RESEARCH PAPER

A Protocol-Driven Approach to Closed Management of Mandibular Condylar Fractures Using Elastic Dynamic Therapy: A Review Article and Case Report

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Abstract
Introduction: Elastic Dynamic Therapy (EDT) is an emerging conservative approach for the management of mandibular condylar fractures, providing stable occlusal guidance while permitting controlled mandibular movement.
Objective: To highlight the clinical versatility, biological advantages, and patient-centred benefits of EDT in the management of mandibular condylar fractures.
Case-Report Findings: Based on the reported cases, demonstrated predictable outcomes in both isolated paediatric condylar fractures and complex adult concomitant fractures involving the condyle with the body or symphysis. Patient-specific elastic traction vectors allow controlled correction of complex muscular forces while maintaining functional mandibular movement. Compared with open reduction and internal fixation (ORIF), Elastic dynamic therapy avoids surgical morbidity and may reduce the risk of prolonged temporomandibular joint stiffness associated with rigid intermaxillary fixation. The technique also facilitates oral hygiene and nutritional intake, while the easily removable elastics provide an additional safety advantage in emergency situations such as vomiting.
Conclusion: Elastic Dynamic Therapy represents a versatile, minimally invasive, and patient-centred treatment option for appropriately selected mandibular condylar fractures. It offers predictable occlusal and functional rehabilitation while avoiding many risks associated with surgical intervention and rigid fixation. Although ORIF remains indicated for severely displaced or unsuitable fractures, Elastic Dynamic Therapy should be considered a front-line treatment option in closed craniomaxillofacial trauma when clinically indicated.
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INTRODUCTION

Definition: A non-rigid closed reduction technique that employs specialized elastomeric traction vectors across maxilla and mandible arch bars or brackets.

Mechanism of Action: Instead of complete jaw locking, DET relies on the intrinsic restorative, adaptive, and compensatory capacity of the neuromuscular system and the TMJ.

The Biomechanical Advantage: It guides the patient's jaw into maximum intercuspation while allowing restricted, controlled functional movements. This dynamic micro-motion stimulates soft tissue stretching, bone remodeling, and rapid functional rehabilitation.

Fractures of the mandibular condyle represent one of the most common injuries involving the facial skeleton. Their management remains controversial because both surgical and conservative approaches have demonstrated favourable outcomes under appropriate clinical conditions.[1]

The principal objectives of treatment include restoration of occlusion, maintenance of mandibular function, preservation of ramal height, and prevention of temporomandibular joint dysfunction.[2]

Historically, closed treatment relied upon prolonged rigid maxillomandibular fixation (MMF). Although effective in stabilizing fractures, prolonged immobilization frequently resulted in restricted mouth opening, muscle stiffness, ankylosis, nutritional compromise, and patient discomfort. Dynamic elastic therapy was developed to overcome these limitations by permitting controlled mandibular movement during fracture healing while maintaining adequate occlusal guidance. This

protocol represents a shift from rigid immobilization toward functional rehabilitation. [3,4]

CASE REPORT: - A 37-year-old male patient visited Jaipur dental college and hospital with **Chief Complaint:** As Complete loss of normal biting alignment (acute post-traumatic malocclusion), severe pain localized to the lower jaw and left preauricular region, and traumatic fractures of the upper front teeth.

Mechanism of Injury: High-velocity, direct traumatic impact to the anterior mandible (symphysis/mental region).

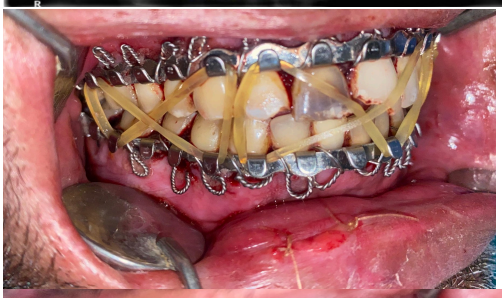
Medical History: No associated medical history was presented from patient.

RADIOGRAPHIC EXAMINATION: -

MOUTH -OPENING During OPD First time

Management: -

Phase I Implementation (Fixating Elastics Vector Design)- Heavy latex elastic bands (3/16inch, 6-oz) are hooked across the upper and lower lugs in a tight, crossed Figure-of-8 configuration.



