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Clinical Case Report

Infected mandibular angle fracture non-union managed with sticky bone and platelet-rich fibrin: a case report

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ABSTRACT

This case report describes a 50-year-old male smoker with no known systemic disease who presented with pain, restricted mouth opening, exposed hardware, purulent discharge, and unstable occlusion three months after double-plate fixation of a right mandibular angle fracture. No gross segmental mobility was evident before surgery. After a one-week preoperative course of oral amoxicillin–clavulanic acid and chlorhexidine mouthwash, the loose hardware was removed. Mobility became evident after hardware removal, and debridement revealed fibrous tissue and necrotic bone; these combined clinical, radiographic, and operative findings supported infected non-union over delayed union. The residual gap, which did not constitute a segmental continuity defect, was managed with a four-hole KLS Martin miniplate, four 2.0 × 5-mm monocortical screws, and four weeks of elastic intermaxillary fixation. Approximately 3 mL of 3–5-mm Atident human cancellous allograft was combined with autologous fibrin glue to form sticky bone and covered with platelet-rich fibrin membranes. At three months, mouth opening was 42 mm with stable occlusion, no mobility or recurrent exposure, and progressive radiographic bridging compatible with consolidation; at 12 months, consolidation was maintained, and mouth opening was 38 mm. Sticky bone facilitated particulate-graft handling and containment, but this single case cannot establish an independent biological benefit of platelet-rich fibrin or the fibrin-based graft matrix. (Rev Port Estomatol Med Dent Cir Maxilofac. 2026;67(x):1-7)

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Introduction

Mandibular fractures account for a substantial proportion of facial fractures. The angle region is particularly susceptible to complications because of local biomechanics, dentition, and surgical access. Non-union is a multifactorial failure of fracture healing, established by a combination of time course, symptoms, mechanical instability, occlusal findings, imaging, and operative findings rather than by a radiographic gap alone. Local infection, inadequate reduction or stability, impaired bone contact, smoking, diabetes, and other systemic factors may contribute.[1-4]

Non-union management depends on infection burden, bone viability, soft-tissue condition, mandibular continuity, residual bone stock, and the mechanical environment. Debridement and stable fixation remain central. Options may include autogenous corticocancellous grafting, load-bearing reconstruction plates, staged reconstruction, and, for extensive composite or continuity defects, vascularized bone flaps. Bone morphogenetic proteins and other biologics have been used selectively, but indications, availability, cost, and safety limit routine use. No universally applicable numerical threshold defines a critical-size mandibular defect; therefore, descriptive reporting of continuity loss and post-debridement defect characteristics is preferable.[3-5]

Platelet concentrates have emerged as adjuncts to accelerate soft-tissue and bone healing. While platelet-rich fibrin (PRF) alone provides an autologous fibrin matrix, sticky bone combines particulate graft with a fibrin-rich liquid to yield a cohesive composite. This approach has primarily been studied in alveolar and implant-related defects, not infected mandibular fracture non-union. Recent systematic reviews suggest possible improvements in selected oral, maxillofacial, and mandibular-fracture outcomes. However, heterogeneity, variable preparations, residual risk of bias, and limited high-level evidence preclude attributing union to PRF alone.[6-11]

This report describes a single infected mandibular angle fracture non-union treated with removal of loose hardware, debridement, re-fixation, allogeneic particulate graft combined with autologous fibrin glue, PRF membranes, and temporary elastic intermaxillary fixation. The report follows the CARE case-report guideline where applicable.[12]

Case report

A 50-year-old male patient was referred to a tertiary oral and maxillofacial surgery clinic. Three months earlier, a road-traffic injury caused a right mandibular angle fracture that was treated by open reduction and internal fixation with two plates at another center. The original operative record, including plate system, screw dimensions, fracture displacement, and the precise chronology of hardware exposure, was unavailable. He reported persistent pain and restricted mouth opening and was aware that the fracture had not healed. The duration of each symptom before referral could not be reconstructed from the archived record.

