

## A POSTERIOR INTEROSSEOUS NERVE SYNDROME ASSOCIATED WITH SPONTANEOUS RUPTURE OF THE EXTENSOR POLLICIS LONGUS TENDON

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### Abstract

Posterior interosseous nerve entrapment syndrome and spontaneous rupture of the extensor pollicis longus tendon are rare conditions. The authors describe the bizarre combination of a spontaneous rupture of the extensor pollicis longus tendon in a 82-year-old lady with a posterior interosseous nerve syndrome. As far as the authors know, this is the first description of such an association in the literature. Surgical exploration revealed compression of the posterior interosseous nerve at the proximal portion of the supinator muscle and at Henry's leash. The nerve was freed, and the tendon of the extensor index proprius was transferred to the extensor pollicis longus. Six months after the procedure, the patient had resumed her daily activities, showing a good functional result.

**Keywords:** Entrapment Neuropathies; Radial Nerve Lesion; Tendon Injuries; Tendon Transfer.

### Introduction

Posterior interosseous nerve (PIN) entrapment syndrome is rare, corresponding to less than 0,7% of all upper limb peripheral nerve compression syndromes<sup>1</sup>. Annual incidence of this syndrome is estimated to be only around 0,003%<sup>2</sup>. Spontaneous rupture of the extensor pollicis longus (EPL) tendon is even rarer, with only a few cases reported in the literature<sup>3</sup>. The authors describe the unlikely combination of a spontaneous rupture of the EPL ten-

don in an elderly lady with PIN syndrome. As far as the authors could determine this is the first description of such an association in the literature.

### Case Report

A 82-year-old right-handed lady was referred to the Hand Clinic for increasing ill-defined pain and soreness in the dorsum of her left forearm and wrist for the previous three months. She also complained of progressive weakness in the extension of her fingers, during that period. In particular, she mentioned that, around one month previously, when she was holding her grand-child, she felt an intense pain in the dorsum of the radial aspect of the dorsum of her wrist, after which she was unable to actively extend the interphalangeal joint of her left thumb, nor keep it extended after passively putting it in that position. She denied ever having numbness. She didn't have any significant co-morbidities and was only taking non-steroidal anti-inflammatory drugs for the pain.

Physical examination revealed moderate pain during palpation of the proximal forearm at the level of the supinator muscle. Pain was also elicited in that position when the patient was asked to supinate her left forearm against resistance. There was no Tinel sign. Manual muscle testing scores were: abductor pollicis longus: 3; extensor pollicis brevis: 3; EPL: 0; extensor digitorum communis: 3; extensor indicis proprius (EIP): 3; extensor digiti minimi: 4; and extensor carpi ulnaris: 4. Strength of the extensors carpi radialis longus and brevis were 5, as was the strength in the remainder of the forearm and arm muscles. However, she was unable to extend her left thumb at the interphalangeal joint, and showed a reduced power at the metacarpalphalangeal joint (Fig. 1). There seemed to be a lack of continuity of the EPL tendon at the medial border of the snuff box area. There was no sensory disturbance.

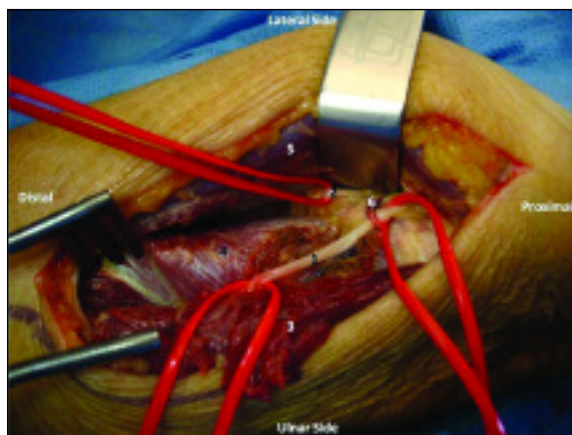
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**Figure 1.** Patient's left hand at presentation, when asked to maximally extend her fingers and to abduct her thumb. There was severe limitation in the extension of the interphalangeal and metacarpal-phalangeal joints of the thumb, as well as in thumb's abduction. Extension is possible in the last four digits, but extension strength is severely diminished. The patient is only able to fully extend the third finger by pushing it with the fourth finger, as it is seen in the picture.



**Figure 2.** Intraoperative view of the dorsum of the patient's left forearm, after myotomy of the superficial head of the supinator muscle. Henry's leash is seen compressing the posterior interosseous nerve.