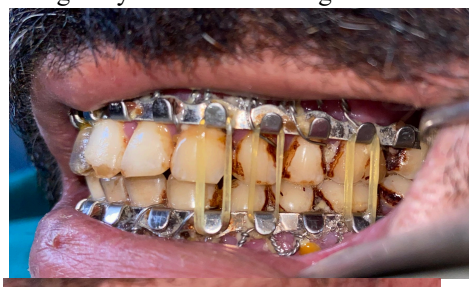
Custom Left-Side Traction Vector: A high-tension Class II elastic vector is placed on the left side (spanning from the mandibular molars to the maxillary premolars/canines).

Mechanical Goal: The Class II direction acts against the superior muscle pull, downward-tractioning the shortened left ramus back out to its anatomic vertical length.

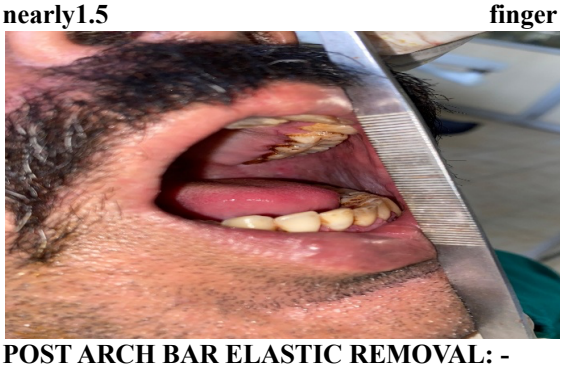
Anterior and Right Stabilization: Cross-crossed figure-of-8 bands are carried forward to lock the occlusion into centric alignment, preventing horizontal rotational shearing (yaw) across the fresh anterior symphysis miniplate.

Phase II (Guiding Phase - Weeks 2–4): The crossed Figure-of-8 bands are removed and replaced with parallel, uncrossed ¼-inch (6-oz) elastics. This maintains vertical height but permits a guarded, controlled functional mouth opening (<1 cm) for swallowing and speaking.

Phase III (Supportive Phase - Weeks 4–6): Elastics are simplified to neutral, vertical Class I bilateral orientations to stabilize the dental arch during early functional loading

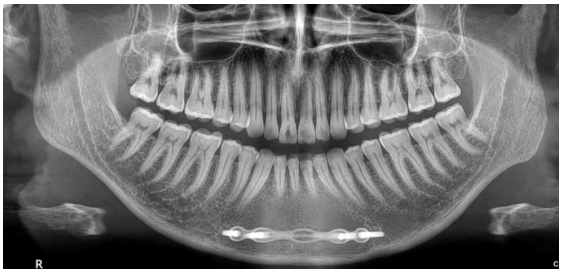


Post Treatment Mouth Opening was increased by nearly1.5 finger



POST ARCH BAR ELASTIC REMOVAL: -

POST TREATMENT RADIOGRAPH: -



Review For Protocols on Elastic Dynamic Therapy: -

Anatomy and Biomechanics

The mandibular condyle forms the superior articulation of the mandible with the temporal bone at the temporomandibular joint. It plays an essential role in mastication, speech, and mandibular growth. Fractures may involve:

- Condylar head (intracapsular)
- Condylar neck
- Sub condylar region

Displacement commonly results from contraction of the lateral pterygoid muscle, producing shortening of ramal height, malocclusion, mandibular deviation, and impaired mandibular function.[5]

Classification

Mandibular condylar fractures are commonly classified according to:

Anatomical location

- Intracapsular (condylar head)
- Condylar neck
- Subcondylar

Degree of displacement

- Nondisplaced
- Displaced
- Dislocated

Laterality

- Unilateral
- Bilateral

The degree of displacement significantly influences treatment planning.

Principles of Dynamic Elastic Therapy

Dynamic elastic therapy employs orthodontic elastics attached to arch bars or orthodontic brackets to provide controlled traction across the fracture.

