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CASE REPORT

Segmental Open Mandibular Fracture with Type 2 Diabetes Mellitus Managed by Intraoral Open Reduction, Internal Fixation and 101 Days of Arch Bar Retention: A Case Report with a Structured Care-Gap Analysis

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ABSTRACT

Background: Mandibular fracture is the maxillofacial injury most often treated operatively, and road traffic collision is its dominant cause. Published series report fixation technique and union; far fewer report the perioperative variables that govern outcome when a metabolic comorbidity is present.

Objective: To present the staged intraoral repair of a segmental open mandibular fracture in an adult with type 2 diabetes mellitus and, through a structured audit of the record, to identify the measurable perioperative determinants of outcome that were not documented during care.

Case presentation: A 51-year-old man was struck by a car while riding a motorcycle and sustained a multiple open mandibular fracture of the symphysis, right parasymphysis and a segmental right body, with an anterior open bite, an interincisal opening of 24 mm, right mandibular crepitus and an avulsed right mandibular canine. He had treated hypertension and type 2 diabetes mellitus. Computed tomography with three-dimensional reconstruction defined the pattern and excluded condylar and intracranial injury. On the eighth day after injury, intraoral open reduction with four plates was combined with Erich arch bar maxillomandibular fixation. Rigid intermaxillary fixation was released at 21 days and the mandibular arch bar retained for 101 days. At day 116 mouth opening was unrestricted and mastication pain-free, with no infection, dehiscence, malunion or plate exposure. Structured review of the record showed that four determinants of outcome were never documented: any glycaemic measurement, inferior alveolar nerve sensation, the disposition of the avulsed canine and the retained dental roots, and a closing interincisal measurement.

Conclusion: A staged intraoral repair restored occlusion and function in a diabetic adult with a segmental open mandibular fracture. The favourable result was achieved despite four recording gaps, each fixable at no cost, that would have converted a good outcome into a demonstrated one.

1. Introduction

The mandible is the only mobile bone of the facial skeleton, and its exposed, projecting position at the lower third of the face makes it one of the two most frequently fractured bones of the facial skeleton and the one most often taken to theatre. In a 15-year multi-institutional registry analysis of 2,705 adults undergoing open reduction and internal fixation of the mandible, the body was involved in 42%, the angle in 22% and the symphysis in 16%, and 9.4% of patients experienced a complication within 30 days.[1] A five-year review of 338 subjects operatively treated for maxillofacial trauma at a Netherlands tertiary centre found mandibular fractures in 162 subjects (48%) and additional injuries elsewhere in the body in 198 (59%), confirming that the fractured mandible is rarely an isolated clinical problem.[2]

The causal profile differs sharply between settings. Road traffic collision accounted for the injury in 64 of 142 patients (45.1%) in one recent single-centre series, in which 76.8% of patients were male, 82.4% were younger than 35 years and 84 (59.2%) had a compound fracture; those 142 patients carried 171 fracture sites, of which 79 (46.2%) were symphyseal or parasymphyseal.[3] In a 10-year Taiwanese review of 118 patients with 202 fracture sites, road traffic collision caused the fracture in 75 of the 113 patients whose cause could be identified (66.1%), motorcycle accidents alone accounting for 52 of those 113 (46.0%).[4] Two-wheeled transport is the specific hazard in much of Asia: among 424 two-wheeler riders with maxillofacial injury, only 27.2% had been wearing a helmet, 86.8% were male and 45.3% were aged 20 to 29 years.[5] Helmet type modifies severity rather than merely presence, a retrospective cohort of 282 motorcycle-related maxillofacial fractures recording a Comprehensive Facial Injury score of 8.16 for open-face helmet wearers; the source does not label that figure a mean and does not report the size of the open-face subgroup.[6]

The anterior mandible presents a particular mechanical problem. The symphyseal and parasymphyseal region is subject to torsional and splaying forces during function, and the segment behind a parasymphyseal fracture line is elevated and medially rotated by the masseter, medial pterygoid and temporalis sling while the anterior segment is depressed by the suprahyoid group. Fixation must therefore neutralise a rotational moment as well as a bending moment. Contemporary practice is dominated by titanium plate osteosynthesis: in a prospective study of 425 patients across 12 European centres, rigid osteosynthesis was used for 74% of mandibular fractures, with malocclusion in 5.6% and infective complications in 5.4%.[7] Whether the plates should be supplemented by maxillomandibular fixation, and for how long, remains unsettled. Among 336 patients enrolled prospectively at those same European centres, postoperative maxillomandibular fixation of median duration three weeks was applied in 140 patients (64%) once those reduced manually were excluded, and malocclusion was no less frequent with it (5%, 95% confidence interval 2 to 10) than without it (4%, 95% confidence interval 1 to 11).[8]

Superimposed comorbidity changes the calculus further. Frailty and physiological reserve, rather than chronological age alone, predict adverse events after facial fracture repair: American Society of Anesthesiologists class 3 to 4 carried an odds ratio of 3.63 (95% confidence interval 1.91 to 6.91) for any adverse event among 1,806 patients,[9] and non-surgical-site complications occurred in 21 of 314 patients (6.7%), with age 60 years or older the strongest independent predictor against patients aged 16 to 59 (adjusted odds ratio 5.55, 95% confidence interval 1.92 to 16.21).[10] Diabetes mellitus is the comorbidity most often encountered in this population and the one with the clearest dose- response relationship to surgical harm: across 282,131 general surgical patients with an available glycated haemoglobin, 36% had diagnosed diabetes and a further 6.4% had values in the diabetic range without a diagnosis, and among those with diabetes the adjusted odds of any 30-day complication rose progressively from 1.06 (95% confidence interval 1.00 to 1.11) below 6.0% to 1.32 (95% confidence interval 1.25 to 1.39) above 9.0%.[11]

The published case literature on mandibular trauma is overwhelmingly technical, describing which plate was used, through which approach, and whether union followed. What is far less often reported is the perioperative record itself: whether the metabolic state that determines healing was ever measured, whether the nerve most at risk was ever tested, whether the dentition adjacent to the hardware was ever addressed, and whether the function that defines success was ever quantified. **The novelty of the present report is twofold. First, it pairs a conventionally successful staged repair of a segmental open mandibular fracture in an adult with type 2 diabetes mellitus with an explicit, item-by-item audit of the perioperative record against the determinants of outcome that the recent primary literature identifies. Second, it shows that four of those determinants were never documented, despite three general anaesthetics and six recorded clinical contacts spanning 116 days.** The aim of this study is likewise twofold. The first aim is to describe the anatomical, operative and functional course of a segmental symphyseal, parasymphyseal and body fracture treated by intraoral open reduction, internal fixation and staged release of maxillomandibular fixation in a patient with diabetes. The second is to derive from that course a short, explicitly numbered set of measurements that cost nothing and would convert a favourable clinical impression into a documented outcome.

2. Case presentation

Patient information and mechanism of injury

Table 1 presents the demographic, injury and comorbidity profile of the patient. A 51-year- old man presented to the emergency department of Dr. M. Djamil General Hospital, Padang, with pain in the lower jaw of five days' duration. Five days earlier he had been riding a motorcycle when a car struck him from the left; he fell against the kerb on the right side of the road and the right side of his face made contact with the road surface. He was taken to a private hospital in Padang, where multiple open mandibular fracture, hypertension and type 2 diabetes mellitus were diagnosed, the facial lacerations were sutured and a nasogastric tube was placed. As Table 1 records, he remained there for five days on intravenous fluid with a tramadol infusion, intravenous ampicillin-sulbactam, intravenous dexamethasone, subcutaneous insulin glulisine and insulin detemir, oral amlodipine and a povidone-iodine gargle before referral for definitive management.

The presenting symptom set listed in Table 1 was confined to the lower face. Swelling of the right lower jaw, lacerations of the right and left lower jaw already sutured at the referring hospital, pain and difficulty opening the mouth, and pain on chewing had all been present since the collision. There was no epistaxis, no otorrhoea or otorrhagia, no pain elsewhere in the face, no reduction in olfaction, no disturbance of ocular motility, no visual loss or diplopia, no odynophagia, no sensation of cheek fullness, no numbness of the cheek and no dyspnoea. He reported no headache, seizure, alteration of consciousness or projectile vomiting, and no injury elsewhere on the body. Diabetes mellitus and hypertension were both documented as previously diagnosed and controlled, and both are listed in Table 1 among the factors that shaped the perioperative plan.

Clinical examination on admission

Table 2 summarises the systematic maxillofacial examination performed on admission, and Figure 1 shows the corresponding preoperative clinical photographs. The general condition was moderate and the patient was fully conscious; vital signs were recorded as within normal limits, although no numerical values were entered in the record. Otological examination was normal. The nasogastric tube was correctly sited in the left nasal cavity. As shown in Table 2, the abnormal findings were entirely restricted to the right mandibular region: oedema, crepitus, haematoma, tenderness on palpation and the sutured laceration. The frontal region, both zygomatic regions, both maxillary regions, the left mandibular region and both temporomandibular junctions were free of abnormality.

