

Superficial radial neuropathy secondary to intravenous infusion at the wrist: a case report

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Radial sensory neuropathy is a rare clinical entity. Only one other case attributed to intravenous infusion at the wrist has been reported in the literature. Also known as cheiralgia paresthetica or Wartenberg's disease, this benign compression mononeuropathy is often mis-diagnosed as is revealed in this case report. Understanding of the anatomy of the wrist, common etiologic factors which may be gleaned from the patient's history, as well as pertinent symptoms and physical findings, may help to arrive at the diagnosis. Conservative treatment is often beneficial and should be considered before more invasive measures.

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KEY WORDS: neuropathy, cheiralgia, Wartenberg, nerve compression, wrist injuries, manipulation (extremities), chiropractic.

La neuropathie sensitive radiale constitue une entité clinique rare. Un seul autre cas attribué à une perfusion intraveineuse au poignet a été rapporté. Aussi connue sous le nom de chiralgie paresthésique, cette mononeuropathie de compression bénigne est souvent mal diagnostiquée, comme on peut le constater dans cette étude de cas. La compréhension de l'anatomie du poignet, les facteurs causaux pouvant être glanés dans les antécédents médicaux du patient, ainsi que les symptômes pertinents et l'observation physique, peuvent contribuer à établir le diagnostic. Le traitement conservateur est souvent positif et devrait être pris en considération avant d'entreprendre d'autres mesures plus envahissantes.

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MOTS CLÉS: neuropathie, chiralgie, chiralgie paresthésique, compression nerveuse, blessures au poignet, manipulation (extrémités), chiropractie.

Introduction

Superficial radial neuropathy, a sensory mononeuropathy, is a rare clinical entity which has not been described in most neurology text books.^{1,2} Reports have Wartenberg describing five cases of isolated neuropathy of the superficial branch of the radial nerve in 1932.^{1,2} Realizing the similarity to isolated involvement of the lateral cutaneous nerve of the thigh, or meralgia (thigh pain) paresthetica, he coined the term "cheiralgia (hand pain) paresthetica"² and the condition subsequently bears his name. However, he was not the first to describe this entity and cites previous descriptions by other authors in the early 1920's.² Sprockin reported three cases of this disorder seen over the course of one year.² He suggested that the condition

was less rare than originally thought and that cheiralgia paresthetica was second only to meralgia paresthetica in frequency among the mononeuropathies. However, since the symptoms are often mild and may be overlooked,³ its true incidence is unknown.

Early cases were thought to be a result of trauma to the wrist or as a result of tight wrist-watch straps.^{1,4} Linscheid,⁵ upon review of the records of the Mayo clinic between 1948 and 1965, found seventeen cases of which the etiology was due to surgical procedures about the wrist or trauma. Braidwood,¹ in 1975 reported twelve cases with the majority having similar surgical or traumatic etiology. Dellon and Mackinnon³ found less than twenty-five cases previously described in the world's literature. They went on to report fifty-eight cases of radial sensory neuropathy, describing various other causative factors.³

The following case report is a description of radial sensory neuropathy of iatrogenic origin, subsequent to an intravenous (IV) infusion at the wrist. To our knowledge, only one other such case has been described to date. This was documented by Braidwood¹ and was a result of a cut-down procedure or IV infusion.

