

An effective repair of the posterior interosseous nerve with a vein conduit: a case report

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ABSTRACT

Traumatic injuries of the motoric branch of the radial nerve in the forearm posterior interosseous nerve are very uncommon in hand surgeon practice. This nerve lies deep among the extensors muscles of the forearm and therefore is relatively well protected against injury. The case of a 43-year-old man who sustained deep wound to his proximal forearm, resulted in the posterior interosseous nerve injury is presented. As the

trauma caused an approx. 1.5 cm defect of the nerve substance, a standard repair by neurorrhaphy was not applicable; an alternative technique of repair was then used, namely coaptation of the nerve stumps with a vein conduit. At the 1-year follow-up the patient had regained almost full finger extension, which suggested a recovery of the repaired nerve function.

Keywords: posterior interosseous nerve; nerve repair; vein conduit.

INTRODUCTION

Traumatic injuries of the radial nerve are relatively uncommon in the daily practice of a hand surgeon. If so, they mostly concern the trunk of the radial nerve in the arm or the superficial sensory branch in the forearm. Injury to the motoric branch of the radial nerve in the forearm posterior interosseous nerve (PIN) is very uncommon. The PIN is the distal motor branch of the radial nerve which arises from the radial nerve along the lateral epicondyle of the humerus before emerging through the 2 heads of the supinator muscle at the arcade of Frohse (Fig. 1). The PIN then divides into the lateral and medial branch approx. 8 cm below the elbow. In comparison to the median and ulnar nerves, the PIN is relatively well protected against injury due its deep anatomical course among the extensor muscles.

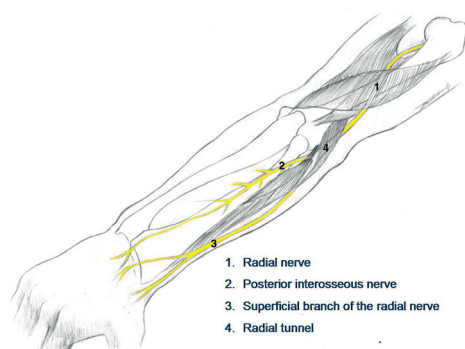


FIGURE 1. Course of the radial nerve in the arm

Signs and symptoms of PIN injury may develop as a result of trauma or compression. The former is mostly a result of closed fractures, contusions, or (very rarely) deep wounds. Compression of the PIN may be caused by a fibrous band, ganglion cyst or tumour (i.e. lipoma). In the case of penetrating injury involving the nerve, it requires standard repair by neurorrhaphy (epineural,

end-to-end suture of the nerve stumps) [1]. The operation is not easy and needs microsurgical skills, magnification devices, microsurgical instruments and materials. However, the PIN is a relatively thin structure and is susceptible to defects as a result of greater injuries. In these situation, a plain neurorrhaphy is not applicable and other reconstruction techniques are necessary. The standard technique repairing nerve defects is nerve grafting, usually with the sural nerve. Other alternative techniques include a nerve conduit, a neurotube, or a vein conduit [2].

The article presents the course and results of the treatment of a patient with an isolated PIN injury after sustaining a deep wound to the proximal arm. As literature is lacking of such examples, the author decided to describe this interesting case.

CASE REPORT

In 2020, a 43-year-old patient presented to the author's institution with an extensive injury to his right proximal forearm caused by a circular saw. On admission, the patient could not extend his all digits in the metacarpo-phalangeal joints (MCP), suggesting injury to the extensor muscles, the PIN, or both structures simultaneously. As the symptoms and signs demonstrated by the patient were obvious, and there were no bone fractures on an X-ray and his condition was good, he was given immediate surgery. The operation was performed under brachial plexus anaesthesia and with a tourniquet. The wound on the proximal forearm was extended and stumps of the PIN were identified among the lacerated extensor muscles. The stumps were also lacerated and cleaning (cutting) of the healthy ends resulted in a 1.5 cm defect between the stumps (Fig. 2). This prompted operators to choose an alternative technique of reconstruction – use of a vein conduit for restoration of nerve continuity. A 4 cm long fragment of the saphenous vein was harvested from the calf. After elaboration of the vein graft (adequate shortening and

widening), the stumps of the PIN were introduced to the ends of the vein (approx. 2 mm inside the lumen) and fixed with 3 sutures 8/0 on each end (Fig. 3, 4).

