



Evidence Favours Observation, But Practice Promotes Exploration: Spontaneous Recovery of Radial Nerve Palsy After Minimally Invasive Plating of a Closed Humeral Shaft Fracture

Gupta PK* and Kumar R

Department of Orthopaedics, ISIC Multispecialty hospital, Vasant Kunj, New Delhi, India

Abstract

Radial nerve palsy is the most common peripheral nerve injury associated with the fractures of the humeral shaft. Most published studies, including systematic reviews and a decision analysis, show that primary palsy after a closed humeral shaft fracture recovers spontaneously in the great majority of patients and that early exploration of the nerve does not improve the outcome, even when the fracture is fixed surgically. In India, however, many orthopaedic surgeons still recommend exploring the radial nerve, and in our experience, this recommendation is driven more by the fear of litigation than by scientific evidence. We report the case of a 42-year-old man who sustained a closed, displaced transverse fracture of the left humeral shaft with a small butterfly fragment (AO/OTA 12B3) following a road traffic accident. He presented with complete wrist and finger drop and reduced sensation over the first dorsal web space. After the deficit had been documented, the fracture was fixed two days after the injury with a 12-hole locking compression plate using an anterior minimally invasive plate osteosynthesis technique. The radial nerve was not explored at the fracture site. Eight weeks and five days after surgery, the patient had regained full active wrist extension. We review the published evidence and contrast it with the recommendations of Indian surgeons and the medicolegal climate in which they work. We argue that in closed injuries without specific indications, the nerve injury need not be surgical surgically explored. Careful documentation, clear communication, informed consent, and structured follow-up are the real safeguards for patient and surgeon.

OPEN ACCESS

*Correspondence:

Pratyaksh Kumar Gupta, Department of Orthopaedics, ISIC Multispecialty hospital, Vasant Kunj, New Delhi, India, E-mail: pratyaksh@aosm.in

Received Date: 21 Sep 2026

Accepted Date: 02 Oct 2026

Published Date: 05 Oct 2026

Citation:

Gupta PK, Kumar R. Evidence Favours Observation, But Practice Promotes Exploration: Spontaneous Recovery of Radial Nerve Palsy After Minimally Invasive Plating of a Closed Humeral Shaft Fracture. *Clin Case Rep Int*. 2026; 10: 1793.

Copyright © 2026 Gupta PK. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Keywords: Radial nerve palsy; Humeral shaft fracture; Nerve exploration; Minimally invasive plate osteosynthesis; Neurapraxia; Medicolegal; Defensive medicine

Introduction

Radial Nerve Palsy (RNP) is the most common peripheral nerve injury associated with fractures of the humeral shaft [1]. Humeral shaft fractures are particularly prone to it because of the anatomical course of the nerve [2], and the reported incidence after closed fractures ranges from 7% to 17% [3]. A systematic review of 4,517 fractures found an overall prevalence of 11.8%; palsy was more often associated with transverse and spiral patterns and with fractures of the middle and middle-distal parts of the shaft [4].

Whether the nerve should be explored early or observed has been debated for decades. Early exploration and repair are accepted for open fractures, whereas the management of palsy after closed fractures has long been considered uncertain [5]. Most published evidence now points in one direction: more than 90% of primary palsies after closed fractures recover without intervention, and early exploration offers no demonstrable benefit [6]. Practice has not followed the evidence. In an international survey of orthopaedic surgeons, most of whom worked in Latin America or the Asia-Pacific region, the majority preferred to explore the radial nerve acutely at the time of fracture fixation [7].

In India, published recommendations continue to favour early exploration or formal exposure of the nerve [8,9], and in our experience, exploration remains common in routine practice. Road traffic injuries are registered as Medicolegal Cases (MLCs), and a nerve deficit noticed after surgery is readily blamed on the operating surgeon. In our view, it is this medicolegal fear, rather than

scientific evidence, that sustains the recommendation to explore. We report a patient whose closed humeral shaft fracture with RNP, registered as an MLC, was fixed with anterior Minimally Invasive Plate Osteosynthesis (MIPO) without exploration of the nerve, and whose wrist extension recovered fully within nine weeks of the injury. This case allows us to contrast what the literature shows with what Indian surgeons recommend.

