



Belated posterior interosseous nerve palsy with chronic radial head dislocation: a case report



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ARTICLE INFO

Keywords:

PIN palsy
Posterior interosseous nerve
Monteggia fracture
Case report
Radial tunnel
Capitlectomy
Neuroma

Isolated acute palsy of the posterior interosseous nerve (PIN) is an uncommon condition which has to be accurately investigated specially in absence of recent traumas. Caused frequently by a compression within the borders of the radial tunnel, taking the name of radial tunnel syndrome (RTS), it could be mild or severe according to Jin Bo Tang.¹² A chronic radial head dislocation could also mimic a severe RTS due to the mechanical compression at the level of the radial tunnel.

In adults, chronic radial head dislocation is infrequent³ and sometimes ascribable to a misdiagnosed Monteggia fracture during the childhood. Easily assessed by clinical examination and imaging, this condition could be paucisymptomatic or clinically silent until a sudden manifestation of PIN compression signs.

In this article, we describe a case of delayed PIN palsy referable to a chronic radial head dislocation in an adult patient caused by a trauma in the childhood, a rare condition with few other previous reports in English literature.^{2,4-6,9}

Case report

A 44-year-old man, a right-handed truck driver, presented with inability to actively extend the thumb and extend long fingers of the right hand, weakness during thumb abduction, slight strength deficiency with radial deviation during wrist extension against resistance, and no sensitivity impairment. The patient referred that

the symptoms arose spontaneously within few days with no recent traumas or any change of daily habits. Symptoms were described as a slightly increasing weakness in extending the right wrist and fingers, more evident after waking up in the morning, which became conspicuous after a week.

The clinical assessment was conducted 15 days after the first moment of deficiency noted by the patient.

On clinical examination, the extension of the long fingers and extension of the thumb was 1/5 according to the Medical Research Council scale, abduction of the thumb was 3/5, extension of the wrist was 4/5 with radial deviation during the active movement (Fig. 1, A and B), and full strength and full range of motion (ROM) of the elbow in flexion (135°), extension (0°), and supination (90°) with a lack of pronation (65°) were assessed, subcutaneously palpable radial head anteriorly dislocated was as well detected.

The clinical history was silent except for an unspecified trauma on the ipsilateral forearm in the childhood treated with a cast. Due to the distant past of the accident, the patient was not able to provide any documentation about it; nevertheless, according to the clinical presentation, we believe it could be a Monteggia fracture.

X-rays imaging confirmed the anterior dislocation of the radial head with balloon-shaped deformation and degenerative changes of the lateral distal humerus (Fig. 2, A and B). Magnetic resonance was then executed with detection of PIN compression caused by the dislocated radial head, a neuroma, and focal swelling of the nerve within the radial tunnel. Furthermore, fatty degeneration of the whole supinator muscle was revealed (Fig. 3).

Surgical exploration was performed with a posterolateral approach of the elbow described by Thompson and Kaplan^{8,13} between the planes of the extensor digitorum communis and the

Institutional review board approval was not required for this case report.

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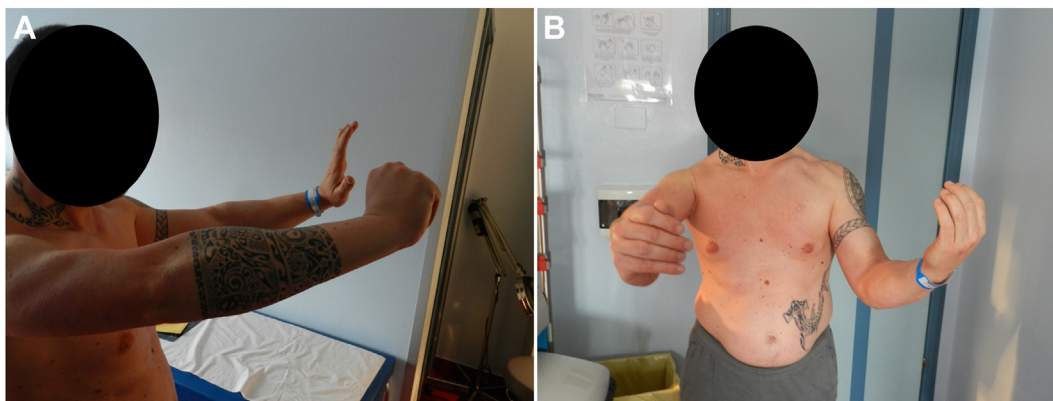


Figure 1 Lateral (A) and front (B) view of the extension deficit of fingers and thumb during preoperative clinical examination. It is noticeable the radial deviation during wrist extension.