The patient reported smoking approximately 10–20 cigarettes per day. He had no known systemic diseases, including diabetes, and his general condition was good. No regular medication or known nutritional disorder affecting bone healing was recorded. Alcohol history was not documented. Oral hygiene was moderate. The fracture line had no teeth, no extraction was performed, and no specific odontogenic source of infection was documented.

At presentation, intraoral examination showed exposed fixation plates with purulent discharge. Occlusion was unstable. No gross segmental mobility was apparent on the preoperative clinical examination. Cone-beam computed tomography (CBCT) showed a persistent radiolucent gap at the right mandibular angle without convincing bridging (Figure 1). The differential diagnosis included delayed union because the presentation was at three months and preoperative mobility was not grossly evident. The following combined findings subsequently supported infected non-union: exposed loose hardware and purulence, unstable occlusion, the persistent gap, mobility after hardware removal, and fibrous tissue with necrotic bone at surgery. No preoperative or intraoperative cultures, deep-tissue samples, or bone specimens were obtained. No routine inflammatory laboratory tests were obtained, and osteomyelitis was not diagnosed.



Figure 1. Preoperative clinical and radiographic findings. (A) Cone-beam computed tomography (CBCT) coronal view; (B) CBCT cross-sectional image; (C) intraoral view showing exposed fixation hardware and the local oral environment.

To reduce the local inflammatory burden before revision, the patient was prescribed oral amoxicillin–clavulanic acid (875 + 125 mg) twice daily for seven days together with Kloroben oral rinse (Drogsan İlaçları Sanayi ve Ticaret A.Ş., Ankara, Turkey), containing 0.12% chlorhexidine gluconate and 0.15% benzydamine hydrochloride. Revision surgery was performed under general anesthesia. No intraoperative antibiotic was administered. The exposed intraoral incision was extended anteriorly and posteriorly, and a full-thickness mucoperiosteal flap was elevated subperiosteally. Both previously placed plates and their associated screws were loose; no plate fracture was present. After hardware removal, mobility was observed between the segments. Fibrous tissue, devitalized soft tissue, and necrotic bone were removed by curettage and rotary instrumentation until clinically viable margins were obtained.

Calibrated post-debridement mesiodistal, vertical, and buccolingual measurements were not recorded, and reliable retrospective three-dimensional measurement was not possible from the available exported CBCT images. Nevertheless, the operative and imaging records showed a limited residual gap without segmental loss of mandibular continuity. No formal critical-size classification was made. The dentate segments could be reduced into occlusion, and intermaxillary fixation (IMF) screws were placed while avoiding dental roots. Elastic bands were used to reproduce the pre-injury occlusion based on available reference photographs.

The fracture was re-fixed through the intraoral approach with a single four-hole KLS Martin titanium miniplate (KLS Martin Group, Tuttlingen, Germany) on the buccal aspect and four 2.0 × 5-mm monocortical screws distributed across the two segments. With preserved mandibular continuity and reducible dentate segments, this construct was intended as load-sharing fixation and was supplemented by four weeks of elastic IMF. The operative record described functionally stable fixation, although quantitative stability testing was not performed.

Approximately 45 mL of venous blood was collected in five 9-mL, 16 × 100-mm polyethylene terephthalate (PET) tubes before graft preparation. Three red-capped Vacufine serum clot-activator tubes containing spray-coated silica (REF 409190; Makrolab A.Ş., Konya, Turkey) were used to prepare PRF clots. Two Ayset additive-free tubes (Z; REF 70653; Ayset A.Ş., Adana, Turkey) were used to obtain autologous fibrin glue. Centrifugation began approximately 20–40 seconds after venipuncture. A Hettich EBA 20 centrifuge (Andreas Hettich GmbH, Tuttlingen, Germany) with an eight-place, 33° fixed-angle rotor was used. The manufacturer reports a maximum rotor radius of 86 mm for the relevant tube configuration; therefore, 2700 rpm corresponded to a maximum relative centrifugal force of approximately 701 × g at the tube bottom, calculated as $1.118 \times 10^{-5} \times 8.6\ \text{cm} \times 2700^2$. The two additive-free tubes were removed after 2 minutes, and the fibrinogen-rich liquid was aspirated with a sterile syringe. The three clot-activator tubes remained in the centrifuge for an additional 10 minutes, for a total of 12 minutes. The resulting clots were compressed between sterile gauze pads for 10 seconds to form PRF membranes. Cap colors were not used as standardized product identifiers.

