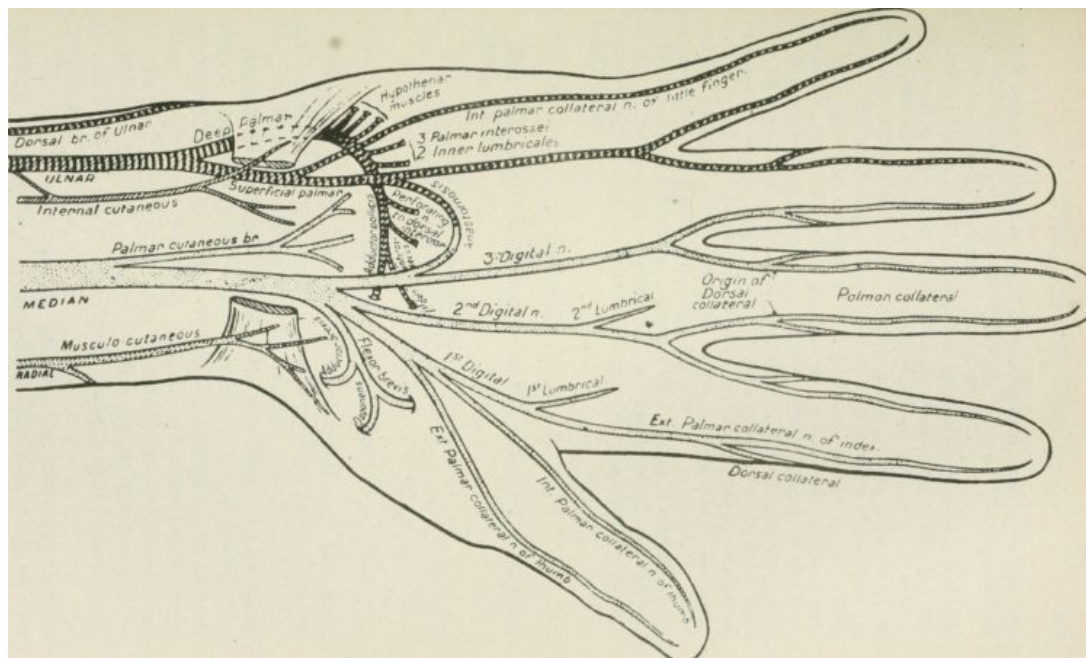


Mononeuropathy (Peripheral Neuropathy) — Causes and Diagnosis

[See online here](#)

This article runs through the common presentations, pathophysiology, differential diagnoses and common therapies for mononeuropathies. It looks in detail at a number of common nerve injuries, including radial nerve, ulnar nerve, brachial plexus, phrenic nerve, common peroneal nerve, and the femoral nerve. It covers common examination findings in order to make an accurate and specific diagnosis.



Pathophysiology and Etiology of Mononeuropathies

Mononeuropathies are **lesions to individual peripheral or cranial nerves**. For all mononeuropathies, the underlying causes can be varied but are most often **trauma**. Occasionally, nerves can become entrapped (i.e. from a **tumor**).

- **Radial nerve injury:** The nerve can be injured at a number of sites. It is commonly injured at the spiral groove of the humerus, the axilla (often known as Saturday night palsy or from crutches) and the forearm (for instance, posterior interosseous syndrome).
- **Median nerve injury:** The common site of injury is at the carpal tunnel of the wrist.
- **Ulnar nerve injury:** Commonly injured at the elbow, either from trauma (this will be included in the patient's history) or from leaning on the elbow.
- **Brachial nerve injury:** Can be caused by a number of things, but is most

likely the result of trauma. Can also be the result of radiotherapy or thoracic outlet compression.

- **Phrenic nerve injury:** Can also be caused by trauma, but is often associated with lung cancer, thoracic surgery iatrogenic injury, [HIV](#), Lyme disease, C3-5 Zoster and [TB](#) amongst other causes.
- **Common peroneal nerve:** Commonly injured at the head of the fibula.