Unlike rigid MMF, elastics:

- Maintain centric occlusion
- Permit limited mandibular movement
- Encourage early joint mobilization
- Preserve muscle activity
- Reduce risk of temporomandibular ankylosis
- Allow gradual correction of mandibular deviation

Elastic vectors can be modified during follow-up according to occlusal changes and mandibular function. [1-5]

Protocol for Dynamic Elastic Therapy

Kamel et al. proposed a standardized three-phase protocol.

Phase I: Fixating Elastics (Weeks 0–2)

Objectives:

- Re-establish centric occlusion
- Restore midline
- Prevent excessive mandibular movement

Protocol:

- Class II elastics on the fractured side
- Class I elastics on the opposite side
- Figure-of-eight heavy elastics
- Liquid diet

For severe displacement:

- Contralateral Class III elastics

For bilateral fractures:

- Bilateral Class II elastics

Phase II: Guiding Elastics (Weeks 2–4)

Objectives:

- Controlled functional movement
- Begin mandibular rehabilitation

Features:

- Smaller elastics
- Limited mouth opening (<1 cm)
- Blenderized diet
- Weekly reassessment

Phase III: Supportive Elastics (Weeks 4–6)

Objectives:

- Functional rehabilitation
- Muscle adaptation
- Final occlusal refinement

Protocol:

- Bilateral Class I elastics
- Soft diet
- Removal of arch bars after satisfactory healing

Patients not meeting clinical criteria remain in the previous phase until occlusion normalizes. [1,6,7]

Indications

Dynamic elastic therapy is indicated in:

- Minimally displaced fractures
- Moderately displaced unilateral fractures
- Intracapsular fractures
- Pediatric condylar fractures
- Patients unsuitable for surgery

- Cooperative patients capable of attending follow-up

Contraindications

Closed treatment may be unsuitable in:

- Grossly displaced fractures
- Lateral extracapsular dislocation
- Bilateral fractures with severe open bite
- Comminuted condylar fractures
- Edentulous patients
- Patients unable to comply with therapy

Advantages

Compared with conventional MMF, dynamic elastic therapy offers:

- Early mandibular mobilization
- Improved patient comfort
- Better oral hygiene
- Reduced muscle atrophy
- Lower risk of TMJ ankylosis
- Preservation of mandibular function
- Avoidance of facial nerve injury
- No external surgical scar
- Lower treatment cost
- Shorter immobilization period

Limitations

Potential disadvantages include:

- Dependence on patient compliance
- Frequent clinical follow-up
- Technique-sensitive elastic placement
- Possible malocclusion if protocol is not followed
- Limited evidence from large randomized trials

Discussion based on Case Report:-

Kamel et al. treated six patients using the dynamic elastic protocol. Despite variations in fracture severity, all patients achieved:

- Stable centric occlusion
- Resolution of mandibular deviation
- No facial asymmetry
- No TMJ pain
- Average treatment duration of six weeks

One patient required temporary return to a previous treatment phase before progressing successfully.

A 2017 systematic review concluded that no standardized protocol existed for closed treatment and emphasized the need for reproducible conservative management strategies. Dynamic elastic therapy directly addresses this gap by providing a structured, phased protocol.

More recently, a randomized controlled trial comparing conventional static elastics with dynamic elastic therapy found improved functional outcomes and patient satisfaction with dynamic elastic therapy, supporting its increasing role in conservative management of unilateral sub condylar fractures.

Comparison Between Dynamic Elastic Therapy and ORIF

Parameter	**Dynamic Elastic Therapy**	**ORIF**
Surgical procedure	No	Yes
Facial scar	None	Possible
Facial nerve injury	None	Possible
Hospital stay	Short	Longer
Early jaw movement	Yes	Yes
Cost	Lower	Higher
Occlusal correction	Gradual	Immediate
Risk of ankylosis	Low	Low
Best indication	Mild–moderate fractures	Severely displaced/dislocated fractures
Surgical procedure	No	Yes

Future Perspectives

Future research should focus on:

- Multicenter randomized controlled trials
- Long-term TMJ functional outcomes
- Digital planning of elastic vectors
- Integration with CAD/CAM splints
- Patient-reported quality-of-life outcomes [1,4,8]

DISCUSSION

EDT is a vital treatment therapy when it comes to condylar fractures, specially during planning treatment plan.