Approximately 3 mL of 3–5-mm Atident/Atigreft human cancellous bone chips (product code 10021; Atigen-Cell Teknoloji Özel Sağlık Hizmetleri A.Ş., Trabzon, Turkey) were mixed with autologous fibrin glue and allowed to polymerize into a cohesive sticky bone composite (Figure 2). According to the manufacturer's product documentation, the allograft is derived from cancellous femoral-head tissue obtained from screened living donors, processed with peracetic acid and Sorensen buffer, freeze-dried to a residual water content of ≤6%, and terminally gamma irradiated at 25 kGy. The composite filled the limited residual gap and was covered with the PRF membranes. The flap was closed primarily without tension.

Elastic IMF was maintained for four weeks and then released. Postoperatively, the patient used oral amoxicillin–clavulanic acid (Augmentin) 1000 mg twice daily for seven days and Kloroben oral rinse three times daily for seven days. He also used oral dexketoprofen 25 mg (as dexketoprofen trometamol; Arveles) twice daily for seven days for analgesia, and a soft diet was recommended. The patient was reviewed weekly until complete wound healing. No formal physiotherapy protocol was recorded; mandibular function was monitored after IMF release.

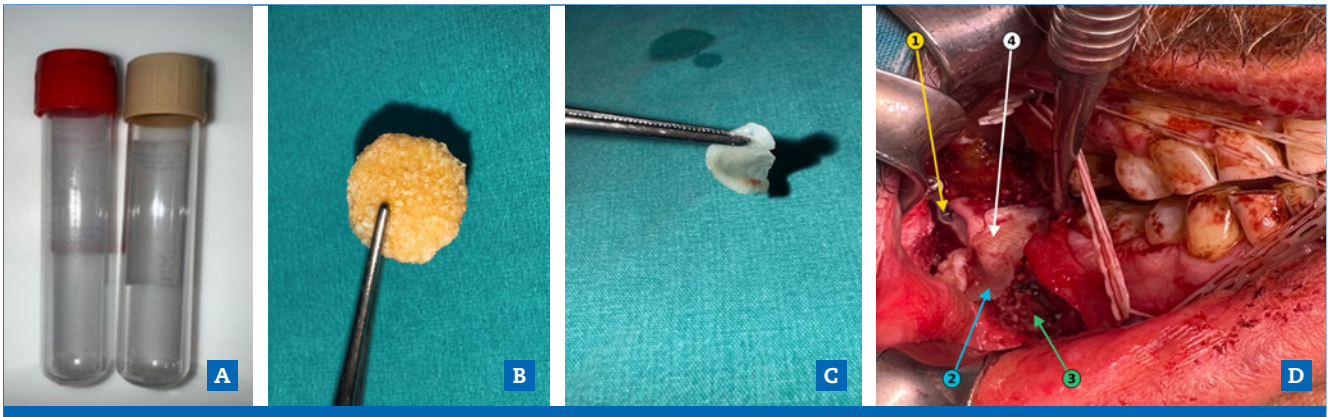


Figure 2. Preparation and placement of adjunctive materials. (A) Representative examples of the two tube types used (the image does not show all five tubes). (B) Sticky bone prepared from approximately 3 mL of 3–5-mm Atident/Atigreft human cancellous bone chips and autologous fibrin glue. (C) Platelet-rich fibrin (PRF) membrane formed by compression between sterile gauze pads for 10 seconds. (D) Intraoperative placement: 1, fixation plate; 2, treated fracture/defect region; 3, sticky bone graft; 4, PRF membrane.