Diagnosis of Mononeuropathy

Beware of **mononeuritis multiplex**. Patients can present with **multiple mononeuropathies** and this occurs in a number of conditions like [Diabetes mellitus](#), malignancies, HIV or hepatitis C and [neurofibromatosis](#) to name but a few. When there is symmetrical mononeuropathy, then these can be difficult to differentiate from **polyneuropathies**.

With all mononeuropathies, clinical diagnosis is usually enough. However, the definitive diagnosis can be made using **nerve conduction tests**.

Radial nerve injury



Image: "Black and white photograph of a hand some months after an injury to the radial nerve." by http://wellcomeimages.org/indexplus/obf_images/0b/c4/43ef08f3039b4cdae01fdbf7eb9a.jpg Gallery: <http://wellcomeimages.org/indexplus/image/L0061847.html>. License: [CC BY 4.0](#)

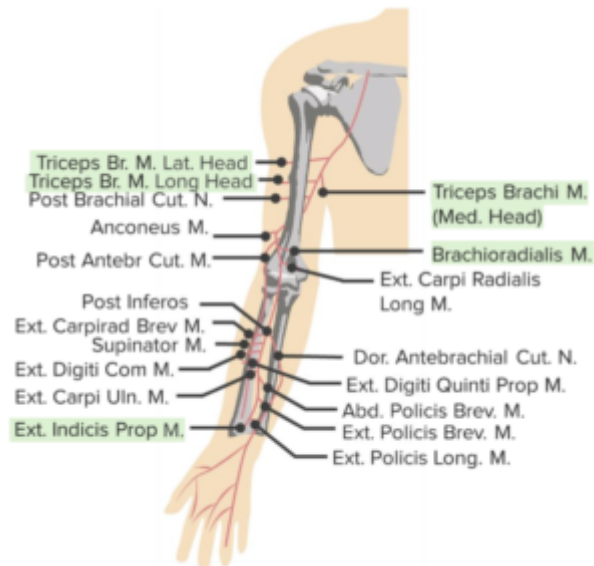
As mentioned previously, the history might include **damage at the spiral groove of the humerus, axilla or in the forearm**. Patients will often complain of being unable to extend their wrist. They may also have some forearm/hand/thumb numbness.

Risk factors to take from the history include **diabetes, alcoholism, leaning on their arms excessively, trauma** and **lead poisoning**. A full history should be included to identify all risk factors.

On examination, patients will have **wrist drop** with an inability to extend the wrist and fingers. Make sure you examine the **triceps, brachioradialis** and **extensor indicis proprius**.

Triceps can be examined by asking the patient to extend their elbow, brachioradialis by asking them with their thumbs pointing to the ceiling to flex their forearm. Finally, extensor indicis proprius can be tested by asking the patient, with their hand flat on the bed, to raise their index finger upwards.

Make sure a **neurological examination** is done with **sensation tested in the upper limbs**. Patients can often have decreased sensation over the dorsum of the hand/thumb area. They may have **difficulty spreading their fingers** (the pseudo ulnar interossei often have weaknesses).



Localizing the lesion is an important part of the physical examination in a patient with suspected radial nerve palsy. The three lesion locations can be differentiated by examination of the triceps, brachioradialis and extensor indicis proprius. If the injury is in the axilla, triceps brachioradialis and extensor indicis proprius will all have limited function and are weak on examination.

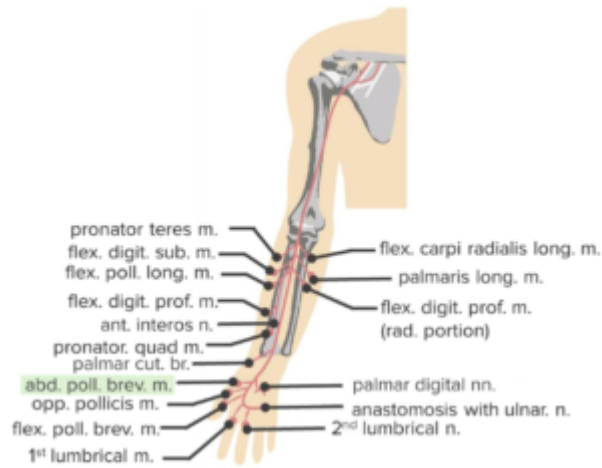
If there is a lesion at the level of the humeral spiral groove, expect patients to have normal triceps function (radial nerve has already supplied this muscle before reaching the spiral groove), but brachioradialis and extensor indicis proprius will be weak.