Case Presentation

A 42-year-old man with no significant medical or surgical history presented to the emergency department with pain and swelling of the left arm and left-sided chest pain after a road traffic accident in which the tire of an auto-rickshaw burst and toppled over. He was conscious and oriented, and his vital signs were stable. The skin over the left arm was intact, with swelling and tenderness over the middle third of the arm. He could not actively extend the wrist or the fingers, and sensation was reduced over the first dorsal web space, findings consistent with radial nerve palsy. No other distal neurovascular deficit was recorded. Radiographs showed a displaced transverse fracture of the left humeral midshaft with a small butterfly fragment, classified as AO/OTA 12B3 (Figure 1). The injury was registered as an MLC at admission. The working diagnosis was a closed humeral shaft fracture with primary RNP, most likely neurapraxia, and the deficit was recorded in the admission notes before any intervention.

Two days after the injury the fracture was fixed using an anterior

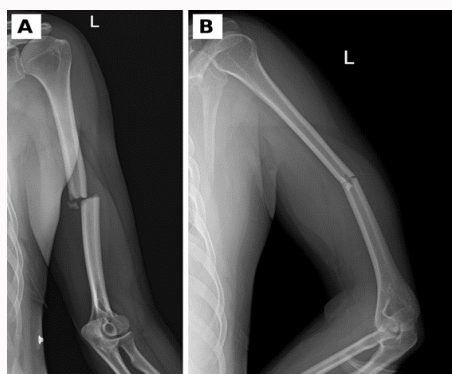


Figure 1: Preoperative radiographs of the left humerus. Anteroposterior (A) and lateral (B) views showing a displaced transverse midshaft fracture with a small butterfly fragment (AO/OTA 12B3).

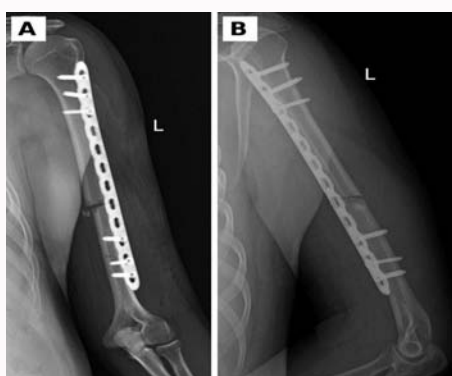


Figure 2: Immediate postoperative radiographs. Anteroposterior (A) and lateral (B) views showing bridge fixation with an anteriorly placed 12-hole locking compression plate inserted by the minimally invasive technique, with three screws in each main fragment.

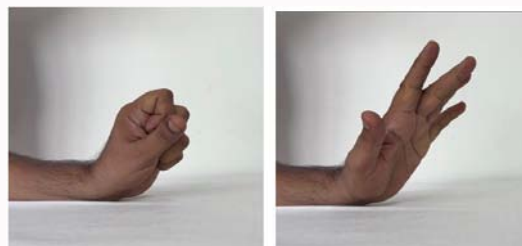


Figure 3: Clinical photographs eight weeks and five days after surgery. Active extension of the left wrist, showing recovery of radial nerve function without nerve exploration.

MIPO technique through two incisions. The proximal window was developed through the deltopectoral interval, with the cephalic vein protected, to expose the anterior humerus between the deltoid and pectoralis major. A sleeve-mounted 12-hole locking compression plate was passed in an extra periosteal tunnel from the proximal to the distal window. The fracture was reduced, held provisionally with Kirschner wires through the plate, and fixed with three screws in each main fragment after length, alignment, and rotation had been confirmed on anteroposterior and lateral fluoroscopic views (Figure 2). The fracture site was not opened, and the radial nerve was not explored in the zone of injury. The wounds were closed in layers.

The postoperative period was uneventful, and the check radiographs were satisfactory. The patient was discharged on the second postoperative day with an arm sling, cold therapy, analgesics, and instructions for active-assisted shoulder and elbow exercises. The discharge summary recorded the radial nerve injury as probable neurapraxia, with a very good chance of complete recovery over four to five months. At the two-week review, the wounds were clean and dry without signs of infection, the sutures were removed, and the exercise program was continued.