Table 1. Demographic, injury and comorbidity profile of the patient at presentation to the tertiary centre.

Characteristic	Finding
Age	51 years
Sex	Male
Mechanism of injury	Motorcycle rider struck by a car from the left; fell against the kerb with impact to the right side of the face
Interval from injury to tertiary presentation	5 days
Presenting complaint	Pain in the lower jaw
Associated symptoms	Swelling of the right lower jaw; sutured lacerations of the right and left lower jaw; pain and difficulty opening the mouth; pain on chewing
Relevant negative symptoms	No epistaxis, otorrhoea or otorrhagia, facial pain elsewhere, hyposmia, ocular motility disturbance, visual loss or diplopia, odynophagia, cheek fullness, cheek numbness or dyspnoea
Neurological symptoms	None: no headache, seizure, alteration of consciousness or projectile vomiting
Injuries elsewhere	None identified
Comorbidity	Type 2 diabetes mellitus and hypertension, both documented as previously diagnosed and controlled
Interim management at the referring hospital*	5 days of admission; lacerations sutured; nasogastric tube placed; Ringer's lactate 500 mL with tramadol 30 mg every 8 h; ampicillin-sulbactam 1.5 g intravenously three times daily; dexamethasone 5 mg intravenously three times daily; insulin glulisine 8 IU three times daily; insulin detemir 15 IU once daily; amlodipine 10 mg once daily; povidone-iodine gargle
Imaging obtained before referral	Maxillofacial computed tomography with three-dimensional reconstruction, performed on the day of injury
Referral diagnosis	Multiple open mandibular fracture, hypertension, type 2 diabetes mellitus

* Recorded verbatim from the referral documentation. No indication for the glucocorticoid is documented, and no capillary glucose or glycated haemoglobin value accompanies the insulin prescriptions.

Two intraoral findings established the diagnosis at the bedside. The mouth could not be closed normally and a gap was present between the upper and lower incisors, an anterior open bite; and mouth opening was restricted to an interincisal distance of 24 mm. Both values appear in Table 2 and both are highlighted there because they are the two measurements that define the functional deficit at baseline. The occlusion was described qualitatively only; no Angle classification was assigned at presentation and no pre-injury occlusal class is recorded, which matters here because the right maxillary premolars and first molar were already absent. The oropharynx could not be assessed because of the trismus. The mandible was clinically displaced to the right, an asymmetry also apparent in the frontal view reproduced as panel A of Figure 1.

Figure 1 documents these findings photographically. Panel A of Figure 1 is the frontal view, in which the fullness of the right lower face is apparent against the normal contour on the left, and the nasogastric tube is seen emerging from the left nostril. Panels B and C of Figure 1 are the right and left lateral profiles respectively, the laterality being fixed by the course of the nasogastric tube, which descends over the left cheek and is therefore visible only in panel C. Panel D of Figure 1 is the submental view, which displays the sutured lacerations of the chin and submandibular region; panel E is a close-up of the same sutured wound, and panel F a close-up of the lower face demonstrating the anterior open bite and the inability to bring the lips into normal repose.

Table 2. Systematic maxillofacial and intraoral examination on admission. Abnormal findings are shown in bold red; all other regions were normal.

Region or parameter	Finding	Interpretation
General condition	Moderate; fully conscious	Fit for staged operative management
Vital signs	Recorded as within normal limits*	No numerical values entered in the record
Ear, both sides	Normal	No temporal bone involvement
Nose	Nasogastric tube correctly sited in the left nasal cavity	Enteral access established before referral
Oral cavity: lip competence	Mouth cannot be closed normally	Loss of occlusal contact
Oral cavity: incisal relationship	Gap between the upper and lower incisors (anterior open bite)	Occlusal expression of a displaced anterior mandibular fracture
Oral cavity: mouth opening	Interincisal opening 24 mm (trismus)	Restricted; normal adult range is 40 to 60 mm
Oropharynx	Could not be assessed	Limited by trismus
Frontal region	No abnormality	Frontal bone intact
Zygomatic region, both sides	No abnormality	Zygomatic complex intact
Maxillary region, both sides	No abnormality	Midface intact
Mandibular region, right	Oedema, crepitus, haematoma, tenderness on palpation, sutured laceration	Site of the open segmental fracture
Mandibular region, left	No abnormality	Contralateral mandible clinically intact
Temporomandibular junction, both sides	No abnormality	Concordant with the intact condyles seen on computed tomography
Mandibular position	Deviated to the right	Consistent with unfavourable displacement of the right body segment
Mental nerve sensation	Patient reported no numbness of the cheek; no formal testing documented	Symptom-level information only; see section 3.7
Occlusal classification	Not assigned; occlusion described qualitatively only	No Angle class recorded before or after injury; the right maxillary occlusal reference was already lost with teeth 1.4, 1.5 and 1.6
Physical status class	Not recorded at any of the three anaesthetic assessments	Not reconstructed retrospectively; see section 3.1

* The record states that vital signs were within normal limits without entering measured values; this is reported as found and is addressed as a limitation in section 3.12.

Figure 1. Preoperative clinical photographs on admission, five days after injury. (A) Frontal view showing fullness of the right lower face against the normal contour on the left, with the nasogastric tube emerging from the left nostril. (B) Right lateral profile. (C) Left lateral profile; the nasogastric tube descends over the left cheek and is visible only in this projection, which fixes the laterality of panels B and C. (D) Submental view showing the sutured lacerations of the chin and submandibular region. (E) Close-up of the sutured laceration. (F) Close-up of the lower face demonstrating the anterior open bite and loss of lip competence. The periocular region is masked in every panel in which it appears.

Diagnostic imaging

Figure 2 presents the maxillofacial computed tomography with three-dimensional reconstruction that had been obtained at the referring hospital on the day of injury. The formal radiological conclusion was a segmental fracture of the mandibular body, predominantly on the right side, with no intracranial haemorrhage. Panel A of Figure 2 is the coronal reformat and panel B the axial slice at the level of the mandibular body; panels C and D of Figure 2 are the lateral and frontal volume renderings. As shown in Figure 2, panel D, the fracture lines interrupting the right mandibular body and running forward towards the midline are directly visible on the frontal rendering, and the right-sided predominance is unambiguous because the patient's right is displayed to the viewer's left in that projection. Two negative findings visible in Figure 2 carried as much weight as the positive ones. Neither condylar process was fractured and both condyles remained seated in the glenoid fossa, which is concordant with the clinically normal temporomandibular junctions recorded in Table 2; and the axial slice in panel B of Figure 2 excludes intracranial haemorrhage. Because the three-dimensional reconstruction can be rotated and inspected from any angle, it also established the number, position, displacement and direction of the fracture lines that determined the operative plan. All laterality statements in this report were taken from the axial and coronal source images and from the operative record, not from the rotated volume rendering, which does not by itself establish side.

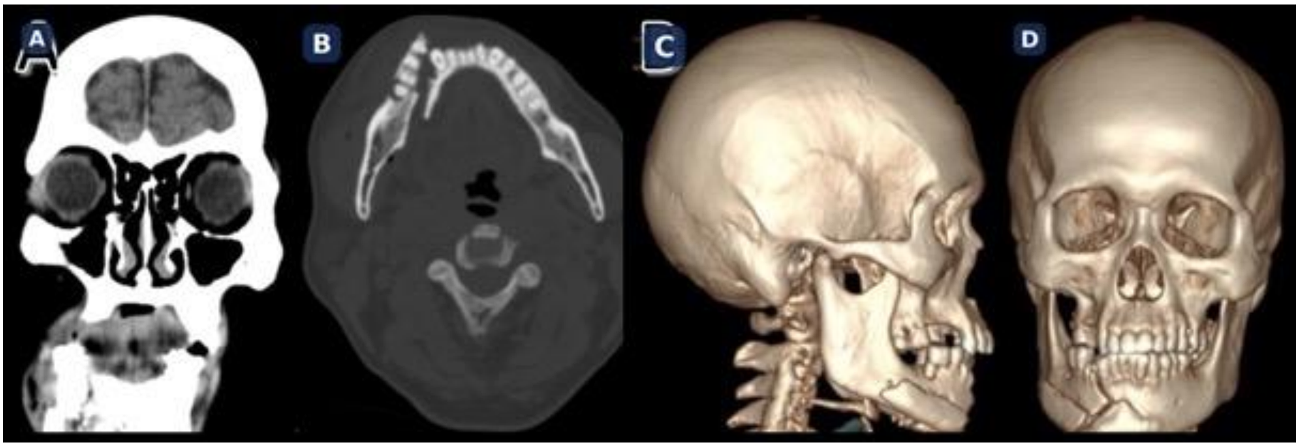

Figure 2. Maxillofacial computed tomography with three-dimensional reconstruction obtained on the day of injury. (A) Coronal reformat. (B) Axial slice at the level of the mandibular body, excluding intracranial haemorrhage. (C) Lateral volume rendering. (D) Frontal volume rendering, in which the fracture lines interrupting the right mandibular body and running forward towards the midline are directly visible; the patient's right is displayed to the viewer's left in this projection. Both condylar processes are intact and seated in the glenoid fossa. All burned-in identifiers, institution strings and acquisition time-stamps have been removed by cropping. Laterality was taken from the axial and coronal source images and the operative record, not from the rotated volume rendering.