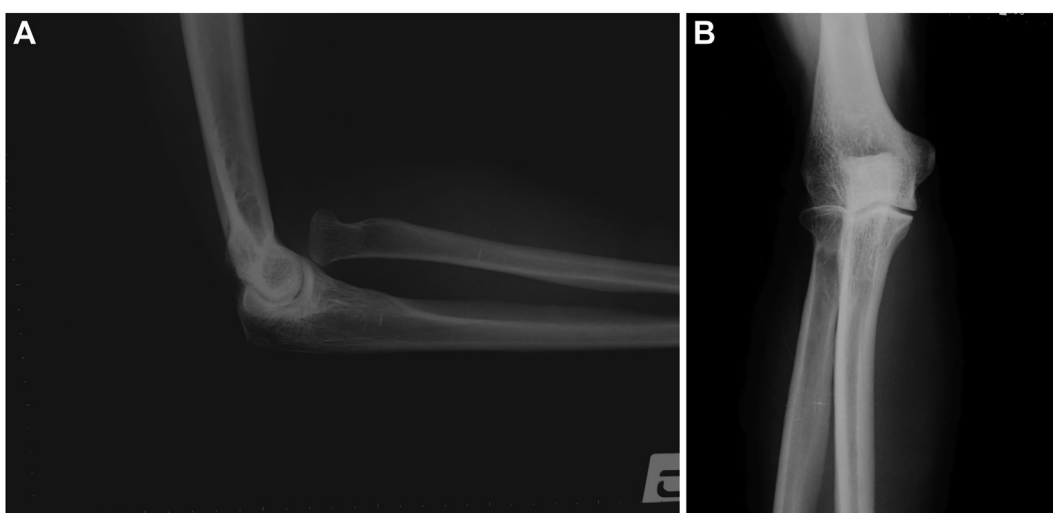


Figure 2 Lateral (A) and front (B) view of the preoperative X-rays. Anterior dislocated radial head with balloon shape and flattening of the capitellum is visible.

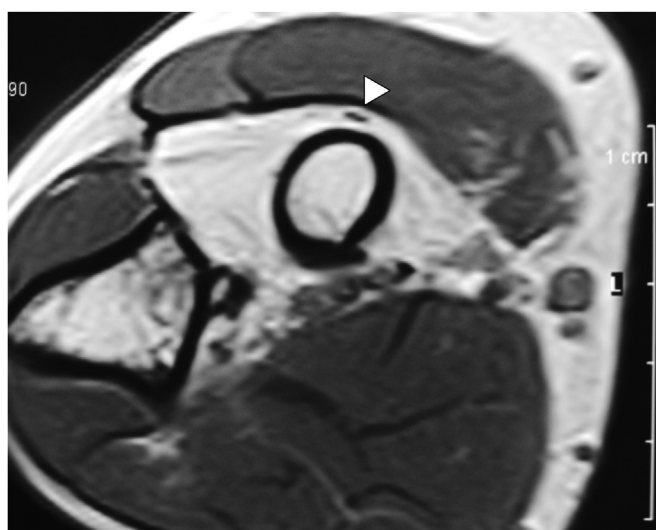


Figure 3 Magnetic resonance showing fatty degeneration of the supinator. White arrow.

extensor carpi radialis brevis (ECRB) muscles (Fig. 4, A-C). The degenerated supinator muscle was then exposed and within it the PIN was isolated with detection of a neuroma immediately distal to the entrance in the radial tunnel (Fig. 5, A and B), the nerve was stretched, and suffering by the underlying dislocated radial head. Exposition of the radial head and capitellotomy with an oscillating bone saw were performed, resulting in satisfactory decompression of the PIN (Fig. 6, A-D). Conduction studies executed intra-operatively showed no interruption of the electric impulse through the neuroma hence was taken the decision to not excise it and adopting a conservative approach after performing an adequate external neurolysis.