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Case report

A forty-six-year-old woman presented with a five year history of progressive right wrist pain of insidious onset. Three months prior to the onset of her symptoms she underwent reconstructive maxillofacial surgery. Initially her symptoms were intermittent. She sought medical treatment for her discomfort and was sent for physiotherapy. A three month treatment regimen consisted of massage, ultrasound and prescription of a wrist brace. This offered her complete but short term relief. No definitive diagnosis was made at the time. Her condition continued to slowly progress and three years later she sought chiropractic intervention. A diagnosis of right-sided carpal tunnel and thoracic outlet syndrome was made and she was started on a course of treatment consisting of ultrasound, electrotherapy and carpal manipulation. Complete resolution of symptoms was achieved within two weeks and treatment was terminated. The patient returned two years later as her symptoms had gradually returned five months prior. At this time symptoms were intermittent and were described as a dull, nagging discomfort with occasional paraesthesia radiating proximally up the right forearm. These were dermatomal in distribution and clearly followed the course of the radial nerve. Past history did not reveal any evidence of trauma to the wrist prior to her maxillofacial surgery. Further questioning about her surgery revealed that the nursing staff had a great deal of difficulty keeping the IV needle in place and were forced to reinsert it numerous times. This was apparently due to the fact that she was allergic to the standard adhesive tape and the nurses were forced to use hypoallergenic tape instead, which was not very adhesive and kept coming off.

Physical examination revealed full and pain-free wrist ranges of motion. Neurological examination revealed an absence of light touch and decreased sensation to pin-prick extending from the lateral aspect of the wrist to the dorsum of the thumb as far as the interphalangeal joint. Motor strength and deep tendon reflexes of the upper limb were unremarkable. Stressing the right wrist and elbow revealed positive Phalen's, Tinel's, and Finkelstein's manoeuvres. Combined passive wrist pronation, flexion and ulnar deviation was also markedly painful. Exquisite tenderness was noted on percussion of the right brachioradialis muscle from its insertion, extending proximally. Inter-carpal and first carpometacarpal joint restriction was noted. Examination of the right shoulder and cervical spine was unremarkable.

A diagnosis of mononeuritis involving the superficial sensory branch of the radial nerve (radial sensory neuropathy) was made. A one month trial of therapy was recommended. This consisted of ultrasound and electrotherapy directed to the lateral wrist and dorsum of the thumb, cross fibre massage to the brachioradialis tendon followed by ten minutes of cryotherapy and carpal/carpometacarpal mobilization/manipulation. Complete resolution of symptoms was achieved within ten treatments. At two year follow-up the patient continues to be symptom free.

Discussion

Anatomy

The superficial branch of the radial nerve is a direct continuation of the radial nerve as it divides into its deep and superficial branches.⁶ The superficial branch runs beneath the brachioradialis muscle, just lateral to the radial artery. In the lower third of the forearm it crosses to the dorsum and passes distally, deep to the brachioradialis tendon, near the lateral epicondyle of the radius.⁶ The nerve becomes subcutaneous when it emerges from the posterior border of the brachioradialis (see Figure 1). This is where it is most likely to be injured. Once becoming subcutaneous it supplies the skin of the lateral aspect of the lower forearm, wrist, dorsal aspect of the thumb, and proximal ends of the second, third, and radial side of the fourth finger (see Figure 2).^{1,6}

Epidemiology/etiology

The incidence of superficial radial neuropathy is rare¹ and descriptions of this clinical entity cited in the literature were few before Dellon and MacKinnon's report of fifty-eight cases in 1986.³ Perhaps it is because the dorsum of the hand is not a critical sensory surface in daily hand function, or because other hand problems may be mistaken as the cause of the patient's complaints, and hence is often not considered in the differential diagnosis.³ Most cases described are attributed to traumatic events such as falls, forearm fractures,^{1,7} crush injuries to the forearm,³ operative procedures such as for de'Quervain's stenosing tenosynovitis^{1,8} and forearm fracture plating techniques.^{1,5} Other traumatic etiologies include hand cuffing,^{9,10,11} stretching or hyperpronation/twisting injuries³ and repetitive pronation, supination, ulnar flexion activities as seen in some sports where the athletes may acquire symptoms secondary to traction or shearing effects on the superficial branch of the radial nerve.¹² Non-traumatic cases usually have no clear cause but superficial radial neuropathies have been noted following steroid injections,⁸ development of painful neuromas,¹³ ganglion cysts at the elbow,¹⁴ diabetes mellitus,^{3,8} neuronal intra-fascial lymphatic compression,¹⁵ and, as was originally thought to be the most common cause, a tight watch or wrist band.^{1,4,5,8} No predilection to specific age group or sex has been reported.