Historical lot/batch numbers and expiration dates could not be retrieved for the Atident/Atigreft allograft, fixation plate and screws, IMF screws, Vacufine and Ayset tubes, Kloroben, Augmentin, or Arveles. Additional catalog identifiers for the fixation hardware and medicinal products were unavailable. The available historical records did not provide the manufacturer, model, and dimensions of the IMF screws or the manufacturer details of the Augmentin and Arveles products dispensed at the time of treatment. Available product identifiers are reported above; missing traceability information has not been reconstructed or estimated.

At three months after revision, the mucosa had healed without hardware exposure, recurrent purulence, or other recorded adverse events. The patient was asymptomatic, had returned to work and regained normal dietary function, and had a maximum interincisal opening of 42 mm. Occlusion was stable, with no segmental mobility. CBCT showed increasing radiopacity and bridging across the previous fracture gap, compatible with progressive consolidation; residual allograft could not be distinguished from newly mineralized tissue by CBCT alone (Figure 3A-C).

At 12 months, the patient remained asymptomatic with a maximum interincisal opening of 38 mm, stable occlusion, and no recurrent exposure or infection. No hardware removal or hardware-related complication was recorded. CBCT showed continued radiographic bridging compatible with consolidation (Figure 3D-E). The clinical course is summarized in Figure 4.

At follow-up, the patient reported that the revision procedure was well tolerated and recovery was satisfactory, particularly the improvement in mouth opening and eating.

Discussion and conclusions

At three months, a radiographic fracture gap without callus could still represent delayed union. In this patient, infected non-union was diagnosed based on a combination of findings rather than imaging alone: persistent symptoms, unstable occlusion, exposed hardware with purulent discharge, loosened fixation, mobility after hardware removal, and fibrous tissue with necrotic bone at debridement. The absence of gross mo-

