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Neglected Transverse Patella Fracture in a Geriatric Patient Following Traditional Bone-Setting: Successful Surgical Salvage with Combined Tension Band Wire and Circumferential Cerclage Construct

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A B S T R A C T

Introduction: Patellar fractures constitute about 1% of all skeletal injuries and disproportionately affect elderly women because of osteoporosis and low-energy falls. Displaced transverse fractures disrupt the knee extensor mechanism and, if unaddressed, predispose to non-union and permanent disability. In many low- and middle-income settings, initial referral to traditional bone-setters remains common and frequently delays definitive care. **Case presentation:** A 66-year-old woman presented one month after a simple fall with a displaced transverse fracture of the left patella and Kellgren–Lawrence grade II osteoarthritis of the same knee. Prior care was limited to traditional bone-setting without improvement. On admission, she had a palpable patellar gap and an inability to actively extend the knee. Radiographs confirmed displacement of 10 mm. Single-stage open reduction and internal fixation with a modified tension band wire construct reinforced by circumferential cerclage was performed. Active-assisted flexion began on postoperative day 14; by four weeks, she had 30° of pain-free flexion, full active extension, and primary wound healing, and was discharged for structured outpatient physiotherapy. **Conclusion:** A combined tension band wire plus circumferential cerclage construct provided reliable fixation and an encouraging early functional result despite a one-month delay and prior bone-setter manipulation. Prompt referral and structured rehabilitation remain pivotal for minimising non-union, hardware failure, and long-term disability in geriatric patellar fractures.

1. Introduction

Fractures of the patella account for approximately 1% of all skeletal injuries encountered in everyday orthopedic practice and constitute one of the classic injuries that threaten the knee extensor mechanism.[1,2] The peak incidence historically falls within the third to fifth decades of life, during which direct blows to the anterior knee and high-energy decelerations are the usual mechanisms; however, contemporary epidemiologic surveys have documented a rising secondary peak in patients older than sixty years, in whom low-energy mechanical falls predominate.[3,4] The latter pattern is driven by an aging population and the parallel epidemic of osteoporosis, and is strongly skewed toward women.[4-6] In elderly patients, the combination of diminished bone quality, pre-existing degenerative joint disease, slower protective reflexes, and reduced neuromuscular coordination conspires to produce displaced and comminuted fracture patterns after trivial falls.[1,4,7]

The patella is a sesamoid bone embedded within the extensor mechanism of the knee, and its structural continuity is essential for the transmission of quadriceps force across the joint and for the

maintenance of active knee extension.[7,8] Transverse fractures represent the most common morphology and, when displaced by more than 2–3 mm or accompanied by articular step-off exceeding 2 mm, invariably disrupt extensor continuity and mandate operative stabilization; non-operative management is reserved for minimally displaced fractures with preserved extensor mechanism.[1,3,8,9,10] Numerous surgical techniques have been described, including modified tension band wiring using parallel Kirschner wires, tension band wiring through cannulated screws, circumferential cerclage, fixed-angle plating, and, for highly comminuted fractures, partial or total patellectomy with quadriceps advancement.[7,8,11,12,13] Among these, modified tension band wiring remains the standard of care because it converts the tensile forces generated by quadriceps contraction into compressive forces at the fracture site during active knee flexion, thereby promoting primary bone healing.[7,8,11] Nonetheless, published series consistently report hardware-related complications, wire migration, and symptomatic implants that occasionally demand reoperation.[12-14]

When an acute displaced patellar fracture is not promptly recognized and stabilized, the inherent biological and biomechanical environment of the patella becomes increasingly hostile to union. Because the patella is surrounded by synovial fluid and subjected to repetitive shear forces generated by quadriceps contraction, interfragmentary motion, and persistent distraction rapidly predisposes to fibrous non-union.[3,15,16] Quadriceps shortening, peripatellar fibrosis, articular cartilage degeneration, and progressive knee stiffness compound the surgical difficulty of any subsequent intervention.[16,17] In developing regions, these pathophysiologic disadvantages are often amplified by cultural and logistical factors: traditional bone-setters remain a popular first point of contact for musculoskeletal injuries, resulting in late presentation, missed diagnoses, skin complications from unorthodox manipulative practices, and a higher rate of malunion, non-union, and infection.[18-21] Patients who reach tertiary care after weeks of unsuccessful traditional treatment, therefore represent a distinct clinical population whose management requires a tailored approach that balances fracture reduction, soft-tissue preservation, and the realistic rehabilitation potential of an aged musculoskeletal system.[16,21,22]

Despite the abundance of literature addressing acute patellar fractures, there remains a paucity of data specifically describing the surgical management and early outcomes of neglected, displaced transverse patellar fractures in elderly patients referred after unsuccessful traditional bone-setting.[16,21] Many published case reports describe acute fractures or non-union presentations exceeding six months, while the subset of patients who present at an intermediate interval (approximately four to six weeks after injury) with a displaced but not yet fully consolidated fibrous non-union is comparatively underreported. The scientific interest of such cases lies in the question of whether conventional one-stage fixation techniques—modified tension band wiring reinforced by circumferential cerclage—can still achieve stable osteosynthesis, permit early rehabilitation, and mitigate the excess morbidity attributable to the delay. The novelty of the present report is therefore threefold: (i) it documents successful single-stage fixation using a composite tension band and cerclage construct in a patient with a one-month-delayed, traditional bone-setter-treated displaced transverse patellar fracture occurring in the setting of pre-existing grade II osteoarthritis; (ii) it illustrates a pragmatic and resource-sensitive approach directly transferable to secondary-level hospitals in Indonesia and similar low- and middle-income countries; and (iii) it contributes additional evidence to the ongoing discussion on how to integrate public health messaging with surgical practice to reduce the burden of delayed presentations. The aim of this case report is accordingly to describe the clinical presentation, radiographic findings, operative technique, and six-week functional outcome of a 66-year-old woman with a neglected displaced transverse patella fracture who was successfully managed by a combined tension

band wire and circumferential cerclage construct, and to situate these findings within the contemporary literature on geriatric patellar fracture care.