Pathophysiology

Sensation of numbness and tingling experienced in the extremities are usually secondary to peripheral nerve or nerve root compression. The pathophysiologic mechanism of entrapment neuropathies involves primarily mechanical compression and vascular compromise.¹² It is likely that the primary lesion of entrapment neuropathy is vascular compromise of a segment of the nerve. With obstruction of venous return from the nerve by compression of any magnitude, venous congestion within the nerve results involving epineurial, perineurial and intrafascicular vessels. Anoxia of the nerve segment may result with subsequent edema that may enhance the effect of the original com-

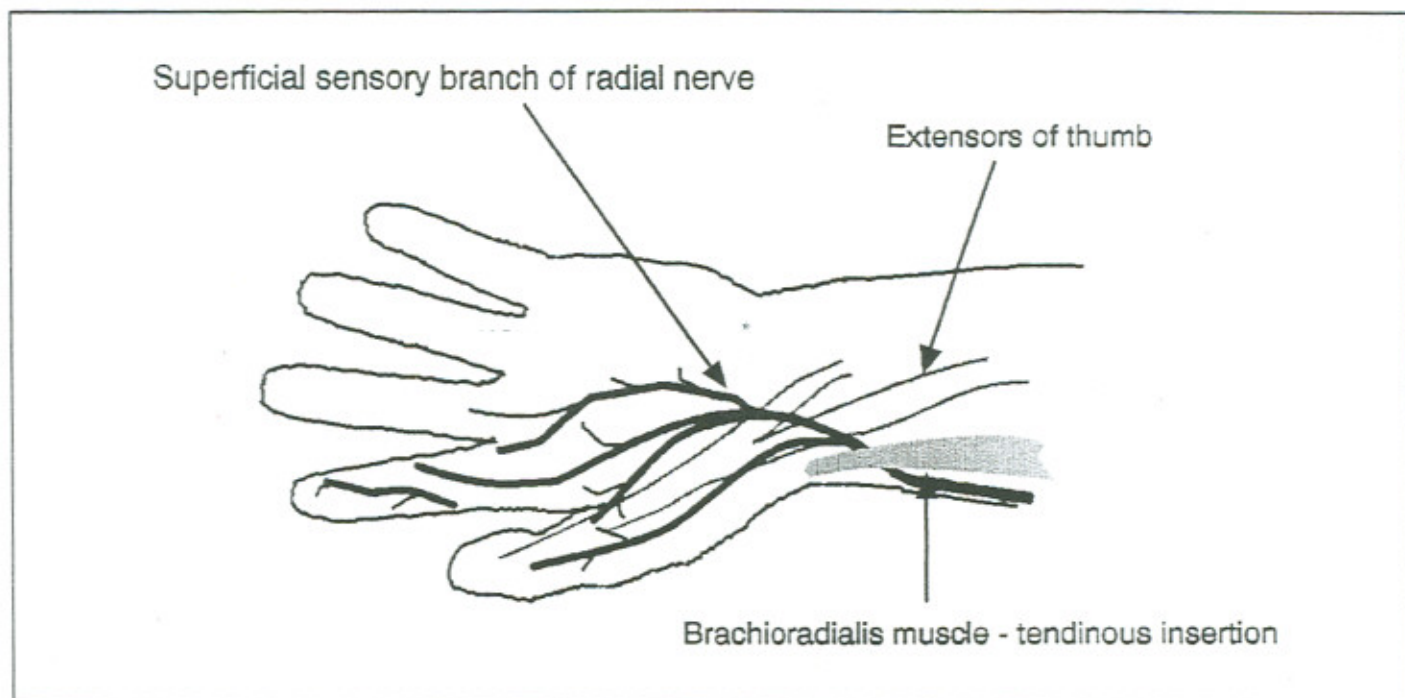


Figure 1. The anatomical distribution of the terminal branches of the superficial sensory branch of the radial nerve. (Adapted from: Braidwood AS. Superficial radial neuropathy. *J Bone Jt Surg [Br]* 1975; 57(B)(3):380-383.)