Diagnosis and operative plan

The diagnosis was multiple open mandibular fracture involving the symphysis, the right parasymphysis and the right mandibular body, with hypertension and type 2 diabetes mellitus. Open reduction and internal fixation with plates and screws, combined with maxillomandibular fixation using Erich arch bars, was planned. Informed consent was obtained and operation was deferred for one to three days to allow the facial oedema to settle. During that interval the patient was nursed at 40 degrees head-up and received intravenous fluid with a tramadol infusion, intravenous ampicillin-sulbactam, ketorolac, ranitidine and a nasogastric liquid diet. He was referred to the departments of internal medicine and of anaesthesiology and intensive therapy for assessment of fitness for operation, and both cleared him. No American Society of Anesthesiologists physical status class is entered in the record for any of the three anaesthetics, and it is not reconstructed here.

Operation 1: intraoral open reduction, internal fixation and maxillomandibular fixation

Figure 3 shows the intraoperative findings at the index procedure, performed on the eighth day after injury under general anaesthesia with the patient supine. All operative findings reported in this section are taken from the contemporaneous operative note. After aseptic preparation and double sterile draping, the oral cavity was inspected. As shown in Figure 3, panel A, the fracture line ran between the lateral incisor and the first premolar, the canine had been avulsed, and there was a visible difference in the vertical level of the mandibular dentition across the fracture, the step-off that is the classical bedside sign of a displaced mandibular fracture. A tear of the gingiva ran along the whole length of the fracture line. The right mandibular body segment lay higher than the right parasymphyseal segment, the direction of displacement expected when the elevator muscle sling acts on the posterior fragment of an unfavourable fracture.

The line of incision in the inferior labiogingival sulcus was infiltrated with epinephrine 1:200,000. An arch bar was applied to the maxillary arch and secured with interdental wire, an arch bar was then applied to the mandibular arch and secured in the same way, and the two arch bars were tied together with wire to establish maxillomandibular fixation. Figure 3, panel B, shows the completed fixation with both arch bars in position. The inferior labiogingival sulcus was then incised as far as the level of the central incisor. Direct inspection confirmed a fracture line at the right parasymphysis extending into the symphysis, and a displaced, fragmented fracture of the right mandibular body.

The mental foramen was inspected specifically. The mental nerve was seen emerging from the foramen and was intact, but a fracture line ran along the inferior border of the foramen. Reduction was achieved with a 10 mm screw, the right mandibular body was reapproximated to the parasymphysis, and the fragments were secured with plates and screws so that the reconstructed outline followed the original contour of the bone. Panel B of Figure 3 shows the plate lying across the reduced fracture beneath the mandibular arch bar. The situational suture in the submental region placed at the referring hospital was opened and a drain inserted through it. Haemostasis was secured, the labiogingival incision was closed with 4-0 polyglactin and the skin with 5-0 polypropylene, and a dressing was applied.

Figure 3. Intraoperative findings at the index procedure on the eighth day after injury. (A) Oral cavity before fixation, showing the difference in vertical level of the mandibular dentition across the fracture line, the step-off, with the fracture running between the lateral incisor and the first premolar and the canine avulsed. (B) Completed fixation, with Erich arch bars applied to the maxillary and mandibular arches and secured by interdental wire, and the plate seated across the reduced fracture beneath the mandibular arch bar.

Early postoperative course

Table 3 sets out the chronology of the three-stage operative course together with the perioperative pharmacotherapy at each stage. Immediately after the index operation the patient received intravenous fluid with ketorolac, intravenous ampicillin-sulbactam and ranitidine, and, as Table 3 records, metformin 500 mg twice daily and glimepiride 2 mg once daily administered through the nasogastric tube together with amlodipine 10 mg once daily.

On the first postoperative day pain was minimal, there was no bleeding from the mouth, the nasogastric tube and both arch bars were correctly positioned, and the drain in the right mandibular region was patent with some ooze. A sliding-scale insulin protocol was ordered by the internal medicine team and a 1% povidone-iodine gargle was started three times daily, both entered against day 9 in Table 3. On the second postoperative day pain had decreased further and there was no bleeding; the drain was removed, the wound was dressed with gauze and paraffin gauze, oral clindamycin 150 mg four times daily replaced the intravenous agent, the liquid nasogastric diet was continued and the patient was discharged. At the outpatient review on the fourth postoperative day, listed in Table 3, pain remained minimal and the only positive finding was a residual haematoma in the right mandibular region; clindamycin, paracetamol and the povidone-iodine gargle were continued.

Table 3. Chronology of the three-stage operative course with the perioperative pharmacotherapy recorded at each stage. Day 0 is the day of injury.

Day	Interval	Procedure or event	Pharmacotherapy recorded
0	Injury	Motorcycle struck by a car; computed tomography with three-dimensional reconstruction obtained at a private hospital	Not recorded
0 to 4	Referring hospital	Lacerations sutured; nasogastric tube placed	Tramadol 30 mg every 8 h; ampicillin-sulbactam 1.5 g three times daily intravenously; dexamethasone 5 mg three times daily intravenously; insulin glulisine 8 IU three times daily; insulin detemir 15 IU daily; amlodipine 10 mg daily; povidone-iodine gargle
5	Admission	Presentation to the tertiary centre; operation deferred 1 to 3 days for resolution of oedema; internal medicine and anaesthetic clearance obtained	Head-up 40 degrees; Ringer's lactate 500 mL with tramadol 100 mg every 8 h; ampicillin-sulbactam 1.5 g three times daily intravenously; ketorolac 30 mg three times daily intravenously; ranitidine 50 mg twice daily intravenously; nasogastric liquid diet
8	Operation 1	Intraoral open reduction and internal fixation with four plates and screws; Erich arch bars applied to both arches and wired together	Epinephrine 1:200,000 infiltration; Ringer's lactate 500 mL every 8 h with ketorolac 30 mg three times daily; ampicillin-sulbactam 1.5 g four times daily intravenously; ranitidine 25 mg twice daily intravenously; metformin 500 mg twice daily and glimepiride 2 mg daily via nasogastric tube; amlodipine 10 mg daily via nasogastric tube
9	Day 1 after operation 1	Minimal pain; drain patent with ooze; arch bars and nasogastric tube correctly positioned	As above, plus a sliding-scale insulin protocol ordered by internal medicine and 1% povidone-iodine gargle three times daily
10	Day 2 after operation 1	Drain removed; wound dressed; discharged	Clindamycin 150 mg four times daily orally; 1% povidone-iodine gargle three times daily; liquid nasogastric diet
12	Day 4 after operation 1	Outpatient review; residual haematoma in the right mandibular region; no bleeding	Clindamycin 150 mg four times daily; paracetamol 500 mg three times daily; povidone-iodine gargle
25	Day 17 after operation 1	Preoperative workup; full blood count reported as within normal limits*	Not recorded
29	Operation 2	Removal of the maxillary arch bar and the intermaxillary wires; rigid intermaxillary fixation therefore lasted 21 days	Ringer's lactate 500 mL every 8 h; ampicillin-sulbactam 1.5 g four times daily intravenously; ketorolac 30 mg three times daily by infusion; ranitidine 25 mg twice daily intravenously
30	Day 1 after operation 2	Pain on opening the mouth; mandibular arch bar and nasogastric tube in position; discharged	Clindamycin 150 mg four times daily; povidone-iodine gargle
41	Day 12 after operation 2	Panoramic radiograph after release of fixation	Not recorded
99	Day 70 after operation 2	Laboratory screen for the third procedure reported as within normal limits*	Not recorded
109	Operation 3	Removal of the mandibular arch bar, 80 days after operation 2 and 101 days after operation 1	Not recorded
110	Day 1 after operation 3	No bleeding; no pain on opening; discharged	Clindamycin 150 mg four times daily; paracetamol 500 mg three times daily
116	Day 7 after operation 3	Final review: unrestricted mouth opening; no swelling; no pain on opening, chewing, swallowing or speaking	None

* Reported in the source record as a categorical impression without accompanying numerical values. No glycated haemoglobin or capillary glucose value appears anywhere in the record; see section 3.6.
† Intervals are recalculated from the recorded calendar dates. The source record gives the interval to operation 3 variously as 77, 80 and 91 days; see section 2.7.