If the lesion is at the level of the forearm, patients will have **posterior interosseous syndrome**, triceps and brachioradialis will be normal with extensor indicis proprius being weakened.

Median nerve injury

Simply put, the median nerve controls precision grip. The classical mnemonic to remember what the nerves innervate is **LOAF** (2 lumbricals, opponens pollicis, abductor

pollicis brevis and flexor pollicis brevis).



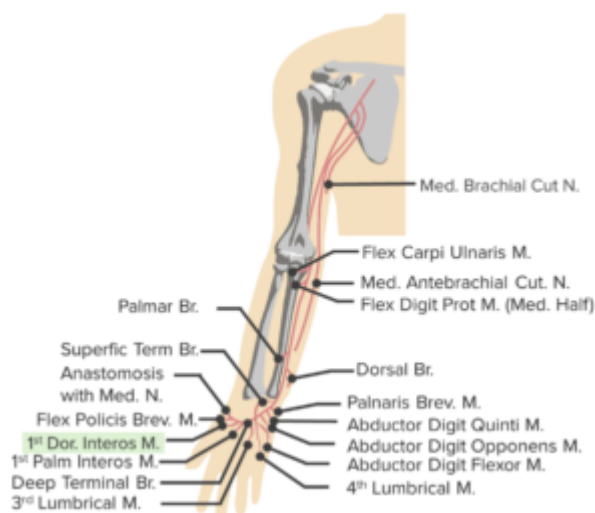
Patients with a median nerve injury will sometimes complain of **dropping objects**. They may have **tingling and numbness** in their hand, thumb, index and or middle fingers. This can radiate up the arm and occasionally up to the shoulder.

Ask if the **symptoms are worse at night** as patients often complain of worsening numbness etc. at night and will wake to the sensation. Ask about the onset, as symptoms can develop over months to years (depending on the cause; the most common of which is [carpal tunnel syndrome](#).)

Risk factors for median nerve damage include female gender, patients with a diagnosis of diabetes, pregnancy (especially in the third trimester), [hypothyroidism](#) (the link between hypothyroidism and carpal tunnel syndrome exists but is not completely understood), weight gain, trauma, [HIV infection](#) and occupations in which work is carried out with the hands (e.g. secretaries, operating machinery, computer joysticks, manual labour etc).

A physical examination should include a test of the abductor pollicis brevis muscle (“Push your thumb up against my hand”). Another sign of a median nerve injury is a positive **Tinel’s sign** (this is tingling upon tapping the median nerve over the wrist, by the carpal tunnel).

Ulnar nerve injury



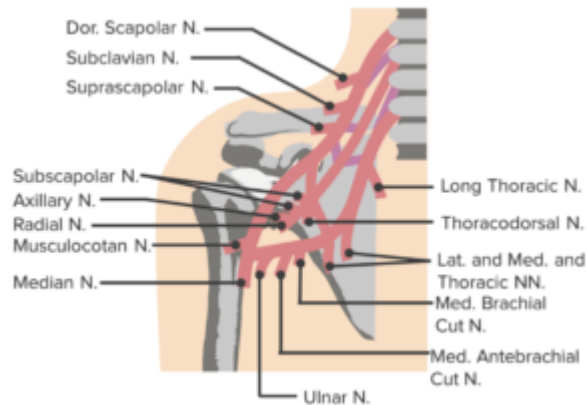
Patients will complain of a “**weak hand**” and often describe instances of **dropping objects** and having difficulty turning their keys or the ignition in their car. They typically have **numbness** and **tingling** of the fourth and fifth digits. On examination, there may be some wasting of the interossei muscles. Again, the onset of symptoms is important to

ascertain as they may appear of months/years dependent on the underlying cause.

Risk factors include being male, diabetes, alcoholism, HIB, leaning on elbows (this can be occupational in nature – e.g. ulnar palsies are common in receptionists). Also, make sure trauma is asked in history as this is obviously associated with ulnar nerve injury.