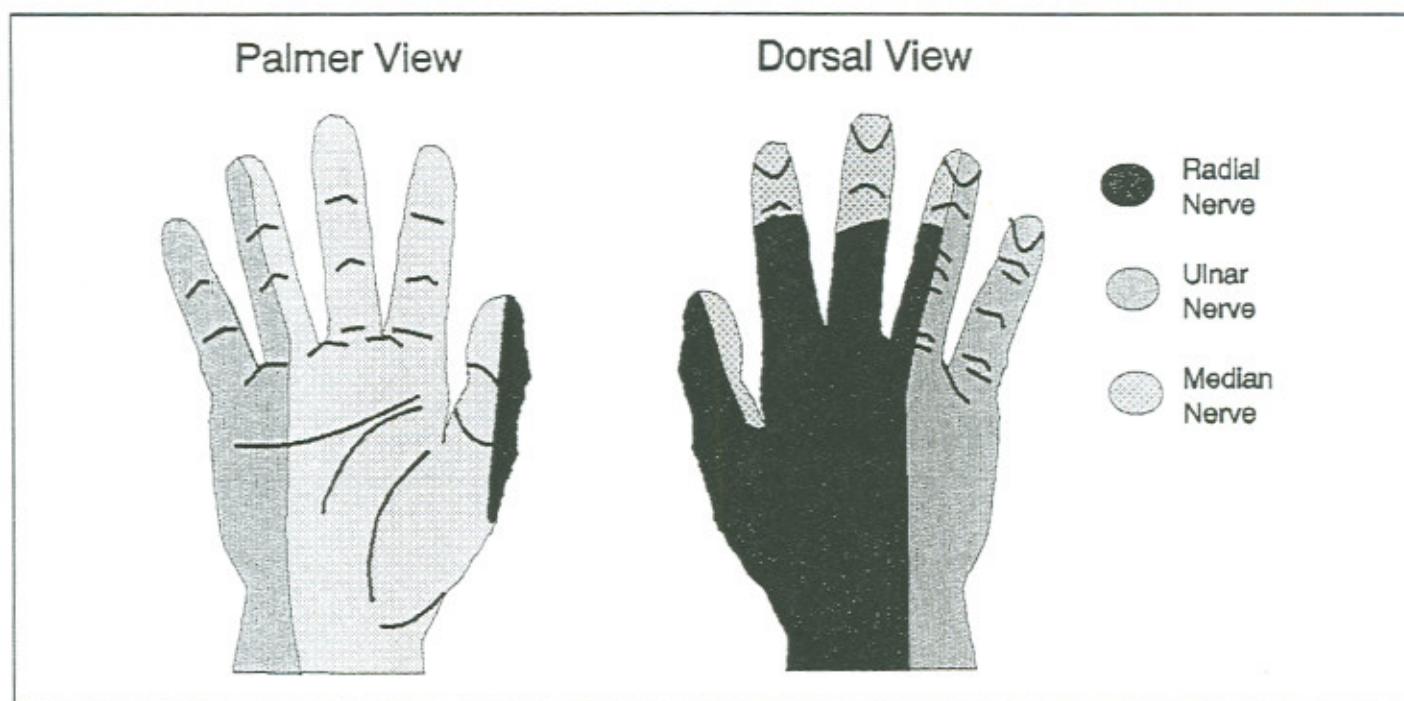


Figure 2. Dermatome distribution of the right hand. (Adapted from: Akesson EJ, Loeb JA, Wilson-Pauwels L. Thompson's Core Textbook of Anatomy. 2nd ed. Philadelphia: JB Lippincott Company, 1990: 518.)

pression.¹² This may produce neuropraxia, the least severe nerve injury, simply meaning "non-action"; the nerve is temporarily rendered non-functional.¹⁶ If this process continues for a prolonged period, proliferation of fibroblasts will eventually lead to intraneural scarring.¹²

In this case, it is very likely that following a series of attempts to maintain an IV infusion in the patient's wrist, an inflammatory response developed in the tendon sheath of the brachioradialis muscle. This may have led to adhesion formation in the tendon sheath and subsequent healing with considerable scar tissue formation. Excessive scar tissue formation may have caused the eventual compressive neuropathy of the sensory branch of the radial nerve as it surfaced from its position deep to the brachioradialis tendon.

