

EFFECTS OF OCCLUSAL ALTERATIONS FOLLOWING MANDIBULAR FRACTURE TREATMENT ON POSTURAL STABILITY, PLANTAR PRESSURE AND GAIT: A SYSTEMATIC REVIEW

Oral & Maxillofacial Surgery

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ABSTRACT

Background: Mandibular fracture treatment (maxillomandibular fixation or open reduction and internal fixation) can leave residual occlusal discrepancies of uncertain effect on posture and gait. **Objective:** To systematically identify evidence linking occlusal alteration after mandibular fracture treatment to instrumented plantar pressure, postural, or gait outcomes. **Methods:** This review was conducted according to PRISMA 2020 recommendations. PubMed, Embase, Scopus, Web of Science, CINAHL and the Cochrane Library were searched (inception to 27 July 2026). As the review was not prospectively registered, study selection and data extraction were performed by a single reviewer. **Results:** Only one study met full eligibility criteria - a case series of 15 patients with condylar head fracture assessed by static stabilometry, rated high/uncertain risk of bias (JBI Case Series Checklist). No study used dynamic plantar pressure platforms or gait analysis in mandibular fracture patients. A 2026 systematic review of the broader, non-trauma occlusion-posture literature found no consistent association (GRADE: low to very low certainty). **Conclusion:** Current evidence is insufficient to establish whether occlusal alterations following mandibular fracture treatment influence postural stability, plantar pressure, or gait. Well-designed, prospective studies using objective dynamic assessment tools are urgently required.

KEYWORDS

Mandibular Fractures; Occlusion; Postural Balance; Plantar Pressure; Gait; Stabilometry

INTRODUCTION

Mandibular fractures are commonly treated by closed reduction with maxillomandibular fixation (MMF) or open reduction and internal fixation (ORIF), and residual occlusal discrepancy remains a recognized complication of both. Research on the stomatognathic system proposes that trigeminal afferents from periodontal ligaments, the temporomandibular joint, and masticatory muscles converge with cervical and vestibular pathways governing postural control, so altering occlusion could in principle shift center of pressure, plantar loading, and gait. A narrative review of post-traumatic craniocervical disorders reached a parallel conclusion, noting that the stomatognathic system warrants assessment after head and neck trauma even though evidence for its contribution remains preliminary [1]. Because trauma and its treatment alter occlusion much as orthodontic intervention does, mandibular fracture patients could plausibly show measurable postural or gait change during recovery, with relevance to fall risk and rehabilitation planning; this is not part of standard postoperative assessment. No prior review has specifically addressed this intersection. This review aimed to systematically identify and appraise evidence connecting occlusal alteration after mandibular fracture treatment to instrumented plantar pressure, postural stability, and gait, and to situate any such evidence within the broader literature.

METHODS

Eligibility Criteria (PICOS)

Population	Patients of any age treated for mandibular fracture (any modality: MMF, ORIF, or combined)
Intervention/Exposure	Occlusal alteration attributable to the fracture and/or its treatment
Comparison	Pre-injury or contralateral occlusion, normo-occlusive controls, or ORIF vs. closed reduction
Outcome	Instrumented plantar pressure, postural stability/stabilometry, or gait analysis
Study design	Comparative studies, cohorts, or case series with quantitative outcome data
Language	No restriction
Publication type	Peer-reviewed articles; conference abstracts without full data excluded

Search Strategy

PubMed/MEDLINE, Embase, Scopus, Web of Science, CINAHL and the Cochrane Library were searched from inception to 27 July 2026 (date of last search) using: ("mandibular fracture" OR "condylar fracture") AND (occlusion OR malocclusion) AND (posture OR gait OR stabilometry OR "plantar pressure"), supplemented by reference-list and citation tracking; ClinicalTrials.gov and WHO ICTRP were also checked for registered studies. Duplicate records were removed

manually by comparing title, author, and publication year; no reference-management software was used.

Screening and Risk-of-Bias Assessment

This review was conducted according to PRISMA 2020 recommendations. As it was not prospectively registered, screening and data extraction were performed by a single reviewer using a web-based search and retrieval process rather than native database export; Figure 1 presents the resulting search and screening flow. Risk of bias in the eligible study was appraised using the JBI Critical Appraisal Checklist for Case Series (Table 2). Full-text access to the article could not be obtained, so appraisal was based on the published abstract and indexed metadata.

RESULTS

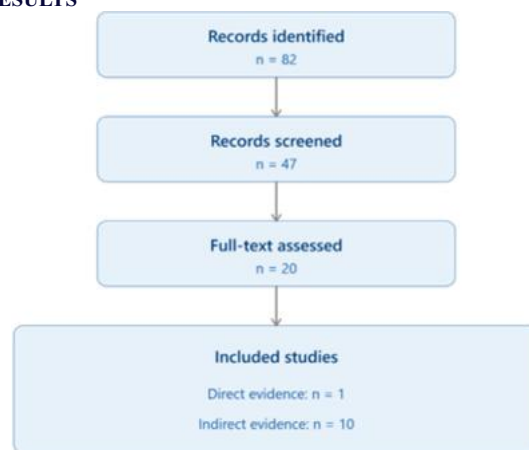


Figure 1 Search And Screening Flow

Only one study directly satisfied the eligibility criteria. Faralli et al. [2] prospectively studied 15 adults with unilateral or bilateral condylar head fracture from sport or traffic trauma, assessing static balance by computerized stabilometry (statokinesigram surface, stomatognathic influence index, frontal-plane oscillation) under Romberg, bite-test, and head-retroflexion conditions. No plantar pressure platform or gait analysis was used, and results were not stratified by treatment modality. Postural destabilization was concentrated in patients with concomitant vestibular dysfunction or cervical/neck pain rather than being proportional to fracture severity or treatment received (Table 1; risk of bias, Table 2).

