FACIAL TRAUMA

VOLUME IV

Restoring the Mandible

Occlusion, continuity, ramal height, and temporomandibular function

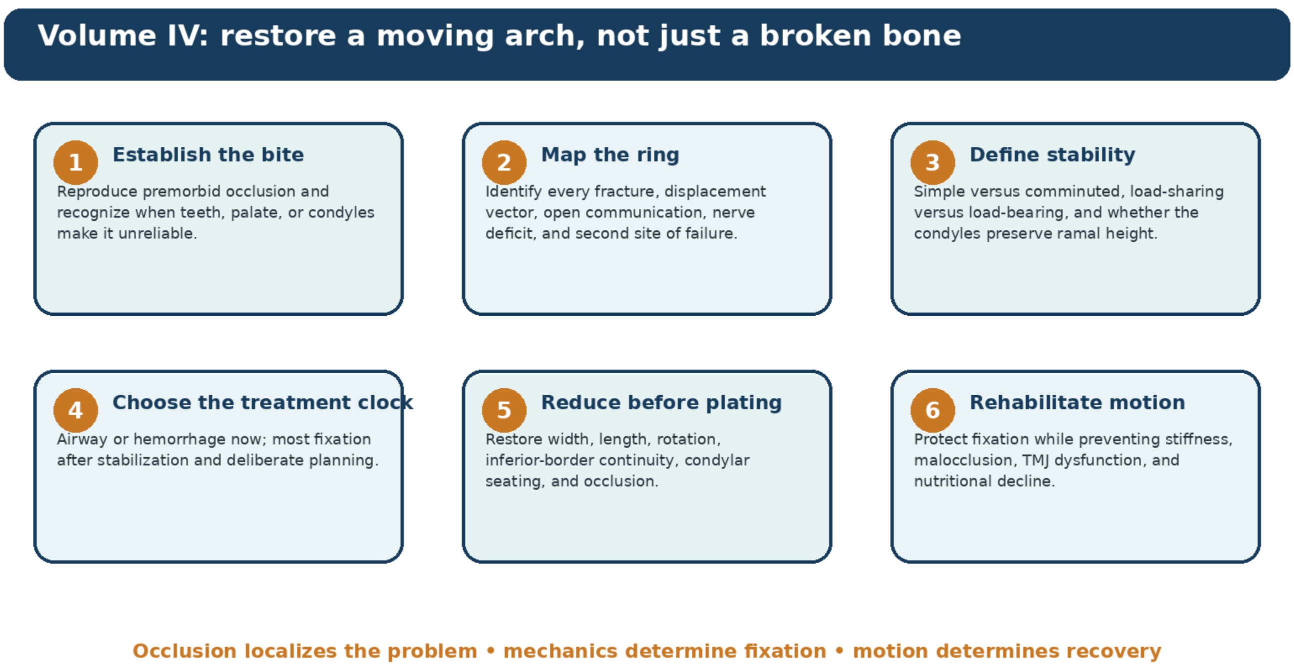

Figure 0.1. Volume IV moves from the patient's bite and fracture map to mechanical stability, anatomic reduction, and functional rehabilitation.

CENTRAL QUESTION

How do you restore a mobile lower facial arch when trauma has disrupted occlusion, mandibular continuity, transverse width, ramal height, nerve function, and one or both temporomandibular joints?

Resident-level study guide • Prepared July 2026

How to Use This Volume

Volume IV treats the mandible as a dynamic system. The lower jaw is simultaneously a U-shaped ring, the mobile half of the occlusal apparatus, an airway-supporting platform, and a pair of joints. A fracture therefore cannot be understood from its location alone. The resident must determine what happened to the bite, width, length, ramal height, condylar position, nerve, teeth, and soft-tissue envelope.

The guide begins with first-principles anatomy, occlusion, examination, imaging, and biomechanics. It then applies those principles to anterior, body, angle, ramus, and condylar fractures before integrating approaches, postoperative rehabilitation, complications, and oral-board cases. The repeated question is not "which plate?" but "what load must this construct carry, and how will I prove the jaw is correct?"

SCOPE
Volume III introduced dentoalveolar trauma and the maxillary dental platform. This volume revisits teeth only as they affect mandibular reduction, infection, and long-term vitality. Complex ballistic soft-tissue loss belongs in Volume V, and full panfacial sequencing belongs in Volume VI.

Learning objectives

- Use occlusion, mandibular motion, palpation, and CT to localize injury and identify additional fracture sites.
- Explain tension, compression, torsion, muscle displacement, and ring behavior before selecting fixation.
- Match load-sharing or load-bearing fixation to simple, comminuted, infected, atrophic, and segmental injuries.
- Manage teeth, open communication, prophylaxis, oral hygiene, and timing without applying universal dogma.
- Plan anterior, body, angle, ramus, and multiple-fracture reduction from reliable occlusal and skeletal references.
- Compare closed functional treatment and ORIF for condylar injuries by level, function, rehabilitation, and operative cost.
- Choose the least morbid exposure that permits reduction, safe fixation, and independent verification.
- Recognize malocclusion, infection, nonunion, hardware failure, nerve injury, and TMJ dysfunction.

EVIDENCE CALIBRATION
Fixation principles are durable, but many details remain pattern- and surgeon-dependent. A 2026 meta-analysis limited to condylar-head fractures found small functional advantages with ORIF, but the certainty was low to very low. A 2025 evidence analysis found that common numeric ORIF thresholds remain weakly supported. This guide therefore emphasizes function, reducibility, ramal height, fracture level, rehabilitation capacity, and patient factors rather than a single cutoff.[7,8]

Abbreviations

Abbreviation	Meaning	Clinical role
IAN	Inferior alveolar nerve	Sensation to mandibular teeth and lower lip; course influences symptoms and screw placement.
MMF	Maxillomandibular fixation	Reproduces occlusion during reduction or supports closed/functional treatment.
ORIF	Open reduction and internal fixation	Direct reduction with stable fixation.
TMJ	Temporomandibular joint	Condylar articulation governing ramal height and mandibular motion.
MIO	Maximum interincisal opening	Practical measure of postoperative and rehabilitative function.
CR	Closed reduction / treatment	Occlusal guidance and functional rehabilitation without direct fracture exposure.

Contents

How to Use This Volume 2
Scope, objectives, evidence calibration, and abbreviations

1 **The Mandible as a Moving Ring** 4
Anatomy, airway, dental arch, paired joints, and injury patterns

2 **Occlusion, Examination, and Imaging** 6
Localization, documentation, CT review, teeth, nerve, and second fractures

3 **Initial Management and the Treatment Clock** 8
Airway, open fractures, antibiotics, teeth, timing, observation, and disposition

4 **Fixation Biomechanics and MMF** 10
Load sharing, load bearing, reduction, construct selection, and MMF safety

5 **Symphysis, Parasymphysis, and Body** 12
Transverse width, torsion, IAN protection, atrophy, and sequencing

6 **Angle and Ramus Fractures** 14
Muscle vectors, third molars, coronoid, comminution, and approaches

7 **Condylar Process and Head Fractures** 15
Fracture level, open versus closed care, pediatrics, and rehabilitation

8 **Operative Approaches and Technical Decisions** 17
Exposure, nerve and salivary risk, screw safety, and verification

9 **Postoperative Care and Complications** 19
Occlusion, diet, infection, nonunion, nerve injury, and TMJ recovery

10 **Integrated Cases and Final Workflow** 21
Oral-board reasoning across isolated, multiple, and complex fractures

A-E **Practical Appendices** 25
CT, examination, operative, postoperative, and oral-board tools

References and Figure Credits 26
Linked sources and image attribution

CHAPTER 1

The Mandible as a Moving Ring

CENTRAL QUESTION
What must the normal mandible preserve before a fracture can be understood?

OPENING CASE
A patient falls onto the chin. The only obvious laceration is anterior, yet the bite is open posteriorly and both preauricular regions are tender. The injury is not confined to the point of impact.

The mandible is the strongest facial bone, but it is mechanically exposed. It has no rigid bony attachment to the cranial base. Instead, a U-shaped tooth-bearing arch is suspended by muscles and articulates through two condyles. Force applied at one point can therefore fracture the impact site, propagate around the ring, or fail at one or both condylar necks.

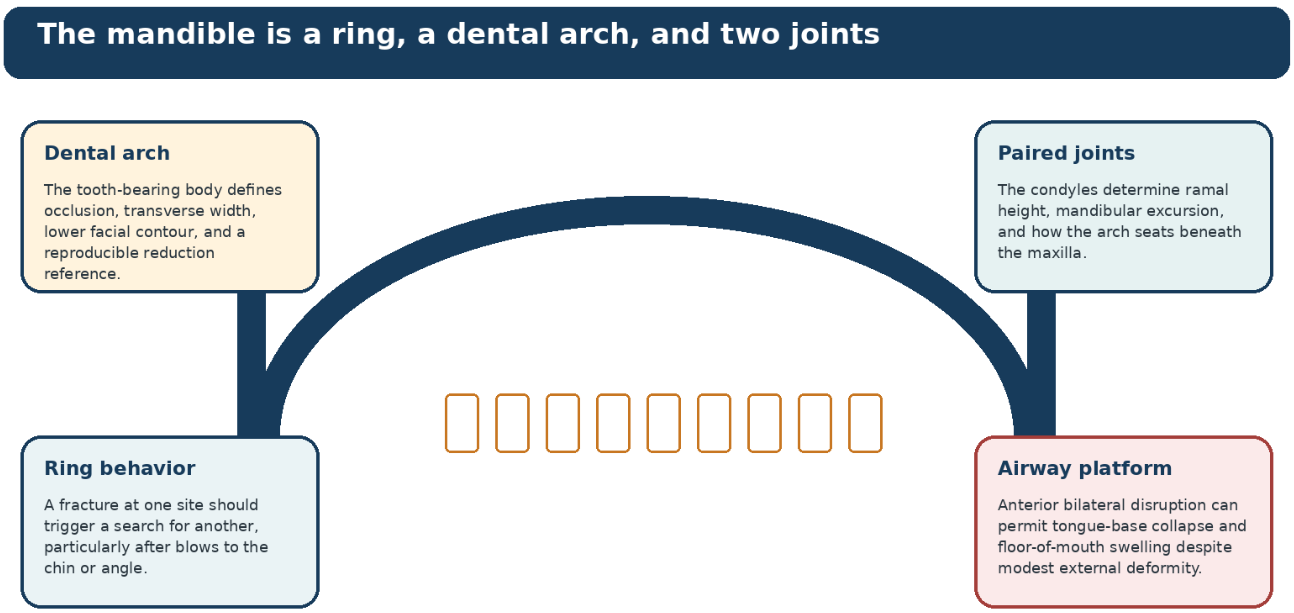

Figure 1.1. The mandible functions simultaneously as a dental arch, a structural ring, an airway-supporting platform, and a pair of joints.