Staged release of fixation and radiographic review

Preparation for removal of the maxillary arch bar began on the seventeenth postoperative day with a full blood count reported as within normal limits, again without numerical values in the record. The internal medicine department agreed to operation and advised anaesthetic review and control of blood glucose; anaesthesia was approved. The patient was readmitted and, **on the twenty-first day after the index operation**, the maxillary arch bar and the intermaxillary wires were removed under general anaesthesia. Rigid intermaxillary fixation therefore lasted 21 days. The mandibular arch bar was deliberately left in place as a passive splint. He was discharged the following day on clindamycin and the povidone-iodine gargle, and the record of that day still describes the nasogastric tube as correctly positioned.

Figure 4 is the panoramic radiograph obtained twelve days after release of the intermaxillary wires. As shown in Figure 4, bone structure was good, the mandibular dental fixation was in position, and four plates with their screws were seated across the reconstructed mandible; the wire loops of the retained mandibular arch bar are seen encircling the necks of the lower teeth. Figure 4 also records the dental inventory: teeth 1.4, 1.5, 1.6, 2.8, 3.7, 3.8, 4.7 and 4.8 were absent, retained roots were present at 2.5 and 4.4, caries was present at 2.6, multiple restorations were visible, and there was no periapical lucency. The right and left orientation markers are preserved at the lower corners of Figure 4.

Removal of the mandibular arch bar was then planned. A full laboratory screen on day 99, that is 70 days after the second operation, was again reported as within normal limits, internal medicine advised a sliding-scale protocol for glycaemic control and anaesthesia was approved. **The mandibular arch bar was removed on the eightieth day after the second operation, which is the one- hundred-and-first day after the index operation.** The source clinical record describes this interval inconsistently, as the seventy-seventh day in one entry and the ninetieth-first day in another; recalculation from the recorded calendar dates gives 80 days from the second operation and 101 days from the first, and those recalculated intervals are used throughout this report. The wires were divided with a wire cutter, the mandibular arch bar was lifted off, bleeding was controlled with suction and the procedure was completed. No plate exposure, wound dehiscence or infection was found at any of the three procedures.

Figure 4. Panoramic radiograph obtained twelve days after release of the intermaxillary wires, that is 41 days after injury. Four plates with their screws are seated across the reconstructed mandible and the wire loops of the retained mandibular arch bar encircle the necks of the lower teeth. Teeth 1.4, 1.5, 1.6, 2.8, 3.7, 3.8, 4.7 and 4.8 are absent, retained roots are present at 2.5 and 4.4, and caries is present at 2.6; no periapical lucency is seen. The right and left orientation markers are preserved at the lower corners. The burned-in patient identifiers, date of birth, study number and acquisition time-stamp have been removed by cropping.

Functional outcome

Figure 5 shows the clinical appearance seven days after removal of the mandibular arch bar. On day 110, the first day after that third procedure, there was no bleeding from the mouth and no pain on opening; the oral cavity showed no active bleeding and no clot, and the patient was discharged on oral clindamycin and paracetamol. At review seven days later, the endpoint illustrated in Figure 5, he was able to open and close the mouth as he had before the injury, there was no swelling of the jaw, and there was no pain on opening the mouth, on chewing, on swallowing or on speaking. Panel A of Figure 5 is the frontal view, panels B and C the right and left lateral profiles, and panel D the submental view; comparison with the corresponding panels of Figure 1 shows resolution of the right-sided facial swelling, restoration of lip competence and healing of the submental lacerations to a fine linear scar.

Occlusion was judged clinically to have returned to its pre-injury relationship, the patient was eating and drinking normally, and speech was unaffected. No complication attributable to either the internal fixation or the maxillomandibular fixation was identified at any point in the 116 days from injury to final review. He was discharged from follow-up with instructions to return if symptoms recurred. Figure 5 is therefore the final objective record of this patient's face.

Figure 5. Clinical appearance seven days after removal of the mandibular arch bar, that is 116 days after injury. (A) Frontal view. (B) Right lateral profile. (C) Left lateral profile. (D) Submental view. Comparison with the corresponding panels of Figure 1 shows resolution of the right-sided facial swelling, restoration of lip competence and healing of the submental lacerations to a fine linear scar. The periocular region is masked in every panel.

Summary of the clinical course

Figure 6 assembles the entire course into a single timeline, from the collision on day 0 to the final review on day 116. As Figure 6 makes clear, the definitive operation took place on day 8, that is eight days after the injury and three days after arrival at the tertiary centre, and the two subsequent procedures were staged deliberately rather than forced by complication. The intervals shown in Figure 6 were recalculated from the recorded calendar dates rather than transcribed from the narrative, for the reason given in section 2.7.

Figure 6 also makes visible the feature that dominates the discussion below: the two distinct durations of fixation. Rigid intermaxillary fixation, in which the jaws were wired together and oral intake was impossible, occupied the 21 days between day 8 and day 29 of Figure 6. Retention of the mandibular arch bar as a passive splint occupied a further 80 days, to day 109. Conflating these two intervals, as the source record does, obscures a fivefold difference in the physiological burden imposed on the patient.

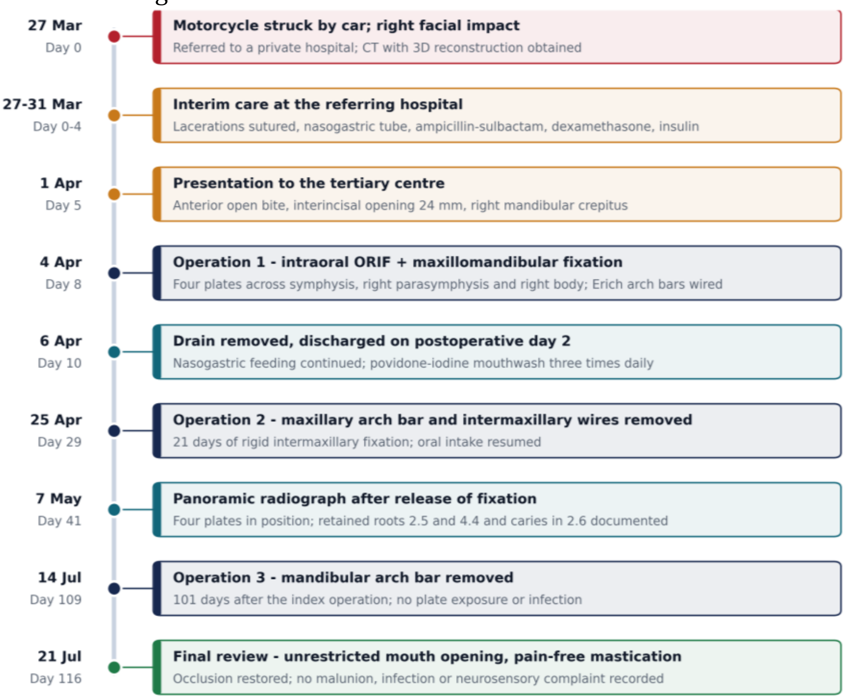

Figure 6. Timeline of the clinical course from the collision on day 0 to the final review on day 116. The three operative events are shown in dark blue. All intervals were recalculated from the recorded calendar dates rather than transcribed from the source narrative, which gives the interval to the third procedure inconsistently. The figure distinguishes the 21 days of rigid intermaxillary fixation, between days 8 and 29, from the further 80 days of mandibular arch bar retention, to day 109.

3. Discussion

Epidemiological placement of the case

The patient sits at the edge of the modal epidemiological profile rather than at its centre, and that displacement is itself informative. He shares the dominant mechanism, since road traffic collision accounted for 64 of 142 patients (45.1%) in one contemporary series[3] and for 75 of 113 patients (66.1%) in a 10-year Taiwanese review, in which motorcycle accidents alone contributed 46.0%.[4] He shares the dominant sex, males constituting 76.8% of that first series[3] and 86.8% of 424 injured two- wheeler riders in southern India.[5] He does not, however, share the dominant age. In the same series 82.4% of patients were younger than 35 years,[3] and 45.3% of the two-wheeler riders were aged 20 to 29 years;[5] at 51 he belongs to a minority in which comorbidity is the rule rather than the exception. Table 1 records both of his, hypertension and type 2 diabetes mellitus, each documented as previously diagnosed and controlled.

That distinction matters because the literature attaches measurable risk to it. Among 314 patients undergoing mandibular fracture surgery, non-surgical-site complications occurred in 21 (6.7%), and age of 60 years or more, which is how that study defines elderly, was the strongest independent predictor against patients aged 16 to 59, with an adjusted odds ratio of 5.55 (95% confidence interval 1.92 to 16.21).[10] Physiological reserve rather than birth date is the operative variable: among 1,806 patients undergoing mandibular fracture fixation, American Society of Anesthesiologists class 3 to 4 carried an odds ratio of 3.63 (95% confidence interval 1.91 to 6.91) for any adverse event,[9] and in a registry series of operative facial fracture repairs 626 patients (12.7%) were moderately frail and 208 (4.20%) severely frail by the modified frailty index, while 237 subjects (4.82%) sustained a complication.[12] The denominator of that series is worth stating carefully: the published abstract prints 4,290, but every percentage it reports reconciles only to 4,920, which is also the sum of its own frailty strata. A 51-year-old man with hypertension and type 2 diabetes mellitus carries at least two of the five modified frailty index components, and the smooth 116-day course described here should be read against that expectation rather than as the default.