At the review eight weeks and five days after surgery (nine weeks after the injury), the treating surgeon recorded that the radial nerve palsy had resolved and that the patient had regained active dorsiflexion of the left wrist (Figure 3). Radiographs showed no implant loosening, and the fracture line was still visible, consistent with union in progress. A further review with radiographs was planned in two months. Nerve function was assessed clinically throughout, and neither electrodiagnostic studies nor nerve ultrasonography was performed. The clinical course is summarized in Table 1.

Discussion

What the literature shows

The publications reviewed are summarized in Table 2, and most of them lead to the same conclusion. In the review by Shao, et al., the overall recovery rate was 88.1%, spontaneous recovery occurred in 70.7% of conservatively treated patients, and final results did not differ between initial observation and early exploration, which suggested that expectant treatment avoids many unnecessary operations Hendrickx, et al. [4] pooled 1,758 patients with closed fractures and found that recovery after operative treatment with nerve exploration (98%) did not differ from recovery after non-operative treatment (91%; $p = 0.29$), whereas secondary palsy was more frequent after operative treatment (4% vs. 0.4%) [6]. In the review by Hegeman, et al., the most common finding at exploration was no nerve lesion at all (35%), and no neurological procedure was performed in nearly 41% of explorations [3]. In other words, a large proportion of explorations

Table 1: Timeline of the clinical course.

Time point	Event	Radial nerve status
Day 0	Road traffic accident; admission; registration as a medicolegal case	Complete wrist and finger drop; reduced sensation over the first dorsal web space
Day 2	Anterior minimally invasive plate osteosynthesis with a 12-hole locking compression plate	Nerve not explored at the fracture site
Postoperative day 2	Discharge with sling and exercise program	Documented as probable neurapraxia; recovery expected over four to five months
Two weeks after surgery	Wound review and suture removal with clinical review	Active wrist dorsiflexion not possible, flickering present. Exercises continued
Eight weeks and five days after surgery	Clinical and radiographic review	Active wrist dorsiflexion and palmar flexion; no implant loosening

Table 2: Publications reviewed and their position on early exploration of the radial nerve.

ORIF: open reduction and internal fixation. Positions are those stated or implied by the authors of each publication.

Study	Country	Design	Main finding	Position on early exploration
Shao, et al. [4]	United Kingdom	Systematic review; 1,045 patients with palsy	Recovery 88.1%; spontaneous recovery 70.7%; similar results after observation and early exploration	Initial observation
Hendrick, et al. [6]	Netherlands	Systematic review; 1,758 closed fractures	Recovery 98% after operative treatment with exploration versus 91% after non-operative treatment (p = 0.29)	No benefit of early exploration
Hegeman, et al. [3]	United States	Systematic review; 4,972 fractures	No nerve lesion in 35% of explorations; no neurological procedure in nearly 41%	Indications not yet defined
Bishop and Ring. [10]	United States	Decision analysis	Expected value 8.4 for observation versus 6.7 for early surgery	Initial observation
Korompilias, et al. [5]	Greece	Retrospective series; 25 complete palsies	13 recovered without surgery (mean 12 weeks); 10 of 12 later explorations found intact nerves	Observe for 16-18 weeks
Ring, et al. [11]	United States	Retrospective series; 24 high-energy fractures	Transections only in open, complex injuries; palsies with closed fractures nearly always recovered	Patience in closed injuries
Alder, et al. [12]	United States	Retrospective comparison; 15 patients	Similar onset and completion of recovery with and without acute ORIF	Palsy is not an indication for surgery to speed recovery
Acar, et al. [13]	Turkey	Retrospective series; 469 patients	Recovery 89.3% with conservative care versus 71.4% after surgery; new postoperative palsy in 22.5%	Surgery did not improve recovery
Vaishya, et al. [14]	India	Review of secondary palsy	No advantage of early exploration in most studies	Observe for at least 4-5 months
Kong, et al. [15]	South Korea	Retrospective series; 31 palsies	After high-energy injury, recovery 88.9% with exploration versus 55.6% without	Explore after high-energy injury
Giordano et al. [7]	International	Survey of 279 surgeons	62.0% preferred acute exploration; 26.3% chose fixation without exploration	Most respondents favored exploration
Rajadurai, et al. [8]	India	Case report	Nerve trapped between the fragments of a midshaft fracture	Early exploration when presentation is atypical
Jain, et al. [9]	India	Cadaveric study; 36 limbs	Danger zone of the radial nerve defined in an Indian population	Identify and protect the nerve through a wide incision

find nothing to repair.