Regional anatomy that changes management

The symphysis and parasymphysis form the chin and anterior dental arch. The mental foramina usually lie near the premolars, where the IAN exits as the mental nerve. Posteriorly, the body transitions through the angle into the ramus. The coronoid receives the temporalis insertion; the condylar process supports the TMJ and receives the lateral pterygoid. The mandibular canal carries the IAN and vessels through the ramus and body.

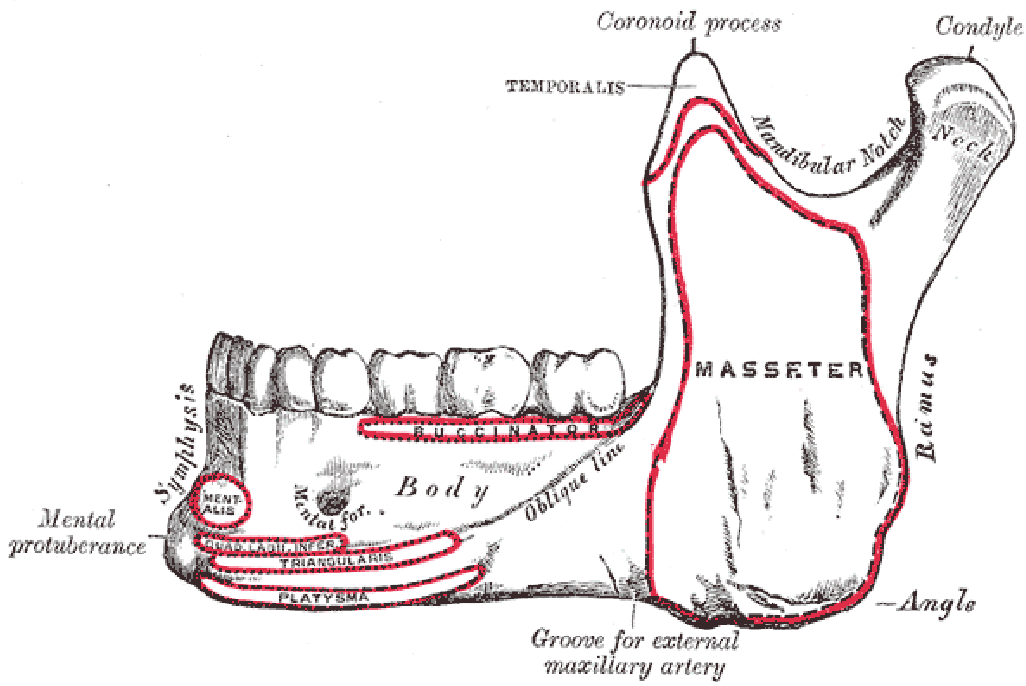

Figure 1.2. Lateral mandibular anatomy and major muscle attachments. The fracture's relationship to teeth, mental foramen, angle, coronoid, condyle, and muscle vectors matters clinically. Source: Henry Vandyke Carter / Gray's Anatomy, public domain, via Wikimedia Commons.

The airway consequence

Most isolated mandibular fractures do not obstruct the airway, but selected patterns can. Bilateral anterior fractures may detach the genial segment and permit posterior tongue-base displacement. Floor-of-mouth hematoma, bleeding, pain, edema, teeth, and intoxication can compound the problem. A patient who is sitting forward and suctioning constantly may deteriorate when sedated or placed supine.

Ring behavior and the second fracture

Force transmission varies with impact point and direction, dentition, and local bone weakness. A chin impact should prompt a search for symphyseal and unilateral or bilateral condylar injury. A lateral body or angle impact can pair a local fracture with a contralateral condylar, body, or symphyseal fracture. Mechanism directs the search; it does not predict the second fracture. Once one fracture is found, inspect the entire arch and both joints.[1-3]

Table 1.1. Mechanism guides the search pattern; it does not replace examination or CT.

Impact / pattern	Likely second injury	Why it occurs
Chin impact	One or both condyles	Force travels posteriorly through the rami toward the condylar necks.
Lateral body / angle impact	Contralateral condyle, body, or symphysis	Force propagates around the arch; vector, dentition, and third-molar anatomy influence failure.
Symphysis + bilateral condyles	Transverse widening	Loss of posterior constraint permits the lingual cortex to open.
High-energy body injury	Comminution or segmental defect	The bone cannot share load reliably and soft-tissue injury may dominate biology.

CLINICAL BRIDGE
The lower jaw can appear locally aligned while global width, condylar position, or occlusion is wrong. Always evaluate the whole ring.

RESIDENT SYNTHESIS
A mandibular fracture is failure of a moving system: airway support, arch continuity, transverse dimension, paired ramal height, nerve function, and joint motion must all be accounted for.

CHAPTER 2

Occlusion, Examination, and Imaging

CENTRAL QUESTION
How does the resident localize the injury before choosing treatment?

OPENING CASE
A patient reports that “the teeth do not meet.” The radiology report names a left body fracture. Examination shows right preauricular pain and deviation to the right on opening—evidence of a second injury that changes the plan.

Malocclusion is a localization test

Ipsilateral premature contact	**Contralateral open bite**	Ipsilateral condylar shortening or displacement
Anterior open bite	**Posterior premature contact**	Bilateral condylar shortening or bilateral posterior fractures
Crossbite / widened arch	**Lingual symphyseal gap**	Symphysis + bilateral condylar injury
Midline step / local open bite	**Segmental mobility**	Tooth-bearing body, parasymphysis, or dentoalveolar fracture
Deviation on opening	**Toward injured side**	Unilateral condylar dysfunction or mechanical restriction
No obvious bite change	**Persistent pain / numbness**	Nondisplaced fracture still possible; examine and image

Figure 2.1. Common occlusal and motion patterns can localize condylar, bilateral posterior, widened anterior, and tooth-bearing injuries.

Occlusion is the most sensitive functional clue

Ask the patient whether the bite feels different before manipulating the jaw. Inspect dental midlines, overjet, overbite, anterior and posterior contacts, open bite, crossbite, premature contact, fractured restorations, dentures, and wear facets. The goal is not to create an ideal orthodontic bite; it is to reproduce the patient’s premorbid relationship.

A bite may be unreliable because of preexisting malocclusion, missing teeth, poor dentition, a maxillary fracture, a palatal split, bilateral mandibular fractures, condylar displacement, or altered consciousness. State that uncertainty explicitly and seek collateral references such as photographs, dental records, dentures, or prior imaging.

A reproducible examination

- Inspect lower facial width, chin deviation, lacerations, drooling, bleeding, and floor-of-mouth swelling.
- Palpate the entire inferior border, symphysis, body, angle, rami, and both preauricular regions.
- Test segmental mobility gently; document gingival laceration, sublingual ecchymosis, exposed bone, and tooth-bearing instability.
- Account for every tooth and document baseline mobility, caries, fractures, avulsion, and dentures.
- Map V3 sensation before local anesthetic or surgery, especially lower-lip and chin numbness.
- Measure mouth opening when safe; observe deviation, lateral excursion, protrusion, and mechanical block.
- Reassess after analgesia, sobriety, extubation, or improved cooperation if the initial examination is limited.

Imaging strategy

Thin-cut maxillofacial CT is the usual cross-sectional study in modern facial trauma and should be reviewed in axial, coronal, and sagittal planes. A panoramic radiograph provides an efficient overview of the dental arch and fracture line but can miss displacement in the third dimension and may be unavailable or technically limited in acute trauma. Cone-beam CT can be useful in selected stable patients. Three-dimensional reconstructions help communicate global pattern and width but do not replace multiplanar review.

Figure 2.2. Panoramic radiograph showing a minimally displaced right mandibular body fracture. Note the local occlusal separation adjacent to the fracture.

Table 2.1. A systematic mandibular CT review.

CT pass	Questions
Dental arch	Where is the fracture relative to roots, sockets, mental foramina, and the mandibular canal?
Inferior border	Is there translation, rotation, a lingual gap, comminution, or segmental loss?
Angles / rami	Is the fracture favorable or unfavorable? Is there third-molar involvement or muscle displacement?
Condyles	Head, neck, or base? Angulation, medial displacement, dislocation, shortening, intracranial or EAC extension?
Whole ring	Is there a second fracture, widening, asymmetry, or a maxillary injury that alters occlusion?
Soft tissue	Floor-of-mouth hematoma, emphysema, foreign body, tooth aspiration risk, or vascular concern?

DIAGNOSTIC TRAP

A nondisplaced fracture can preserve apparent occlusion. Conversely, a dramatic CT displacement does not explain the bite until condylar seating, dental contacts, and the rest of the ring are assessed.

RESIDENT SYNTHESIS

Examination and imaging should produce a functional injury map: fracture sites, displacement, occlusion, transverse width, condylar position, teeth, IAN status, open communication, and examination reliability.

CHAPTER 3

Initial Management and the Treatment Clock

CENTRAL QUESTION
What must happen now, what can wait, and which routine practices are actually evidence-based?

Airway, bleeding, and immediate stabilization

Secure the airway when the patient cannot protect it, cannot handle secretions, has progressive floor-of-mouth or tongue-base swelling, uncontrolled hemorrhage, severe bilateral anterior instability, or requires airway control for associated injuries. Remove loose teeth or foreign bodies only when they pose an immediate aspiration risk and can be retrieved safely. Direct pressure, suction, temporary wound control, and correction of coagulopathy usually precede definitive fracture fixation.