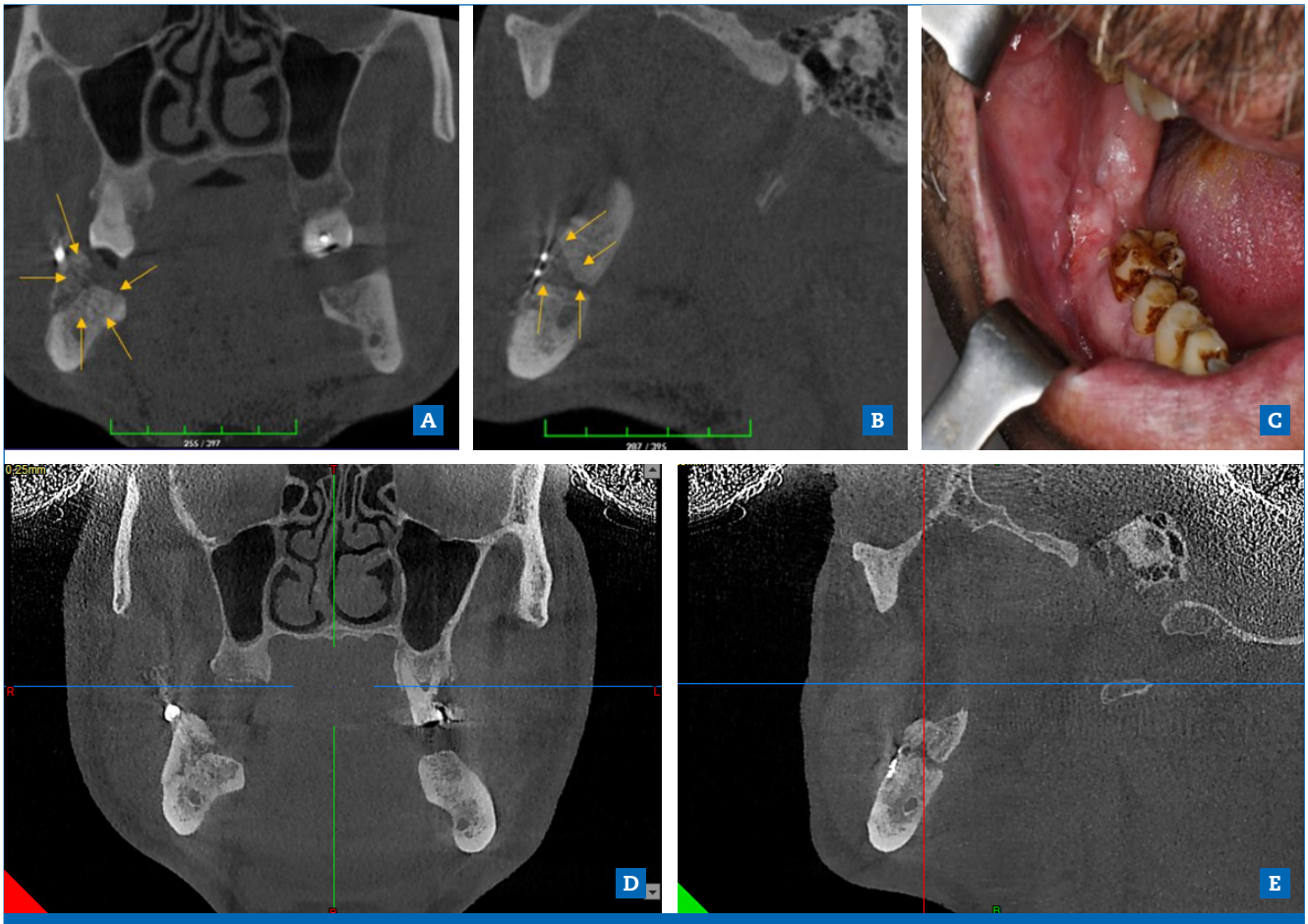


Figure 3. Postoperative follow-up. (A) Three-month cone-beam computed tomography (CBCT) coronal view. (B) Three-month CBCT cross-sectional image. Arrows in panels A and B indicate increasing radiopacity and bridging across the previous fracture gap, compatible with consolidation. (C) Three-month intraoral healing. (D) Twelve-month CBCT coronal view. (E) Twelve-month CBCT cross-sectional image showing continued radiographic bridging compatible with consolidation. CBCT cannot distinguish residual allograft from newly mineralized tissue without histology.