Postoperative immobilization in rigid elbow brace was maintained for 2 weeks, after this period was allowed free and full mobilization of the joint avoiding lifting heavy weights for other 30 days.

The patient recovered full strength (5/5 on Medical Research Council scale) of the wrist, thumb, and fingers and a complete ROM in pronosupination of the elbow was achieved at the follow-up examination 3 months after the surgery (Fig. 7). After 1 year of follow-up, no ROM deficiencies or strength or sensitivity impairments were assessed.

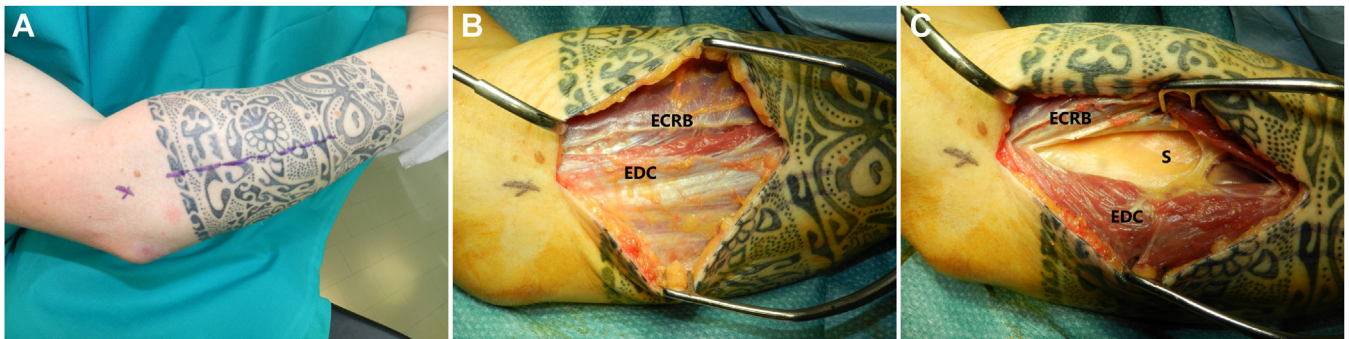


Figure 4 (A-C) Surgical approach to the radial head between extensor digitorum communis (EDC) and extensor carpi radialis brevis (ECRB) exposing the fatty degenerated supinator muscle (S).

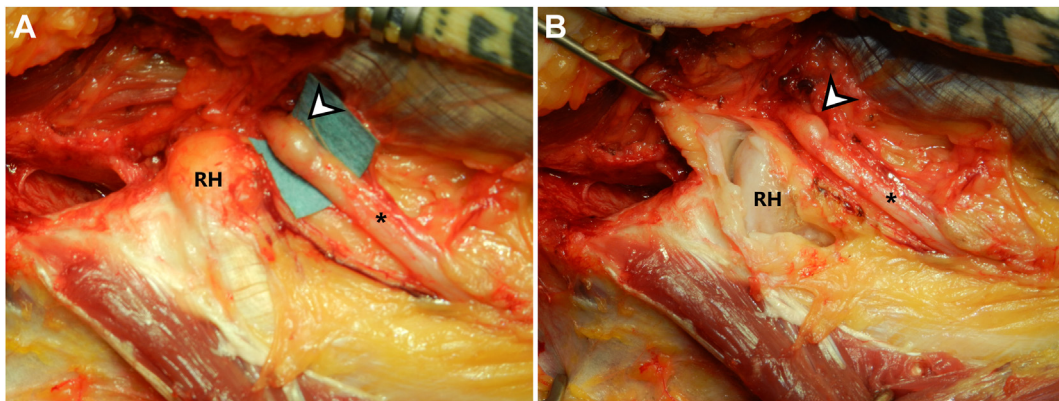


Figure 5 (A-B) RH, radial head; asterisk: PIN; white arrow neuroma.