Open fracture is contamination, not infection

A tooth-bearing fracture that communicates through the periodontal ligament, mucosa, or skin is open and contaminated, but contamination is not established infection. Current adult-trauma guidance limits prophylaxis for open mandible fractures to 24 hours or less and recommends none for closed nonoperative fractures. Longer therapy is reserved for purulence, cellulitis or abscess, osteomyelitis, systemic infection, or another therapeutic indication. Antibiotics do not replace irrigation, debridement, tooth source control, or stable reduction and fixation.[5,6]

EVIDENCE AND OPEN-WOUND CHECK
These are prophylaxis limits, not infection-treatment durations. Select the agent by protocol, allergy, contamination, oral flora, and stewardship. Irrigate, remove foreign material, preserve viable periosteal attachments, debride nonviable tissue, and assess tetanus vaccine and immune-globulin needs by wound and immunization history.[5,18]

Teeth in the fracture line

A tooth is not removed merely because the fracture crosses its socket. Retention can preserve occlusion and bone. Extraction is favored when the tooth is nonrestorable, grossly mobile, infected, fractured through the root, has severe periodontal disease, lies in a comminuted fragment with poor viability, or physically prevents reduction. The decision should be documented because either unnecessary extraction or retention of a diseased tooth can compromise the result.

Table 3.1. Teeth in and around mandibular fractures.

Finding	Usual implication	Caveat
Healthy stable tooth in line	Often retain	Monitor vitality and periodontal status.
Root fracture / nonrestorable crown	Often remove	Coordinate timing so extraction does not destabilize reduction.
Periapical infection or gross caries	Strong removal consideration	Treat established infection, not merely contamination.
Third molar at angle fracture	Individualize	Do not remove automatically; consider interference, infection, and fracture stability.
Avulsed / missing tooth	Account for it	Consider airway, chest, or GI imaging when aspiration/ingestion is plausible.

Timing and disposition

Most mandibular fractures are urgent reconstructive problems rather than minute-to-minute emergencies. Timing depends on airway, physiology, contamination, swelling, associated injuries, access to expertise, and the ability to maintain nutrition and hygiene. Evidence does not support a universal hour cutoff. Delay becomes problematic when it permits infection, fibrosis, malocclusion, nutritional decline, or loss to follow-up, but a medically unstable patient should not undergo fixation solely to meet an arbitrary window.

The treatment clock follows physiology, not the fracture label

NOW

TRIGGER
Airway compromise, uncontrolled hemorrhage, aspiration hazard, expanding floor-of-mouth swelling

RESPONSE
Resuscitate, control the airway and bleeding, remove immediate hazards, coordinate trauma priorities.

URGENT

TRIGGER
Unstable bite, open contaminated injury, nutrition failure, associated injury, unreliable disposition

RESPONSE
Admit or expedite specialty care; serial airway and occlusion checks; plan definitive treatment.

PLANNED

TRIGGER
Stable airway and physiology, controlled pain, reliable follow-up, no time-critical associated threat

RESPONSE
Protect diet and hygiene, document occlusion and nerve function, then reduce deliberately before fibrosis or loss to follow-up.

A medically unstable patient is not made safer by meeting an arbitrary fixation deadline.

Figure 3.1. The mandibular treatment clock is driven by physiology, associated threats, and reliability rather than a universal hour cutoff.

Table 3.2. Disposition is driven by physiology and reliability, not the fracture label alone.

Disposition	Appropriate features	Required plan
Discharge	Stable airway, controlled pain, tolerates intake, no urgent associated injury, reliable follow-up	Diet, hygiene, analgesia, selective antibiotics, explicit return precautions, timely specialty review.
Admission	Airway/bleeding concern, polytrauma, inability to hydrate, uncontrolled pain, infection, unsafe follow-up, urgent OR	Serial airway and occlusion checks, nutrition, operative coordination.
Immediate OR / procedure	Airway threat, uncontrolled hemorrhage, grossly unstable contaminated injury, other operative indication	Resuscitation and multidisciplinary planning remain first.

RESIDENT SYNTHESIS

Initial care protects airway and nutrition, treats established infection, preserves useful teeth, and creates a safe bridge to definitive reduction. Avoid prolonged prophylaxis and false urgency.

SELECTED NONOPERATIVE PATHWAY

Observation without reduction or fixation is reserved for an incomplete or minimally displaced, nonmobile fracture with a stable reproducible premorbid bite, no mechanical block, and reliable follow-up. Prescribe analgesia, oral hygiene, a no-chew or soft diet, early specialty review, and serial occlusion and function checks, with imaging as indicated.[19]

ESCALATE

Change strategy for new malocclusion, mobility or displacement, infection, increasing pain, failure to progress, or unreliable follow-up. Observation is distinct from closed reduction with MMF; published evidence remains small and highly selected.

CHAPTER 4

Fixation Biomechanics and MMF

CENTRAL QUESTION
How should the fracture pattern determine reduction and fixation?

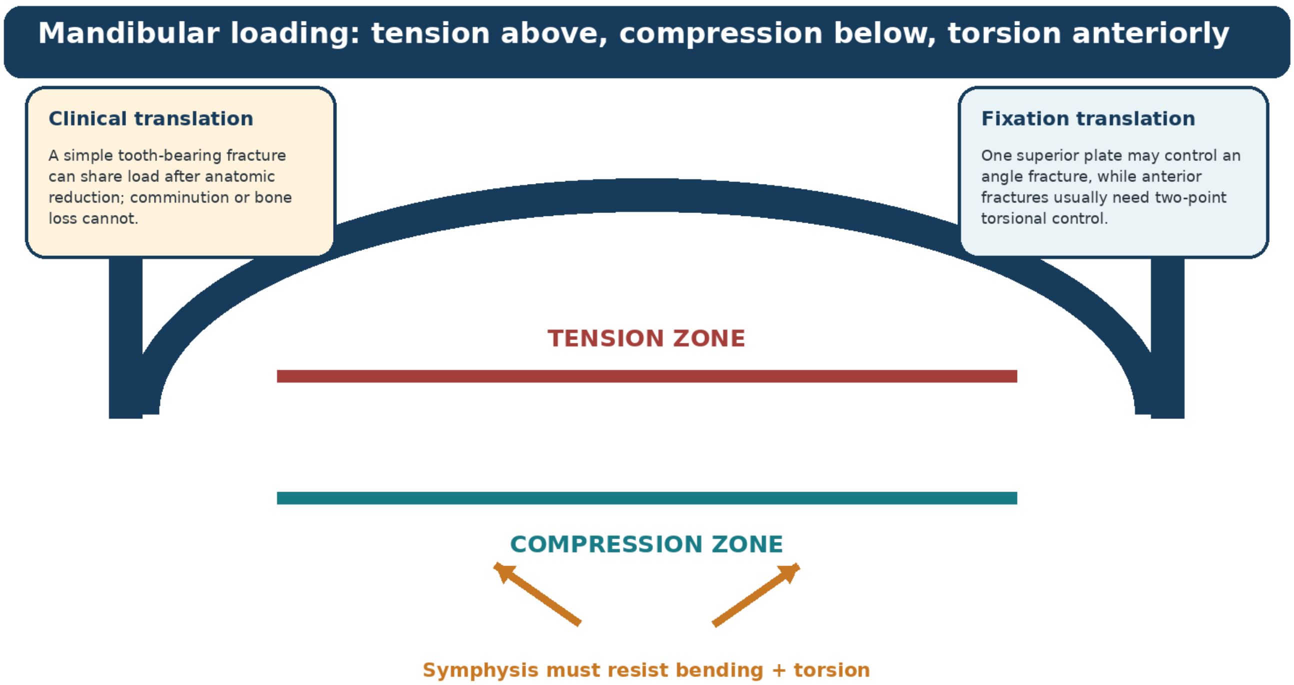

Figure 4.1. Simplified mandibular loading: superior tension, inferior compression, and prominent torsional forces in the anterior arch.

Reduction is the treatment; hardware preserves it

The first goal is restoration of the patient’s occlusion and the mandibular geometry that creates it. Align the lingual and buccal cortices, inferior border, alveolar ridge, and rotational relationship. Seat the condyles in a reproducible position. A plate can compress or distract a malreduction, so the bite and bone must be checked before and after each major fixation step.

Load-sharing versus load-bearing

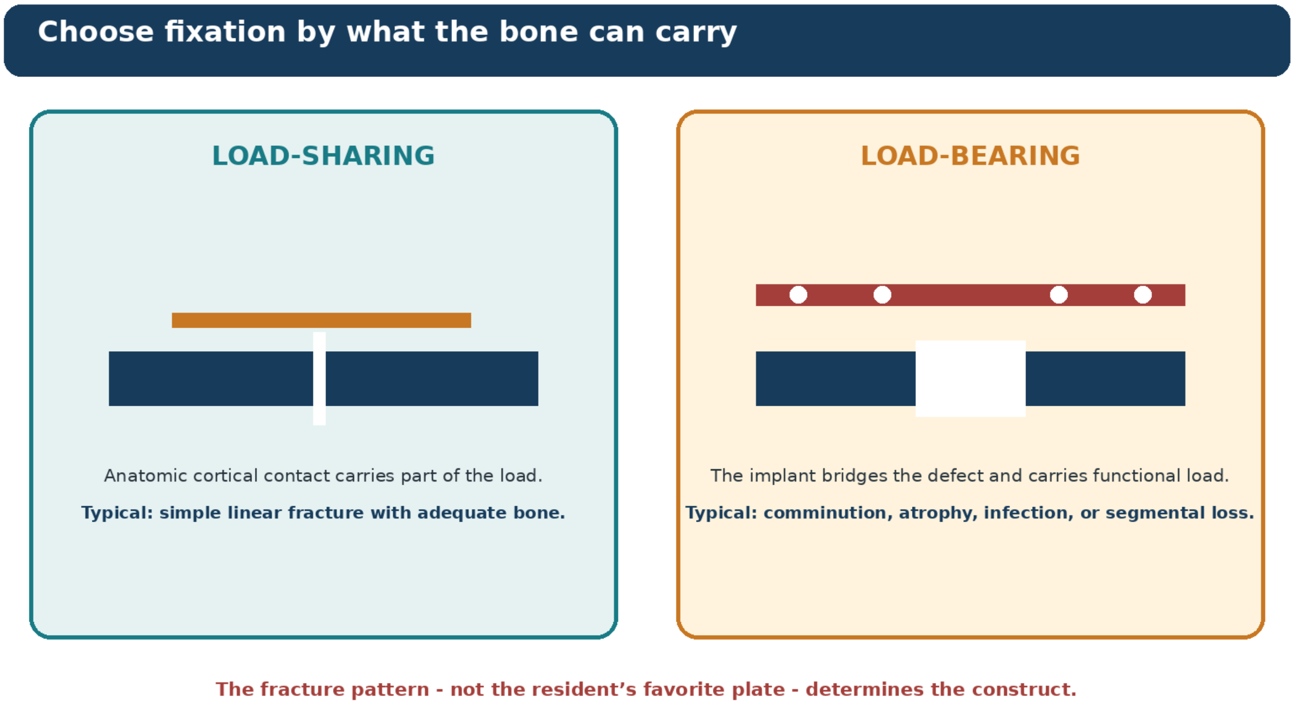

Figure 4.2. Load-sharing requires useful cortical contact; load-bearing bridges a defect and assumes the functional load.