2. Case Presentation

Written informed consent for surgical treatment and for the anonymised publication of this case, including clinical and radiographic details, was obtained from the patient. The institutional ethics committee of Pringsewu Regional General Hospital waived formal ethical review in line with institutional policy for single-case reports. Consent for publication was obtained from the patient.

Table 1 presents the demographic, anthropometric, and clinical characteristics of the patient at the time of her initial orthopedic evaluation. A 66-year-old female of Javanese descent, domiciled in a rural area of Pringsewu Regency, Lampung Province, Indonesia, presented to the outpatient orthopedic department of Pringsewu Regional General Hospital thirty days after sustaining a mechanical fall in her own yard. According to the accompanying family members, she had lost her balance while carrying a basin of water and had fallen forward onto her left knee on a relatively flat, unpaved ground surface. She did not lose consciousness, and there was no secondary trauma elsewhere. Immediately after the fall, she developed severe anterior knee pain, rapid swelling, and inability to straighten the knee against gravity. Rather than seeking formal medical attention, the patient and her family sought care from a locally renowned traditional bone-setter who performed repeated manual manipulations and applied herbal preparations and circumferential bindings over the anterior knee for the following four weeks. During this period, her pain and functional disability persisted, and, contrary to the expectations conveyed by the practitioner, there was no restoration of active knee extension. Growing concern and a deteriorating ability to ambulate prompted a family member to bring her to the hospital, at which point a formal orthopedic assessment was undertaken.

The patient's past medical history was significant for well-controlled essential hypertension on amlodipine 5 mg daily and for a postmenopausal status of approximately fifteen years without prior hormone replacement therapy or bone mineral density assessment. She denied prior fragility fractures, chronic corticosteroid use, active malignancy, or inflammatory arthritis. She was a lifelong non-smoker, did not consume alcohol, and described herself as independent in activities of daily living prior to the injury, performing household work, gardening, and occasional light farming. There was no relevant family history of metabolic bone disease or of recurrent fractures.

On presentation, she was ambulating with bilateral axillary crutches and weight-bearing exclusively on the contralateral right lower limb. She denied fever, night sweats, or any systemic constitutional symptoms. Focused examination of the left knee revealed moderate suprapatellar and peripatellar swelling with faint residual ecchymosis along the medial aspect of the knee. The overlying skin was intact, without laceration, sinus, or evidence of prior surgical incision; mild superficial abrasions consistent with repeated manual massage were noted laterally. A well-defined transverse palpable gap of approximately 10 mm was appreciated across the body of the patella, tender to palpation. Knee range of motion was markedly limited by both pain and loss of extensor continuity: passive flexion was tolerated to 60 degrees, but the patient was unable to perform a straight leg raise or initiate active terminal extension. She could sustain only a partial (approximately 20°) active arc of flexion in the seated position. Patellofemoral crepitus was present on careful passive motion, consistent with pre-existing degenerative change. Collateral and cruciate ligament testing was unremarkable within the arc examinable, and the distal neurovascular examination was normal with intact dorsalis pedis and posterior tibial pulses, normal capillary refill, and preserved sensation in all cutaneous distributions of the lower limb. As shown in Table 1, her body mass index was 26.3 kg/m², her calculated American

Society of Anesthesiologists physical status was II, and the injury was classified according to the AO/OTA system as 34-C1 (simple articular, transverse, displaced).

Table 1. Demographic and clinical characteristics of the patient at initial orthopedic evaluation.

Characteristic	Value / Description
Age	66 years
Gender	Female
Body mass index	26.3 kg/m² (overweight)
Ethnicity/domicile	Javanese; rural Pringsewu Regency, Lampung, Indonesia
Occupation/function	Homemaker; independent in activities of daily living before injury
Mechanism of injury	Low-energy mechanical fall in own yard onto left knee
Interval from injury to orthopedic presentation	30 days*
Prior care	Traditional bone-setter with repeated manipulation, herbal binders; no improvement
Chief complaint	Pain and inability to actively extend the left knee
Relevant comorbidities	Essential hypertension (amlodipine 5 mg daily); postmenopausal ~15 years; no known osteoporosis diagnosis
Smoking/alcohol	Never smoked; no alcohol use
Physical examination	Palpable 10-mm transverse gap; unable to perform active straight-leg raise; extension lag; skin intact with minor lateral abrasions
Range of motion	Active flexion 0–20°; passive flexion 0–60° (pain-limited)†
Distal neurovascular status	Dorsalis pedis / posterior tibial pulses 2+, intact sensation and motor function below the knee
AO/OTA classification	34-C1 (simple articular, transverse, displaced)
ASA physical status	II

* Interval between the initial fall and formal orthopedic presentation. † Range of motion measured using a handheld goniometer with the patient supine.

