent, 1983 *Level III* ; Devlin, Hislop & Carton, 2002 *Level I*; Tullio & Sesenna, 2000 *Level II-2*).

RECOMMENDATIONS

1. The retromandibular approach is recommended when open reduction is used to reduce unilateral condylar fracture where the oral surgeon does not have the training and facilities to carry out endoscopically assisted techniques in open reduction of fracture of condylar neck.
Grade A
2. The pre-auricular approach is recommended for access to high condylar neck fracture.
Grade A
3. The endoscopic-assisted intraoral approach is recommended for open reduction provided intensive training has been undertaken by the oral surgeons and equipment for the procedure is available
Grade B

3.5 Methods of Immobilization

3.5.1 Reduction with fixation

Mini bone plate is the first choice for fixation, followed by screw fixation, inter osseous wiring, K wire fixation and pin fixation (Iizuka et al 1998, *Level III*). The two mini-plate fixation system provides the greatest stability (Choi, 1999 *Level III*). For one mini-plate system, a mini-dynamic compression plate or a single 2.4 mm plate needs to be used but the patients has to be on a soft diet for a long period (Hammer et al, 1997 *Level III*).

3.5.2 Reduction without fixation

There has been report on a good long term clinical results using open reduction without fixation or dislocated condylar process fractures (Iizuka et al 1998 *Level III*). Following open reduction MMF for two weeks was used. Long term mouth opening was excellent but the patients experienced an average loss of ramus height of 4.4mm

4. REHABILITATION

In adults, irregardless of open or closed reduction, a good functional outcome and absence of ankylosis depends on the quality of active rehabilitation (Lemiere et al, 2003 *Level III*). This consists of early mobilisation, active jaw movements (Ziccardi et al, 1995 *Level II-3*) and close supervision by the therapist as well as compliance by the patient (Walker, 1994 *Level III*). Functional treatment with intermaxillary guiding elastics is preferable (Ward Booth, 1997 *Level III*) than rigid inter-maxillary fixation (Ward Booth, 1997 *Level III*).

RECOMMENDATIONS

Post fracture physiotherapy (refer Appendix 2) is essential to ensure optimum outcome.

Grade C

5. FOLLOW-UP

Regular follow-up is required until the following outcome criteria are achieved:

- Restoration of pre injury occlusion
- Restoration of normal mouth opening in excess of 40mm interincisal clearance (adult)
- Pain free opening of the mouth
- Full range of mandibular excursions
- Restoration of facial and mandibular symmetry (Walker, 1994 *Level III*)

The treatment method may need to be reviewed if there is no or slow progress.

RECOMMENDATIONS

Regular follow-up is required until the outcome criteria of therapy are achieved.

Grade C

REFERENCES

- Al-Zubi, A.Y., Lian, C.B., Ngeow, W.C. (2004). Treatment and complications of fractures of the mandible: a retrospective study. *Mal J Oral Maxillofac Surg* 3:1-7.
- Avrahami, E., Frishman, E., Katz, R. (1994). CT evaluation of otorrhagia associated with condylar fractures. *Clin Radiol*. Dec; 49(12):877-878
- Avrahami, E., Katz, R. (1998). An association between imaging and acute posttraumatic ear bleeding with trismus. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* Mar;85(3):244-247.
- Bos, R.R., Ward Booth, R.P., de Bont, L.G. (1999). Mandibular condyle fractures: a consensus. *Br J Oral Maxillofac Surg*. Apr;37(2):87-89
- Choi, B.H. (1997). Magnetic resonance imaging of the temporomandibular joint after functional treatment of bilateral condylar fractures in adults. *Int J Oral Maxillofac Surg*. Oct;26(5):344-347.
- Choi, B.H., Kim, K.N., Kim, H.J., Kim, M.K. (1999). Evaluation of condylar neck fracture plating techniques. *J Craniomaxillofac*
- DeFabianis, P. (2001). TMJ fractures in children: clinical management and follow-up. *J Clin Pediatr Dent*;25(3): 203-208.
- DeFabianis, P. (2003). TMJ fractures in children and adolescents: treatment guidelines. *J Clin Pediatr Dent Spring*; 27(3):191-199.
- Devlin, M. F., Hislop, W .S., Carton, A .T. M. (2002). Open reduction and internal fixation of fractured Mandibular condyles by retromandibular approach:surgical morbidity and informed consent. *Br J Oral Maxfac Surg*; 40:23-25
- Dimitroulis, G. (1997). Condylar injuries in growing patients. *Australian Dental Journal*; 42;(6):367-371
- Eckelt, U., Rasse, M. (1995). Clinical, radiographic and axiographic control after traction-screw osteosynthesis of fractures of the mandibular condyle region *Rev Stomatol Chir Maxillofac.*; 96(3):158-165.
- Ellis, E., Simon, P., Thockmorton, G.S. (2000). Occlusal results after open or closed treatment of fractures of the mandibular condylar process. *J Oral Maxillofac Surg*; 58: 260-268
- Ellis, E., Dean, J. (1993). Rigid fixation of Mandibular condyle fractures. *Oral Surg Oral Med Oral Pathol*; 76:6-15.