Simple linear fractures with anatomic contact can share load with miniplates. Comminuted fractures, segmental defects, atrophic edentulous bone, infected nonunion, and fractures in which bone cannot reliably transmit force require a load-bearing construct. Locking plates reduce the need to compress a plate to bone but do not eliminate reduction or adequate screw purchase.

MMF is a tool, not the endpoint

Arch bars, hybrid systems, interdental wiring, or MMF screws can reproduce occlusion during ORIF or support closed treatment. If stable fixation has been achieved, rigid postoperative MMF is often unnecessary. Condylar rehabilitation usually favors the fewest light guiding elastics needed to permit active motion.

> **MMF SAFETY CHECK**
> Postoperative rigid MMF is an airway decision. Confirm airway protection and secretion handling; address nausea and aspiration risk. Keep the correct release tool immediately available and teach the patient, caregiver, and bedside team exactly what to release and when. Document the plan; use releasable elastics when they provide adequate stability.[16,17]

Table 4.1. Match the construct to the mechanical problem.

Construct	Best use	Major limitation
Single superior miniplate	Selected simple angle fracture with useful cortical contact	Inadequate for comminution, poor bone, or uncontrolled torsion.
Two-point anterior fixation	Simple anterior fracture requiring bending and torsional control	Root and mental-nerve constraints; technique sensitive.
Inferior border + tension band	Body or parasymphysis requiring increased stability	More dissection and hardware.
Reconstruction plate	Comminution, atrophy, segmental loss, infected/nonunion salvage	Bulk, exposure, and need for strong purchase.
Closed / functional care	Selected stable fractures and many condylar injuries	Requires reliable occlusion, follow-up, and early motion.

> **OPERATIVE PEARL**
> Release MMF and check the bite before closure. A correct-looking plate with a wrong bite is a failed reduction.

CHAPTER 5

Symphysis, Parasymphysis, and Body Fractures

CENTRAL QUESTION
How do you restore transverse width, inferior-border continuity, and torsional stability while protecting teeth and the IAN?

Anterior fractures change more than the chin

Symphyseal and parasymphyseal fractures commonly accompany condylar injuries. When both condyles are disrupted, the anterior mandible may open at the lingual cortex and widen from a normal V toward a U. If only the buccal surface is aligned, the mandible can be fixed too wide, creating posterior crossbite, altered condylar position, and an apparently inexplicable malocclusion.

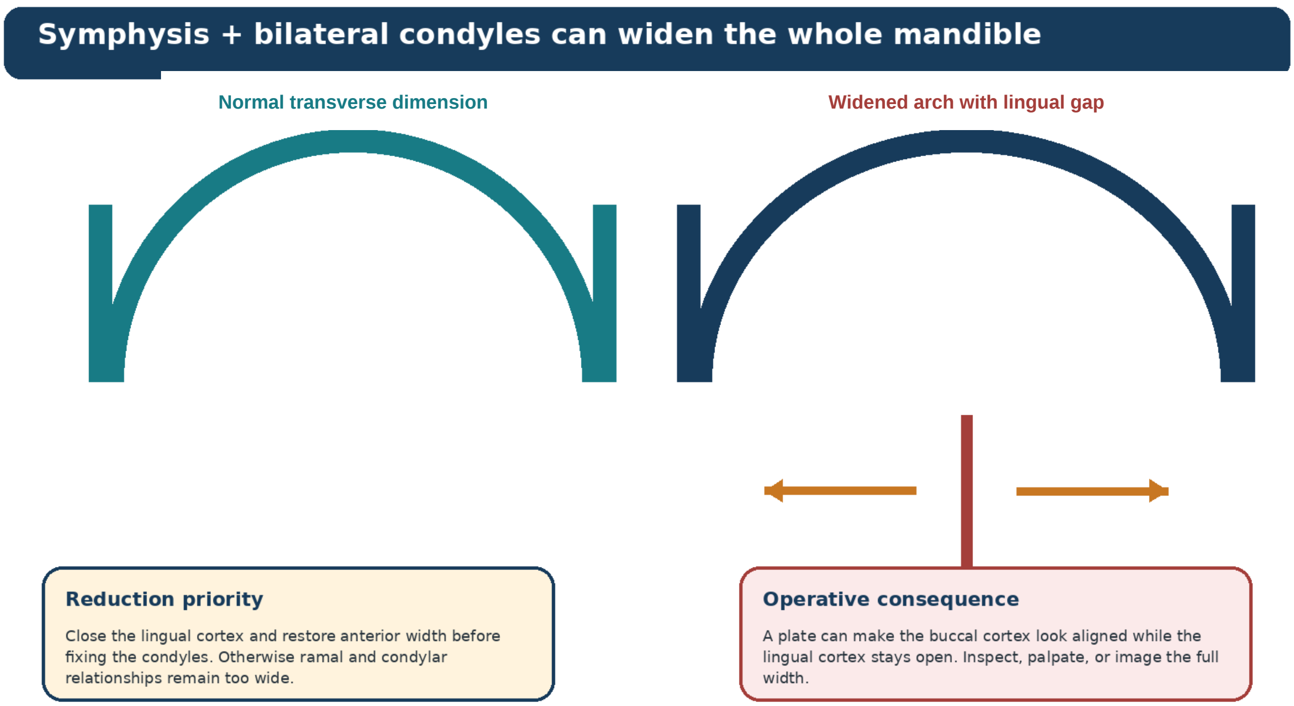

Figure 5.1. In symphysis-plus-bilateral-condyle injuries, the anterior fracture must be reduced through the lingual cortex to restore transverse dimension.

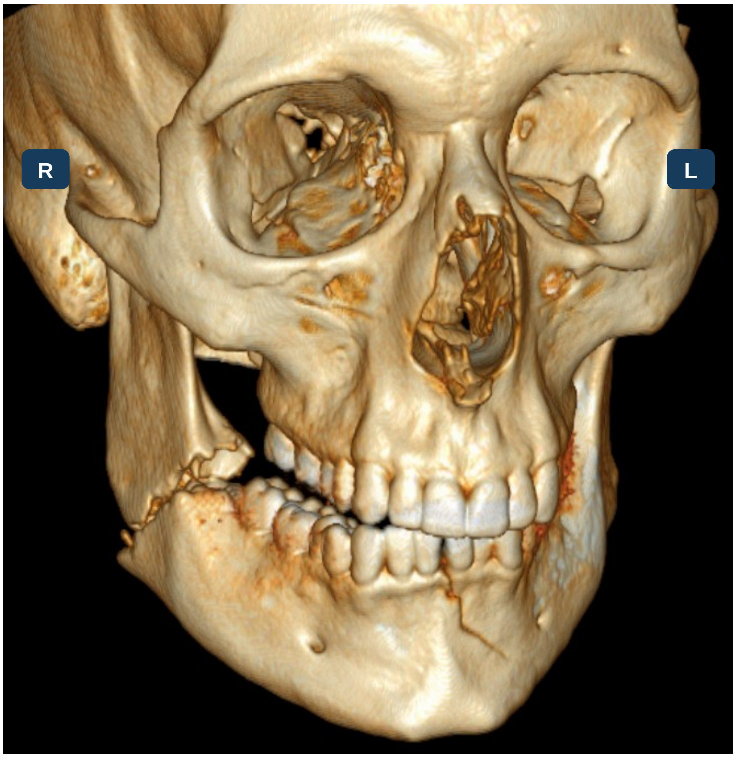

Figure 5.2. Three-dimensional CT reconstruction of a right angle fracture and left parasymphyseal fracture. Three-dimensional views communicate pattern but must be paired with multiplanar CT and examination. Source: Coronation Dental Specialty Group, CC BY 3.0, via Wikimedia Commons.

Reduction strategy

Establish the dental relationship, expose enough bone to see or palpate the inferior and lingual alignment, reduce the anterior width, and apply provisional fixation. Recheck posterior contacts and condylar symmetry before definitive tightening. In multiple fractures, the tooth-bearing anterior component is often treated first to recreate the arch, while the posterior fracture receives fixation matched to its mechanics.

Body fractures and the IAN

Body fractures traverse the mandibular canal and dental roots. Baseline lower-lip sensation should be documented before local anesthesia. During exposure, identify and protect the mental nerve. Monocortical screws near roots and the canal reduce neurovascular risk; bicortical screws at the inferior border require a safe distance from the mental foramen and canal. Persistent postoperative numbness may reflect the injury itself rather than operative damage, but new or worsened deficit warrants review of reduction and screw position.

Table 5.1. Anterior and body fracture priorities.

Pattern	Reduction priority	Typical stability need
Simple symphysis	Close lingual gap; restore width and dental midline	Two-point torsional control or equivalent rigid construct.
Parasymphysis near mental foramen	Occlusion, inferior border, mental nerve protection	Two-point control with careful screw trajectory.
Simple body	Align alveolar and inferior borders; protect IAN	Load-sharing if cortical contact is anatomic.
Comminuted body	Preserve soft-tissue attachments and bridge viable segments	Load-bearing reconstruction plate; grafting/staging as needed.
Atrophic edentulous body	Restore continuity without reliable occlusal guide	Load-bearing fixation with attention to poor bone and biology.

DIAGNOSTIC TRAP

An anterior plate can close the buccal cortex while leaving the lingual cortex open. Occlusion and transverse width - not the visible plate position - prove the reduction.

ATROPHIC EDENTULOUS MANDIBLE

There may be no tooth-based reduction reference, bone stock is limited, and the IAN may lie superficially. A displaced fracture requiring surgery is a load-bearing problem: bridge it with a long locking reconstruction plate anchored in adequate native bone, minimize periosteal stripping, and graft selectively for a gap or poor biology.[20]

CHAPTER 6

Angle and Ramus Fractures

CENTRAL QUESTION

How do muscle pull, third molars, comminution, and limited exposure change treatment?