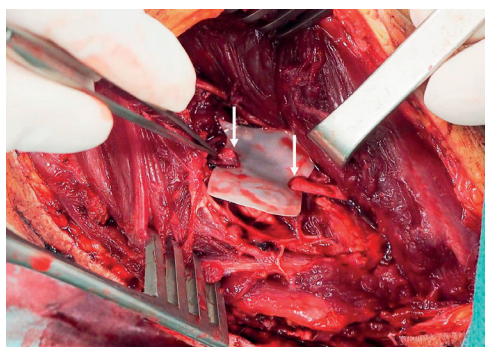


FIGURE 2. Intraoperative view of the PIN stumps; note the nerve defect approx. 1.5 cm

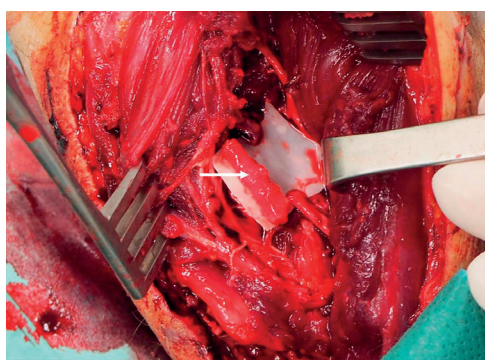


FIGURE 3. Vein conduit matched to the nerve defect



FIGURE 4. The nerve stumps connected with a vein conduit

Next, the extensor muscles were sutured and a drain was left in the wound before closure. Postoperative course was uneventful and the patient was released home by the 3rd day. He was then followed-up in an outpatient setting over several months. From the 4th month following surgery, discrete signs of reinnervation of the extensor muscles appeared, manifested by improvement in the extension of the fingers in the MCP joints. At the 1-year follow-up the patient presented almost a full finger extension (range 180°, 87% of the extension of the fingers in a healthy hand). The thumb extension was slightly worse, but it had no significant effect on the hand function, which was generally good. The Disability of Arm, Shoulder and Hand questionnaire score was 15 points. The patient returned to his original job.

DISCUSSION

The presented case is very rare both in regard to the anatomical (penetrating PIN injury) and technical (method of the nerve repair) aspects. There are single case reports about traumatic PIN injuries, but most of them were a consequence of closed fractures of the distal humerus and head of the radius, or surgeries for these fractures, as well as repair of the tendon of the biceps muscle (iatrogenic injuries) [3, 4, 5, 6, 7].

Shrestha et al. reported a case of an isolated injury to the PIN in a 27-year-old patient who presented with an inability to extend the ulnar 3 fingers of his left hand after sustaining fractures of the left ulna and radius in a motorbike accident. The patient was operated on and the fractures were fixed with plates, but the radial nerve was not explored. The patient recovered partially over the course of 3 months but presented continuously radial deviation of his left wrist and incomplete extension of the ulnar 3 fingers, which suggested a partial PIN injury. On 2nd exploration, denervated muscles supplied by the recurrent branch of the PIN were found. A decision was made to perform a tendon transfer, with a good clinical outcome after 12 months [3].

Daurka et al. reported the case of a 55-year-old patient with delayed PIN palsy associated with a radial head fracture. The patient developed symptoms of wrist drop 24 h after the injury whilst awaiting surgery for the radial head fracture. Nerve conduction studies confirmed the presence of a PIN lesion. Surgical exploration revealed oedematous soft tissues surrounding the PIN. Location of the nerve close to the fracture site and its course through the arcade of Frohse caused its compression as a result of trauma and subsequent oedema. Revision and decompression of the nerve resulted in full recovery after 2 months [4].

No case similar to that presented here could be found in literature; likewise, it was the only such case in the author's surgical practice, which prompted him to prepare this report.

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