EDITORIAL

Radial nerve

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By definition, proximal radial nerve injuries are lesions of the radial nerve distribution that occur in the infraclavicular brachial plexus up to the axillary level. If the injury occurs at the divisional to the posterior cord level then they can be categorized as “cord injuries,” and if they extend distally to the radial nerve then they have been categorized as “cord-to-nerve” injuries. The incidence of proximal radial nerve or posterior cord injury is infrequently discussed in the literature and its epidemiology is largely unknown. Isolated injuries to the triceps branches may be a result of humeral fractures. Occasionally, this may happen during shaft repair as well. However, stretch injuries remain the most frequent cause of posterior cord or proximal radial nerve injuries. Gunshot wounds and other penetrating injuries are among the uncommon causes of infraclavicular injuries and are less frequently reported in the literature. This lack of information makes the experience and recent data from a large-volume center highly relevant. In this article, Bertelli and Ghizoni report on 13 patients with proximal radial nerve injuries, which resulted from high-velocity stretch mechanisms; all patients were injured in motorcycle accidents and many had concomitant musculoskeletal injuries, and several had injuries to other brachial plexus elements.

The prevalence of proximal radial nerve injuries is still unknown, unlike the detailed knowledge about the risk of radial nerve palsy due to humeral shaft fractures. The prevalence of radial nerve palsy due to humeral shaft fractures is 11.8%; however, when the shaft length is divided into thirds, only 1.8% of the proximal third fractures are associated with radial palsy, whereas a 15.2% incidence is associated with middle shaft fractures and 23.6% with distal third shaft fractures. On the other hand, Wang et al. reported iatrogenic radial nerve palsy in 30 of 707 surgically treated patients with humeral shaft fractures (an incidence of approximately 4.2%) over a period of 10 years. Shoulder girdle injuries are usually associated with multiple nerve palsies including the radial nerve. De Laat et al., in a study that involved 101 patients with shoulder dislocation and humeral neck fracture, reported axonal loss (i.e., at least an axonotmetic injury) on electromyographic evaluation of the radial nerve in 22% of cases, whereas 29% had axonal loss in the suprascapular nerve and 37% in the axillary nerve.

For patients with confirmed radial laceration due to open injuries as well as for those who had no signs of nerve recovery within 3–4 months after the injury, surgical exploration is usually performed. The surgical options vary from simple decompression and neurolysis to nerve grafting. Other authors advocate select distal nerve transfer if the radial nerve injury is extensive and very proximal. There remains some controversy about the timing of intervention, especially for the patients who have radial palsy associated with closed humeral shaft fractures. Some advocate early exploration, whereas others recommend waiting 16–18 weeks. Several studies have reported spontaneous recovery from the injury for more than 75% of patients after 3 months, so in most patients with typical humeral shaft–associated radial nerve injuries, we recommend waiting 4 months, with serial clinical and electroneurophysiological follow-up prior to exploration. However, for the proximal radial nerve injuries associated with severe stretch mechanisms, as in the series reported herein, we too would recommend exploration by 3–4 months, with intention for nerve grafting.

One of the largest series of surgically treated patients with posterior cord to radial nerve stretch injuries was from the Kline experience at Louisiana State University Health Sciences Center (LSUHSC). In that study, researchers reported performing neurolysis or grafting in 65 individuals. Pan et al. reported on 44 surgically treated patients with proximal radial nerve injury at the infraclavicular level over a 17-year period. Results of grafting for proximal radial nerve in the literature are variable. Acciarri et al. reported only a 50% recovery rate after a long follow-up of 2 patients with reconstructed and trans-
posed radial nerves. On the other hand, Henry reported complete recovery of radial nerve function in 2 cases with lengthy proximal injuries managed with early cable nerve grafting. The outcome was excellent (Medical Research Council [MRC] Grade 5/5) for both patients, in a follow-up period of 31 weeks in one and 62 weeks in the other. In a larger case series of patients with posterior cord to radial nerve stretch injuries, 32 individuals underwent graft repair at LSUHSC, and the recovery average, using a composite radial nerve score, was graded at 2.7.

The largest case series of graft repair of the proximal radial nerve was reported by Pan et al. They studied 244 cases for whom radial nerve grafting was performed due to nerve injury at different levels. Among them, 44 patients had injury to the radial nerve at the infraclavicular level. At 21.5 months, 80% of them recovered wrist extension to MRC Grade 3 or 4, irrespective of the level of injury, whereas thumb and finger extension recovered only for those patients with injury of the very distal radial nerve at the posterior interosseous nerve (PIN) level. Those results underscore the authors’ contention regarding the need for a long follow-up period and clear demarcation of MRC Grade 3 versus 4 recovery in wrist extension to properly evaluate the outcome. The fact that only a minority of patients achieve Grade 4 or better wrist extension function (considered to be clinically useful extension) despite graft repair underscores the need for careful follow-up and early consideration of a nerve (or tendon) transfer to augment wrist extension function.

The authors describe the surgical approach well; their descriptions are supported by illustrative photos taken during the surgeries. However, the presented photos are not specific for cord to cord-to-nerve lesion, and 6 of 13 patients had preserved triceps. In essence the authors are presenting a series of heterogeneous cases of proximal radial nerve palsy, and given this heterogeneity and small sample size, the data regarding graft length are not so meaningful. However, they do challenge the concept of nerve grafting alone if the target is the wrist, and particularly thumb and finger extension, all of which can be achieved with reasonable success by nerve or tendon transfers. Indeed, the authors’ discussion is relevant and very detailed, particularly in the manner they present the pros and cons of nerve transfer versus tendon transfer for thumb and finger extension restoration. This is the main value of the paper.

There is considerable controversy about the use of nerve versus the more accepted use of tendon transfers for restoration of wrist and finger extension function. Defenders of nerve transfer from the median nerve branches for the purpose of reanimating the PIN branches note the advantage of this method for the potential of restoration of near normal radial nerve function, including independent finger motion. The opponents of this method see that in case of failure of the nerve transfer, the use of the flexor carpi ulnaris (FCU) tendon transfer is compromised because the radialis has been paralyzed. Restoration of thumb and finger extension is possible using the FCU tendon, which can be transferred to reanimate the extensor pollicis longus (EPL) and extensor digitorum communis (EDC). As yet there is no Class I literature evidence favoring tendon over nerve transfers, but both options are reasonable. The authors’ recommendation of combining nerve grafts with early nerve and tendon transfers seems appropriate for cases with truly proximal radial nerve palsy, especially when associated with impaired elbow extension (triceps palsy). Although this method has already been adopted by many peripheral nerve and upper-extremity reconstructive surgeons, this article is further verification toward the best practice in this evolving field.

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References


Disclosure

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