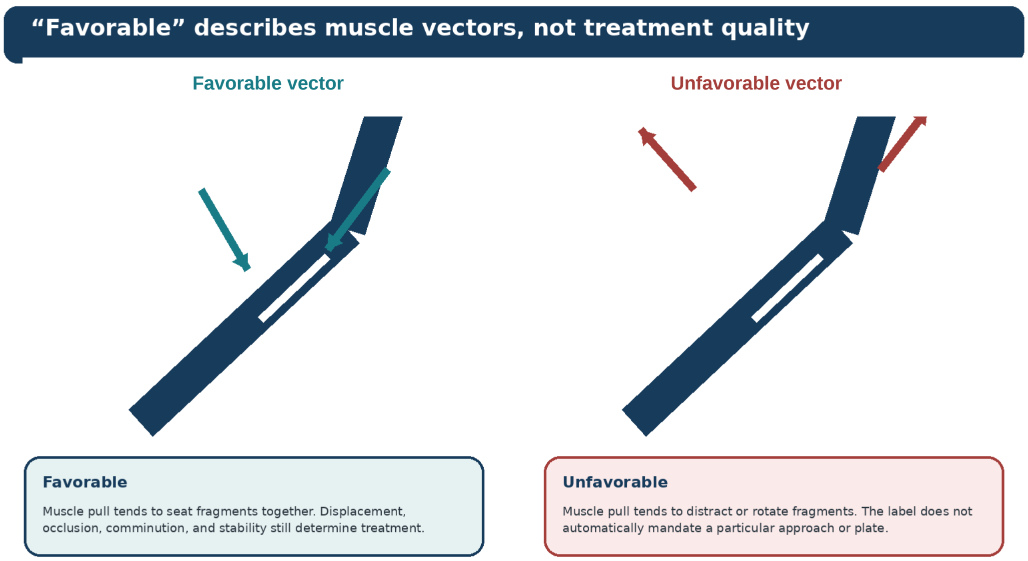

Figure 6.1. Favorability describes whether muscle vectors tend to seat or distract fragments; it does not by itself determine operative treatment.

Why the angle is different

Why the angle is different

The angle is a transition between tooth-bearing body and vertical ramus, commonly weakened by an impacted third molar. Masseter and medial pterygoid form a muscular sling around the region, while temporalis and pterygoid forces influence the proximal segment. A simple angle fracture may be stabilized along the superior border in the functional tension-band zone, but comminution, displacement, bilateral fractures, poor bone, and unfavorable geometry may require stronger fixation.

Third molars

An impacted third molar can contribute to the fracture pathway but does not mandate extraction. Retain it when healthy and not interfering with reduction or plate placement. Remove it when infected, fractured, severely mobile, nonrestorable, or mechanically obstructive. Extraction can enlarge the defect or destabilize the proximal segment, so timing matters.[12]

Ramus fractures

Isolated ramus fractures may be splinted by the muscular envelope. Stable occlusion and vertical height may permit closed care; displacement, comminution, associated fractures, inability to restore occlusion, or the need for direct control may justify ORIF. Respect the facial nerve, parotid, mandibular foramen, and limited bone around the sigmoid notch.

Coronoid fractures

Coronoid fractures are rare and often occult. Review CT for displacement and associated zygomatic-arch injury when trismus is disproportionate. Treat minimally displaced fractures without obstruction conservatively with early motion; consider fixation or coronoidectomy for persistent mechanical block or impingement.[21]

Table 6.1. Angle and ramus treatment choices.

Option	Advantage	Limitation / risk
Single superior-border plate	Limited dissection for selected simple angle fractures	Does not control severe comminution, inferior-border gap, or complex torsion.
Transoral + transbuccal	No major facial incision; perpendicular screw placement	Cheek puncture, limited visualization, operator dependence.
Submandibular exposure	Broad angle/body access and inferior-border control	Marginal mandibular nerve, scar, wider dissection.
Load-bearing plate	Bridges comminution or poor bone	More hardware, dissection, and exposure.

CHAPTER 7

Condylar Process and Head Fractures

CENTRAL QUESTION
When should the resident favor closed functional treatment, and when does the benefit of ORIF outweigh its operative cost?

OPENING CASE
A unilateral condylar base fracture is medially displaced. The patient has ipsilateral premature contact, contralateral open bite, and loss of ramal height. The key question is not the displacement angle alone—it is whether function can be restored predictably without direct reduction.

Figure 7.1. Condylar treatment integrates occlusion, ramal height, fracture level, rehabilitation capacity, operative morbidity, and growth.

Condylar anatomy and displacement

Condylar fractures may involve the head, neck, or base. The lateral pterygoid commonly pulls the proximal fragment anteromedially. Unilateral shortening produces ipsilateral premature contact, contralateral open bite, and deviation toward the injured side. Bilateral shortening tends to produce anterior open bite and loss of posterior facial height. Intracapsular injury adds risk of disc derangement, stiffness, remodeling, and ankylosis.

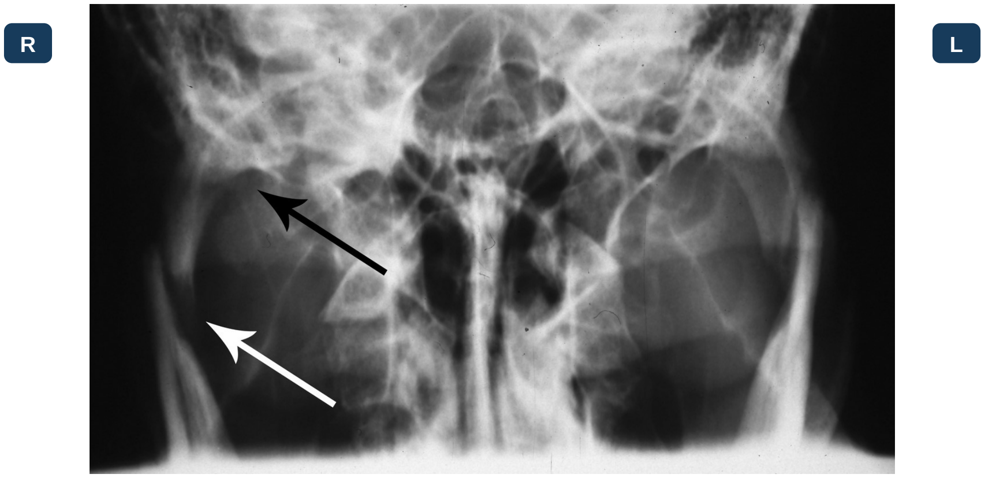

Figure 7.2. Towne view of bilateral condylar neck fractures with medial displacement. Modern CT better defines fracture level, dislocation, ramal height, and associated EAC or skull-base injury. Source: Coronation Dental Specialty Group, CC BY 3.0, via Wikimedia Commons.

Closed functional treatment

Closed care is active rehabilitation, not passive observation. Use analgesia, a comfort-based soft diet, and the fewest light guiding elastics needed to recover a repeatable bite. Record occlusion and MIO at baseline; reassess at about 1 week and regularly thereafter. Prescribe active maximum opening, bilateral excursion, and protrusion several times daily. Avoid prolonged rigid immobilization; change strategy for worsening occlusion, persistent mechanical block, or failure to progress.[16]

When direct or open management becomes more compelling

- Direct control is generally required for middle-cranial-fossa displacement, lateral extracapsular dislocation or an irreducible mechanical block, a retained TMJ foreign body, or an open injury requiring debridement.
- ORIF becomes more compelling when a stable premorbid bite cannot be restored or maintained, clinically important ramal-height loss or bilateral shortening compromises function, associated fractures need a stable mandibular platform, or early reliable function outweighs nerve, scar, and salivary risks.
- Name the fracture level first. Condylar-head, neck, and base fractures differ in access, fixation feasibility, remodeling, and evidence. Common numeric cutoffs should inform, not determine, judgment.[8]

> **EVIDENCE NOTE**
> In nine comparative studies of 547 condylar-head fractures, ORIF produced a 2.72-mm postoperative MIO advantage and lower odds of occlusal discrepancy, but certainty was low to very low. Facial-nerve weakness was approach-specific (3% with standard versus 23% with modified preauricular approaches), not a general ORIF rate. These data do not automatically apply to neck or base fractures.[7,8]

The growing mandible

Most pediatric condylar fractures favor analgesia, early motion, selective elastics, and long-term growth surveillance. For stable greenstick or minimally displaced noncondylar fractures, soft diet and close follow-up may suffice; displaced injuries may need a dental or cap splint or brief closed fixation. Reserve ORIF for marked displacement or mobility, comminution, unstable combined patterns, or failure of closed control. If plating is necessary, minimize exposure and protect developing tooth buds.[9,22]

Table 7.1. Condylar treatment is an individualized balance.

Factor	Favors closed functional care	Favors ORIF consideration
Occlusion	Restorable and stable with guidance	Cannot be restored or repeatedly collapses.
Ramal height	Preserved or modestly altered	Clinically important shortening or bilateral loss.
Fracture level	Head/high fracture with remodeling potential	Accessible neck/base fracture with major functional displacement.
Patient / morbidity	Growing patient, higher operative risk, reliable rehab	Direct restoration benefit outweighs nerve, scar, and parotid cost.

CHAPTER 8

Operative Approaches and Technical Decision Points

CENTRAL QUESTION
Which exposure provides the necessary reduction and fixation while minimizing facial nerve, salivary, dental, and scar morbidity?

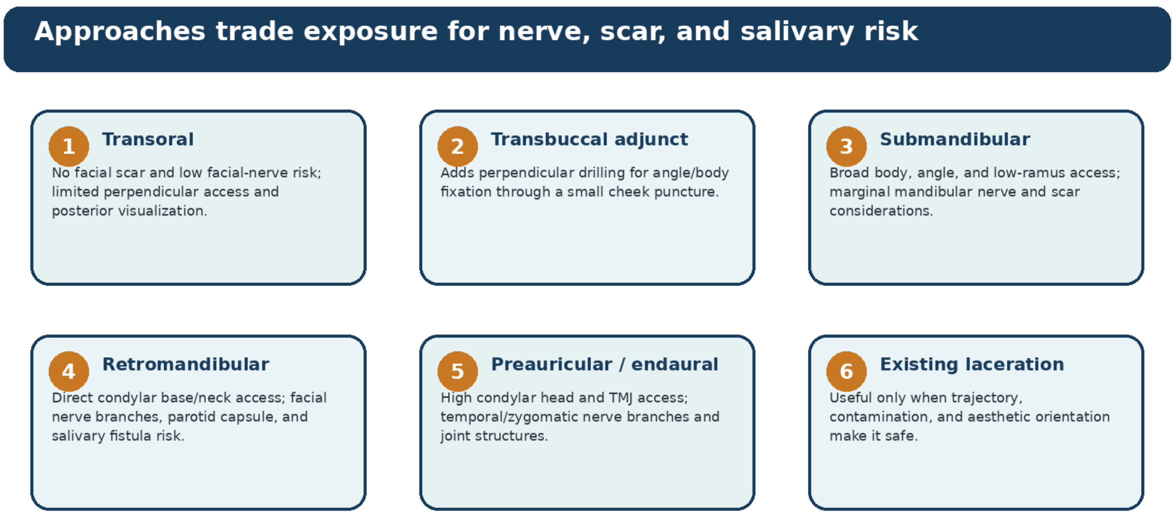

Figure 8.1. Mandibular approaches trade direct access for scar, facial nerve, parotid, and soft-tissue morbidity.