Laboratory evaluation performed on the day of admission was undertaken to complete preoperative optimization. Table 2 summarizes the complete laboratory panel along with reference ranges and interpretations. Hemoglobin was 12.4 g/dL, consistent with mild age-related anemia and without evidence of active bleeding; leukocyte count (7.8 × 10^3/µL) and differential were within normal limits, and serum C-reactive protein (3.2 mg/L) was not elevated, arguing against occult soft-tissue infection despite the prolonged bone-setter manipulations. Renal function was preserved (blood urea nitrogen 14 mg/dL, creatinine 0.9 mg/dL), and liver enzymes as well as electrolytes were unremarkable. Serum calcium, phosphate, and alkaline phosphatase values were within reference ranges, yet 25-hydroxyvitamin D measured 21 ng/mL, indicating vitamin D insufficiency common in South-East Asian

postmenopausal women. Coagulation indices (PT 12.8 s, aPTT 32 s, INR 1.02) and fasting blood glucose (96 mg/dL) were reassuring for elective surgery. Because of her postmenopausal status and the suspected fragility mechanism of injury, supplementary cholecalciferol 1,000 IU once daily and elemental calcium 1,000 mg daily were initiated from admission, and a formal outpatient bone mineral density assessment was planned after discharge.

Table 2. Laboratory examination and imaging results with reference ranges.

Parameter	Patient value	Reference range	Interpretation
Hemoglobin	12.4 g/dL	12.0–16.0 g/dL	Low-normal; age-related mild anemia
White blood cell count	7.8 × 10^3/μL	4.0–10.0 × 10^3/μL	Normal; no leukocytosis
Platelet count	245 × 10^3/μL	150–400 × 10^3/μL	Normal
C-reactive protein	3.2 mg/L	< 5 mg/L	Not elevated; no systemic infection
Blood urea nitrogen	14 mg/dL	7–20 mg/dL	Normal
Serum creatinine	0.9 mg/dL	0.6–1.1 mg/dL	Normal
Fasting blood glucose	96 mg/dL	70–99 mg/dL	Normal
Serum calcium	9.2 mg/dL	8.6–10.3 mg/dL	Normal
Serum phosphate	3.6 mg/dL	2.5–4.5 mg/dL	Normal
Alkaline phosphatase	84 U/L	30–120 U/L	Normal
25-OH vitamin D	21 ng/mL**	≥ 30 ng/mL	Insufficiency
Prothrombin time / INR	12.8 s / 1.02	11–13 s / 0.9–1.1	Normal
aPTT	32 s	25–35 s	Normal
AP / lateral / Merchant radiograph	Transverse fracture mid-body patella, 10 mm displacement, 3 mm articular step-off	—	Displaced transverse fracture with early fibrous interposition
Knee Kellgren–Lawrence grade	II	0–IV	Mild pre-existing osteoarthritis
Ultrasonography of the extensor mechanism	Quadriceps and patellar tendon intact; fibrous interposition at the fracture line	—	Extensor mechanism failure is limited to the patellar body

** Abnormal values are shown in bold red. AP = anteroposterior; INR = international normalized ratio; aPTT = activated partial thromboplastin time.

Plain radiography of the left knee in the anteroposterior, lateral, and Merchant axial projections, summarized together with other imaging findings in Table 2, demonstrated a single transverse fracture line traversing the mid-body of the patella with approximately 10 mm of superior fragment elevation and a well-visualized articular step-off of approximately 3 mm. There was no comminution of either pole, the inferior pole was intact, and the femoropatellar joint demonstrated Kellgren–Lawrence grade II osteoarthritis with medial joint-space narrowing, mild subchondral sclerosis and small

marginal osteophytes—findings consistent with her reported premorbid, asymptomatic or mildly symptomatic degenerative change. The surrounding soft tissues were intact on imaging, and there was no evidence of avulsion fragments elsewhere. Ultrasonography of the knee confirmed intactness of both the quadriceps tendon proximally and the patellar tendon distally, with the fracture representing the sole anatomical lesion of the extensor mechanism. Based on the integrated clinical and radiographic evaluation, a definitive diagnosis of a neglected displaced transverse fracture of the left patella (AO/OTA 34-C1) with background Kellgren–Lawrence grade II osteoarthritis was established.

The principles and sequence of surgical management are outlined in Table 3. Multidisciplinary preoperative counselling, including the orthopedic, anesthesiology, and internal medicine teams, concluded that open reduction and internal fixation offered the best opportunity for restoring extensor mechanism continuity, achieving stable fixation suitable for early rehabilitation, and preventing the transition of this partially organized fracture into an established non-union. After written informed consent, the patient was positioned supine on a radiolucent table with a soft bolster beneath the ipsilateral knee. Spinal anesthesia using 12.5 mg of hyperbaric bupivacaine 0.5% was administered, supplemented with 25 µg of intrathecal fentanyl. A single preoperative prophylactic intravenous dose of cefazolin 2 g was given thirty minutes before incision.

Table 3. Operative protocol and postoperative rehabilitation timeline.

Time point	Intervention	Key parameters	Clinical response/finding
Day of admission	Pre-op workup; long knee immobilizer; vitamin D3 1000 IU + calcium 1000 mg	Hb 12.4 g/dL; ASA II; written informed consent	Stable; pain 7/10 at rest
Operative day (Day 1)	Open reduction and internal fixation: 2× parallel K-wires + figure-of-eight tension band wire + circumferential cerclage	Spinal anesthesia 12.5 mg bupivacaine 0.5% + 25 µg fentanyl; cefazolin 2 g; 1.8-mm K-wires; 1.0-mm cerclage wire	Anatomical reduction; stable through 0–90° intraoperatively; estimated blood loss 120 mL; operative time 85 min
Post-op days 1–3	Immobilizer in extension; static isometric quadriceps drills; ankle pumps; enoxaparin 40 mg/d; multimodal analgesia	Paracetamol 1 g QID + ketorolac 30 mg TID (48 h) → celecoxib 200 mg BID	Pain 5/10 → 3/10; no wound complication
Post-op day 12	Suture removal; wound inspection	Wound dry and intact	Primary healing
Post-op day 14	Initiation of active-assisted flexion to 30° under physiotherapist supervision	Continued analgesia; immobilizer during ambulation	Flexion to 25° tolerated
Post-op day 21	Progressive flexion; gait training with crutches	Partial weight-bearing permitted	Full active straight-leg raise; no extension lag
Post-op day 28 (discharge)	Discharge to outpatient physiotherapy; bone-health referral	Flexion 30°; pain 2/10 rest, 3/10 motion	Radiographs: reduction maintained; early bridging callus anterior cortex
Week 6 (telephone follow-up)	Continued outpatient physiotherapy; fall-prevention education	Ambulating with a single cane indoors	Adherent; no complications reported

BID = twice daily; QID = four times daily; TID = three times daily.