1. Posterior Interosseous Nerve; 2. Superficial radial nerve; 3. Superficial head of the supinator muscle; 4. Deep head of the supinator muscle; 5. Brachioradialis muscle; 6. Henry's leash.

Radiographic analysis of the cervical spine, shoulder, arm, forearm, and wrist showed no significant abnormalities. Ultrasonography revealed no masses or other changes affecting the radial or posterior interosseous nerves. However, rupture of the EPL tendon was confirmed ultrasonographically. Electromyographic testing confirmed the presence of PIN palsy of moderate severity.

Upon surgical exploration, the PIN was found to



**Figure 3.** Intraoperative view of the dorsum of the patient's left hand and wrist. The extensor pollicis longus tendon was found to be disrupted at Lister's tubercle, and the distal end of the ruptured tendon was grossly frayed and adhered to the surrounding tissue. The proximal stump of this tendon wasn't found. 1. Distal stump of the extensor pollicis longus tendon; 2. Extensor indicis proprius tendon.

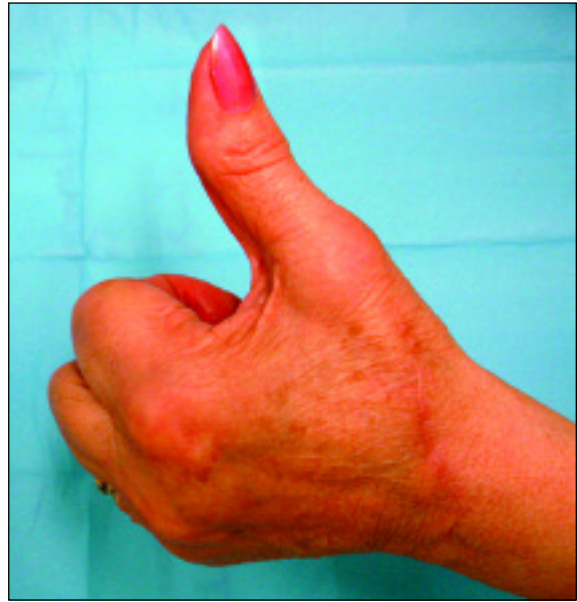
be compressed at the entrance of the supinator muscle, and also by a pair of recurrent veins that formed the classical leash of Henry (Fig. 2). A true Frohse's arcade wasn't present. A myotomy of the superficial head of the supinator muscle was performed, and the PIN was freed from all compressions. The EPL tendon's distal stump was grossly ragged and adhered to the surrounding tissue (Fig. 3). The proximal stump of the EPL tendon had retracted into the forearm. As the patient had adamantly expressed her intention of not having unaffected tendons used to try to rehabilitate the compromised ones, the EIP tendon was transferred to the distal stump of the EPL, and these two tendons were sutured together using the Pulvertaft technique (Fig. 4). The patient was immobilized in a short-arm cast with the wrist in abduction and extension for 5 weeks. Afterwards, she underwent an intensive physiotherapy program. Six months after the operation, she had no pain, and had regained full thumb motion (Fig. 5). Extension of the remaining fingers returned to normal, with the exception of the EIP, which had been used to restore the EPL function (Fig. 6). She resumed her daily activities with no limitation.



**Figure 4.** Intraoperative view of the dorsum of the patient's left wrist. The extensor indicis tendon was sectioned at the metacarpal-phalangeal joint and the proximal portion was transferred to the distal stump of the extensor pollicis longus tendon. **1.** Extensor pollicis longus tendon; **2.** Extensor index proprius tendon; **3.** Suture of the extensor pollicis longus and the extensor indicis proprius tendon using the Pulvertaft technique.

## Discussion

The differential diagnosis of a patient with pain in the dorsum of the forearm and wrist with weakness in the extensor muscles of the fingers includes posterior interosseous syndrome, extensor tendon rupture or subluxation, neuralgic amyotrophy, cervical radiculopathy, brachial plexopathy, and focal myopathy<sup>2, 4-7</sup>. However, in our patient, there were no changes in superficial sensibility, and motor impairment was almost confined to extensor digitorum communis, abductor pollicis longus, extensor pollicis brevis, EIP, and more pronouncedly to EPL. Regarding mechanical limitations to finger and thumb extension, the hallmark of extensor tendon subluxation is the ability to maintain but not actively obtain metacarpal-phalangeal extension, whereas tendon rupture is characterized by the inability of both obtaining and maintaining extension, as it was observed in this patient<sup>2</sup>. Taking all these data into consideration, the two most likely diagnoses would be a PIN syndrome and a spontaneous rupture of the EPL tendon. The report made by the patient of a sudden pain in the dorsum of the wrist after which she couldn't actively extend her thumb is, in fact, highly suggestive of a tendon rupture. This hypothesis is further supported by the patient's physical examination in which there seemed to be an interruption of the EPL ten-



**Figure 5.** Six months postoperatively, the patient showed normal extension across the interphalangeal and metacarpal-phalangeal joints of her left thumb.



