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RESEARCH ARTICLE

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A Rare Case of Radial Nerve Injury at the Bifurcation Managed by Inter-Positional Nerve Graft

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ABSTRACT

Penetrating injuries to the radial nerve at the bifurcation are rare injuries. Early diagnosis and nerve repair or reconstruction can significantly improve outcome. We present a case of radial nerve injury at the bifurcation resulting from a penetrating injury, one week post injury and managed using an interposition nerve graft.

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Radial nerve, Bifurcation, Interposition, Nerve graft.

Introduction

The radial nerve originates from the posterior cord of the infraclavicular brachial plexus, provides the motor branches to the extensor muscles of the arm and forearm, and is responsible for the skin sensation over the dorsal surface of arm, forearm, wrist and hand. Radial nerve paralysis can cause dramatic loss of extension of the elbow, wrist and digits leading to wrist drop, but causes little sensory loss.

Blunt injury to the radial nerve is common and is most associated with humerus fractures with an incidence of 11.8% in humeral shaft fractures [1]. Penetrating injury to the radial nerve is however less common than similar injuries to the median and ulnar nerves.

Injuries to the radial nerve have been divided into four levels depending on the level of injury as Level 1 or infraclavicular radial nerve injury, Level 2 or humerus spiral groove radial nerve injury, Level 3 or lateral arm and antebrachial fossa radial nerve injury and Level 4 or posterior interosseus or radial sensory nerve injury [2]. Injuries occurring just at the nerve bifurcation have not published in the past. Treatment options for the lacerated radial nerve include direct suture, nerve grafting and reconstructive options such as nerve and tendon transfers [3,4].

We present a case of radial nerve injury at the bifurcation resulting from a penetrating injury, reporting to us one week post injury and managed using an interposition nerve graft.

Materials and Methods

The patient is a 25-year-old male, with no prior medical history, who presented to the outpatient, with inability to extend his fingers and thumb after an accidental knife penetrating injury at the elbow one week prior to presentation. On examination, finger and thumb drop were noted. A healed puncture wound was visualized on the anterolateral aspect proximal forearm, just distal to the elbow. Percussion over the scar caused the patient to wince with pain the patient describing it as an electric shock like sensation. On neurological examination, the finger extension and thumb extension were grade zero while the finger flexors and intrinsic hand muscles were normal. Wrist extension and wrist flexion were grade 5. There was no loss of sensation in the radial, median or ulnar nerve innervated territories.

Ultrasound revealed a partial transection of the radial nerve with a 2.3mm gap between cut ends with a pseudoneuroma at the proximal cut end of the nerve. The rest of the radial nerve was normal in thickness and echo pattern. A nerve conduction study revealed a conduction block across the right radial nerve between elbow and forearm on electrical stimulation. The superficial radial nerve SNAP amplitude was reduced compared to the opposite side. With the patient supine and under brachial block, parts painted and draped, an incision was made extending from the anterolateral aspect distal arm to the proximal forearm. The radial nerve was identified in the brachialis – brachioradialis interval in the distal arm and traced distally to the bifurcation into the radial cutaneous nerve and posterior interosseous nerve. Scarring was seen at the bifurcation (Figure 1). On neurolysis through the scar tissue, the fascicles leading to the radial cutaneous branch were largely in continuity. The fascicles continuing to the posterior interosseous nerve was found divided with only scar tissue connecting the cut ends. After excising the scar and resection of the cut ends of the nerve to healthy fascicles, the nerve gap was about 2.5 cm. (Figure 2). A single cable of reversed sural nerve, harvested from the left leg was used as a reversed interposition graft to reconstruct the posterior interosseous nerve (Figure 3). The graft was coapted with the proximal and distal cut ends of the posterior interosseous nerve using 9-0 ethilon sutures. Wound was closed using 3-0 prolene sutures. An above elbow slab was provided for two weeks.