A decision analysis by Bishop and Ring identified observation as the optimal strategy (expected value 8.4 versus 6.7 for early surgery) [10]. Clinical series agree. Korompilias, et al. [5] observed 25 patients with complete palsy after closed fractures for 16 weeks; 13 recovered fully without surgery at a mean of 12 weeks (range, 7-14 weeks), and 10 of the 12 nerves explored later were intact. Even after high-energy trauma, Ring, et al. [11] found transected nerves only in open fractures that were part of complex upper-limb injuries, whereas palsies associated with closed fractures nearly always recovered. Fixing the fracture does not accelerate recovery. Alder et al. [12] found similar times to the onset (6.4 versus 10.8 weeks) and completion (35.7 versus 29.9 weeks) of recovery with expectant management and with acute Open Reduction and Internal Fixation (ORIF), during which the nerve was visualized and protected, and concluded that RNP should not be an indication for surgery aimed at faster nerve recovery. Acar, et al. [13] observed recovery in 89.3% of conservatively managed palsies but in 71.4% of surgically treated palsies, a difference they attributed to greater injury complexity. An Indian review by Vaishya, et al. [14] reached the same conclusion for secondary palsy that appears after manipulation or surgery: early exploration showed no advantage in most studies, and the authors recommended observation for at least four to five months unless there is misplaced hardware, a visible nerve laceration, or fracture displacement.

Our patient's course matches this evidence. Wrist extension

returned within nine weeks of the injury, within the 7-14-week range of the non-explored patients of Korompilias, et al. [5], a timeline consistent with a neurapraxic lesion.

When exploration is justified

The literature does identify situations in which early exploration is appropriate: open fractures, irreducible fractures or unacceptable reduction, associated vascular injury, palsy after manipulation, and intractable neurogenic pain [5]. Some authors add high-energy injuries. Kong et al. reported recovery in 16 of 18 explored nerves (88.9%) but in only five of nine unexplored nerves (55.6%) after high-energy trauma, although the decision to explore was not randomized [15]. Rajadurai, et al. [8] described a midshaft fracture in which the nerve was trapped between sharp fragments and advised early exploration when the clinical presentation or fracture morphology is atypical. Even so, exploration often reveals an intact nerve, as in the combined radial and ulnar nerve palsy reported by Alageel, et al. [2]. In which both nerves were contused but in continuity and recovered completely by six months. Ultrasonography can help identify these patients without an operation. Bodner, et al. found that ultrasonographic signs of severe nerve damage, including entrapment between fragments, disruption, laceration by a loose plate, and envelopment in callus, were confirmed at surgery, whereas nerve continuity was shown in all six patients treated conservatively [16]. Our patient had a closed fracture, no vascular deficit, a palsy that was present before any intervention, and a fracture that could be reduced

without opening the fracture site; none of these indications applied.

Fixing the fracture does not mandate exploring the nerve

A common argument is that once the fracture is being fixed, the nerve may as well be explored. Indian anatomical work reflects this view and recommends that the radial nerve be identified and protected, with a wide incision and blunt dissection, during surgery for humeral fractures [9]. The argument has some force for posterior or anterolateral open approaches, in which the nerve lies in the operative field. It has little force for anterior MIPO, in which the plate is passed along the anterior surface through windows away from the fracture. Shah et al. [17] from India noted that this approach avoids direct manipulation of the radial nerve and reported no permanent nerve palsy in 13 patients. In our patient, exploring the zone of injury would have required a separate open exposure of the fracture, with soft-tissue stripping, a longer operation, and a risk of iatrogenic injury to an already compromised nerve, and it would have sacrificed the biological advantages of MIPO. Secondary palsy is a recognized hazard of operative treatment. It occurred in 4% of operatively treated patients in one review [6], and in another series, new palsy developed after surgery in 22.5% of patients without a preoperative deficit [13]. A deficit that worsens after exploration creates a medicolegal problem of its own.

What Indian surgeons recommend, and why

Expert opinion diverges sharply from this evidence. In the survey by Giordano et al., which included 124 surgeons from the Asia-Pacific region among its 279 respondents, 88.4% recommended surgery for a humeral shaft fracture with traumatic RNP, 62.0% preferred to explore the radial nerve acutely, and only 26.3% chose fixation without exploration [7]. Several Indian publications share this preference for early exploration or formal exposure of the nerve [8,9], although an Indian review favours observation [14], and to our knowledge, no Indian guideline or consensus statement addresses the question. In our experience, most Indian surgeons still advise exploring the radial nerve when a humeral shaft fracture with palsy is operated on, particularly when the injury is an MLC.