Diagnosis

Superficial radial neuropathy is characterized by pain in the proximal forearm and hypaesthesia, paraesthesia or dysesthesia on the dorsum and radial surface of the thumb.^{1,2,3,5,7,12} There is no associated muscle weakness or paralysis, trophic changes, and no motor conduction abnormalities seen on electromyography.^{3,7} However, decreased or absent nerve conduction studies have been demonstrated with this entity.^{3,9} The most common complaint is discomfort over the dorsoradial aspect of the hand, characterized most commonly as a burning or shooting pain and less frequently as numbness or tingling.^{3,5} Onset may be rapid when associated with trauma,³ but may also be insidious and present at a later date as in this case. Symptoms may be intermittent or persistent, depending on the cause of the entrapment.³ Severity of the complaint varies considerably from mild discomfort, seen most commonly, to intense pain.² Pertinent physical findings include a positive Tinel's sign at the point of compression^{1,3,5,12} and pain with hyperpronation, ulnar deviation and volar flexion of the wrist.^{3,12} The above mentioned manoeuvre stretches the nerve which causes pain if the nerve is irritated. A test which is very similar to this manoeuvre is Finkelstein's test, in which the patient's thumb is clasped by the other fingers of the hand. This test maximally stretches the tendons of the extensor pollicis longus and brevis and is considered diagnostic of stenosing tenosynovitis.³ Thus, with superficial radial neuropathy, false positive Finkelstein's tests are often seen.³ Other tests which approximate the above mentioned manoeuvres are Phalen's test and the Mill's manoeuvre. These may also demonstrate false positive findings. It is not difficult to see why superficial radial neuropathy may often be mis-diagnosed, and why conditions such as de Quervain's stenosing tenosynovitis and carpal tunnel syndrome are important differential diagnoses. Nerve root entrapment due to cervical spondylosis¹ and lateral antebrachial cutaneous neuropathy should also be considered.³ The key to the diagnosis of sensory radial neuropathy is an understanding of the relevant anatomy of the wrist and a thorough history which may draw out possible precipitant etiological factors.

Treatment and prognosis

Initially, conservative treatment is recommended with early cases of radial sensory neuropathy.^{9,12,16} This may include, rest, ice, splinting, padding, cessation of activities that may have played a role in contributing to the original problem, alteration of work activities, non-steroidal anti-inflammatory medications and attention to any underlying medical condition which may be an etiologic factor, e.g. diabetes mellitus.^{3,12,16} These authors also found manual and electrotherapy to be beneficial in the reported case. If symptoms persist, in spite of conservative treatment and signs and symptoms worsen, surgery is warranted.^{12,16}

Posner¹⁶ reports that conservative measures are usually effective in reversing an acute neuropathy. Dellon and MacKinnon³ suggest that patients whose symptoms occurred after relatively minor trauma and whose duration of symptoms is less than one year will respond to non-operative treatment.

Conclusion

As Wartenberg stated,² sensory mononeuropathies are quite often not described in neurology text books and are also frequently mis-diagnosed. Therefore, the significance of this benign and relatively short-lived disorder relates largely to its differential diagnosis.² An awareness and understanding of this clinical entity and the analogous mononeuropathies, combined with a thorough history and physical examination will aid the clinician in sifting through the list of differentials which are considered with hand/wrist symptoms. This will in turn help the clinician to arrive at an accurate diagnosis and recommend and/or implement the appropriate plan of therapy.

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