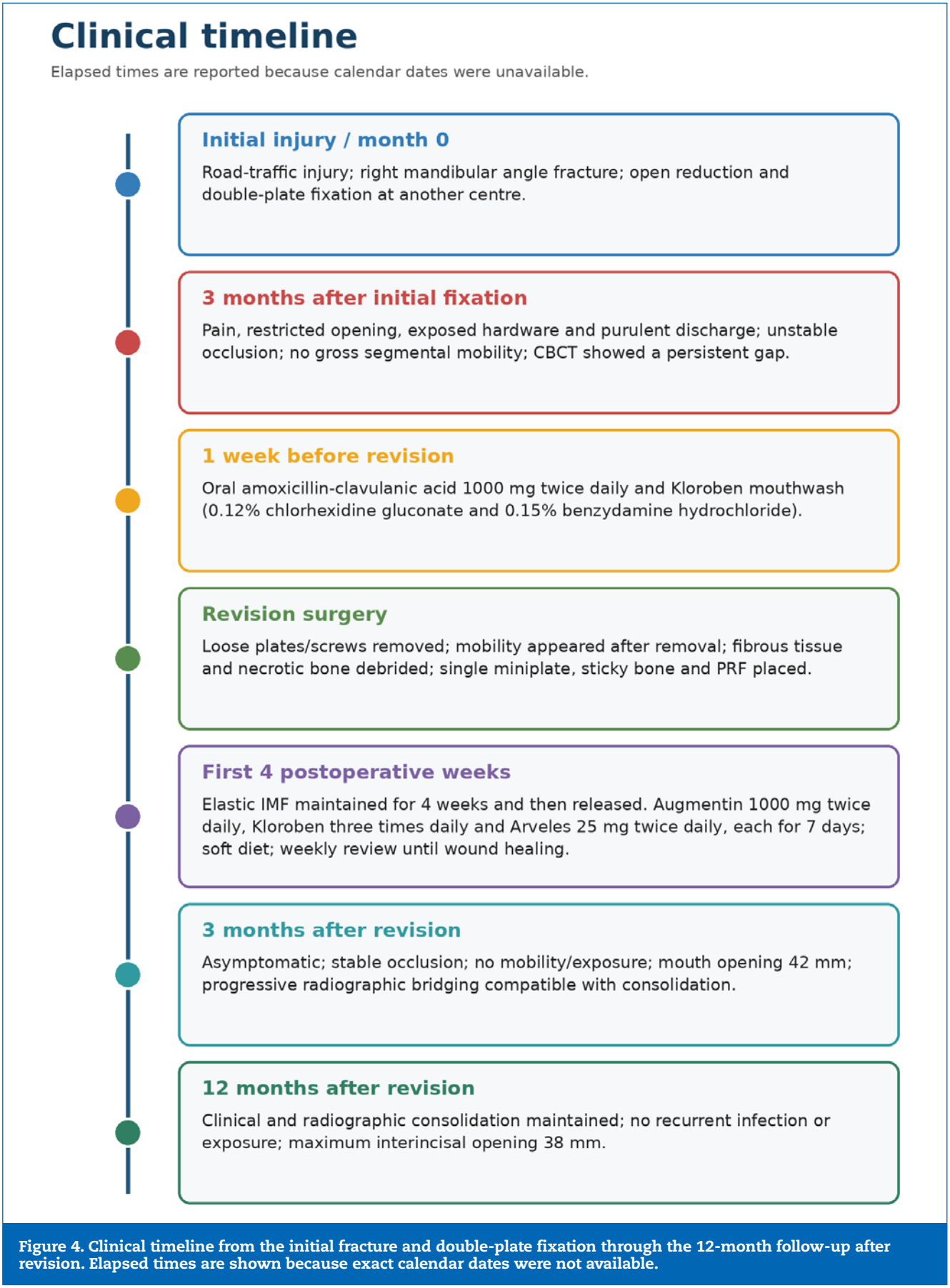


Figure 4. Clinical timeline from the initial fracture and double-plate fixation through the 12-month follow-up after revision. Elapsed times are shown because exact calendar dates were not available.

bility before hardware removal does not negate mechanical failure because the loose construct may have partially masked motion.[3-5]

Successful management of infected mandibular non-union depends primarily on removing non-viable tissue and failed hardware, restoring occlusion, and providing fixation appropriate to the post-debridement mechanical environment. The selection between load-sharing miniplates and load-bearing reconstruction plates should not be based on defect size alone; mandibular continuity, inferior-border support, remaining bone stock, fracture geometry, soft-tissue condition, infection, dentition, and compliance all matter. In this case, the limited residual gap, preserved continuity, reducible dentate segments, and four-week elastic IMF supported a case-specific load-sharing strategy. However, because defect dimensions were not quantified, this rationale remains incompletely reproducible and should not be generalized. Sticky bone and PRF were adjuncts and were not used to compensate for inadequate stability.[3-5] This case-specific approach should not be interpreted as evidence that a single miniplate is appropriate for all infected mandibular non-unions, or that a fibrin-based graft composite can compensate for inadequate fixation.

When bone contact is inadequate, alternatives include: autogenous corticocancellous grafting; more rigid or load-bearing reconstruction plating; staged management in selected infections; and vascularized osseous free flaps for extensive continuity defects, compromised soft tissue, or poor recipient beds. Selected biologics, including bone morphogenetic proteins, may have a role in particular settings, but they do not replace patient-specific mechanical reconstruction. Because no universal numerical critical-size threshold was applied and calibrated three-dimensional measurements were unavailable, this case is described as a limited residual gap with preserved mandibular continuity rather than formally classifying it as a non-critical-size defect.[3-5]

The graft composite in this report was not autologous: it consisted of an allogeneic particulate graft combined with autologous fibrin glue. Its clearest plausible advantage is procedural: the fibrin matrix creates a cohesive material that may facilitate placement and limit particulate migration. There is no strong evidence indicating a biological advantage. A recent systematic review of sticky bone focused mainly on alveolar defects, and a broad PRF systematic review included heterogeneous oral and maxillofacial procedures. A more recent systematic review and meta-analysis of mandibular fracture studies reported improvements in bone mineral density and clinical outcomes with platelet-rich plasma (PRP) or PRF, but judged the overall evidence to be limited and called for higher-quality studies. These findings do not establish effectiveness in infected mandibular angle non-union treated with simultaneous debridement, re-fixation, allograft, and IMF.[8-11,13]