Graziani, M., Parri, C., Logoluso, G., Fasanelli, S. (1995). Fractures of the temporomandibular joints in childhood from indirect trauma to the chin. A report of 4 cases. *Pediatr Med Chir.* May-Jun;17(3):249-252.

Hammer, B., Schier, P., Prein, J. (1997). Osteosynthesis of condylar neck fractures: a review of 30 patients. *Br J Oral Maxillofac Surg* Aug;35(4):288-291.

Hayward, J.R., Scott, R.F. (1993). Fractures of the mandibular condyle. *J Oral Maxillofac Surg*: 57-61

Hovinga, J., Boering, G., Stegenga, B. (1999). Long-term results of nonsurgical management of condylar fractures in children. *Int J Oral Maxillofac Surg.* Dec;28(6):429-440.

Huet, P., Gayet, M., Aldegheri, A., Mounios-Perchenet, A.S., Ferri, J., Piot, B., Mercier, J. (1996). 5 conventional radiographic projections are necessary and sufficient for the study of the zygoma. Technics and results. *Rev Stomatol Chir Maxillofac.* Dec; 97(6):352-364

Hyde, N., Manisali, M., Aghabeigi, B., Sneddon, K., Newman, L. (2002). The role of open reduction and internal fixation in unilateral fractures of the mandibular condyle: a prospective study. *Br J Oral Maxillofac Surg*; 40:19-22

Iida, S., Matsuya, T. (2002). Paediatric maxillofacial fractures: their aetiological characters and fracture patterns. *J Craniomaxillofac Surg.* Aug; 30(4): 237-241.

Iizuka, T., Ladrach, K., Geering, A.H., Raveh, J. (1998). Open reduction without fixation of dislocated condylar process fractures: long-term clinical and radiologic analysis. *J Oral Maxillofac Surg.* May; 56(5):553-61; discussion 561-562

Kahl-Nieke, B., Fischbach, R., Gerlach, K.L. (1994). CT analysis of temporomandibular joint state in children 5 years after functional treatment of condylar fractures. *Int J Oral Maxillofac Surg* 23:332-327.

Kellman, R.M. (2003). Endoscopically assisted repair of subcondylar fractures of the mandible: an evolving technique. *Arch Plast Surg*;5 (3): 244-250.

Kleinheinz, J., Anastassov, G.E., Joos, U. (1999). Indications for treatment of subcondylar mandibular fractures. *Journal of Cranio-Maxillofacial Trauma*, summer 5(2):17-23; discussion 24-26.