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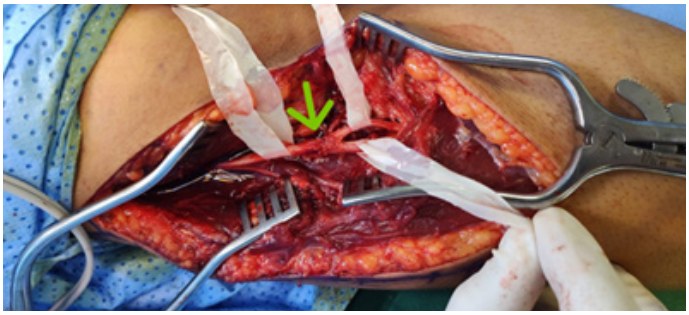

Figure 1: Scarring noted at bifurcation of radial nerve into radial cutaneous and posterior interosseous nerve.

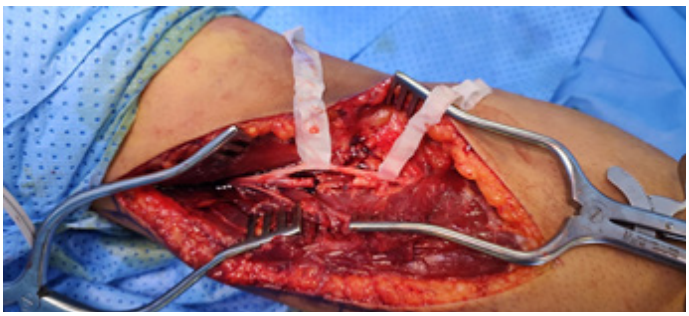

Figure 2: Neurolysis through the scar tissue.

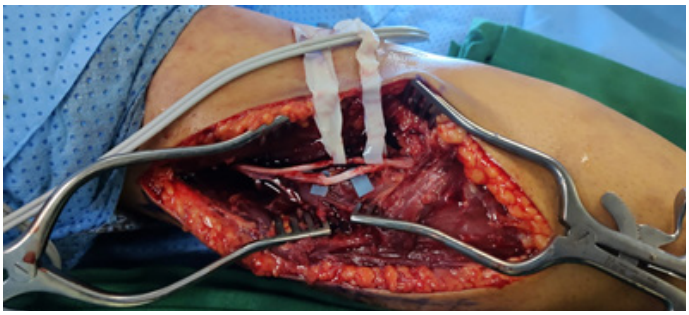

Figure 3: Reversed interposition graft to reconstruct the posterior interosseous nerve.

Results

Post-operative period was uneventful and the patient was discharged on the second day post-surgery. Subsequently he has been on regular outpatient follow up. Sutures were removed and the slab discontinued 2 weeks post-surgery. Subsequently he was started on physiotherapy- electric nerve stimulation to the finger and thumb extensors and passive ROM to prevent joint contractures. He started noting weak finger extension by about 4 months post-surgery and thumb extension by the 5th month. By 7 months, the patient had near normal finger and thumb extension (Figure 4).

Figure 4: Outcome after seven months post-surgery with near normal finger and thumb extension.

Discussion

Penetrating injuries to the radial nerve are uncommon injuries when compared to the median and ulnar nerves, with penetrating injuries at the bifurcation into the posterior interosseous and radial cutaneous nerve not commonly being discussed in literature. Diagnosis involves a combination of clinical examination, electro diagnostic studies and imaging studies. Physical examination will reveal characteristic signs of level 4 radial nerve injury -loss of finger and thumb extension, intact wrist extension, with or without sensory loss in the radial nerve distribution, depending on the involvement of the radial cutaneous nerve High resolution ultrasound and MRI can also help identify the location and extent of injury.

Treatment is aimed at nerve repair and restoration of nerve function with direct repair, nerve grafting, distal nerve transfers and tendon transfers as the available options [2]. Radial nerve injuries usually have a better prognosis than median and ulnar nerve injuries [5] as it only innervates extrinsic muscles of the hand and the distances from the injury site to the motor endplates are short. Patients with level IV radial nerve injury have better outcome than those with more proximal radial nerve injury as the distance to reinnervation is much shorter [2]. Earlier surgical intervention is associated with better recovery [6,7]. Other factors influencing recovery following nerve reconstructions are patient age and the presence of associated injuries [8,9]. The most common nerve used for nerve grafts is the sural nerve. Shorter nerve grafts are associated with better functional outcome [2]. A progressive tinnels sign and electromyography are useful to assess the progress of nerve recovery. Early diagnosis and nerve repair or reconstruction can significantly improve the outcome.

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