The reasons are largely non-clinical. The police and courts may become involved in MLCs, and a deficit noticed after surgery is readily blamed on the operation unless the preoperative examination was documented. Since the judgment in *Indian Medical Association v. V.P. Shantha* in 1995, medical services have fallen within the ambit of consumer protection law, and commentators have warned that high compensation under the Consumer Protection Act, 2019, may encourage defensive practice and affect doctors' mental health through the constant fear of scrutiny [18]. Defensive medicine is a deliberate departure from standard practice to guard against litigation, and it includes performing unnecessary procedures [19]. Routine exploration of a nerve that is expected to recover fits this description. The medicolegal dimension is recognized outside India as well; Basile et al. [1] who reported complete recovery in 86.7% of 30 surgically treated patients, noted that residual deficits after surgical treatment may carry medicolegal implications.

Which view is given more emphasis? In the literature, the emphasis is clearly on observation [4,6,10,12,14]. In Indian practice, it remains on exploration, driven more by fear of litigation than by science. This is paradoxical, because the legal test of negligence is itself anchored in accepted professional practice. Under the Bolam test, a doctor is not negligent if he or she has acted in accordance

with a practice accepted as proper by a responsible body of medical professionals skilled in that art [19]. Observation of primary RNP after a closed fracture, supported by systematic reviews, decision analysis, and an Indian review, is such a practice.

Safeguards that protect both patient and surgeon

What protects the surgeon is the quality of the record, not the exploration. A review of the medicolegal aspects of orthopaedic implants in India identified inadequate counselling, poor documentation, and failure to adhere to protocols as common pitfalls and emphasized communication, informed consent, and meticulous record-keeping [20]. In our patient, the deficit was recorded at admission before any intervention, the probable diagnosis and expected recovery period were stated in the discharge summary, and nerve function was reassessed at follow-up. We suggest grading the wrist, finger, and thumb extensors and mapping sensation before any intervention; explaining, when consent is obtained, the natural history, the reasons for not exploring, and the plan if recovery fails; stating in the operative note whether the nerve was seen and why the zone of injury was or was not explored; and following the patient with serial examinations, adding ultrasonography and electrodiagnostic studies if recovery is delayed and considering exploration if no recovery is seen by 16-18 weeks [5,16].

Limitations

This report describes a single patient. Nerve function was assessed clinically, without formal muscle grading, electrodiagnostic testing, or ultrasonography. Recovery was documented for wrist movement, but finger and thumb extension and sensory recovery were not recorded separately, and the onset of recovery was not captured. Follow-up was short, and fracture union was not yet complete. Our account of Indian practice is based on published reports and our own experience rather than on a national survey, which would be a valuable next step.

Conclusion

Most published studies show that primary radial nerve palsy after a closed humeral shaft fracture recovers on its own and that early exploration does not improve the outcome, even when the fracture is fixed. Our patient, whose injury was registered as a medicolegal case, regained full wrist extension within nine weeks after anterior minimally invasive plating without exploration of the nerve.

Indian surgeons, however, still commonly recommend exploring the nerve, and in our view, this recommendation rests more on medicolegal fear than on evidence. Exploration should be reserved for accepted indications, such as open fractures, vascular injury, irreducible fractures, suspected entrapment, or failure of recovery within the expected period. For other patients, documentation of the preoperative deficit, informed consent that explains the natural history, and structured follow-up are the evidence-based safeguards for patient and surgeon. A national consensus statement, informed by a survey of Indian surgeons, would help close the gap between evidence and practice.

References

1. Basile G, Fozzato S, Bianco Prevot L, Giorgetti A, Gallina M, Basile M, et al. Radial nerve injuries in humeral fractures: case series and medico-legal implications. *Injury*. 2024;55(Suppl 4):111497.
2. Alageel MA, Alabdali A, Alharbi SK, AlTwaijri NA, Alsuwaine B, Alshaygy IS. Radial and ulnar nerve palsies in closed humerus fracture: a case report and literature review. *J Musculoskelet Surg Res*. 2023;7(4):298-301.