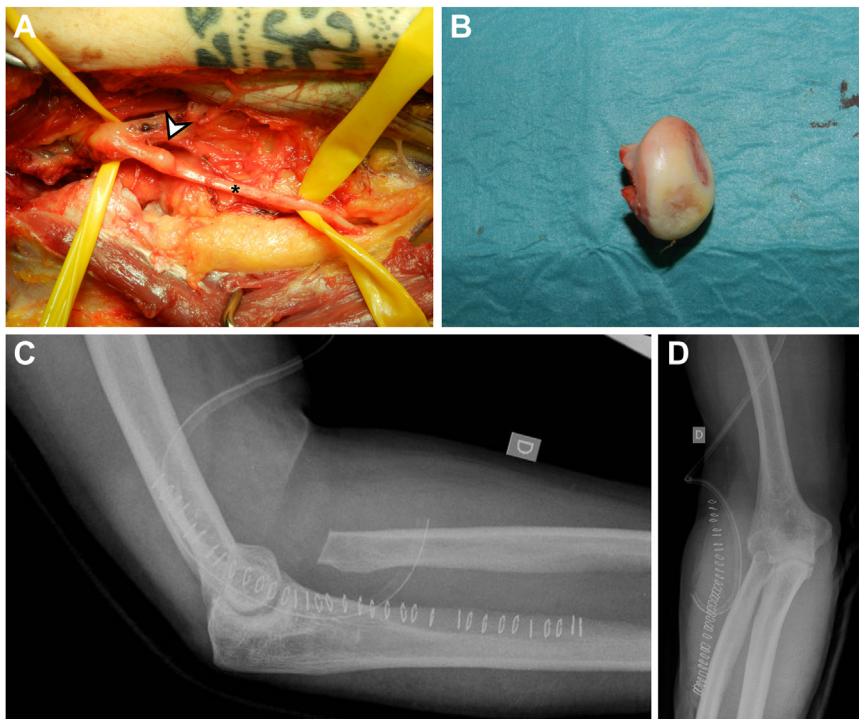


Figure 6 (A) Decompressed PIN after capitellotomy; (B) Removed balloon-shaped radial head; (C-D) X-rays showing the elbow after capitellotomy, the axis of the radial shaft now is in line with the capitellum.



Figure 7 Complete recovery of the extension of fingers, thumb, and wrist with no ulnar deviation 3 months after surgery.

Discussion

The radial nerve in the proximal forearm more commonly gives off its branches to the brachioradialis and extensor carpi radialis longus muscles right before and after the level of the lateral epicondyle, respectively. Thereafter it runs in the cubital fossa anteriorly to the joint capsule where it divides into its terminal branches: the PIN, a purely motor nerve, and the superficial branch of the radial nerve appointed to sensitivity. At the level of the division, the radial nerve or the PIN emits the branch for the ECRB and henceforth the PIN releases the branch for the supinator muscle before entering inside it.¹ Near the exit point from the supinator, the PIN gives off a recurrent superficial motor branch which innervates the extensor carpi ulnaris, the extensor digiti minimi, and the extensor digitorum communis. Hereafter is emitted a following deep branch for the abductor pollicis longus, extensor pollicis longus, extensor pollicis brevis, and extensor indicis.¹¹

Pure motor symptoms such as weakness of the thumb and finger extensors are the most common clinical findings of a severe RTS¹² caused by PIN compression at the Frohse arcade; a typical sign is also weakness and radial deviation during wrist extension because of the involvement of the branch for extensor carpi ulnaris muscle with sparing of the branches for extensor carpi radialis longus and ECRB muscles. Meticulous clinical examination and radiographic imaging are mandatory to assess any possible compression cause including a rare chronic radial head dislocation.

Radiological findings of chronic radial head dislocation from pediatric age are flattening of the capitulum, anterior angulation of the ulna, and radial head convexity,¹⁰ which can unquestionably support in making differential diagnosis, especially in case of uncertain clinical history of the patient. Due to these signs of articular surfaces remodeling, we believe that in case of chronic radial head dislocation, capitellectomy is the best surgical option.