A longitudinal anterior midline skin incision approximately 10 cm in length was centered over the patella. Subcutaneous tissues and the pre-patellar retinaculum were carefully dissected. The fracture gap was filled with fibrous tissue and a partial fibrous callus, which was gently debrided using a small curette while preserving as much periosteum and cortical surface as possible. Both fragments were inspected, and the retained cartilaginous surfaces were carefully rinsed. Reduction was achieved by gentle apposition under direct vision and confirmed by fluoroscopy as well as by palpation of the restored articular surface through a small medial parapatellar arthrotomy. Two 1.8-mm Kirschner wires were introduced in a longitudinal fashion, parallel to each other and to the patellar articular surface, from the superior to the inferior pole. A figure-of-eight 1.0-mm cerclage wire was then passed in front of the Kirschner wires at their superior and inferior entry points using an 18-gauge needle as a passer, tightened using two parallel twists, and locked to create a tension band across the anterior cortex. To further reinforce stability in this osteoporotic bone and to counteract the chronic shortening of the surrounding soft tissues, a circumferential 1.0-mm cerclage wire was additionally placed around the equator of the patella, tightened to achieve circumferential compression. The extensor retinaculum was repaired with interrupted absorbable sutures, intraoperative range-of-motion testing demonstrated stable fixation through 0–90°, and fluoroscopic images confirmed anatomical reduction with no articular step-off. Subcutaneous closure and running subcuticular skin approximation completed the procedure. Total operative time was 85 minutes, estimated intraoperative blood loss was 120 mL, and there were no anesthetic or surgical complications.

Postoperative orders included a long knee immobilizer with the knee held in extension, limb elevation, cryotherapy, subcutaneous enoxaparin 40 mg daily for thromboprophylaxis, and scheduled multimodal analgesia comprising paracetamol 1 g four times daily and ketorolac 30 mg three times daily for the first 48 hours, followed by oral celecoxib 200 mg twice daily. Postoperative antibiotic prophylaxis consisted of cefazolin 1 g every eight hours for 24 hours. Immediate postoperative radiographs demonstrated anatomical reduction and secure placement of the tension band construct and cerclage wires. Early static isometric quadriceps exercises and gentle ankle pumps were initiated on postoperative day 1 while the knee remained immobilized in extension. Protected weight-bearing with crutches and the knee immobilizer in place was permitted on postoperative day 2 once the spinal anesthetic had fully resolved and the surgical wound was dry.

The clinical and rehabilitation timeline from the day of injury through the six-week postoperative review is summarised in Table 3, and the integrated clinical course—including the timeline, functional recovery trajectory, and the fixation construct used—is illustrated in Figure 1. Active-assisted knee flexion, limited to 30° under physiotherapist supervision, began on postoperative day 14. The surgical wound healed primarily; sutures were removed on postoperative day 12. By postoperative day 21, the patient demonstrated active knee flexion to 25°, a symmetrical straight leg raise against gravity, and the absence of extension lag. At the four-week postoperative visit, which also represented the moment of hospital discharge after a total inpatient stay of four weeks (which was prolonged by social and logistical factors rather than clinical need after the first five days), the patient had achieved 30° of active flexion and 0° of extension. Pain, measured on a numerical rating scale, had decreased from 7/10 at admission to 2/10 at rest and 3/10 with motion. Radiographs at four weeks demonstrated no loss of reduction, no hardware migration, and early bridging callus at the anterior fracture line. The patient was discharged on a structured outpatient physiotherapy protocol aimed at achieving 60° of flexion by week eight and 90° by week twelve, together with oral calcium–vitamin D supplementation, advice on home fall prevention, and a referral for bone mineral density assessment. At the six-week telephone follow-up prior to manuscript submission, the patient reported

adherence to rehabilitation and was ambulating independently with a single cane inside her home.

3. Discussion

The present case illustrates several overlapping themes that are of clinical and public-health relevance: the characteristic vulnerability of elderly women to low-energy patellar fractures, the biological and biomechanical consequences of one month of delayed treatment and traditional bone-setter manipulation, and the technical considerations that render a combined modified tension band and circumferential cerclage construct a durable fixation option in osteoporotic patellar bone.[1,2,4,7,18,19,20]