Fracture pattern, biomechanics and the condyles that did not break

The fracture involved the symphysis, the right parasymphysis and, segmentally, the right body. This anterior-dominant pattern is common: 79 of the 171 fracture sites recorded in one series of 142 patients (46.2%) were symphyseal or parasymphyseal,[3] and the body in 42% and the symphysis in 16% of 2,705 registry cases.[1] The intraoperative observation recorded in section 2.5, that the right body segment lay higher than the right parasymphyseal segment, is the mechanical signature of an unfavourable fracture: the masseter, medial pterygoid and temporalis sling inserts on the posterior fragment and lifts it, while the digastric, geniohyoid and mylohyoid group depresses the anterior fragment. That displacement is directly visible in Figure 3, panel A, where the dental step-off across the fracture line is the bedside expression of two fragments pulled to different vertical levels. A fracture whose plane allows the muscles to distract it in this way cannot be held by closed reduction and mandates open reduction with rigid internal fixation. The anterior open bite documented in Table 2 is the occlusal expression of exactly that displacement, and panel F of Figure 1 shows it clinically as the loss of lip competence with which the patient presented.

The more interesting observation is a negative one. The mandible is a closed osseous ring, and energy delivered at one point is classically transmitted around it, which is why multiple fractures and, in particular, a contralateral condylar fracture are so often found with an anterior impact. Here the condyles were intact on the volume renderings shown in Figure 2 and both temporomandibular junctions were clinically normal, as recorded in Table 2. Two features of this injury suggest a hypothesis that a single case cannot test. First, the fracture was segmental and comminuted at the right body, and comminution is generally held to dissipate energy locally rather than transmit it. Second, the injury was open, with avulsion of the canine and a full-length gingival tear, and the creation of new surfaces likewise absorbs energy. Neither proposition can be verified in one patient, and the sparing of the condyles is therefore reported here as an observation whose mechanism remains unproven. The clinical consequence is favourable and should be stated plainly: because the condyles were spared, the whole reconstruction reduced to restoring the anterior arch and the occlusion, and the risk of the long-term temporomandibular sequelae that complicate condylar injury was removed at the outset.

Imaging strategy

Computed tomography with three-dimensional reconstruction, reproduced as Figure 2, was the single most useful investigation and was already available on arrival. Its superiority over plain imaging in this setting is not merely conventional. Among 49 maxillofacial trauma patients studied with multidetector computed tomography, mandibular fracture was the commonest finding, present in 20 of 49 (40.8%);[13] and among 108 patients with mandibular fracture at a single centre, the six split fractures were demonstrated by computed tomography in 6 of 6 cases whereas panoramic radiography showed no fracture line at all in 4 of 6.[14] Practice is nevertheless slow to follow the evidence: in a claims analysis of 281,421 adults with maxillofacial trauma, 72,125 (25.6%) still received low- value plain radiography as their initial imaging, although this fell from 32.9% of cases in 2013 to 18.0% in 2022.[15] For a segmental, comminuted, right-dominant fracture of the kind shown in Figure 2, the rotatable volume rendering was what allowed the number, position and direction of the fracture lines and the integrity of the condyles to be established before incision.

The panoramic radiograph shown in Figure 4 was correctly deployed at a different point in the pathway and for a different question. Once the metalwork was in place, the question was no longer where the fracture lines lay but whether the hardware was seated, whether the bone had consolidated and what the state of the dentition was. For that question a panoramic image is entirely adequate, and it is a general property of the modality that a single panoramic exposure imposes a smaller dose than a repeat cross-sectional study, and the dental inventory that Figure 4 yielded proved, as section 3.9 argues, to be the most actionable information in the whole radiological record.

Fixation strategy and plate configuration

Four plates were used across the symphysis, right parasymphysis and right body. Contemporary practice supports plate osteosynthesis as the default: rigid osteosynthesis was used for 74% of mandibular fractures in a prospective study of 425 patients across 12 European centres, with malocclusion in 5.6% and infective complications in 5.4%.[7] The choice between load-sharing and load-bearing constructs was examined in a cohort of 411 non- condylar mandibular fractures, in which complications arose in 27 of 337 load-sharing fixations (8%), 20 of 337 (6%) requiring repeat osteosynthesis, against 7 of 74 load-bearing fixations (10%) with 2 of 74 (3%) returning to theatre.[16] A segmental, comminuted body fracture is precisely the configuration in which a load-sharing assumption fails, because there is no reliable buttressing contact between the fragments, and the use of four plates rather than the single or double miniplate adequate for a simple parasymphyseal line is proportionate to that. As Table 3 records, all four plates were placed at a single sitting on day 8, and the two later procedures listed in Table 3 removed fixation rather than adding to it.

For the simpler configuration, a single inferior-border miniplate can suffice: in a prospective study of 15 patients with isolated symphysis or parasymphysis fractures treated that way, paraesthesia, malocclusion and soft-tissue infection each occurred in 1 of 15 patients (6.7%) with no plate exposure, dehiscence or non-union.[17] Plate profile also matters: in 60 patients with parasymphyseal fracture, complications occurred in 5 of 22 (22.73%) with high-profile 2.3 mm plates, 5 of 25 (20%) with conventional 2.0 mm miniplates and only 1 of 13 (7.69%) with three-dimensional miniplates.[18] A split-mouth randomised trial in 12 patients with bilateral parasymphyseal fractures found bone density at 12 weeks of 1107.4 ± 142.2 Hounsfield units with three-dimensional interlocking plates against 960.9 ± 97.58 with two conventional miniplates, and impaired mental nerve sensation at six weeks in only 1 of 24 operated sides (4.17%).[19] The intraoral approach used here is also the one against which the modern complication figures are benchmarked, and the absence of dehiscence in this patient is notable against the 22 of 232 patients (9.5%) and 22 of 270 fractures (8.1%) who developed non-infection-related surgical wound dehiscence after intraoral fixation in a Helsinki series, a comparison set out in Table 4.[20] A comparison of two suture materials in 102 transoral mandibular repairs separately identified earlier operation as associated with postoperative infection and dehiscence, smoking with dehiscence, and female sex and immunocompromise with revision surgery, although those were unadjusted bivariate associations.[21]

The eight-day interval between injury and definitive fixation is longer than textbook recommendations but close to observed practice, and the evidence suggests it did no harm. A cohort of 640 patients recorded a mean of 6.9 days from injury to surgery with an overall infection rate of 3.8%.[22] More directly, a retrospective review of 170 patients with isolated, unilateral, favourable, compound mandibular body fractures treated by closed reduction and maxillomandibular fixation, divided by the timing of treatment, found an overall complication rate of 14.1%, with 13.8% among the 87 treated early, at a mean of 5.8 days from injury, and 14.5% among the 83 treated late, at a mean of 10.3 days ($p = 0.89$).[23] Five of this patient's eight days were spent at the referring hospital and three at the tertiary centre awaiting resolution of oedema, and deferring operation until the soft tissues had settled is a defensible trade against a marginal and statistically unsupported increase in infective risk.

What was actually fixed, and for how long

The single most consequential ambiguity in the source record concerns the duration of fixation, and Figure 6 was constructed specifically to resolve it. Two different things were left in place for two very different periods. Rigid intermaxillary fixation, in which the maxillary and mandibular arch bars were wired to each other so that the jaws could not be opened and no oral intake was possible, lasted 21 days. Retention of the mandibular arch bar alone, as a passive splint with the jaws free, lasted a further 80 days, giving the 101 days from the index operation to the third procedure. The narrative in the source record gives this final interval variously as 77, 80 or 91 days; recalculation from the recorded calendar dates gives 80 days from the second operation and 101 from the first, and reporting that discrepancy openly seems preferable to silently adopting one of the three figures. The three shaded rows of Table 3 mark the operative events from which those intervals are measured.

The 21 days of true intermaxillary fixation are defensible and, on current evidence, probably beneficial. Among 307 patients, postoperative inflammatory complications occurred in 8.3% of those given a short period of maxillomandibular fixation against 18.2% of those given none, a difference that was not significant unadjusted ($p = 0.08$) but which reached an adjusted odds ratio of 0.32 (95% confidence interval 0.11 to 0.97) in a separate multivariable model.[24] The European prospective series applied postoperative fixation of median duration three weeks in 140 patients (64%), which is exactly the interval used here, although in that series malocclusion was no less frequent with fixation (5%, 95% confidence interval 2 to 10) than without it (4%, 95% confidence interval 1 to 11).[8] Twenty-one days is also short enough to avoid the temporomandibular sequelae that prolonged immobilisation invites.