Transoral and transbuccal access

The transoral vestibular approach avoids a facial scar and generally avoids direct facial nerve dissection. It provides excellent access to symphysis, parasymphysis, body, and selected angle fractures. Posterior visualization and perpendicular drilling are limited; a transbuccal trocar or angulated instrumentation can improve screw trajectory. Protect the mental nerve, tooth roots, gingiva, and mucosal blood supply.

Submandibular approach

A submandibular incision gives broad control of the inferior border, body, angle, and low ramus, particularly for comminution or reconstruction plates. The incision and dissection should protect the marginal mandibular nerve and facial vessels. Excessive periosteal stripping compromises fragment biology.

Retromandibular and preauricular approaches

Retromandibular approaches shorten the route to condylar base and neck fractures but pass near or through parotid tissue and facial nerve branches. Transparotid dissection may provide direct access but can produce transient facial weakness, sialocele, or salivary fistula. Preauricular or endaural approaches reach higher condylar head and TMJ injuries but require careful handling of temporal and zygomatic nerve branches, superficial temporal vessels, the joint capsule, and disc.

Technical verification

- Place the patient into the intended occlusion before definitive fixation, but release MMF to check free seating and excursion.
- Confirm both condyles are seated consistently; excessive inferior traction can create a false bite.
- Inspect or palpate the lingual cortex in anterior fractures.

- Use monocortical screws near roots and canal; reserve bicortical purchase for safe inferior-border or reconstruction-plate zones.
- Protect mental and facial nerve branches during plate insertion and screw drilling.
- After fixation, recheck dental midlines, posterior contacts, inferior-border continuity, transverse width, and mouth opening.

Table 8.1. Choose the approach according to what must be reduced and verified.

Approach	Best exposure	Principal risk
Transoral vestibular	Symphysis, parasymphysis, body, selected angle	Roots, mental nerve, mucosal dehiscence, limited posterior access.
Transbuccal adjunct	Perpendicular angle/body screws	Cheek puncture, facial nerve/parotid trajectory.
Submandibular	Body, angle, inferior border, low ramus	Marginal mandibular nerve, scar, wider dissection.
Retromandibular	Condylar base/neck and posterior ramus	Facial nerve branches, parotid, sialocele/fistula.
Preauricular / endaural	Condylar head, TMJ, high neck	Temporal/zygomatic nerve branches, joint and scar.
Existing wound	Pattern-specific direct access	Contamination, poor orientation, devitalized tissue.

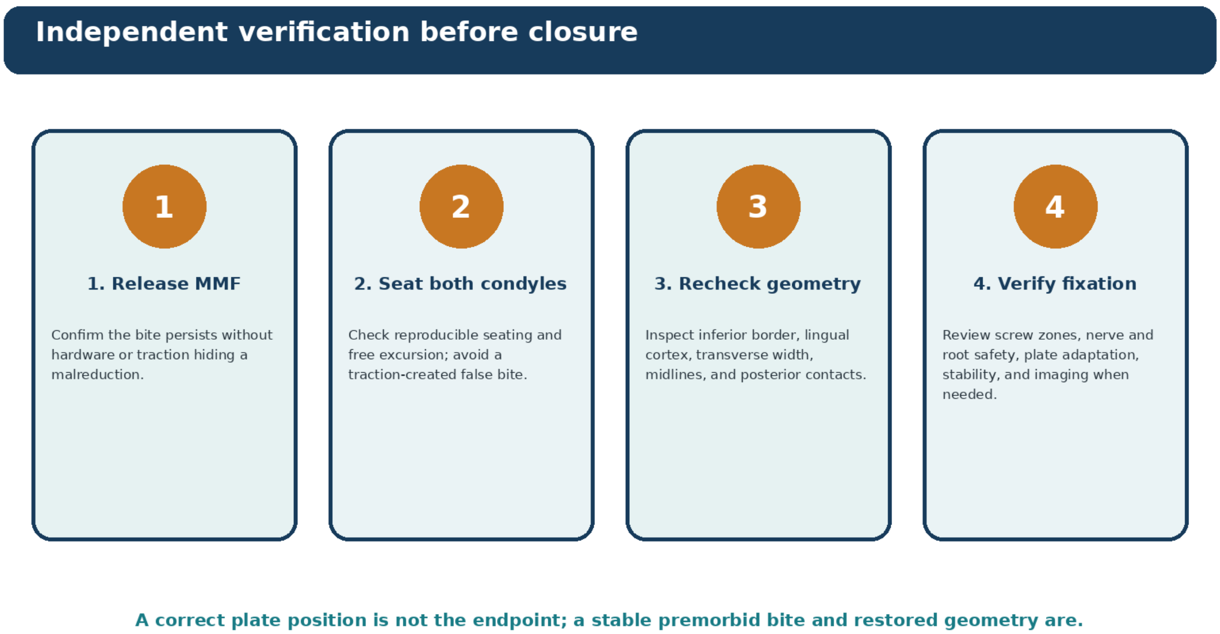

Figure 8.2. Before closure, release MMF and independently verify condylar seating, occlusion, mandibular geometry, screw safety, and fixation stability.

OPERATIVE PEARL

Do not accept a good intraoperative bite until the condyles are seated, the transverse width is correct, and MMF has been released for an independent check.

RESIDENT SYNTHESIS

The best approach is the least morbid exposure that permits anatomic reduction, safe screw placement, and independent verification.

CHAPTER 9

Postoperative Care and Complications

CENTRAL QUESTION
How do you distinguish expected recovery from early mechanical or biologic failure?

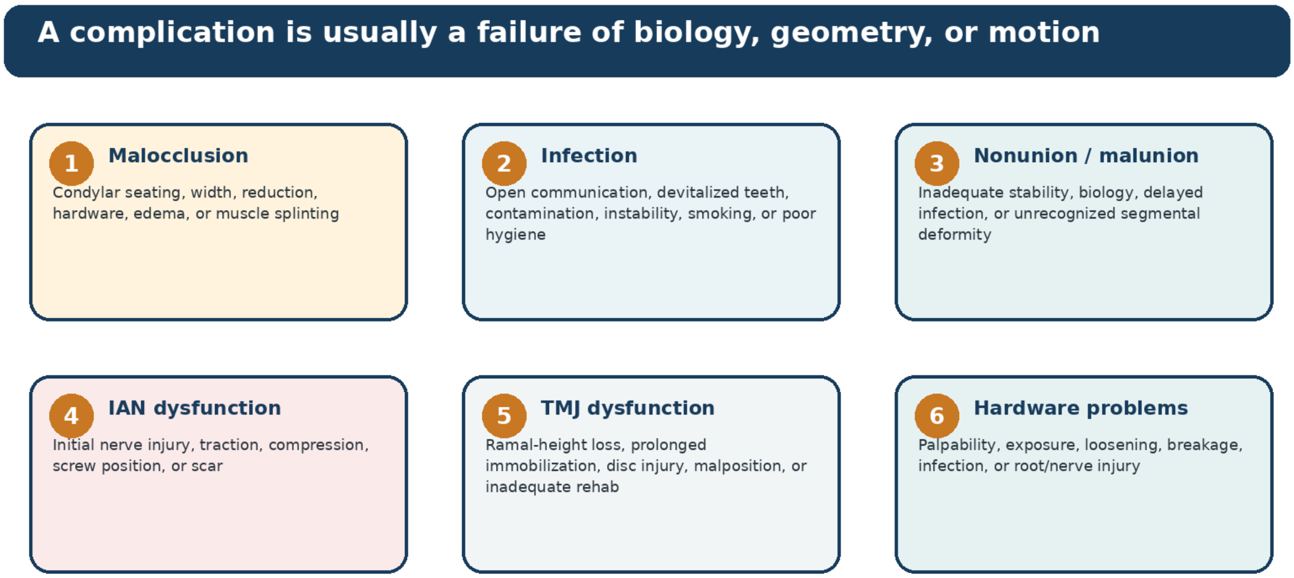

Figure 9.1. Mandibular complications can be organized as failures of geometry, biology, nerve preservation, hardware, or motion.

Immediate priorities

Assess airway, bleeding, floor-of-mouth swelling, nausea, aspiration risk, occlusion, facial nerve function after extraoral approaches, lower-lip sensation, and wound integrity. A new bite change is not simply “postoperative swelling” until condylar seating, reduction, and hardware have been considered.

Diet, hygiene, and motion

Diet is determined by construct stability and fracture pattern rather than a universal duration. Many patients require liquid or no-chew nutrition initially. Protein and caloric intake deserve active attention. Intraoral wounds, arch bars, and elastics require a soft toothbrush, oral rinses, and repeated instruction. For condylar injuries, early controlled motion and light guiding elastics are usually preferable to prolonged rigid immobilization.

Malocclusion: localize before treating

A mild early discrepancy can result from edema or muscle splinting and may respond to the lightest guiding elastics that permit function. A reproducible discrepancy caused by bony malreduction, condylar malposition, transverse widening, hardware failure, or segment displacement will not be corrected by elastics and requires imaging and possible revision.

Infection, nonunion, and hardware

Infection presents through pain, swelling, purulence, fistula, fever, plate exposure, or radiographic lucency. Management addresses drainage, devitalized teeth or bone, culture when useful, stability, soft-tissue coverage, smoking and hygiene, and targeted antibiotics. Instability perpetuates infection. Nonunion and infected nonunion often require debridement to viable bone, load-bearing stabilization, and grafting when biology and contamination permit.