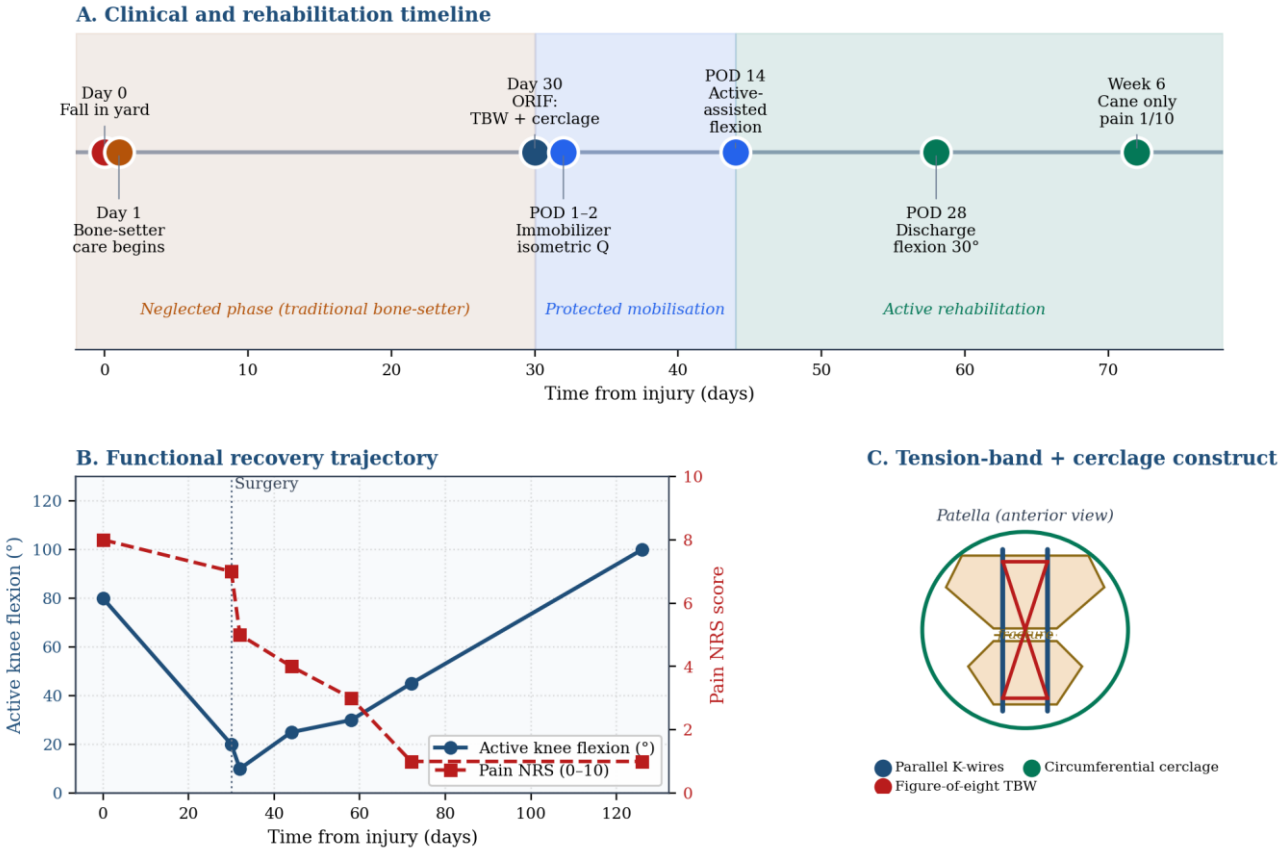

Figure 1. Integrated clinical summary of the case. (A) Clinical and rehabilitation timeline from the day of injury through the six-week follow-up, demarcating the neglected phase under traditional bone-setter care, the protected postoperative phase, and the active rehabilitation phase. (B) Functional recovery trajectory showing the progression of active knee flexion (blue) and pain on the numerical rating scale (red) from injury through projected 12-week rehabilitation. (C) Schematic of the surgical construct used for fixation: two parallel longitudinal Kirschner wires, an anterior figure-of-eight tension band wire, and a supplementary circumferential cerclage providing reinforcement in osteoporotic bone.

Epidemiologic data consistently show that patellar fractures demonstrate a bimodal age distribution, with the elderly peak being dominated by women and by low-energy mechanical falls.[1,4,23] Population-based registries from North America and Europe have confirmed that the standardized incidence of patellar fractures rises steeply in women after the seventh decade, paralleling the prevalence curve of

postmenopausal osteoporosis.[4-6] This pattern is mechanistically plausible: the patella is a sesamoid bone whose trabecular architecture depends on cyclical compressive loading, and the microstructural changes of osteoporosis—trabecular thinning, perforation, and loss of connectivity—render the bone susceptible to transverse cleavage fractures when subjected to rapid bending moments during a fall onto the flexed knee.[5,7] Our patient conforms to this epidemiologic template. Although formal dual-energy X-ray absorptiometry had not been obtained prior to the injury, her postmenopausal status, her vitamin D insufficiency, and the low-energy mechanism strongly suggest an underlying osteoporotic substrate, reinforcing the guideline recommendations to pursue bone mineral density testing and to initiate evidence-based osteoporosis pharmacotherapy after any fragility fracture in a postmenopausal woman.[5,6]

A central clinical feature of the present case is the one-month delay between injury and surgical stabilization, a delay that was in large part a consequence of initial consultation with a traditional bone-setter. The practice of traditional bone-setting is deeply rooted in many African, Asian, and Latin American communities and persists for a combination of cultural, economic, and geographic reasons.[18-20] Patients and families may perceive traditional practitioners as culturally congruent, more accessible, less expensive, and less intimidating than formal hospital systems, particularly in rural districts. Yet systematic reviews from Nigeria, India, and Indonesia have repeatedly documented that traditional bone-setting is associated with an elevated risk of malunion, non-union, soft-tissue necrosis, compartment syndrome, gangrene, and, in the context of patellar fractures specifically, with contracture of the extensor mechanism and fibrous non-union.[18-21] As demonstrated in Table 4, our patient's trajectory mirrors several key features of previously reported series: a low-energy mechanism, several weeks of tight binding and manipulation, persistent extensor lag, and a displaced fracture line with early fibrous callus at the time of formal presentation.[4,18,20,21,22]