The further 80 days of retained Erich arch bar are harder to justify, and this is the first of the four care gaps identified in this report. The Erich arch bar is not a benign passenger. In a retrospective comparison of intermaxillary fixation techniques, acceptable oral hygiene was achieved in only 16 of 31 patients (51.6%) with arch bars against 12 of 13 (92.3%) with intermaxillary fixation screws ($p = 0.015$), and tolerable pain in 14 of 31 (45.2%) against 11 of 13 (84.6%) ($p = 0.017$).[25] A randomised clinical trial in 28 patients found application and removal times longer for Erich arch bars than for intermaxillary fixation screws, and a greater presence of biofilm on the teeth with the bars; the published abstract reports the direction of both differences without an effect size.[26] Mucosal overgrowth was recorded in 15 of 20 patients (75.0%) even with a hybrid arch bar, and mean placement time was 23.3 minutes for the hybrid against 86.4 minutes for the conventional Erich bar in a series of 41 patients.[27] Glove perforation occurred in 6 of the 15 patients randomised to Erich arch bars in a three-arm trial, in which occlusion was successfully achieved in 44 of 45 patients overall.[28] A randomised prospective trial found complete hyperechoic bridging callus at six postoperative weeks in 16 of 26 arch-bar patients (61.5%) against 12 of 24 intermaxillary-fixation-screw patients (50%), a difference that did not reach significance ($p = 0.412$), indicating that the bar confers no union advantage to offset its burden.[29]

Taken together, these data make the case that once rigid intermaxillary fixation has been released at three weeks and four plates are holding the reduction, an Erich arch bar retained for a further eleven and a half weeks is imposing a plaque trap, a periodontal insult and a sharps hazard for no demonstrated mechanical return. In a patient with type 2 diabetes mellitus, in whom periodontal disease is both more prevalent and more consequential, the calculation is worse still: in a cohort of 305 patients after transoral load-sharing osteosynthesis, in which the overall postoperative infection rate was 22.95%, periodontal stage III or IV carried an odds ratio of 7.17 (95% confidence interval 2.95 to 17.41) for wound infection against periodontally disease-negative patients.[30] That this patient escaped infection is a good outcome, not a vindication of the exposure. The bar at issue is the lower of the two seen in Figure 3, panel B, and its wire loops are still encircling the lower teeth in Figure 4 forty-one days after the injury.

Glycaemic control: the determinant that was never measured

The second care gap concerns the metabolic state. The record documents type 2 diabetes mellitus at every one of the three admissions, records that the internal medicine department twice advised a sliding-scale protocol for glycaemic control, and reports the preoperative laboratory screens as within normal limits. It contains no glycated haemoglobin value, no capillary blood glucose value and no numerical laboratory result at any point across 116 days and three general anaesthetics. The advice to control glucose was given and, so far as the record shows, never audited.

The magnitude of the omission is quantifiable. Among 282,131 general surgical patients with an available glycated haemoglobin, 36% had diagnosed diabetes and a further 6.4% had values in the diabetic range with no diagnosis at all; and in the patients with diabetes the adjusted odds of any 30-day complication rose progressively with that value, from 1.06 (95% confidence interval 1.00 to 1.11) below 6.0% to 1.32 (95% confidence interval 1.25 to 1.39) above 9.0%. The gradient is a within-diabetes gradient, which is precisely the population this patient belonged to.[11] A single preoperative glycated haemoglobin measurement would have placed this patient somewhere on that curve before the first incision. It was not obtained.

Two specific prescribing decisions in this record deserve comment because each is individually reasonable and jointly they create a hazard that no measurement was in place to detect. First, the referring hospital administered dexamethasone 5 mg intravenously three times daily alongside two insulins, in a patient with an open, contaminated fracture. Glucocorticoid given to a diabetic patient with an open fracture raises glucose and impairs the inflammatory response on which contaminated-wound healing depends, and no indication for it is documented; it is flagged in both Table 1 and Table 3 for that reason. Second, and more directly, after the index operation the parenteral insulins were replaced by metformin 500 mg twice daily and glimepiride 2 mg once daily delivered through the nasogastric tube, at the precise moment when the jaws were wired shut and the entire caloric intake had become an enteral liquid diet of unrecorded composition and unrecorded volume, a substitution that Table 3 places on the same line as the index operation itself. Glimepiride is a long-acting sulfonylurea. Sulfonylureas act independently of the prevailing glucose concentration, so their hypoglycaemic effect is not attenuated when intake falls; the inference that this makes them poorly suited to a patient whose caloric delivery is unpredictable is ours, and follows from the pharmacology rather than from a trial in this setting.

Two datasets frame that risk. In an Indonesian tertiary hospital, inpatient hypoglycaemia occurred in 80 of 475 admitted patients with type 2 diabetes (16.8%), and 7.4% of those 80 patients had a severe episode[31] — a figure drawn from the same national health system in which this patient was treated. In a matched comparison of 82,994 pairs of adults older than 65 years, severe hypoglycaemia occurred at 13.0 events per 1,000 person-years with dipeptidyl peptidase-4 inhibitors and 9.8 with sodium-glucose cotransporter-2 inhibitors, a hazard ratio of 0.75 (95% confidence interval 0.68 to 0.83) for the latter against the former; and in the stratum of patients already taking a sulfonylurea the same contrast widened to 0.57 (95% confidence interval 0.49 to 0.65). Within the oral agents the choice of class is itself a determinant of hypoglycaemic risk, and the sulfonylurea stratum is the one this patient entered.[32] The concrete, no-cost action that follows is not to withhold the sulfonylurea but to measure: a preoperative glycated haemoglobin, a documented capillary glucose profile for as long as intake is controlled by a feeding tube, and an explicit review of the sulfonylurea at the moment oral intake changes. None of the three appears in this record.

The inferior alveolar nerve: the test that was never done

The third care gap concerns sensation. The operative note in section 2.5 states that the mental nerve was seen emerging from the mental foramen and was intact, and that a fracture line ran along the inferior border of the foramen. That is a precise and valuable observation, and it identifies this patient as being at above-average risk of neurosensory disturbance for two independent reasons: the fracture line abutted the foramen, and the intraoral approach required exposure in its immediate vicinity. Yet the admission note records only the patient's own report that there was no numbness of the cheek, and no formal neurosensory testing of the inferior alveolar or mental nerve distribution is documented at any of the six subsequent clinical contacts.

The base rates make this the most probable complication of the operation performed. In a prospective study of 150 patients with mandibular fracture, inferior alveolar nerve deficit was present in 86 of 150 patients (57.33%) before treatment and in 61.33% afterwards (p = 0.031), no patient having recovered and six having acquired a new deficit.[33] Deliberate skeletonisation of the mental nerve during intraoral fixation is not, however, a sentence: in a prospective study of 26 subjects, all 26 reached S4 functional sensory recovery by 57 days and subjective recovery by 90 days, half reaching S3 recovery an average of 42 days after surgery;[34] and in a further prospective cohort of 26 participants the median time to functional sensory recovery after mental nerve skeletonisation was 6.0 weeks (interquartile range 6.0 to 12.0), with 16 of 26 (61.5%) recovered by six weeks and 26 of 26 (100%) by twelve weeks.[35] Modern plate designs are being selected partly on this endpoint, the split-mouth trial cited above finding impaired mental nerve sensation in only 1 of 24 operated sides (4.17%) at six weeks.[19]

The consequences of the minority who do not recover are not trivial, which is why the measurement matters. Of 232 patients examined after mandibular fracture in one series, 145 had inferior alveolar nerve dysfunction and 52 still had it at six months; among those 52, speaking clearly was affected in 51 (98.1%) and eating in 50 (96.2%).[36] The action indicated is a two-minute bedside examination: light touch, sharp-blunt discrimination and two-point discrimination in the mental nerve distribution, recorded before operation and at each follow-up. Because the whole recovery curve in the cited cohorts is complete by twelve weeks, the follow-up visits at postoperative days 4, 21, 41 and 109 shown in Figure 6 span the entire window in which the answer would have been informative. The opportunity existed four times and was not taken. This patient reported no sensory symptom at final review, and the clinical outcome was therefore in all probability normal; but an unmeasured normal is an assumption, not a finding, and it is stated here as such.

The dentition adjacent to the hardware

The fourth care gap emerges from the panoramic radiograph itself. As Figure 4 shows, retained roots were present at 2.5 and 4.4 and caries at 2.6 in a partially dentate mandible now carrying four titanium plates. The finding was reported by the radiology service and, so far as the record shows, generated no dental referral, no extraction plan and no entry at any subsequent visit.