Clinical Outcomes Reported in Articles Related to Dynamic Elastic Therapy and Functional Management of Mandibular Condylar Fractures

Important: Dynamic elastic therapy as a specifically named, staged protocol is directly evaluated mainly in the Kamel and Lesko reports and in later comparative dynamic-IMF studies. Several other papers below concern broader conservative versus surgical management and therefore do not report outcomes of the exact Kamel protocol.

Researcher / year	Article	Study type / patients	Reported clinical outcomes	Article-specific conclusion
Kamel GN et al., 2019	Establishing a Protocol for Closed Treatment of Mandibular Condyle Fractures with Dynamic Elastic Therapy	Prospective case series; adult patients with intracapsular or extracapsular, displaced or dislocated condylar fractures treated with a staged elastic protocol.	At completion of treatment, all reported patients had objective centric occlusion. None reported subjective malocclusion, chin deviation, facial asymmetry or temporomandibular-joint pain. The protocol permitted progressive mandibular movement while elastics were adjusted according to occlusion.	The authors considered the staged dynamic elastic protocol safe and effective for selected condylar fractures, while acknowledging that the evidence was preliminary and based on a small series.
Lesko RP et al., 2019	The Management of a Pediatric Condylar Fracture With Dynamic Elastic Therapy	Pediatric case report.	Dynamic elastics restored and guided occlusion while allowing early mandibular mobility. The child completed treatment without the prolonged immobilization associated with rigid maxillomandibular fixation, and satisfactory functional and occlusal recovery was reported.	Dynamic elastic therapy was presented as a useful pediatric option because it can guide occlusion, preserve mobility and reduce discomfort; however, this was a single case and does not establish comparative superiority.
Khiabani KS et al., 2021	Does Dynamic Intermaxillary Fixation With Elastics Improve Outcomes Following Unilateral Condylar Fracture?	Randomized clinical study comparing dynamic elastic IMF with a more conventional rigid/static IMF approach in unilateral condylar fractures.	The dynamic group showed better tolerance and superior early functional and clinical recovery, particularly mandibular movement and mouth opening during the treatment period. Fracture healing and occlusal control remained acceptable.	Dynamic IMF was more tolerable and produced better early functional outcomes than rigid immobilization, supporting controlled mobility rather than prolonged complete fixation.
Vanpoecke J et al., 2020	Condylar Fractures: An Argument for Conservative Treatment	Retrospective clinical follow-up of conservatively treated condylar fractures.	Most patients achieved satisfactory occlusion and functional recovery after conservative treatment, but some residual limitation of mandibular movements, deviation, pain or radiographic deformity could persist. Outcomes varied with fracture pattern and patient factors.	Conservative management can yield acceptable long-term clinical results in properly selected patients, especially when early functional rehabilitation and follow-up are provided.
Alyahya A et al., 2020	Mandibular Condylar Fracture: A Systematic Review of Systematic Reviews and a Proposed Algorithm for Management	Umbrella review; no new patient cohort.	Across included reviews, open treatment generally showed advantages for selected displaced fractures in parameters such as mandibular movement, ramal height, occlusion and pain, but evidence quality and study heterogeneity limited certainty. Closed treatment remained appropriate for many minimally displaced or functionally stable fractures.	Treatment should be individualized using displacement, feasibility of fixation, restoration of occlusal/joint function, healing potential and patient-related factors. This paper provides an algorithm, not a direct clinical trial outcome.
Cabral LC et al., 2020	Changes in Mandibular and Articular Dynamics Associated With Surgical Versus Nonsurgical Treatment of Mandibular Condylar Fractures: A Systematic Review and Meta-analysis	Systematic review and meta-analysis; no new patient cohort.	Pooled evidence suggested that surgical treatment may improve some functional variables in displaced fractures, including mandibular excursions and reduction of certain long-term dysfunctions. However, results differed among studies, and nonsurgical treatment still produced acceptable outcomes in appropriately selected fractures.	ORIF may provide functional benefit in displaced fractures, while nonsurgical management remains reasonable for fractures with preserved occlusion and limited displacement.
Spetsotaki C et al., 2021	Functional Appliance Treatment for Mandibular Fractures: A Systematic Review With Meta-analysis	Systematic review of functional-appliance treatment; predominantly growing patients.	Functional appliances were associated with improvement in mandibular function, occlusion and condylar remodeling. Reported outcomes were generally favorable, but protocols, follow-up periods and outcome measures were inconsistent.	Functional treatment may support remodeling and function, particularly in younger patients, but the certainty of evidence was low and better controlled studies were required.
Zide LH and Kent JN, 1983	Indications for Open Reduction of Mandibular Condyle Fractures	Foundational clinical guidance article, not an elastic-therapy trial.	The article did not report a standardized dynamic-elastic cohort; its clinical contribution was to identify absolute and relative indications for open reduction, thereby implying that closed treatment when closed treatment would be inappropriate.	Open reduction was recommended for displaced condylar fractures with entry into the middle cranial fossa, inability to obtain adequate occlusion by closed means, lateral extracapsular displacement and certain foreign-body situations.
Konstantinovic VS and Dimitrijevic B, 1992	Surgical Versus Conservative Treatment of Unilateral Condylar Process Fractures: Clinical and Radiographic Evaluation of 80 Patients	Comparative clinical study.	Both groups could obtain acceptable clinical function, but surgical treatment provided better anatomic reduction in markedly displaced fractures. Conservative treatment was followed by greater radiographic deformity, although satisfactory function was still possible in selected cases.	Treatment choice should depend on displacement and functional disturbance; marked displacement favors surgery, whereas properly selected displaced fractures can be managed conservatively.
Ellis E III and collaborators, 1990s–2000s	Series of clinical studies comparing open and closed treatment of mandibular condylar fractures	Multiple cohort and comparative studies rather than one single EDT article.	Across the series, open treatment generally produced more accurate restoration of ramal height and facial symmetry and less persistent malocclusion in displaced fractures. Closed treatment usually avoided operative morbidity but could be associated with deviation, shortening and occlusal adaptation.	These studies strengthened the indication for ORIF in substantially displaced adult fractures, while still recognizing a role for closed functional treatment in selected cases.