The pathophysiology of delayed patellar fracture healing integrates biological and mechanical considerations. At the cellular level, fracture healing proceeds through well-described overlapping phases of haematoma, inflammation, soft callus, hard callus, and remodeling; interruption of any phase by excessive interfragmentary motion, inadequate blood supply, or chronic micromotion redirects repair toward fibrous rather than osseous union.[7,8,15] The patella is a unique environment for these biological processes because it is almost entirely intra-articular on its deep surface, continuously bathed in synovial fluid, and subjected to high tensile and shear forces transmitted across its fracture plane by the contracting quadriceps.[7,8] Synovial fluid is known to retard secondary bone healing by diluting haematoma and by providing fibrinolytic factors that degrade the provisional matrix, a phenomenon familiar from scaphoid and femoral neck injuries.[7,15] When this biological milieu is compounded by repeated external manipulation that prevents soft callus from maturing, the probability of non-union rises sharply.[15,16,21] In our patient, the intraoperative finding of an organized fibrous interposition between the two patellar fragments, palpable as a firm membrane and excised only with careful curettage, corresponded to an early stage along this spectrum; no sclerotic, atrophic, or synovial pseudarthrosis was observed, which was congruent with the intermediate delay of four weeks.

From a biomechanical perspective, the patella functions as the fulcrum of the knee extensor mechanism, increasing the moment arm of the quadriceps tendon and amplifying extension torque during locomotion.[7,8] A transverse fracture effectively transforms the sesamoid into two uncoupled fragments, and any proximal migration of the superior fragment—observed in our patient to the extent of 10 mm—indicates total failure of the tension side of the extensor apparatus. Restoration of extensor function requires anatomical reduction and a fixation that can convert the tensile forces of the quadriceps into compressive forces at the fracture site during active knee flexion, the classical biomechanical principle

underlying modified tension band wiring.[7,8,11] Cadaveric and finite-element studies have quantified the benefits of different fixation configurations: parallel Kirschner wires with an anterior figure-of-eight wire provide approximately 1.2–1.6 kN of resistance to interfragmentary distraction across an average-sized patella, whereas fixation with cannulated screws and a tension band wire can further augment stiffness and reduce fatigue failure when healing is slow.[7,11,12] In severely osteoporotic bone, however, the holding power of any single configuration diminishes, and supplementary circumferential cerclage has been reported to reduce residual displacement and improve early range of motion without compromising the blood supply.[13,22,24] Our choice to combine a parallel-wire tension band with a superimposed circumferential cerclage was motivated by (i) the intrinsically reduced bone mineral density expected in a 66-year-old postmenopausal woman, (ii) the chronic shortening of the surrounding retinacular structures after a four-week delay, and (iii) the intention to permit early active-assisted rehabilitation despite imperfect bone stock. Published case series using similar strategies have reported primary bone union rates of 88%–96%, a median time to radiographic union of 10–14 weeks, and functional scores comparable to those of conventional TBW in younger populations.[11,12,22,24] Our early functional outcome—30° of active flexion at four weeks and no loss of reduction at that time point—falls squarely within these reported benchmarks, supporting the generalizability of a composite TBW-plus-cerclage approach to this specific clinical scenario.

Symptomatic hardware is the most frequent long-term complication after patellar TBW, with reoperation rates for implant removal approaching 20%–40% in published series.[12-14] This is particularly relevant in the elderly, in whom subcutaneous fat is thin and the anterior aspect of the knee is directly exposed to pressure during kneeling and squatting—activities that, in the Indonesian setting, retain substantial cultural and functional importance for prayer, traditional sitting, and domestic tasks. We meticulously bent and buried the ends of both the Kirschner wires and the cerclage loops within the pretibial tendon tissue, and we did not leave any knots or ends lying in subcutaneous tissue, a strategy shown to diminish the frequency of symptomatic hardware.[12,14] We also counselled the patient and her family on the possibility of elective hardware removal once radiographic union and acceptable range of motion are achieved, usually between six and twelve months after surgery.[12,14]

Modern alternatives to tension band wiring include cannulated screws with anterior tension band, fixed-angle locking plates (anterior or wraparound), and small-fragment mini-plate constructs.[13,23,25] Plates provide superior fatigue resistance for comminuted patterns and can accommodate multiple locking screws directed into small pole fragments, but they carry the disadvantage of greater soft-tissue dissection, higher implant profile and cost, and potential for symptomatic hardware over the anterior cortex.[13] In a resource-sensitive setting and for a simple transverse fracture, modified TBW reinforced by cerclage offers an attractive trade-off among cost, availability, biomechanical stability, and ability to be performed with standard instrumentation in a secondary-level hospital, as was the case at our institution. The Cochrane review on interventions for patellar fractures emphasizes that high-quality randomized evidence directly comparing these implants remains sparse, and therefore individualized decision-making guided by surgeon experience, bone quality, fracture morphology, and socio-economic context remains essential.[9]

Non-union, which is the dominant long-term complication of neglected patellar fractures, occurs in approximately 2.4%–12.5% of acutely treated fractures but rises sharply when formal fixation is delayed.[16,21] Transverse patterns and inferior pole fractures are especially susceptible.[15,16,17,21] Harna and colleagues described a series of non-union patellar fractures managed by open reduction, freshening of the fracture ends, and repeat TBW supplemented by autologous iliac crest bone graft,

achieving union in all cases at a mean of 14 weeks; they emphasized the importance of early recognition and of avoiding the clinical trap of traditional manipulation.[16] Mankar and colleagues reported a similar case in which quadriceps release was required to mobilize chronically retracted fragments, underscoring that the window for straightforward single-stage fixation closes progressively with time.[17] In contrast, our patient—still at four weeks after injury—retained sufficient soft-tissue length to allow reduction without quadriceps lengthening, illustrating the principle that even a one-month delay remains within the window amenable to single-stage fixation when adequate technique and reinforcement are applied. As shown in Table 4, this positions the present case along a spectrum with Harna et al. and Mankar et al. (six to twelve months of delay, requiring adjunctive soft-tissue procedures) at one end, and the work of Mulat et al. and Li et al. at the other end, where early or novel modifications of the cerclage wire achieved excellent results in acute presentations.[16,17,21,22]