The literature on teeth in and around mandibular fracture lines has moved decisively towards retention where the tooth is sound, and that shift makes the management of unsound teeth more rather than less important. Teeth in the fracture line were retained in 64.8% and removed in 35.2% of 54 fractures in 42 patients;[37] tooth-related complications occurred in only 14 of 189 retained teeth (7.4%) across 184 patients, comprising symptomatic apical periodontitis in 9, increased mobility in 4 and hypersensitivity in 1;[38] and in a further series of 78 patients carrying 83 teeth in the fracture line the complication rate was 5.12%, that is 4 of the 78 patients.[39] Both of those papers are quoted here from their results tables rather than their abstracts, because in each case the abstract undercounts what the body of the paper reports, so retention is safe for a sound tooth. A retained root and an actively carious tooth are a different proposition, and the risk they carry is quantified by the periodontal data already cited: in 305 patients, in whom the overall postoperative infection rate after transoral osteosynthesis was 22.95%, periodontal stage III or IV carried an odds ratio of 7.17 for wound infection against periodontally disease-negative patients.[30] Infection after mandibular fracture also declares itself late, typically in the third postoperative month in a cohort of 640 patients with an overall infection rate of 3.8%,[22] which is after most fracture follow-up has ended; and, in a database cohort of 302,575 patients with mandibular fracture, osteomyelitis within one year occurred after propensity-score matching in 1,038 of 94,819 men (1.1%) against 651 of 95,321 women (0.7%), an odds ratio of 0.621 (95% confidence interval 0.563 to 0.686) for women, placing this male patient in the higher-risk group.[40]

Two further dental observations belong here. First, the canine avulsed at the moment of injury is recorded as avulsed and never mentioned again; the record contains no statement of where it went. An unaccounted avulsed tooth in facial trauma is an aspiration and ingestion hazard, and the one-line entry that resolves it, whether the tooth was recovered or a chest radiograph was obtained, is absent from the record at every one of the three admissions. Second, Figure 4 documents that teeth 1.4, 1.5 and 1.6 were absent. Those three teeth are the right maxillary premolars and first molar, and they are precisely the occlusal landmarks against which the right-sided intercuspal relationship would ordinarily be re-established when an arch bar is tightened. The reference standard used to set the fixation was thus compromised on the same side as the fracture, which makes the clinically satisfactory occlusion achieved here a more substantial technical accomplishment than it first appears, and makes an objective occlusal record more valuable rather than less.

Function, nutrition and the measurement that closes the loop

The functional deficit at presentation was quantified: an interincisal opening of 24 mm, recorded in Table 2. The functional outcome was not. The final entry states that the patient could open and close the mouth as before, without pain on opening, chewing, swallowing or speaking, and Figure 5 supports that impression photographically, panels A and D of Figure 5 showing competent lips and a symmetrical lower face. No closing interincisal measurement in millimetres was taken. A baseline figure exists and its counterpart does not. The asymmetry is worth stating because the missing value is among the least burdensome in the whole record to obtain, requiring only a ruler at the final visit.

The nutritional dimension is measurable in the same way and equally unrecorded. A prospective comparative study of 59 patients found mean weight loss of 1.73 kg (standard deviation 1.78) in 29 surgically treated patients at their single postoperative assessment and 2.74 kg (standard deviation 2.35) in 30 conservatively treated patients at the third of their assessments, each significant within its group at $p < 0.001$; the authors concluded that the two groups did not substantially differ from one another.[41] A randomised trial of 50 patients showed that a dietitian-counselled home diet plan during four weeks of maxillomandibular fixation limited weight loss at week four ($p = 0.001$) and improved nutrition-related quality of life in every domain, against a comparator arm that chose its own liquid diet with protein supplements.[42] This patient spent 21 days with the jaws wired and fed entirely through a nasogastric tube, and no body weight, no dietetic referral and no description of the feed composition appears anywhere in the record — in a man whose oral hypoglycaemic agents were being titrated against that same unrecorded intake. Table 3 carries the liquid nasogastric diet from day 5 to at least day 30 without one nutritional entry beside it.

The timing of dietary progression has itself been examined. In 1,023 patients after mandibular fracture repair, intraoral wound dehiscence occurred in 39 of 256 patients (15.2%) advanced to a normal diet before three weeks, 49 of 511 (9.6%) at three weeks and 17 of 256 (6.6%) after four weeks ($p = 0.005$); crucially, that association did not survive adjustment (adjusted odds ratio 1.08, $p = 0.58$), and comorbidity rather than diet timing drove the outcome.[43] A randomised trial comparing graduated return to normal diet at two, four and six weeks found no significant difference in complications between the schedules.[44] The release of intermaxillary fixation at 21 days in this patient sits exactly at the median of the three-week group in the larger study, and the absence of dehiscence is consistent with it. Quality of life is the endpoint that ultimately matters to the patient: 13 of 15 postsurgical mandibular fracture patients (86.7%) fell in the best quality-of-life band of the Oral Health Impact Profile-14, which those authors define as a score below 19, comprising 8 of 8 treated by open reduction and 5 of 7 by closed reduction ($p = 0.419$).[45] A validated instrument of that kind, applied once at the final visit, would have closed the loop on the clinical impression recorded here.

Antimicrobial exposure

The antimicrobial course deserves separate comment because it was long. Ampicillin-sulbactam was given intravenously from the day of injury at the referring hospital through to the second postoperative day at the tertiary centre, a span of some ten days, followed by oral clindamycin; ampicillin-sulbactam was then given again for the second and third procedures, which were elective removals of hardware in a clean-contaminated field. The evidence does not support this duration. In a randomised controlled trial of 77 patients, infection peaked at four weeks in 10 of 41 (24.4%) given only perioperative antibiotics against 4 of 36 (11.1%) given a further five days of oral antibiotics, and by six weeks the counts had fallen to 4 and 1; the difference was not significant at any time point.[46] A retrospective cohort of 218 patients found surgical site infection in 29.3% of the 183 who received more than one preoperative scheduled dose against 25.0% of the 35 who received a single perioperative dose or none.[47] Adherence to a formal protocol is achievable: 91.2% of 114 patients with isolated mandibular fracture were managed in adherence to the Surgical Infection Society antibiotic protocol, deviation being associated with transfer from an outside facility (relative risk 4.1, 95% confidence interval 1.3 to 12.8)[48] — which is exactly the pathway this patient followed. No written institutional prophylaxis protocol was in force at the treating unit during the period of this admission, so the deviation described here is systemic rather than individual. An average antibiotic duration of 11.7 days was recorded in a cohort of 640 patients, 49.7% of whom underwent open reduction and internal fixation, and whose overall infection rate was 3.8%,[22] confirming that prolonged courses remain common without evidence of benefit.

Comparison with the recent literature

Table 4 places the present case against recent original studies of mandibular fracture management, comparing mechanism, fracture pattern, fixation strategy, duration of maxillomandibular fixation, complication rate and the completeness of outcome documentation. As demonstrated in Table 4, the operative decisions taken here align closely with contemporary practice: an intraoral approach, plate osteosynthesis proportionate to a segmental fracture, and three weeks of postoperative intermaxillary fixation matching the median of the largest prospective European series.[8] Compared with the cohorts listed in Table 4, the complication rate in this single patient — zero of the infections, dehiscences, malunions and plate exposures that occurred at rates between 3.8% and 22.95% in those series — is at the favourable extreme.

Two rows of Table 4 bear directly on the decisions taken here. The prospective European cohort listed in Table 4 applied postoperative maxillomandibular fixation of median duration three weeks, exactly the interval used in this patient, yet found malocclusion no less frequent with fixation than without it.[8] The retrospective cohort immediately below it in Table 4 found the opposite direction of effect, inflammatory complications occurring in 8.3% of patients given a short period of fixation against 18.2% of those given none, significant only after adjustment.[24] The honest reading is that three weeks of intermaxillary fixation lies within the range of reasonable practice, and that this case adds one uncomplicated observation to that range rather than settling the question.

The final column of Table 4 is the one this report exists to fill. Every study in Table 4 reports at least one objective endpoint, whether an infection rate, a neurosensory score, a bone density measurement or a validated quality-of-life instrument. The present record reports none, and rests instead on a narrative statement of normality. That contrast is not an indictment of the surgery, which was well conceived and well executed; it is an observation about what a case record must contain if the result is to be usable by anyone other than the team that produced it. Reading down that column of Table 4 shows that the omission is systematic rather than incidental: an infection rate, a Hounsfield measurement, a sensory recovery time and a validated quality-of-life score are all things a busy unit can capture in minutes.

Table 4. The present case set against recent original studies of mandibular fracture management, with particular attention to the completeness of outcome documentation.