Lee, C.Y., McCullon, C., Blaustein, D.I., Mohammadi, H. (1993). Sequelae of unrecognized, untreated mandibular condylar fractures in the pediatric patient. *Ann Dent* Summer;52(1):5-8

- Lemiere, E., Sicre, A., Vereecke, F., Brygo, A., Nicola, J., Ferri, J. (2003). Our Physiotherapy treatment of articular fractures of the mandibular condyle (French). *Rev.Stomatol Chir Maxillofac*. April; 104(2):104-106
- Lindahl, L., Hollender, L. (1977). Condylar fractures of the mandible. *Int. J Oral Surgery*; 6:12 153,166,195
- MacLennan, W.D. (1952). Consideration of 180 cases of typical fractures of the mandibular condylar process. *Br J Plast Surg*.;5:122-128.
- 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
- Martin, M., Lee, C. (2003). Endoscopic mandibular condyle fracture repair. *Atlas of the Oral & Maxillofacial Surgery Clinics of North America*. Sept; 11(2):169-178.
- Mitchell, D.A. (1997). A multicentre audit of unilateral fractures of the mandibular condyle. *Br J Oral Maxillofac Surg*.; 35:230-236
- Posnick, J.C., Wells, M., Pron, G.E. (1993). Pediatric facial fractures: evolving patterns of treatment. *J Oral Maxillofac Surg* Aug; 51(8):836-844; discussion 844-845
- Puig, S., Krestan, C., Glaser, C., Staudenherz, A., Lomoschitz, F., Robinson, S. (2001). Traumatic temporomandibular joint injuries. *Radiologe*. Sep;41(9):754-759
- Ramanathan, K. (1974). Traumatic injuries of the facial skeleton. *Dent J Malays*; 14:13-16.
- Raustia, A.M., Pyhtinen, J., Oikarinen, K.S., Altonen, M. (1990). Conventional radiographic and computed tomographic findings in cases of fracture of the mandibular condylar process. *J Oral Maxillofac Surg*. Dec; 48(12):1258-62; discussion 1263-1264.
- Regev, E., Zeltser, R., Shteyer, A. (2002). The overlooked chin trauma in children. *Refuat Hapeh Vehashinayim*. Apr; 19(2):56-61, 79
- Remi, M., Christine, M.C, Gael P, Soizick P, Joseph-Andre J (2003). Mandibular fractures in children: long term results. *Int J Pediatr Otorhinolaryngol*. Jan; 67(1): 25-30.
- Silvennoinen, U., Iizuka, T., Lindqvist, C., Oikarinen, K. (1992). Different patterns of condylar fractures: an analysis of 382 patients in a 3-year period. *J Oral Maxillofac Surg*. Oct; 50(10):1032-1037.
- Smet, L.M.H., Van Damme, P.A., Stoelinga, P.J.W. (2003). Non-surgical treatment of condylar fractures in adults: a retrospective analysis. *J Cranio-Maxillofac Surg* 31:162-167.

-
- Spanio, S., Baciliero, U., Fornezza, U., Pinna, V., Toffanin, A., Padula, E. (2002). Intracranial dislocation of the mandibular condyle: report of two cases and review of the literature. *Br J Oral Maxillofac Surg*. Jun; 40(3):253-255.
- Sullivan, S.M., Banghart, P.R., Anderson, Q. (1995). Magnetic resonance imaging assessment of acute soft tissue injuries to the temporomandibular joint. *J Oral Maxillofac Surg*. Jul; 53(7):763-766
- Takaku, S., Yoshida, M., Sano, T., Toyoda, T. (1996). Magnetic resonance images in patients with acute traumatic injury of the temporomandibular joint: a preliminary report. *J raniomaxillofac Surg*. Jun; 24(3):173-177
- Thoren, H., Iizuka, T., Hallikainen, D., Nurminen, M., Lindqvist, C. (1997). An epidemiological study of patterns of condylar fractures in children. *Br J Oral Maxillofac Surg*. Oct; 35(5): 306-311.
- Tullio, A., Sesenna, E. (2000). Role of surgical reduction of condylar fractures in the management of panfacial fractures. *British J. Oral Maxillofac Surg*;38:472-476.
- Villarreal, P.M., Monje, F., Junquera, L.M., Mateo, J., Morillo, A.J., Gonzalez, C. (2004). Mandibular condyle fractures: determinants of treatment and outcome. *J Oral Maxillofac Surg*. Feb;62(2):155-163.
- Walker, R.V. (1988). Open reduction of Condylar fractures of the mandible in conjunction with repair of discal injury; A preliminary report. *J Oral and Maxillofac Surg*;46:262
- Walker, R.V. (1994). Condylar fractures: non-surgical management. *J Oral and Maxillofac Surg*; 52:1185-1188.
- Wu, H., Luo, J., Zhu, Z. (2000). Clinical study of three-dimensional reconstruction of computed tomography in diagnosis of condylar fractures *Hua Xi Kou Qiang Yi Xue Za Zhi*. Feb; 18(1):42-44. Chinese
- Yamaoka, M., Furusawa, K., Iguchi, K., Tanaka, M., Okuda, D. (1994). The assessment of fracture of the mandibular condyle by use of computerized tomography. Incidence of sagittal split fracture. *Br J Oral Maxillofac Surg*. Apr; 32(2):77-79.
- Ziccardi, V.B., Ochs, M.W., Braun, T.W. (1995). Management of condylar fractures in children: review of the literature and case presentations. *Compend Contin Dent Educ* XVI(9):874-888.
- Zide, M.F., Kent, J.N. (1983). Indications for open reduction of mandibular condyle fractures. *J. Oral Maxillofac Surg*;41:89-93.