Nerve and TMJ recovery

IAN deficits may improve over months but should be documented serially. New deficits prompt review for traction, compression, or screw position. Transient facial weakness can follow condylar approaches; immediate complete paralysis or worsening deficit requires prompt evaluation. Persistent pain, restricted opening, deviation, or ankylosis risk demands structured therapy and, occasionally, imaging or secondary intervention.

Table 9.1. Postoperative problems should be localized before treatment.

Problem	Early question	Response
New malocclusion	Edema/muscle or bone/condyle/hardware?	Examine, obtain imaging when mechanical cause possible; guide only functional discrepancies.
Purulence / fistula	Is fixation stable and is there a source tooth or necrotic bone?	Drain/source control, culture selectively, targeted antibiotics, restore stability.
Plate exposure	Infection, thin tissue, loose hardware, healed fracture?	Local care versus removal/revision depends on union and biology.
Persistent numbness	Baseline injury or new compression?	Serial mapping; review screws/canal if new or worsening.
Limited opening	Pain, scar, joint, hardware, or prolonged immobilization?	Early therapy when safe; image or revise if mechanical obstruction.
Weight loss / dehydration	Can the patient meet needs with restrictions?	Dietitian support, supplements, antiemetics, adjust fixation plan when necessary.

DIAGNOSTIC TRAP

Training elastics can guide a muscular or functional discrepancy. They cannot correct a widened symphysis, shortened ramus, malreduced condyle, or displaced plate.

RESIDENT SYNTHESIS

Postoperative success is measured by stable occlusion, healing biology, preserved nerve function, adequate nutrition, and progressive motion—not by an intact plate alone.

CHAPTER 10

Integrated Cases and Final Workflow

CENTRAL QUESTION
Can the resident convert examination, CT, mechanics, and patient factors into a defensible plan?

Case 1 — Bilateral anterior fractures with airway concern

CASE
An intoxicated patient has bilateral parasymphyseal fractures, floor-of-mouth hematoma, drooling, and increasing difficulty lying flat.

Questions to answer

- Is the airway currently secure and likely to remain so?
- What immediate measures precede fracture planning?
- How does the fracture pattern affect tongue support?

Reasoning

Bilateral anterior disruption can permit posterior tongue displacement, while hematoma and intoxication reduce reserve. Escalate airway monitoring and secure the airway before deterioration if secretion handling, positioning, or trajectory is concerning.

Suction, hemorrhage control, cervical-spine and trauma priorities, and removal of immediate foreign-body hazards precede definitive ORIF. The dramatic CT is secondary to physiology.

BOARD PEARL
Anterior mandibular fractures can be airway injuries even without major external swelling.

Case 2 — One body fracture and a hidden condyle

CASE
CT is reported as a left mandibular body fracture. The patient has right preauricular tenderness, rightward deviation on opening, and left posterior open bite.

Questions to answer

- What second fracture is likely?
- How does it change fixation and postoperative therapy?
- Which injury is treated first?

Reasoning

The motion and bite suggest a right condylar fracture. Review the CT in all planes and include both joints.

The tooth-bearing body fracture is generally reduced to restore the arch first with fixation stable enough to permit either closed functional management or ORIF of the condyle. The condylar plan depends on ramal height and reducibility.

BOARD PEARL
A mandibular fracture diagnosis is incomplete until both condyles have been assessed.

Case 3 — The widened symphysis

CASE
A patient with bilateral condylar fractures and a midline symphyseal fracture is placed into apparently acceptable anterior occlusion, but the posterior arch is widened.

Questions to answer

- What anatomic error is occurring?
- How is it corrected?
- What should be verified before plating the condyles?

Reasoning

The symphyseal lingual cortex has opened, converting the arch toward a U shape. Anterior contacts can be misleading.

Reduce and stabilize the full symphyseal width first, verifying the lingual cortex and posterior arch. Only then can ramal width and condylar relationships be restored.

> **BOARD PEARL**
> Restore the anterior transverse dimension before the posterior mandible.

Case 4 — Simple angle fracture with an impacted third molar

> **CASE**
> A minimally displaced angle fracture passes through an asymptomatic impacted third molar. Occlusion is reproducible.

Questions to answer

- Must the tooth be removed?
- Is a single superior plate reasonable?
- What factors would change the plan?

Reasoning

The tooth can be retained if healthy and not obstructing reduction or fixation. Automatic extraction may enlarge the defect.

A single superior-border load-sharing plate may be reasonable for a simple stable pattern. Comminution, poor bone, infection, inferior-border gap, or a second fracture can require more stability.

> **BOARD PEARL**
> The third molar and “favorability” modify the plan; neither dictates it.

Case 5 — Comminuted body fracture

> **CASE**
> A high-energy body fracture has multiple devascularization-prone fragments and a 1-cm segmental gap.

Questions to answer

- Can miniplates share load?
- What is the biologic strategy?
- What is the role of antibiotics?

Reasoning

The bone cannot provide dependable cortical load sharing. A load-bearing reconstruction plate should bridge stable proximal and distal bone.

Preserve viable soft-tissue attachments, debride only clearly nonviable tissue, restore length and occlusion, and consider grafting or staging based on contamination and coverage.

Antibiotics support source control but cannot compensate for instability, necrotic bone, or inadequate coverage.

> **BOARD PEARL**
> Comminution is a biology-and-load problem, not merely “more fracture lines.”

Case 6 — Adult displaced condylar base fracture

CASE
An adult has a medially displaced condylar base fracture, 6 mm loss of ramal height, and persistent malocclusion despite guiding elastics.

Questions to answer

- How should open versus closed treatment be framed?
- Which approach is reasonable?
- What risks must be discussed?

Reasoning

Failure to restore occlusion and clinically meaningful ramal-height loss make ORIF more compelling, but the decision remains individualized rather than based on a universal numeric cutoff.

A retromandibular or other level-appropriate approach can provide direct access. Discuss facial nerve weakness, scar, salivary complications, hardware, and the need for rehabilitation.

BOARD PEARL
Defend ORIF through function and reducibility, not the radiographic angle alone.

Case 7 — Pediatric intracapsular fracture

CASE
A 7-year-old has a minimally displaced condylar-head fracture, pain, and mild deviation but a restorable bite.

Questions to answer

- What is the initial treatment?
- Why avoid prolonged MMF?
- What follow-up is needed?

Reasoning

Analgesia, soft diet, early controlled motion, and selective guiding elastics are typical. The growing mandible has meaningful remodeling potential.

Prolonged immobilization increases stiffness and ankylosis risk. Long-term surveillance is needed for asymmetry, malocclusion, growth disturbance, and range of motion.

BOARD PEARL
In children, function and growth surveillance are part of the treatment.

Case 8 — Postoperative bite change

CASE
Two days after ORIF of a body fracture, the patient has a new unilateral posterior open bite. The plate is intact on plain film.

Questions to answer

- Can this be treated with elastics?
- What mechanical causes must be excluded?
- What imaging is useful?

Reasoning

First determine whether the discrepancy is functional or structural. Review condylar seating, fracture reduction, transverse width, screw position, and hidden second injury.

CT or appropriate cross-sectional imaging may be needed. Elastics are reasonable only when the skeleton is correctly reduced and the discrepancy reflects edema or muscle splinting.

BOARD PEARL
An intact plate does not prove an anatomic reduction.

Final resident workflow

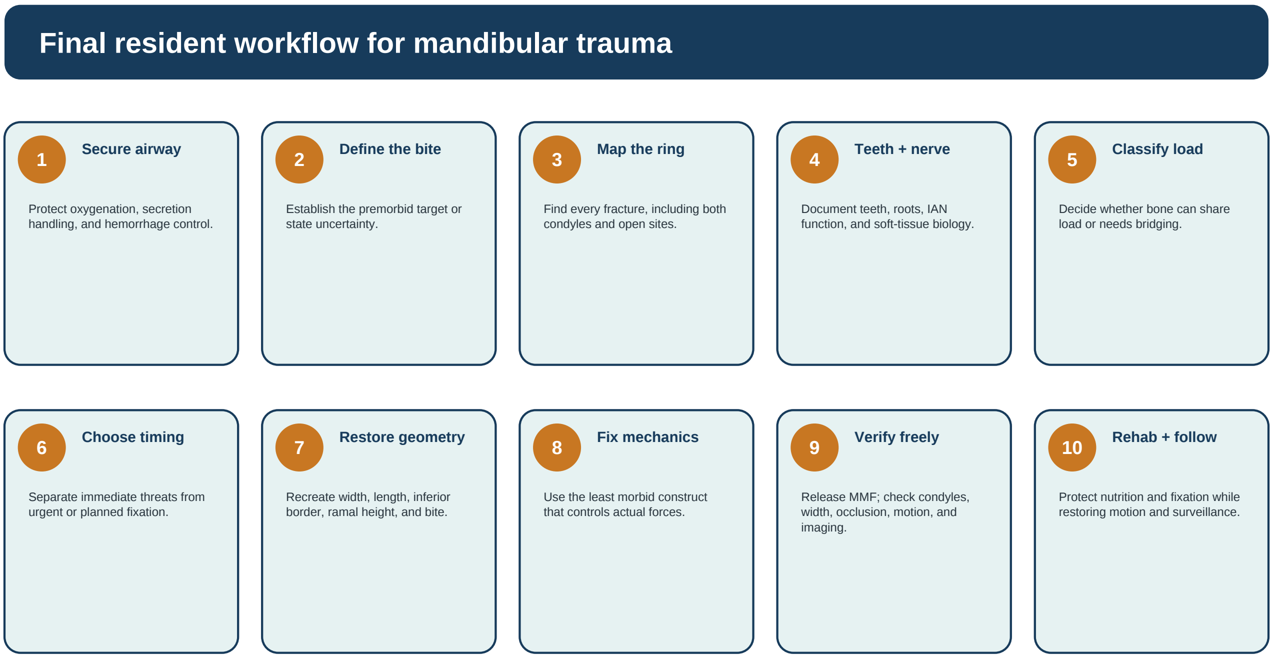

Figure 10.1. A ten-step workflow for translating mandibular examination and CT into stable fixation and functional recovery.

Table 10.1. The mandibular trauma workflow.