It is mandatory to perform a technically correct procedure, executing a straight cut with no deviated edges to avoid impairments of the surrounding tissues and primarily of the PIN. Nevertheless, it is essential to properly assess the elbow stability before and after the surgery to eventually perform retensioning or reconstruction of the collateral ligaments if required.

Monteggia fractures are uncommon but easily misdiagnosed due to a subtle symptomatology of difficult assessment in pediatric age.⁷ As a consequence of this, chronic radial head dislocation could be presented to the physician within few months or years after the trauma or, as have been described formerly, could be clinically silent for longer time. We believe that a radial head dislocation has the time to become chronic when there is not direct compression of the PIN but it is conversely stretched and constricted over time inside the Frohse arcade.

Conclusion

Tardy PIN palsy caused by a chronic radial head dislocation is a rare disorder which can arise with sudden onset symptoms of wrist, thumb, and fingers extension weakness in absence of relevant recent clinical history. Commonly caused by an untreated Monteggia fracture in the childhood, it can be easily diagnosed with clinical examination and plain radiograms.

Surgical decompression of the PIN and radial head excision lead to full strength recovery and improvement of elbow ROM.

Raising the awareness of this uncommon pathology can make the diagnostical process rapid, reduce the discomfort of the patient, and assure a satisfactory outcome.

Disclaimers:

Funding: No funding was disclosed by the authors.

Conflicts of interest: The authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

Patient consent: Obtained.

References

- Abrams RA, Ziets RJ, Lieber RL, Botte MJ. Anatomy of the radial nerve motor branches in the forearm. *J Hand Surg Am* 1997;22:232-7.
- Austin R. Tardy palsy of the radial nerve from a Monteggia fracture. *Injury* 1976;7:202-4.
- Bordet A, Le Mentec O, Arcens M, Trouilloud P, Baulot E, Martz P. Chronic isolated radial head dislocation in adults: Technical note and literature review. *Orthop Traumatol Surg Res* 2021;107:102829. <https://doi.org/10.1016/j.otsr.2021.102829>.
- Cho CH, Lee KJ, Min BW. Tardy posterior interosseous nerve palsy resulting from residual dislocation of the radial head in a Monteggia fracture: a case report. *J Med Case Rep* 2009;3:9300. <https://doi.org/10.1186/1752-1947-3-9300>.
- Hashizume H, Nishida K, Yamamoto K, Hirooka T, Inoue H. Delayed posterior interosseous nerve palsy. *J Hand Surg Br* 1995;20:655-7.
- Holst-Nielsen F, Jensen V. Tardy posterior interosseous nerve palsy as a result of an unreduced radial head dislocation in Monteggia fractures: a report of two cases. *J Hand Surg Am* 1984;9:572-5.
- Hubbard J, Chauhan A, Fitzgerald R, Abrams R, Mubarak S, Sangimino M. Missed pediatric Monteggia fractures. *J Bone Joint Surg* 2018;6:e2. <https://doi.org/10.2106/JBJS.RVW.17.00116>.
- Kaplan EB. Surgical approaches to the proximal end of the radius and its use in fractures of the head and neck of the radius. *J Bone Joint Surg* 1941;23:86.
- Lichter RL, Jacobsen T. Tardy palsy of the posterior interosseous nerve with a Monteggia fracture. *J Bone Joint Surg Am* 1975;57:124-5.
- Lloyd-Roberts GC, Bucknill TM. Anterior dislocation of the radial head in children: aetiology, natural history and management. *J Bone Joint Surg Br* 1977;59-B:402-7.
- Suematsu N, Hirayama T. Posterior interosseous nerve palsy. *J Hand Surg Br* 1998;23:104-6.
- Tang JB. Radial tunnel syndrome: definition, distinction and treatments. *J Hand Surg Eur* 2020;45:882-9. <https://doi.org/10.1177/1753193420953990>.
- Thompson JE. Anatomical methods of approach in operations on the long bones of the extremities. *Ann Surg* 1918;68:309-29.