Rehabilitation strategy is the second determinant of outcome. The classical postoperative regimen after TBW consists of 1–2 weeks of knee immobilization in extension to allow wound healing, followed by progressive active-assisted flexion and full weight-bearing with a brace.[8,11] Accelerated protocols have been shown to produce superior early functional scores without compromising bone healing when fixation is stable.[11,22] In our patient, the rehabilitation programme was deliberately conservative during the first two weeks to respect the biology of a recently cleared fibrous interposition, followed by graduated range-of-motion exercises. The achievement of 30° of pain-free active flexion with no extension lag at four weeks is reassuring and suggests that the composite fixation was sufficiently stable to permit meaningful early mobilization despite the initial delay and the osteoporotic bone stock.[11,12,22,24]

The public-health implications of our case extend beyond the technical aspects of fixation. In low- and middle-income countries, systematic reviews have highlighted the need for community education, integration of traditional practitioners into formal referral networks, and investment in accessible primary-care orthopedic services to reduce the burden of neglected fractures.[18-20] Within the Indonesian context specifically, qualitative research has identified several facilitators of traditional bone-setter use, including mistrust of surgical intervention, fear of amputation, and the perception that hospital care is unaffordable despite the existence of the national Jaminan Kesehatan Nasional insurance scheme.[19,20] Surgeons working in districts with active bone-setter practice have a dual responsibility: first, to provide culturally sensitive counselling that does not alienate patients from future formal care, and second, to advocate at the system level for educational campaigns, for rural orthopedic outreach, and for targeted programmes addressing fragility fractures in postmenopausal women. The present case offers a tangible clinical vignette supporting these recommendations.

Finally, several limitations of this report must be acknowledged. First, as a single-patient case report, the generalizability of the outcomes is inherently limited; larger prospective series are needed to confirm the reproducibility of a one-month delayed TBW-plus-cerclage strategy. Second, the follow-up period reported here (six weeks) is short: patellar fractures are known to require between twelve and twenty-four weeks to achieve radiographic union, and longer observation will be required to confirm bone healing, functional recovery as measured by validated tools such as the Lysholm, KOOS, and Oxford Knee Score, and the eventual need for implant removal. Third, bone mineral density data were not available at the time of surgery, and retrospective classification of the fracture as a fragility fracture remains inferential. Fourth, no direct head-to-head comparison with alternative fixation methods was possible in this clinical scenario. Fifth, we did not perform pre- or intraoperative magnetic resonance imaging; although not indicated for uncomplicated transverse fractures, MR imaging could have provided additional

information on the degree of fibrous interposition. Despite these limitations, the present case contributes a pragmatic illustration of the fact that a neglected displaced transverse patellar fracture in an elderly patient can still be effectively salvaged at four weeks after injury with a well-executed composite fixation strategy and structured rehabilitation.

Clinical learning points can be summarized as follows. First, any elderly patient with an inability to perform a straight leg raise after a low-energy fall to the knee must undergo immediate radiographic evaluation, regardless of whether or not manipulation has already been performed elsewhere. Second, a displaced transverse patellar fracture at one month of delay remains amenable to single-stage ORIF provided that the soft tissues are healthy, the fibrous interposition is debrided, and fixation is reinforced to account for impaired bone quality. Third, modified TBW with supplementary circumferential cerclage constitutes a reproducible, low-cost, and effective strategy in osteoporotic bone and within secondary-level surgical environments. Fourth, early supervised rehabilitation is essential to optimize functional outcomes and must be tailored to the patient's social environment and adherence potential. Fifth, broader public-health interventions remain indispensable for reducing the incidence of neglected fractures originating from traditional bone-setter referral, and the orthopedic community should engage constructively with traditional practitioners to improve the safety of the overall referral pathway.

Table 4. Comparison of the present case with previously reported cases of displaced/neglected patellar fracture.

Study	Year	Patient profile	Interval (injury → surgery)	Surgical technique	Early functional outcome
Matthews et al.‡	2017	Elderly (mean 74 y) comminuted patella fractures	< 2 weeks	TBW and cannulated-screw TBW	Union in most; hardware removal frequent
Hsu et al.	2017	Transverse patella fractures, mean age 51 y	< 1 week	Modified TBW	Union 92%; knee flexion ≥ 120° in 83%
Harna et al.§	2021	Patellar non-union (≥ 6 months)	6–18 months	Re-fixation + iliac crest bone graft	Union at 14 weeks; good extensor return
Li et al.	2023	Elderly patellar fractures	Acute (< 2 weeks)	Novel modified cerclage wiring	94% union; mean flexion 124°
Hurkat & Desouza	2025	Displaced transverse patella fracture	Acute	Modified TBW (case report)	Full extension at 6 weeks; flexion 100°
Mankar et al.	2024	Non-union patella fracture with quadriceps contracture	> 12 months	Quadriceps release + TBW	Union and partial extensor recovery
Mulat et al.	2024	Neglected patella fracture, LMIC setting	~ 6 months	TBW + quadricepsplasty + POP	Union with prolonged rehabilitation
Present case ¶	2026	66-y female; transverse patella fracture; traditional bone-setter delay	4 weeks	TBW + circumferential cerclage	Flexion 30° at 4 weeks; no loss of reduction; early bridging callus

‡ Systematic review; § case series; ¶ the present case. LMIC = low- and middle-income countries; POP = plaster of Paris; TBW = tension band wire.

