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Case Report

Surgical treatment of posterior interosseous nerve paralysis in a tennis player[☆]

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ABSTRACT

We report a rare case of posterior interosseous nerve (PIN) paralysis in a tennis player. The PIN, a 2 cm section from a bifurcation point of the radial nerve, presented increased stiffness in the surgical findings and treated with free sural nerve grafting after excision of the degenerative portion of the PIN. We speculate that PIN paralysis associated with hourglass-like constriction can be caused and exacerbated by repetitive forearm pronation and supination in playing tennis.

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1. Introduction

Nontraumatic paralysis of the posterior interosseous nerve (PIN), which can be caused by entrapment at the arcade of Frohse associated with hyperextension of the elbow and with pronation and supination of the forearm, is not common.^{1–5} In the present report, we present a rare case of PIN paralysis in a tennis player without any major trauma.

2. Case report

A 51-year-old man presented weakness of extension of the right wrist and inability to extend right fingers, as well as pain at the anterolateral aspect of the right elbow while playing

tennis without any major trauma (Fig. 1). Tenderness was detected on the lateral epicondyle of the humerus. Passive range of motion of the wrist and the fingers were preserved. There was no sensory disturbance in the hand and no abnormal findings in radiographs of the elbow. Since we supposed that the diagnosis of the patient was lateral epicondylitis of the humerus, so-called lateral tennis elbow, the patient had been conservatively treated with rest, physical therapy, and medication of nonsteroidal anti-inflammatory drugs for five months. However, disorders in extending the wrist and the fingers were not improved.

In order to evaluate the condition of the nerves in the right upper extremity, we measured motor nerve conduction velocity (MCV). Although MCV of the median nerve and the ulnar nerve was normal, MCV of the radial nerve could not be

[☆] The patient and the family were informed that data from the case would be submitted for publication and gave their consent.

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Fig. 1 – Clinical findings before surgery. The patient presented weakness of extension of the right wrist and inability to extend the right fingers before surgery.

obtained even by maximal stimulation in the cubital fossa. We diagnosed the patient as PIN paralysis and surgery was performed through an anterior approach at the elbow.

After cutting the arcade of Frohse, neurolysis was performed proximal and distal to the arcade of Frohse. Continuity of the radial nerve, including the superficial branch and the PIN, was preserved. The PIN was not entrapped with the arcade of Frohse and there was no space occupying lesion to compress the PIN, however, severely increased stiffness without normal nerve elasticity was observed within a 2 cm section of the PIN, between the bifurcation point of the superficial branch and the PIN from the radial nerve and the arcade of Frohse, suggesting degenerative change of the PIN (Fig. 2). After excision of the increased stiffness section of the PIN, free sural nerve graft (two bundles, 3 cm in length) was performed. In a histological examination of the cross section of the excised nerve, extensive fibrous tissue was observed around the nerve and between the fascicle in the nerve.

At postoperative 2 years, the muscle strength of wrist and finger extension regained more than grade 4 on the Medical Research Council grading system for muscle strength.

3. Discussion

Lateral epicondylitis, so-called lateral tennis elbow, due to repetitive overloading at the origin of the wrist and finger extensor tendons is a common disorder and presents weakness of wrist and finger extension.¹ While playing tennis, paralysis of the PIN can be caused by entrapment at the arcade of Frohse was associated with hyperextension of the elbow, as

well as repetitive pronation and supination of the forearm.¹ In tennis players, PIN paralysis might be caused associated with lateral epicondylitis of the humerus. Therefore, when the tennis players present inability to extend the wrist and the fingers as well as pain at the anterolateral aspect of the elbow, the possible diagnoses are lateral epicondylitis and PIN paralysis. In the present case, the patient was diagnosed with PIN paralysis after being treated as lateral epicondylitis.

Nontraumatic paralysis of the PIN associated with hourglass-like fascicular nerve compression varies from neurapraxia to axonotmesis, depending on the pathoanatomical findings of constricted nerve, from mild constriction to subtotal a tying-off.^{2–5}

Kotani et al reported PIN paralysis after arm squat exercise and needlework.² The nerve constrictions of the PIN were observed between the arcade of the Frohse and a point of bifurcation of the supinator motor branch and external neurolysis with epineurotomy was performed. It was suggested that the constrictions and the adhesions of the nerve were caused by twisting of the nerve in pronation and supination of the forearm.

By contrast, Yongwei et al reported the rare cases of non-traumatic paralysis of the PIN with multiple constrictive lesions at the main trunks of the radial nerve or the PIN.³ The patients were treated with neurolysis, nerve grafting, or neurorrhaphy. The etiology was suggested to be a focal inflammatory response around the feeding arteries in the perineurium.

Lundborg suggested the hypothetical pathophysiology of the hourglass-like fascicular nerve compression: a local inflammatory reaction around the nerve irritation or a subclinical trauma, vascular compromise, and increased stiffness of the nerve with less adaptable to mechanical force in elbow motion.⁵ These disorders can be caused both in the main trunks of the radial nerve and in the PIN and the treatment options have been still controversial.

In the present case, continuity of the radial nerve, including the superficial branch and the PIN, was preserved and the PIN was not entrapped with the arcade of Frohse. However, severely increased stiffness without normal nerve elasticity was observed in the PIN. The cause of extensive fibrous tissue, observed in a histological examination of the excised nerve, was not understood; however, these findings suggested that fibrous tissue related with inflammation, edema, circulation disorder, and hourglass-like constriction resulted in paralysis of the PIN. We speculated that paralysis and increased stiffness of the PIN associated with hourglass-like constriction can be caused and exacerbated by repetitive

Fig. 2 – Intraoperative findings. Increased stiffness was observed within a 2 cm section of the PIN (white circle), between the bifurcation point of the superficial branch and the PIN and the arcade of Frohse. The increased stiffness section of the PIN, indicated by the white circle, was excised and the sural nerve was grafted.

forearm pronation and supination during playing tennis and treated the patient with sural nerve graft after excision of the degenerative section of the PIN.

Conflicts of interest

All authors have none to declare.

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