Step	Question	Output
1	Is airway or hemorrhage threatened?	Stabilize before reconstruction.
2	What was the premorbid bite?	Reliable occlusal target or stated uncertainty.
3	Where are all fracture sites?	Whole-ring map including both condyles.
4	What is open, contaminated, dental, or neurologic?	Antibiotic, tooth, IAN, and soft-tissue plan.
5	Can the bone share load?	Load-sharing versus load-bearing construct.
6	What is the treatment clock?	Observation, closed functional treatment, interval ORIF, or urgent action.
7	What geometry must be restored first?	Width, length, inferior border, ramal height, and occlusion.
8	Which approach and fixation answer the mechanics?	Least-morbid adequate exposure and construct.
9	How will reduction be independently verified?	Release MMF; check bite, condyles, width, motion, and imaging.
10	How will biology and motion be protected?	Diet, hygiene, dental follow-up, elastics, therapy, and complication surveillance.

FINAL RESIDENT TAKEAWAY
The mandible is successfully treated when the patient’s premorbid bite, arch width, continuity, ramal height, joint motion, nerve function, and healing biology are restored. Hardware is only the means by which that functional geometry is preserved.

CHAPTER A

Practical Appendices

CENTRAL QUESTION
What can the resident carry into the trauma bay, CT workstation, operating room, and postoperative clinic?

Appendix A — Mandibular CT review checklist

Region	Review
Symphysis / parasymphysis	Lingual and buccal displacement, width, mental foramina, roots, associated condyles.
Body	Inferior border, canal, roots, comminution, segmental gap, contralateral fracture.
Angle / ramus	Third molar, favorability, muscle displacement, inferior border, coronoid and mandibular foramen.
Condyles	Head/neck/base, medial displacement, dislocation, ramal shortening, EAC or cranial extension.
Whole arch	Second fracture, transverse widening, maxillary injury, occlusal correlate.
Soft tissues	Hematoma, foreign body, open wound, emphysema, tooth aspiration concern.

Appendix B — Mandibular examination checklist

- Airway, secretion handling, floor-of-mouth swelling, bleeding, and aspiration hazards.
- Patient-reported bite change; dental midlines, contacts, open bite, crossbite, wear facets, dentures.
- Palpation from one condyle around the inferior border to the other condyle.
- Segmental mobility, intraoral laceration, sublingual ecchymosis, exposed bone, and every tooth accounted for.
- Baseline V3 / lower-lip sensation before local anesthetic.
- Mouth opening, deviation, lateral excursion, protrusion, trismus, and preauricular pain.
- Examination reliability and explicit plan for repeat assessment.

Appendix C — Operative planning worksheet

Planning field	Resident entry
Premorbid occlusion / reliability	____
Fracture map and open sites	____
Teeth / IAN / soft tissue	____
Load-sharing or load-bearing	____
Reduction sequence	____
MMF strategy	____
Approach	____
Fixation construct	____
Independent verification	____
Diet / motion / follow-up	____

Appendix D - Postoperative quick plan

- Check airway, occlusion, lower-lip sensation, facial movement, wounds, and bleeding.
- Set diet by stability; address calories, protein, hydration, nausea, and oral hygiene.
- Use the lightest guiding elastics needed and promote active motion when safe.
- If rigid MMF remains, verify the release plan, correct tool at bedside and with the patient, patient/caregiver/staff teaching, and nausea and airway precautions.[16,17]
- Image early when occlusion or reduction is uncertain; routine schedules remain pattern-dependent.
- Arrange dental-vitality follow-up for teeth near the fracture.
- Return for dyspnea, secretion difficulty, increasing swelling, fever or purulence, new bite change, hardware exposure, or dehydration.

Appendix E - Oral-board presentation template

TEMPLATE

"This is a [stable/unstable] patient after [mechanism]. Airway and hemorrhage are [state]. The premorbid bite is [known/uncertain], and the current occlusal pattern suggests [localization]. Examination shows [mobility, teeth, IAN, floor of mouth, motion]. CT demonstrates [complete fracture map, displacement, comminution, condylar position, width]. The fracture is [load-sharing/load-bearing] and [open/closed]. I would [observe / closed functional treatment / ORIF] because [function, stability, biology]. My sequence is [state], using [MMF and approach] with [construct]. I will release fixation and verify [occlusion, condylar seating, width, inferior border, motion], then prescribe [diet, hygiene, elastics/therapy, dental and fracture follow-up] while monitoring for [specific complications]."

References

Bracketed numbers in the guide correspond to this linked reference list.

1. AO Foundation. Examination of patients with mandibular fractures. AO Surgery Reference. Accessed July 29, 2026.
2. Homsi N, Rodrigues P, Sanchez Aniceto G, Hammer B, Bartlett S. Biomechanics of the mandible. AO Surgery Reference. Accessed July 29, 2026.
3. AO Foundation. Multiple mandibular fractures. AO Surgery Reference. Accessed July 29, 2026.
4. AO Foundation. Classification and terminology of mandibular fractures. AO Surgery Reference. Accessed July 29, 2026.
5. Appelbaum RD, Farrell MS, Gelbard RB, et al. Antibiotic prophylaxis in injury: an AAST Critical Care Committee clinical consensus document. Trauma Surg Acute Care Open. 2024;9(1):e001304. doi:10.1136/tsaco-2023-001304.
6. Goormans F, Coropciuc R, Vercruysse M, et al. Systemic Antibiotic Prophylaxis in Maxillofacial Trauma: A Scoping Review and Critical Appraisal. Antibiotics (Basel). 2022;11(4):483. doi:10.3390/antibiotics11040483.
7. Rashid S, Kumar RD, Kalimuddin KS. Closed treatment versus open reduction and internal fixation for mandibular condylar head fractures: a systematic review and meta-analysis. J Craniomaxillofac Surg. 2026;54(7):104560. doi:10.1016/j.jcms.2026.104560. PMID: 41966579.
8. Youssef SALY, Raghoebar II, Helmers R, de Lange J, Dubois L. Redefining and identifying evidence-based indications for open reduction and internal fixation in mandibular condylar fractures: a comprehensive systematic review and evidence analysis. Craniomaxillofac Trauma Reconstr. 2025;18(2):25. doi:10.3390/cmtr18020025. PMID: 40416066; PMCID: PMC12101279.

READING THE EVIDENCE

Meta-analyses in mandibular trauma frequently combine heterogeneous fracture levels, approaches, and outcome definitions. Apply pooled estimates only to the population and technique actually studied.

References (continued)

9. Bottini GB, Roccia F, Sobrero F. Management of Pediatric Mandibular Condyle Fractures: A Literature Review. J Clin Med. 2024;13(22):6921. doi:10.3390/jcm13226921.
10. Rughubar V, Vares Y, Singh P, et al. Combination of rigid and nonrigid fixation versus nonrigid fixation for bilateral mandibular fractures: a multicenter randomized controlled trial. J Oral Maxillofac Surg. 2020;78(10):1781-1794. doi:10.1016/j.joms.2020.05.012. PMID: 32589939.
11. Ellis E III. Treatment methods for fractures of the mandibular angle. Int J Oral Maxillofac Surg. 1999;28(4):243-252. doi:10.1034/j.1399-0020.1999.284280401.x.
12. Chrcanovic BR. Teeth in the line of mandibular fractures. Oral Maxillofac Surg. 2014;18(1):7-24. doi:10.1007/s10006-012-0369-y.
13. Bourguignon C, Cohenca N, Lauridsen E, et al. IADT guidelines: fractures and luxations. Dent Traumatol. 2020;36(4):314-330. doi:10.1111/edt.12578.
14. Al-Moraissi EA, Ellis E III. Surgical treatment of adult mandibular condylar fractures versus closed treatment: systematic review and meta-analysis. J Oral Maxillofac Surg. 2015;73(3):482-493. doi:10.1016/j.joms.2014.09.027.
15. Rozeboom AVJ, Dubois L, Bos RRM, Spijker R, de Lange J. Open treatment of condylar fractures via extraoral approaches: a review of complications. J Craniomaxillofac Surg. 2018;46(8):1232-1240. doi:10.1016/j.jcms.2018.04.020.
16. Ellis E III, Schubert W. Closed treatment with MMF for mandibular angle fractures. AO Surgery Reference. Accessed July 29, 2026.
17. American Academy of Otolaryngology-Head and Neck Surgery Foundation. Clinical Indicators: Mandibular Fracture. Published January 1, 2015. Accessed July 29, 2026.
18. Centers for Disease Control and Prevention. Clinical Guidance for Wound Management to Prevent Tetanus. Updated June 10, 2025. Accessed July 29, 2026.
19. Rashid J, Wu S, Naredla P, Breeze J. Outcomes of non-surgical management of non-condylar mandibular fractures: systematic review and meta-analysis. Br J Oral Maxillofac Surg. 2024;62(9):761-768. doi:10.1016/j.bjoms.2024.04.016.
20. Ellis E III, Schubert W. Fractures in the edentulous atrophic mandible. AO Surgery Reference. Accessed July 29, 2026.
21. Pathak R, Kale TP, Kotrashetti SM, Patel H. Interventions for mandibular coronoid process fractures: a systematic review. J Maxillofac Oral Surg. 2023;22(2):433-441. doi:10.1007/s12663-022-01824-0.
22. Jolly SS, Kaur K, Rattan V, Singh A, Kiran T. Management of displaced pediatric mandibular fracture: systematic review and meta-analysis. Arch Craniofac Surg. 2025;26(2):43-50. doi:10.7181/acfs.2026.0007.

Figure credits

- Figures 0.1, 1.1, 2.1, 3.1, 4.1, 4.2, 5.1, 6.1, 7.1, 8.1, 8.2, 9.1, and 10.1 are original educational syntheses created for this guide.
- Figure 1.2 uses "Gray176.png" by Henry Vandyke Carter from Gray's Anatomy, public domain, via Wikimedia Commons.
- Figure 2.2 uses "Simple mandible fracture.jpg" by Coronation Dental Specialty Group, CC BY 3.0, via Wikimedia Commons.
- Figure 5.2 uses "3D CT of bilateral mandible fracture.jpg" by Coronation Dental Specialty Group, CC BY 3.0, via Wikimedia Commons.
- Figure 7.2 uses "Townes view bilateral condyle fracture.jpg" by Coronation Dental Specialty Group, CC BY 3.0, via Wikimedia Commons.

EDUCATIONAL SCOPE

This guide supports resident education and does not replace multidisciplinary judgment, current institutional protocols, operative supervision, or direct review of source material.