CONSERVATIVE MANAGEMENT

- Exercise
 - Increasing mouth opening by pressing the jaw open with the fingers while simultaneously avoiding deviation
 - Push the jaws laterally with hands to restrict lateral movements
- Diet
 - Soft diet
- Analgesics
- Anti-inflammatory
- Soft diet and mouth exercises
 - when patient is able to bring their teeth into normal occlusion
 - assessment of mandibular excursions reveals normal findings
- Elastic MMF for 2-4 weeks
 - when occlusion is found to be altered
 - patient was unable to bring their teeth into normal occlusion presence of pain or swelling

PHYSIOTHERAPY

❖ **Occlusal guidance using elastic band**

- Patient not able to achieve consistent normal occlusion
→ use Class II light elastics on fractured side, retained for 6 days without removal till the next visit

Review after 6 days:

- Patient able to achieve consistent normal occlusion
→ elastics are allowed to be removed when brushing teeth and to replace it immediately after brushing. Withdraw elastics 24 hours before the next appointment
- Patient unable to achieve consistent normal occlusion
→ elastics to be worn 24 hours a day till next review

Review after 6 days:

- Occlusion maintainable
→ halt elastics
- Occlusion difficult to obtain
→ continue elastics until no longer necessary

❖ **Functional Exercises**

Suggested outcome criteria

- > 40 mm interincisal distance (adult)
- > 10 mm lateral excursion
- > 12 mm protrusion

Types of exercises

1. Maximal mouth opening
2. Right lateral excursion
3. Left lateral excursion
4. Protrusive action

Approach

- Achieve interincisal opening first
- Set a new goal each week e.g. increase mouth opening 5mm per week until 40mm. If not achievable use tongue spatula several times a day until goal is achieved. Do it slowly if patient is on elastics
- Maintain mandible in midline when opening mouth and during protrusion. If it deviates use palm to apply pressure on side of deviation
- Once goal for interincisal opening is achieved, then one can start with the lateral and protrusive movement
- For lateral and protrusive movement, try to achieve 2mm per week until maximum

LEVELS OF EVIDENCE SCALE AND GRADES OF RECOMMENDATIONS

The definitions of the types of evidence and the grading of recommendations used in this guideline originate from the U.S./Canadian Preventive Services Task Force.

LEVELS OF EVIDENCE

I	Evidence obtained from at least one properly randomized controlled trial
II - 1	Evidence obtained from well-designed controlled trials without randomization
II - 2	Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group
II - 3	Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence
III	Opinions of respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees

GRADES OF RECOMMENDATIONS

A	Requires at least one randomized controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation. (Evidence levels Ia, Ib)
B	Requires the availability of well conducted clinical studies but no randomized clinical trial on the topic of recommendation. (Evidence levels IIa, IIb)
C	Requires evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality. (Evidence level III)