Table – 1 Characteristics of the Direct-evidence Study

Author, Year	Country	Design	Sample	Fracture type	Treatment	Outcome measure	Limitations
Faralli et al., 2009	Italy	Case series	n=15 adults	Condylar head (sport/traffic trauma)	Not stratified by modality	Static stabilometry (no plantar-pressure/gait tools)	Small, non-comparative, abstract-only access

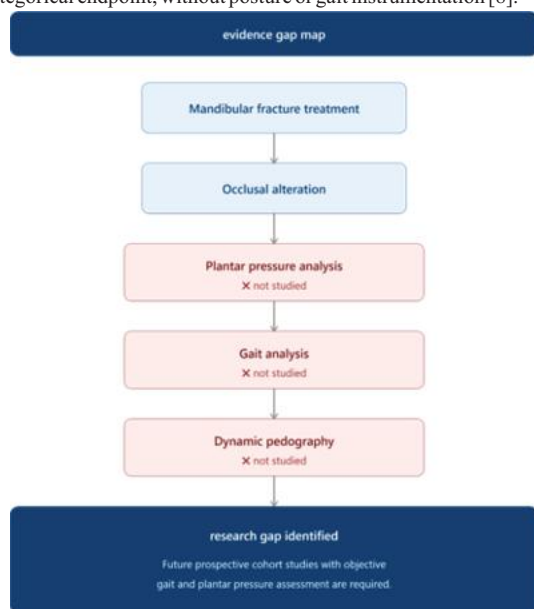
Source: Faralli et al. [2], *Eur Arch Otorhinolaryngol*, 2009.

Table – 2 JBI Critical Appraisal Checklist for Case Series (Faralli Et Al. [2], 2009)

JBI domain	Judgment
1. Clear inclusion criteria	✓
2. Condition measured in a standard, reliable way	?
3. Valid methods for condition identification	?
4. Consecutive inclusion of participants	?
5. Complete inclusion of participants	?
6. Clear demographic reporting	?
7. Clear clinical information reporting	✓ (partial)
8. Clear outcome/follow-up reporting	✓ (partial)
9. Appropriate statistical analysis	?
Overall risk of bias	High/uncertain

Source: JBI Case Series Checklist; appraised from published abstract and indexed metadata. ✓ = yes, ? = unclear.

A 2026 PROSPERO-registered systematic review of seven non-trauma occlusion-posture studies found no consistent association with postural control (GRADE: low to very low certainty), with effects more apparent under dynamic than static testing [3]. Individual studies remain inconsistent: an Angle-classification study of 90 adults found center-of-pressure shifts without a gait correlation [4], static stabilometry showed no correlation with occlusion in another adult sample [5], and experimental cotton-roll-induced occlusal imbalance produced reproducible dynamic plantar-loading changes during walking [6]. A related systematic review in growing subjects similarly reported inconsistent, low-certainty associations between malocclusion and posture/gait parameters [7]. Meta-analyses of ORIF versus closed treatment report post-treatment malocclusion only as a categorical endpoint, without posture or gait instrumentation [8].

**Figure 2**

DISCUSSION

The near-absence of direct evidence is itself a meaningful finding: a biologically plausible, clinically relevant question is addressed by, at most, one small, dated, non-comparative, static-balance study, despite a much more mature adjacent literature on occlusion-posture relationships and on fracture-treatment outcomes considered separately. This can be framed as a formal evidence-gap analysis (Figure 2): plantar pressure, gait, and dynamic pedography in mandibular fracture patients remain entirely unstudied. Even the one directly relevant study suggests postural effects after condylar fracture may depend more on concurrent vestibular or cervical injury than on the fracture or its occlusal consequence per se. This tempers

expectations: even in non-trauma populations without the added confound of acute pain and edema, occlusion's influence on postural control is inconsistent and most apparent under dynamic, provocative testing rather than static stance, suggesting future post-fracture studies are more likely to detect an effect using dynamic plantar pressure and gait protocols than static stabilometry, the only method used to date. Plausible reasons for the gap include disciplinary separation (fracture care in oral/maxillofacial surgery versus posturography in physiotherapy and neurology) and the practical difficulty of standardized balance testing in acute trauma patients.

Clinical implications: Routine postoperative evaluation currently focuses on fracture union, mouth opening, and occlusion. Instrumented gait analysis has not been incorporated despite theoretical neurophysiological links between occlusion and postural control, so providers cannot currently quantify post-fracture balance or fall risk from occlusal change alone and should avoid over-attributing balance complaints to occlusion without excluding vestibular and cervical causes.

Limitations of this review include single-reviewer screening, a non-registered protocol, and abstract-only risk-of-bias appraisal of the sole eligible study (see Methods); these are disclosed rather than concealed.

Future Research

Future studies should:

- Compare postural and gait outcomes between MMF and ORIF
- Incorporate dynamic pedography and force-plate assessment
- Include stabilometry alongside dynamic gait analysis
- Evaluate outcomes across different fracture sites
- Correlate occlusion scores with quantitative gait indices
- Use prospective, multi-reviewer, registered designs

CONCLUSIONS

Current evidence is insufficient to establish whether occlusal alterations following mandibular fracture treatment influence postural stability, plantar pressure, or gait. Direct evidence is limited to one small, non-comparative, high/uncertain-risk case series using static stabilometry alone; no study has used dynamic plantar pressure platforms or instrumented gait analysis in this population, and none has compared outcomes across treatment modalities. Well-designed, prospective studies using objective dynamic assessment tools, stratified by treatment modality and controlling for vestibular/cervical confounders, are urgently required.

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