As shown in above table, various studies has been conducted which includes literature review, case reports as well as series of case reports were specified clinical outcomes are mentioned and is directly corelating with present review as well as case report.[8,9,10]

Management of mandibular fractures, particularly fractures involving the condylar region, remains challenging because treatment must restore mandibular continuity while preserving occlusion, mandibular function, and temporomandibular joint mobility. The choice between conservative, functional, and surgical approaches continues to depend on the fracture pattern, degree of displacement, occlusal disturbance, patient-related factors, and the clinician's experience. [9]

In this context, elastic dynamic therapy provides a functional approach in which controlled elastic forces are used to guide mandibular movement and assist in restoration and maintenance of an acceptable occlusal relationship.

The principal advantage of elastic dynamic therapy is that it combines **occlusal guidance with early functional movement**. Conventional rigid intermaxillary fixation can provide effective immobilization but may restrict mandibular movement for a prolonged period and can contribute to patient discomfort, difficulty in maintaining oral hygiene, nutritional limitations, and reduced temporomandibular joint mobility. Functional treatment using elastics, in contrast, permits controlled mandibular excursions while maintaining the occlusion within a therapeutically desirable range. This concept is particularly relevant in condylar fractures, where prolonged immobilization may adversely affect joint function and mandibular range of motion.[10]

The biological rationale for functional management of condylar fractures is supported by the adaptive capacity of the mandibular condyle and surrounding musculoskeletal structures. Following injury, remodeling of the condylar region may occur, and functional loading can contribute to restoration of mandibular movement. However, remodeling should not be interpreted as an indication that every displaced condylar fracture can be treated conservatively. The extent of displacement, loss of ramus height, occlusal derangement, bilateral involvement, associated mandibular fractures, and functional limitations must be considered when selecting treatment. The literature therefore supports an individualized rather than a universally conservative treatment strategy.

