

CASE REPORT

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## Posterior interosseous nerve palsy related to rheumatoid synovitis of the elbow

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**Abstract** Posterior interosseous nerve palsy (PINP) is a rare complication of rheumatoid arthritis of the elbow. A 58-year-old woman with rheumatoid arthritis, who complained of an inability to extend her left fingers, was referred to our hospital. After a series of studies, extensor tendon ruptures were excluded, and PINP was diagnosed. By means of the Henry anterolateral approach, the radial nerve was exposed, which was compressed by swollen synovial membrane at the Frohse arcade. Elbow synovectomy was performed, and the arcade was opened to release the nerve. The PINP has been recovered completely within 2 weeks after surgery. Various examinations other than magnetic resonance imaging have been reported for the adjunctive diagnosis of PINP, but MR imaging was most useful as an adjunctive examination in this case.

**Key words** Magnetic resonance imaging · Posterior interosseous nerve palsy · Rheumatoid arthritis

### Introduction

Posterior interosseous nerve palsy (PINP) is a rare complication of rheumatoid arthritis of the elbow,<sup>1–8</sup> and its differential diagnosis from extensor tendon rupture in the wrist is difficult because an inability to extend the fingers but without sensory disturbance is a common complaint with both disorders.<sup>1–13</sup> Extensor tendon rupture is a common complication of rheumatoid arthritis, and thus might be mistakenly diagnosed in patients with rheumatoid arthritis.

According to published reports, examinations useful for differentiating PINP from extensor tendon rupture are tendon radiography,<sup>1</sup> tenodesis test,<sup>8</sup> electromyography,<sup>8</sup>

direct exploration,<sup>4,8</sup> and arthrography<sup>3,6</sup> as well as physical examination; however, a definitive diagnosis of PINP remains difficult. We describe a case in which magnetic resonance (MR) imaging was useful as an adjunctive examination in diagnosing PINP. To our knowledge, the use of MR imaging for such an adjunctive examination in diagnosis has not been reported. We include comparison of MR imaging and intraoperative findings.

### Case report

The patient was a 58-year-old woman with a 14-year history of rheumatoid arthritis that was controlled with disease modifying antirheumatic drugs and nonsteroidal anti-inflammatory drugs. She was referred to our hospital by her local clinic because she had been unable to extend the metacarpophalangeal joints of all fingers on her left hand because she had lifted a heavy object. There was no sensory disturbance, wrist swelling, elbow pain, or elbow swelling. Moderate ulnar deviation of the fingers was seen.

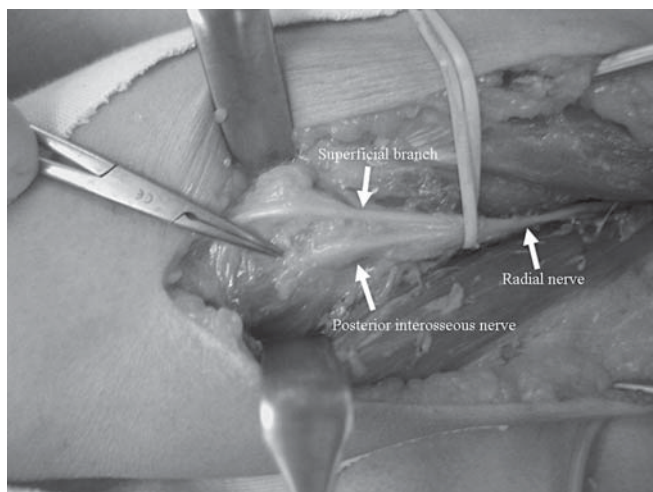
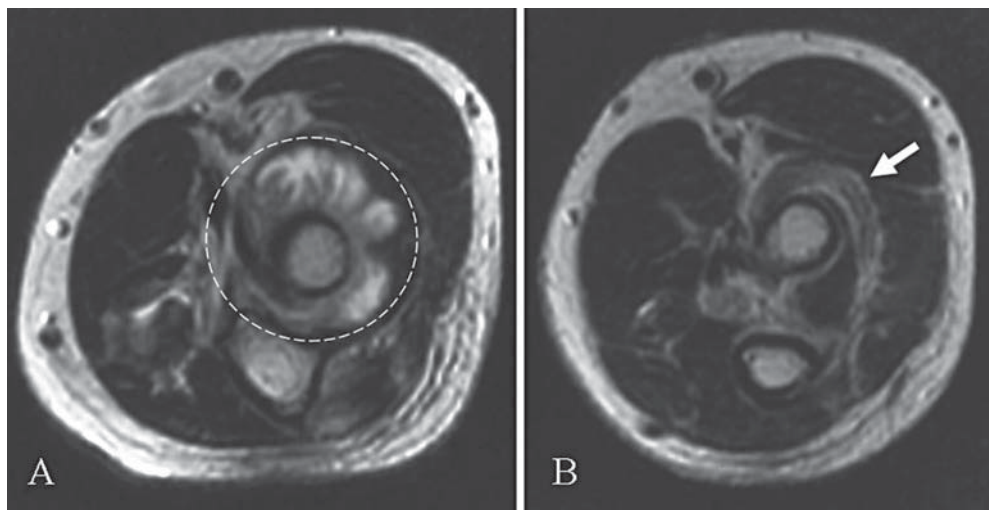
Rupture of the extensor digitorum communis tendon and the extensor pollicis longus tendon was first suspected, but this was excluded by the tenodesis test.<sup>10</sup> Plain radiography showed Larsen grade I rheumatoid arthritis of the left wrist and Larsen grade II rheumatoid arthritis of the left elbow. Electromyography showed severe denervation of all muscles supplied by the posterior interosseous nerve. MR imaging resolved a synovial cyst extending from the elbow to the supinator muscle; the supinator muscle, through which the posterior interosseous nerve passes via the fibrous arcade of Frohse, was edematous (Fig. 1). On the basis of these findings, PINP was diagnosed, and surgery was planned.