Study	Design and size	Fixation strategy	Reported complication rate	Objective outcome measure reported
Present case	1 patient, 51 years	Intraoral ORIF, 4 plates; Erich arch bars; 21 days rigid IMF, 101 days arch bar retention	None: no infection, dehiscence, malunion or plate exposure at 116 days	None: narrative statement of normal function only
Alfertshofer et al.[1]	Registry cohort, 2,705	ORIF, mixed constructs	9.4% within 30 days	30-day registry-defined complications
Sobrero et al.[7]	Prospective, 425	Rigid osteosynthesis in 74%	Malocclusion 5.6%; infective 5.4%	Occlusal and infective endpoints
Roccia et al.[8]	Prospective, 336	ORIF; postoperative MMF, median 3 weeks, in 140 patients (64%)	Malocclusion 5% with MMF, 4% without	Malocclusion with confidence intervals
Sarai et al.[16]	Retrospective, 411 fractures	Load-sharing versus load-bearing	27 of 337 (8%) load-sharing; 7 of 74 (10%) load-bearing	Return to theatre for repeat osteosynthesis
Kulkarni et al.[17]	Prospective, 15	Single inferior-border miniplate + arch bar	Paraesthesia, malocclusion and infection each 1 of 15 (6.7%)	Itemised complication audit
Mahmoud and Habaka[18]	Retrospective, 60	Three plating systems compared	22.73%, 20% and 7.69% by group	Group-wise complication rate
Abdelhamed et al.[19]	Split-mouth RCT, 12 (24 sides)	3D interlocking versus 2 miniplates	Impaired mental nerve sensation 1 of 24 sides (4.17%)	Bone density in Hounsfield units; neurosensory grading
Certa et al.[24]	Retrospective, 307	ORIF with or without short MMF	8.3% with short MMF versus 18.2% with none	Adjusted odds ratio 0.32 (0.11 to 0.97)
Janaphan et al.[30]	Retrospective, 305	Transoral load-sharing osteosynthesis	Infection 22.95%	Periodontal staging against infection
Oksa et al.[20]	Retrospective, 232	Intraoral approach	Non-infection-related dehiscence 22 of 232 (9.5%)	Dehiscence with multivariable predictors
Ragsdale et al.[22]	Retrospective, 640	Mixed; ORIF in 49.7%	Infection 3.8%, typically at 3 months	Time to infection; antibiotic duration
Xavier et al.[35]	Prospective, 26	Intraoral ORIF with mental nerve skeletonisation	Not applicable	Median time to functional sensory recovery, 6.0 weeks
Amran et al.[45]	Observational, 15	Open versus closed reduction	Not applicable	Oral Health Impact Profile-14 and GOHAI

* ORIF, open reduction and internal fixation; MMF, maxillomandibular fixation; IMF, intermaxillary fixation; RCT, randomised controlled trial; GOHAI, General Oral Health Assessment Index.
† The rightmost column is the comparison this report exists to make: every comparator study reports at least one measured endpoint, whereas the present record rests on a narrative statement of normality.

Limitations

This is a single case, and no causal inference can be drawn from it. The specific limitations are those the analysis above has itself identified and should be restated plainly. No numerical vital signs, laboratory values or glycated haemoglobin were recorded, so the statements that observations were within normal limits cannot be independently verified. No formal neurosensory testing was performed, so the absence of inferior alveolar nerve injury is inferred from the absence of a reported symptom rather than demonstrated. No closing interincisal measurement, body weight or validated quality-of-life instrument was obtained, so the functional outcome is a clinical impression supported by the photographs reproduced as Figure 5 rather than a measured value. The source record contains an internal arithmetic inconsistency in the reported interval to the third procedure, which has been recalculated from calendar dates and declared in section 2.7 rather than silently corrected. Follow-up ended 116 days after injury and seven days after the final procedure, which is shorter than the third-postoperative-month window in which mandibular infection most often declares itself,[22] and shorter than the twelve weeks within which neurosensory recovery is complete.[35] Finally, the preoperative computed tomography was performed at a referring institution and the reconstructions available for reproduction as Figure 2 are those supplied with the referral. The pharmacotherapy set out in Table 3 was likewise transcribed from the records of two institutions and, for the referring hospital, from the referral documentation alone.

A four-item minimum data set for the diabetic patient with an open mandibular fracture

The four gaps identified above are not a list of everything that could be measured; they are the four things this case shows were missing when a favourable result had to be demonstrated rather than asserted. Each maps to one measurement, one moment and one reason, and none requires equipment the operating unit does not already possess.

One. A glycated haemoglobin before the first anaesthetic, and a documented capillary glucose profile for as long as intake is delivered by a feeding tube. The moment is the preoperative workup, repeated whenever the route or the agent of glycaemic control changes. The reason is that the odds of a 30-day complication rise with glycated haemoglobin across the whole range, and that a sulfonylurea introduced at the moment oral intake ceases cannot be titrated against an intake nobody has recorded.

Two. Light touch, sharp-blunt discrimination and two-point discrimination in the mental nerve distribution, recorded before operation and at every follow-up visit. The moment is each of the contacts that already occur; in this case that was days 4, 21, 41 and 109 after the index operation, which spans the entire twelve-week window within which functional sensory recovery is complete in the published cohorts. The reason is that neurosensory deficit is the most probable complication of intraoral fixation near the mental foramen, and an unmeasured normal is an assumption rather than a finding.

Three. A dental disposition entry generated by the postoperative radiology report, and a statement of what became of any tooth avulsed at the moment of injury. The moment is the clinic visit at which the panoramic film is reviewed. The reason is that retained roots and active caries adjacent to titanium hardware are a documented infection risk in a patient whose periodontal reserve is already reduced by diabetes, and that an unaccounted avulsed tooth is an aspiration hazard which one line resolves.

Four. An interincisal opening in millimetres at the final visit, to set against the figure measured at presentation. The moment is the discharge review. The reason is that a baseline was measured, that the endpoint is the variable the whole reconstruction exists to restore, and that a ruler converts a clinical impression into a result. In this patient the baseline of 24 mm was recorded and its counterpart was not, which is why a favourable outcome can be described here but not quantified.

Applied together, these four entries would add perhaps five minutes to the whole of a 116-day episode of care. Their absence did not harm this patient. It did, however, make it impossible to demonstrate that he came to no harm, and that distinction is the substance of this report.

4. Conclusion

A 51-year-old man with hypertension and type 2 diabetes mellitus sustained a multiple open mandibular fracture of the symphysis, right parasymphysis and a segmental right body when a car struck his motorcycle. Intraoral open reduction with four plates and screws, combined with Erich arch bar maxillomandibular fixation on the eighth day after injury, restored the pre-injury occlusion. Rigid intermaxillary fixation was released at 21 days and the mandibular arch bar retained for 101 days; at 116 days after injury mouth opening was unrestricted, mastication, swallowing and speech were pain-free, and no infection, dehiscence, malunion, plate exposure or neurosensory complaint had occurred. Sparing of both condylar processes simplified the reconstruction to restoration of the anterior arch and removed the risk of long-term temporomandibular sequelae.

Set against that favourable course, structured review of the record identified four determinants of outcome that were never documented, each remediable at no cost. No glycaemic measurement of any kind was recorded across three general anaesthetics, although a sulfonylurea was introduced through a feeding tube at the moment oral intake ceased. No neurosensory testing was performed, although the fracture line abutted the mental foramen and the nerve was exposed at operation. Retained dental roots and active caries adjacent to four titanium plates were reported radiologically and never acted upon, and the avulsed canine was never accounted for. A baseline interincisal opening of 24 mm was measured and its counterpart at discharge was not. A preoperative glycated haemoglobin, a two-minute mental nerve examination at each visit, a dental referral generated by the panoramic report, and a closing measurement in millimetres would together have converted a favourable clinical impression into a documented outcome. In a diabetic adult with an open mandibular fracture, those four entries are as much a part of the operation as the plates.

Declarations

Ethical approval

This case report was prepared in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments.

Informed consent

Written informed consent for the publication of this case report and the accompanying clinical images was obtained from the patient. The periocular region is masked in every photograph in which it appears, and all burned-in identifiers have been removed from the radiological images by cropping. No information that could identify the patient is included in this report.

Reporting guideline

This case report was prepared in accordance with the CARE (CAse REport) reporting guideline. The CARE timeline item is implemented as Figure 6, which sets out the whole clinical course from the day of injury to the final review with every interval recalculated from the recorded calendar dates.

Image provenance and resolution

The clinical photographs and the intraoperative images were acquired at the treating institution. The computed tomography of Figure 2 and the panoramic radiograph of Figure 4 were acquired at the referring institution and were supplied with the referral; they are reproduced from those files at their native resolution, with contrast and cropping adjusted only to remove burned-in identifiers and to present each panel at a uniform printed height. No diagnostic content has been added to, removed from or altered within any image.

Data availability

All data supporting the findings of this report are contained within the article. Further detail is available from the corresponding author on reasonable request, subject to the protection of patient confidentiality.

Conflict of interest

The authors declare that they have no competing interests.

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Author contributions

All authors contributed to the conception of the report, the acquisition and interpretation of the clinical data, the drafting and critical revision of the manuscript, and the approval of the final version, and all agree to be accountable for all aspects of the work.

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Generative AI disclosure

The authors declare that no generative artificial intelligence tools were used in the design, analysis, or writing of this manuscript.

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