3. Hegeman EM, Polmear M, Scanaliato JP, Nesti L, Dunn JC. Incidence and management of radial nerve palsies in humeral shaft fractures: a systematic review. *Cureus*. 2020;12(11):e11490.
4. Shao YC, Harwood P, Grotz MR, Limb D, Giannoudis PV. Radial nerve palsy associated with fractures of the shaft of the humerus: a systematic review. *J Bone Joint Surg Br*. 2005;87(12):1647-52.
5. Korompilias AV, Lykissas MG, Kostas-Agnantis IP, Vekris MD, Soucacos PN, Beris AE. Approach to radial nerve palsy caused by humerus shaft fracture: is primary exploration necessary? *Injury*. 2013; 44(3):323-6.
6. Hendrickx LAM, Hilgersom NFJ, Alkaduhimi H, Doornberg JN, van den Bekerom MPJ. Radial nerve palsy associated with closed humeral shaft fractures: a systematic review of 1758 patients. *Arch Orthop Trauma Surg*. 2021;141(4):561-8.
7. Giordano V, Belangero W, Pires RE, Labronici PJ. Humerus shaft fracture associated with traumatic radial nerve palsy: an international survey among orthopedic trauma surgeons from Latin America and Asia/Pacific. *J Orthop Surg (Hong Kong)*. 2017;25(3):2309499017727914.
8. Rajadurai OR JW, Likhith CS, Kumar S, Purushothaman K, Duraisamy NK, et al. When the nerve lies between the fragments: a mid-shaft humeral fracture mimicking a Holstein-Lewis injury. *J Orthop Case Rep*. 2026;16(7):354-61.
9. Jain RK, Champawat VS, Mandlecha P. Danger zone of radial nerve in Indian population – a cadaveric study. *J Clin Orthop Trauma*. 2019;10(3):531-4.
10. Bishop J, Ring D. Management of radial nerve palsy associated with humeral shaft fracture: a decision analysis model. *J Hand Surg Am*. 2009;34(6):991-6.
11. Ring D, Chin K, Jupiter JB. Radial nerve palsy associated with high-energy humeral shaft fractures. *J Hand Surg Am*. 2004;29(1):144-7.
12. Alder KD, Pulos N, Shin AY. Outcome of radial nerve palsy in closed humeral shaft fractures treated operatively and expectantly. *J Hand Surg Glob Online*. 2026;8(6):101091.
13. Acar A, Girgin AB, Acar AB, Özcan MF, Torun Ö. Radial nerve palsy associated with humeral shaft fractures: incidence, recovery patterns, and functional outcomes in surgically treated patients. *Medicina (Kaunas)*. 2026;62(7):1427.
14. Vaishya R, Kandel IS, Agarwal AK, Vijay V, Vaish A, Acharya K. Is early exploration of secondary radial nerve injury in patients with humerus shaft fracture justified? *J Clin Orthop Trauma*. 2019; 10(3):535-40.
15. Kong CG, Sur YJ, Jung JW, Park HY. Primary radial nerve palsy associated with humeral shaft fractures according to injury mechanism: is early exploration needed? *J Shoulder Elbow Surg*. 202;30(12):2862-8.
16. Bodner G, Buchberger W, Schocke M, Bale R, Huber B, Harpf C, et al. Radial nerve palsy associated with humeral shaft fracture: evaluation with US initial experience. *Radiology*. 2001;219(3):811-6.
17. Shah P, Sinha PR, Gupta S, Jain R, Yadav DK. Anterior bridge plate through minimally invasive approach: a game-changer for humeral shaft fracture: a clinical case series. *J Orthop Case Rep*. 2026;16(5):509-15.
18. Vajawat B, Dinakaran D, Nandimath OV, Arpitha HC, Kumar CN, Basavarajappa C, et al. The Consumer Protection Act, 2019: a critical analysis from a medical practitioner's perspective. *Indian J Med Ethics*. 2024;9:65-9.
19. Dudeja S, Dhirar N. Defensive medicine. sword of Damocles. *Natl Med J India*. 2018;31(6):364-5.
20. Pai SN. Nails, plates, and legal claims. the medicolegal aspects of orthopaedic implants. *Indian J Orthop*. 2026;60(5):1185-90.