### Operative findings

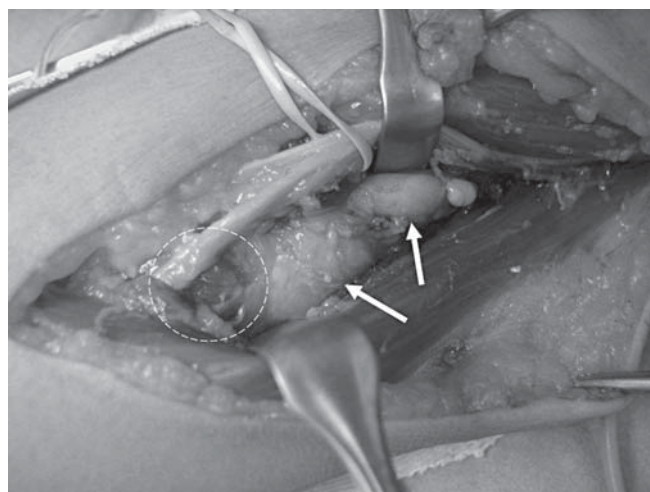
By means of the Henry anterolateral approach, the radial nerve was exposed between the biceps muscle and the brachioradialis muscle. Division of the deep fascia was carried

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**Fig. 1.** **A** T2-weighted MR imaging at the level of the proximal radio-ulnar joint. Soft tissue of high signal intensity around the radius is seen pushing out the supinator muscle and the biceps brachii tendon (*white dotted circle*). **B** 5 mm distal slice of **A** is shown. The supinator muscle (*arrow*) is of high signal intensity and swollen. It was thought that the posterior interosseous nerve, which passes through the arcade of Frohse on the supinator muscle, was entrapped at this level



**Fig. 2.** The posterior interosseous nerve is seen passing through the arcade of Frohse and entrapped (at the mosquito clamp). The posterior interosseous nerve, superficial branch, and supinator muscle are pushed up from below by a synovial cyst



**Fig. 3.** At surgery, the arcade of Frohse was opened, and the proximal part of the supinator muscle was split along with the posterior interosseous nerve, releasing the entrapped nerve (*white dotted circle*). A synovial cyst is seen between the brachioradialis muscle and the biceps brachii tendon and under the supinator muscle (*arrows*)

out from the bifurcation of the radial nerve to the arcade of Frohse. The posterior interosseous nerve was seen penetrating the supinator muscle through the arcade of Frohse. The posterior interosseous nerve and the supinator muscle were displaced distally and compressed together by yellowish soft tissue, and the nerve was clearly compressed at the arcade; i.e., the nerve did not seem to slide through the arcade under normal tension (Fig. 2). The yellowish soft tissue extended from the capsule of the elbow joint under the brachialis muscle to the supinator muscle. Elbow synovectomy was performed, and the arcade was opened to release the nerve (Fig. 3). The nerve appeared somewhat shrunken at the point of compression, but did not appear degenerated. The wound was closed after the placement of a Penrose drain.

The patient was able to extend her fingers somewhat just after surgery. She recovered completely from the PINP within 2 weeks after surgery.

## Discussion

PINP due to rheumatoid arthritis is a rare condition, and a differential diagnosis between extensor tendon rupture and PINP is always difficult.<sup>1-8</sup> Clinically, finger drop is often seen in patients with rheumatoid arthritis, and it may appear to result from extensor tendon rupture. The clinical characteristic of extensor tendon rupture, typically, an inability to extend the fingers but without sensory disturbance, is similar to that of PINP.

Our patient reported that she was suddenly unable to extend her left fingers, in turn from the little finger to the thumb. This history made the differential diagnosis more difficult because extensor tendon rupture occurs frequently in the ring finger and the little finger.<sup>9-13</sup> In our patient, the muscles supplied by the posterior interosseous nerve may have been disturbed one after another. This theory is sup-

ported by previous reports concerning variations of posterior interosseous nerve palsy.<sup>3</sup>

Electromyography,<sup>8</sup> arthrography,<sup>3,6</sup> radiography, and physical examination are reported to be examinations that are useful for diagnosing PINP. However, in our case, MR imaging was most useful as an adjunctive examination. The supinator muscle and soft tissue change around the muscle were clearly recognizable on the MR imaging. This is in contrast to what can be depicted by arthrography. Although the posterior interosseous nerve may not be shown by MR imaging, the biceps brachii muscle tendon, the radial head, and the supinator muscle are clearly seen and serve as landmarks of the route of the nerve. These findings are important in diagnosing PINP because PINP associated with rheumatoid arthritis is a result of the entrapment of the posterior interosseous nerve at the arcade of Frohse on the supinator muscle.<sup>1-8</sup>

In summary, although PINP is a rare complication, there can be a need for the differential diagnosis of PINP from an extensor tendon rupture in patients with rheumatoid arthritis. MR imaging, in addition to physical examination, electromyogram, and radiograph, is useful as an adjunctive examination for diagnosing PINP.

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