Elastic therapy may be particularly useful during the early postoperative or post-injury period when the primary objective is to establish a reproducible occlusal relationship without completely eliminating functional movement. Elastics can be positioned according to the direction of mandibular deviation and the desired occlusal correction. Their force can subsequently be reduced or modified as the patient's occlusion and mandibular movements improve. This dynamic character distinguishes elastic therapy from purely immobilizing methods and allows treatment to be adjusted according to the patient's clinical response.[11]

An important outcome in the management of condylar fractures is **maximum mouth opening**. Restriction of mouth opening may result from pain, muscular spasm, edema, mechanical interference, or prolonged immobilization. Early controlled exercises and progressive reduction of elastic guidance can help prevent persistent limitation of mandibular movement. Previous clinical studies of functional treatment have reported satisfactory recovery of mouth opening and mandibular excursions in appropriately selected patients. Nevertheless, recovery is influenced by fracture severity, age, associated injuries, compliance with exercises, and duration of treatment, and therefore mouth opening should be assessed serially rather than at a single postoperative time point.

Occlusal stability is another critical parameter. The immediate objective of elastic guidance is not necessarily anatomical repositioning of every fracture fragment but restoration of a functional and stable occlusion. In condylar fractures treated without open reduction, a degree of radiographic displacement may persist despite satisfactory clinical function. Several studies have demonstrated that clinical outcomes do not always correlate directly with the radiographic position of the condyle. Consequently, evaluation should incorporate occlusion, range of movement, pain, mandibular deviation, and patient-reported function in addition to radiographic findings.[12]

The use of dynamic elastics may also reduce some of the morbidity associated with prolonged rigid fixation. Patients can potentially maintain better oral hygiene and nutritional intake, and the ability to remove or adjust elastics can facilitate supervised

physiotherapy. However, the success of this approach is highly dependent on **patient compliance**. Inadequate elastic use, failure to perform prescribed exercises, premature discontinuation of treatment, or inappropriate elastic positioning may result in persistent malocclusion or restricted movement. Thorough patient education and regular clinical review are therefore essential components of elastic dynamic therapy.[13]

Al-Moraissi and Ellis championed open treatment citing superior functional outcomes which were in accordance with the present treatment in case report.[14.]

Along with these considerations, fracture location is important to selection of therapy as intracapsular fracture exposure is more difficult and bears increased risk for facial nerve injury.

Delaire, Le Roux, and Tulasne[15] emphasized the importance of very early mandibular mobilization and anterior positioning following condylar and subcondylar fractures. Their approach used intermaxillary traction followed by functional rehabilitation, with the objective of restoring mandibular movement while maintaining an appropriate occlusal relationship.

Similarly, **Schettler and Rehrmann**[16] described long-term results using a functional traction technique in 23 patients with condylar fractures. Their method used a modifiable rubber traction system to reposition the mandible and restore occlusion while allowing mandibular opening.

Hennig et al.[17] reviewed functional orthodontic therapy for mandibular condylar fractures and highlighted the potential of functional treatment to influence both functional and morphological outcomes.

There are certain guidance's for both open and closed treatment of adult condylar fractures which has to be considered before, during and after the treatment.

Conclusion

Dynamic elastic therapy represents a significant advancement in the conservative management of mandibular condylar fractures. The protocol developed by Kamel et al provides a structured, reproducible method that combines stable occlusal guidance with controlled mandibular movement. Current evidence suggests excellent functional outcomes, restoration of occlusion, reduced complications, and high patient satisfaction in carefully selected cases. Although ORIF remains the preferred treatment for severely displaced fractures, dynamic elastic therapy has become an important evidence-based alternative for appropriate patients.

Based on Case Report: -

- Versatility: DET is highly predictable for both single-site pediatric fractures and complex, multi-site adult concomitant fractures (condyle + body/symphysis).
- Biological Excellence: By utilizing patient-specific elastic traction vectors, DET addresses complex muscle pulls, avoids the surgical risks of ORIF, and eliminates the long-term joint stiffness caused by rigid wire loops.
- Patient Centric: Maximizes nutritional intake, simplifies oral hygiene, offers a non-surgical escape route in emergency situations (elastics can be easily cut if vomiting occurs), and yields high patient satisfaction.

➢ DET should be considered a front-line approach in closed craniomaxillofacial trauma management wherever indicated.