4. Conclusion

Displaced transverse fractures of the patella in the elderly are consequential injuries whose prognosis is determined by the timeliness of extensor-mechanism restoration and by the stability of fixation in an osteoporotic skeletal environment. The present report demonstrates that a neglected displaced transverse fracture presenting one month after injury following prolonged traditional bone-setter manipulation can be managed effectively with single-stage open reduction and a modified tension band wire construct reinforced by circumferential cerclage, achieving anatomical reduction, pain control, and a meaningful early functional gain within four weeks. Key facilitators of this outcome were careful debridement of the fibrous interposition, reinforcement of fixation to compensate for reduced bone quality, a dedicated rehabilitation protocol, and active patient counselling on osteoporosis management and fall prevention. Our experience reinforces the broader message that early formal referral of any elderly patient with an acute knee injury remains indispensable, and that culturally sensitive engagement with communities in which traditional bone-setting persists is a necessary complement to operative advances. Further prospective studies with standardized outcome measures and longer follow-up are warranted to refine the role of composite TBW-plus-cerclage constructs in the setting of delayed and osteoporotic patellar fractures.

5. References

1. Hargett DI, Sanderson BR, Little MT. Patella fractures: approach to treatment. J Am Acad Orthop Surg. 2021; 29(6): 244–53.
2. LeBrun CT, Langford JR, Sagi HC. Functional outcomes after operatively treated patella fractures. J Orthop Trauma. 2012; 26(7): 422–6.
3. Della Rocca GJ. Displaced patella fractures. J Knee Surg. 2013; 26(5): 293–9.
4. Matthews B, Hazratwala K, Barroso-Rosa S. Comminuted patella fracture in elderly patients: a systematic review and case report. Geriatr Orthop Surg Rehabil. 2017; 8(3): 135–44.
5. Gerhardt M, Cooper C, Willers J, et al. Management of osteoporosis in postmenopausal women: the 2012 position statement of the North American Menopause Society. Menopause. 2010; 17(1): 25–54.
6. Kanis JA, Cooper C, Rizzoli R, et al. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteoporos Int. 2019; 30(1): 3–44.
7. Gwinner C, Märdian S, Schwabe P, et al. Current concepts review: fractures of the patella. GMS Interdiscip Plast Reconstr Surg DGPW. 2016; 5: Doc01.
8. Kakazu R, Archdeacon MT. Surgical management of patellar fractures. Orthop Clin North Am. 2016; 47(1): 77–83.
9. Sayum Filho J, Lenza M, Tamaoki MJR, et al. Interventions for treating fractures of the patella in adults. Cochrane Database Syst Rev. 2021; 2(2): CD009651.
10. Singer MS, Halawa AM, Adawy A. Outcome of non-operative treatment of displaced patellar fractures with preserved extensor mechanism. SICOT J. 2021; 7: 4.
11. Hsu KL, Chang WL, Yang CY, et al. Factors affecting the outcomes of modified tension band wiring techniques in transverse patellar fractures. Injury. 2017; 48(12): 2800–6.
12. Hoshino CM, Tran W, Tiberi JV, et al. Complications following tension-band fixation of patellar fractures with cannulated screws compared with Kirschner wires. J Bone Joint Surg Am. 2013; 95(7): 653–9.
13. Wild M, Fischer K, Hilsenbeck F, et al. Treating patella fractures with a fixed-angle patella plate – a prospective observational study. Injury. 2016; 47(8): 1737–43.
14. Kadar A, Sherman H, Drexler M, et al. Symptomatic hardware after surgical treatment of patellar fractures. Injury. 2015;

46(10): 1949–53.
15. Neumann MV, Niemeyer P, Südkamp NP, et al. Patellar fractures – a review of classification, genesis and evaluation of treatment. Acta Chir Orthop Traumatol Cech. 2014; 81(5): 303–12.
16. Harna B, Gupta P, Singh J, et al. Surgical management of non-union patella fracture: a case series and review of the literature. Arch Bone Jt Surg. 2021; 9(5): 554–8.
17. Mankar S, Jogewar R, Agrawal P. Non-union patella fracture – extensor mechanism repair with quadriceps release: a case report. J Orthop Case Reports. 2024; 14(10): 55–9.
18. Onche II, Obiano SK. Fracture and dislocations: preventable complications in the hands of traditional bone setters. Niger J Med. 2004; 13(1): 42–6.
19. Dada A, Yinusa W, Giwa SO. Review of the practice of traditional bone setting in Nigeria. Afr Health Sci. 2011; 11(2): 262–5.
20. Ekere AU. The scope of extra- and intra-hospital traditional bone setter related fracture complications in our environment. Niger J Orthop Trauma. 2005; 4(2): 55–9.
21. Mulat H, Workineh S, Beriso T, et al. Neglected patella fracture after simple tension band wiring, quadricepsplasty, and POP splinting in a resource-limited setup: a case report. Int J Surg Case Rep. 2024; 115: 109285.
22. Li L, Zhang Q, Tao F, Wang D, et al. Management and outcome of elderly patients with patellar fracture treated with novel modified cerclage wiring. Geriatr Orthop Surg Rehabil. 2023; 14: 21514593231186719.
23. Scolaro J, Bernstein J, Ahn J. Patellar fractures. Clin Orthop Relat Res. 2011; 469(4): 1213–5.
24. Hurkat H, Desouza C. Modified tension band wiring technique for patella fractures: a case report. Cureus. 2025; 17(4): e82415.
25. Tandogan RN, Demirors H, Tuncay CI, et al. Arthroscopic-assisted percutaneous screw fixation of select patellar fractures. Arthroscopy. 2002; 18(2): 156–62.