**Figure 6.** Six months postoperatively, the patient showed normal extension of all fingers, including the index finger. She also presented normal thumb abduction.

don at the medial border of the snuff box area.

However, on clinical grounds alone, a partial PIN syndrome in which the EPL muscle was more severely affected couldn't be entirely discarded<sup>8</sup>. In fact, it is well established that the PIN is usually compressed at the level of the supinator muscle, producing the classical presentation of dropped fingers and thumb, with a variable degree of pain in the dorsal and lateral forearm and wrist<sup>2,9,10</sup>.



However, compression can also occur more distally, producing uneven distribution of weakness in the territory of the PIN, and causing partial PIN syndromes<sup>2</sup>. Typically, when the medial branch of the PIN is involved, weakness of the extensor carpi ulnaris, extensor digiti minimi, and extensor digitorum communis ensues, while when there is entrapment of its lateral branch weakness of the abductor pollicis longus, extensor pollicis brevis, EPL, and EIP is present<sup>11</sup>. Moreover, even cases of isolated EPL paralysis have been described as very localized forms of PIN palsy<sup>8</sup>.

In our patient, electromyography confirmed the clinical diagnosis of PIN syndrome, and ultrasonography corroborated the rupture of the EPL tendon. These two ancillary tests are often requested in this context: electromyography for establishing the topography and severity of the lesion<sup>10</sup>; and ultrasonography as a cheap, non-invasive method for identifying extrinsic causes of nerve entrapment, as ganglions or lipomas<sup>12</sup>. Although MRI provides clearer visual discrimination than sonography, it is seldom used<sup>2,13</sup>.

Spontaneous rupture of the EPL has rarely been reported in the literature<sup>3</sup>. Various mechanisms have been proposed to account for spontaneous tendon ruptures. Among these are necrosis caused by pressure, crush injury, nutrition impairment, attrition of the tendon on a sharp fragment of bone or callus, attrition on a roughened area of the radius or from nonunion of Lister's tubercle, tenosynovitis from repetitive activities or sports, or a combination of impaired nutrition and attrition of the tendon<sup>3,14</sup>. In this patient this last mechanism probably played a major role. Interestingly, as far as the authors know, this is the first time a case of spontaneous rupture of the EPL associated with PIN syndrome is reported in the literature.

Usually, in a classical PIN syndrome, a course of conservative therapy, including rest, activity modification, splinting, stretching, nonsteroidal medications, and sometimes steroid injections, would be standard therapy until about three months after the development of complaints<sup>1,2</sup>. After that period, if functional recovery is absent or symptoms are worsening, most authors would recommend surgery, as motor endplates must be reinnervated within 1 year, if motor function is to be restored<sup>15</sup>. However, in this case the indication for surgery was clear, since the patient was already having symptoms for 3 months, and because she had EPL rupture.

For the surgical treatment of EPL rupture there were three options: primary repair, tendon grafting, and tendon transfer<sup>3</sup>. Primary repair is only possible in early cases<sup>3,14</sup>. In our patient, as this was not the case, and as the proximal stump of the EPL tendon had retracted proximally, the only possibilities would be tendon grafting or tendon transfer<sup>3,14</sup>. Given that the patient refused the use of unaffected tendons, a EIP tendon was transferred to the EPL tendon to rehabilitate the function of the last.

Notwithstanding the atypical presentation of this patient and her advanced age, six months after surgery, the therapeutic outcome was satisfactory, and the patient was able to return to her daily activities, with no significant functional impairment. In fact, operative release of the PIN and surgical treatment of EPL rupture are generally successful, being unsuccessful cases usually related to long-lasting clinical syndromes with severe motor deficit<sup>10,16</sup>. Hence, it is important that every doctor is familiarized with these conditions, so that these diagnoses can be made early and therapy started accordingly.

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