References

1. Kamel GN, De Ruiter BJ, Baghdasarian D, Mostafa E, Levin A, Davidson EH. Establishing a protocol for closed treatment of mandibular condyle fractures with dynamic elastic therapy. *Plast ReconstSurg Glob Open*. 2019;7(12): e2506.
2. Rozeboom AVJ, Dubois L, Bos RRM, Spijker R, de Lange J. Closed treatment of unilateral mandibular condyle fractures in adults: a systematic review. *Int J Oral Maxillofacial Surg*. 2017;46(4):456–464.
3. Oikarinen K., Ignatius E., Kauppi H., Silvennoinen U. Mandibular fractures in Northern Finland in the 1980s—A 10-year study. Br. J. Oral Maxillofacial. Surg. 1993; 31:23–27. doi: 10.1016/0266-4356(93)90092-B
4. Schienbein H. Treatment of temporomandibular fractures with an activator (II). Quintessence Int Dent Dig. 1977 Jul;8(7):9-18. PMID: 270107.
5. Snyder SK, Cunningham LL Jr. The biology of open versus closed treatment of condylar fractures. *Atlas Oral Maxillofacial Surg Clin North Am*. 2017; 25:35–46.
6. Bhagol A, Raj N, Dahiya A, Singh V, Chikara D, Britto A. Comparative evaluation of conventional (static) versus dynamic elastic therapy for closed treatment of unilateral mandibular sub-condylar fractures: a randomized controlled trial. *J Maxillofacial Oral Surg*. 2025;24(6):1630–1641.
7. Shiju M, Rastogi S, Gupta P, Sharma A, Singh VP. Fractures of the mandibular condyle: open versus closed—a treatment dilemma. *J Craniomaxillofacial Surg*. 2015; 43:448–451.
8. Li J, Yang H, Han L. Open versus closed treatment for unilateral mandibular extracapsular condylar fractures: a meta-analysis. *J Craniomaxillofacial Surg*. 2019; 47:1110–1119.

9. Zide MF, Kent JN. Indications for open reduction of mandibular condyle fractures. *Journal of Oral and Maxillofacial Surgery*. 1983;41(2):89–98.
10. Ellis E 3rd, Throckmorton GS. Facial symmetry after closed and open treatment of fractures of the mandibular condylar process. *Journal of Oral and Maxillofacial Surgery*. 2000;58(7):719–728.
11. Eckel U, Schneider M, Erasmus F, et al. Open versus closed treatment of fractures of the mandibular condylar process—a prospective randomized multi-centre study. *Journal of Cranio-Maxillofacial Surgery*. 2006;34(5):306–314.
12. Haug RH, Assael LA. Outcomes of open versus closed treatment of mandibular sub condylar fractures. *Journal of Oral and Maxillofacial Surgery*. 2001;59(4):370–375.
13. Villarreal PM, Monje F, Junquera LM, Mateo J, Morillo AJ, Serra I. Mandibular condyle fractures: determinants of treatment and outcome. *Journal of Oral and Maxillofacial Surgery*. 2004;62(2):155–163.
14. Al-Moraissi EA, Ellis E 3rd. Surgical treatment of adult mandibular condylar fractures provides better outcomes than closed treatment: a systematic review and meta-analysis. J Oral Maxillofacial Surg. 2015; 73:482–493.
15. Delaire J, Le Roux J, Tulasne JF. Le treatment functional des fractures du condyle mandibulaire et de son col [Functional treatment of fractures of the mandibular condyle and its neck]. Rev Stomatal Chir Maxillofac. 1975 Jun;76(4):331-50. French. PMID: 1057237.
16. Schettler D, Rehmann A. Long-term results of functional treatment of condylar fractures with the long bridle according to A. Rehrmann. J Maxillofacial Surg. 1975 Mar;3(1):14-22.
17. Hennig CL, Krause F, Nitzsche A, Tolksdorf K, Reise M, Kranz S, Dederich's M, Schultze-Mosgau S, Jacobs C. Functional Orthodontic Therapy for Mandibular Condyle Fracture: A Systematic Review. Medicina (Kaunas). 2024 Aug 16;60(8):1336.