Radiographic interpretation also requires restraint. Allogeneic particles can remain radiopaque, so CBCT cannot confirm histological new bone. In this patient, the combined absence of pain and mobility, stable occlusion, absence of recurrent exposure or infection, and progressive radiographic bridging over 12 months support consolidation. Histology was not performed, and the independent contribution of PRF, autologous fibrin glue, and the allograft cannot be separated from debridement, reduction, renewed fixation, and IMF.

This report has several limitations: a single-patient design without a comparator; smoking habits; incomplete records from the initial operation and symptom chronology; no calibrated post-debridement dimensions; no microbiological culture, susceptibility testing, inflammatory laboratory evaluation, or histology; incomplete historical product traceability; and no documented formal physiotherapy protocol. These limitations reduce reproducibility and prevent causal inference.

In conclusion, debridement, removal of loose hardware, occlusal reduction, case-specific load-sharing fixation, allogeneic particulate graft combined with autologous fibrin glue, PRF membranes, and temporary elastic IMF were associated with clinical and radiographic consolidation of this infected mandibular angle non-union at 12 months. Sticky bone may facilitate graft handling and containment, but this case cannot establish an independent regenerative benefit of PRF or the fibrin-based graft matrix. Mechanical stability and infection-focused surgical principles remain decisive.

Conflict of interest

The authors have no conflicts of interest to declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

CRediT authorship contribution statement

Zeynep Burçin Gönen: Conceptualization; Data curation; Formal analysis; Methodology; Project administration; Resources; Supervision; Writing – original draft; Writing – review & editing. **Mert Şahin:** Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing.

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Pseudartrose infetada do ângulo mandibular com sticky bone e fibrina rica em plaquetas: caso clínico

RESUMO

Descreve-se o caso de um homem de 50 anos, fumador, sem doença sistémica conhecida, que se apresentou com dor, limitação da abertura oral, exposição do material de osteossíntese, drenagem purulenta e oclusão instável três meses após osteossíntese com duas placas de uma fratura do ângulo mandibular direito. Não havia mobilidade segmentar evidente antes da cirurgia. Após uma semana de amoxicilina e ácido clavulânico por via oral e bochechos com clorexidina, o material de osteossíntese solto foi removido. A mobilidade tornou-se evidente após a remoção, e o desbridamento revelou tecido fibroso e osso necrótico. Os achados clínicos, radiográficos e operatórios sustentaram o diagnóstico de pseudartrose infetada, em vez de atraso de consolidação. O espaço residual, sem perda de continuidade mandibular, foi tratado com uma miniplaca KLS Martin de quatro orifícios, quatro parafusos monocorticais de 2,0 × 5 mm e fixação intermaxilar elástica durante quatro semanas. Cerca de 3 mL de aloenxerto esponjoso humano Atident, com partículas de 3–5 mm, foram misturados com cola de fibrina autóloga para formar sticky bone e cobertos com membranas de fibrina rica em plaquetas. Aos três meses, a abertura oral era de 42 mm, com oclusão estável, sem mobilidade ou nova exposição, e com sinais radiográficos de consolidação progressiva. Aos 12 meses, a consolidação mantinha-se e a abertura oral era de 38 mm. O sticky bone facilitou o manuseamento e a contenção do enxerto, mas este caso não permite estabelecer um benefício biológico independente da fibrina rica em plaquetas ou da matriz de fibrina. (Rev Port Estomatol Med Dent Cir Maxilofac. 2026;67(x):xxx-xxx)

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Palavras-chave:
Regeneração óssea
Substitutos ósseos
Relatos de casos
Fraturas não consolidadas
Fraturas mandibulares
Fibrina rica em plaquetas