On examination, look for **atrophy of the first dorsal interosseous** (FDI). Test the interossei strength by asking the patient to spread their fingers against resistance. On sensation testing, ulnar nerve injury shows **decreased sensation to touch** and **pinprick** over the fourth and fifth fingers. They may also have a positive **Tinel's test**.

Brachial plexus injury

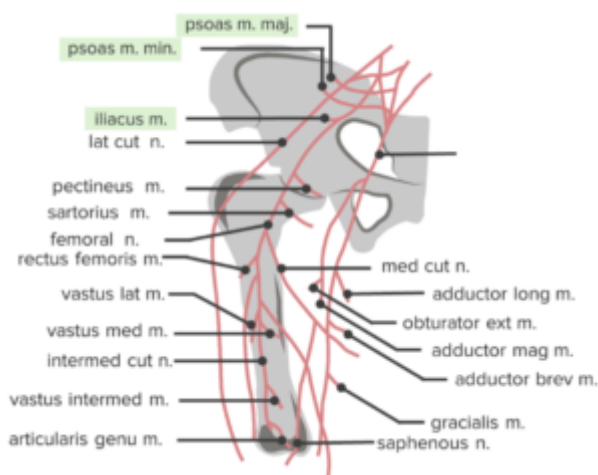


The brachial plexus innervates spinal nerves C5-T1. It branches and has a number of functions, including opening the fist. It can be injured in a number of different traumatic scenarios, but often it will be seen in patients that **fall on an outstretched arm**.

Phrenic nerve injury

Patients with **shortness of breath** who have a **raised diaphragm** on chest X-ray should have a phrenic nerve injury considered. Remember – the innervation pattern of the Phrenic nerve –C3,4,5 keep the diaphragm alive!

Femoral nerve injury

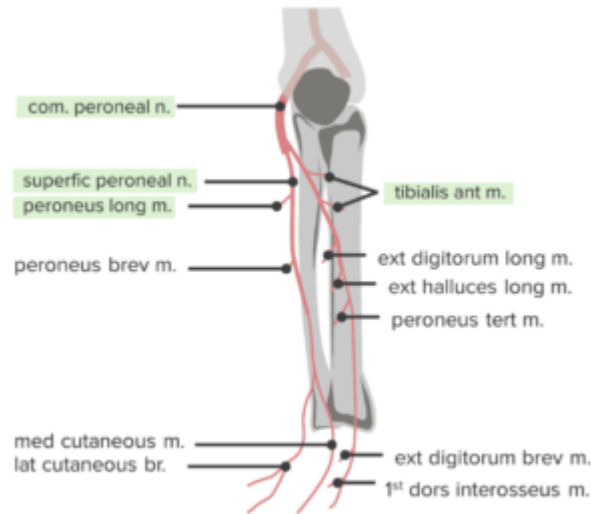


Femoral nerve injury results in both **motor and sensory deficits**. These include **iliopsoas and quadriceps weakness**, which causes an inability to flex the hip or knee and **“Meralgia paresthetica”**, which is the result of compression of the lateral femoral cutaneous nerve of the thigh resulting in **lateral thigh numbness**.

Common peroneal nerve injury

A common peroneal nerve injury can present as **foot drop** and **numbness** and **tingling** of the leg/top of the foot. Patients often complain of this with a history of **squats** or **yoga**.

Risk factors include diabetes, alcoholism, HIV, tight cast, leg crossing.



On examination, patients may be unable to pull their foot or toes upwards on command. You will need to localize any possible lesion. Check the peroneus longus by foot eversion, tibialis anterior by foot dorsiflexion and sensation over the dorsal surface of the foot. If the peroneus longus, tibialis anterior are involved and there is decreased dorsum foot sensation, then common peroneal lesion at or above the fibular head.

However, if the peroneus longus is involved and there is decreased dorsum foot sensation but the tibialis anterior is spared, then there is a superficial peroneal lesion usually below the fibular head. Finally – is the peroneus longus spared and the dorsum foot sensation preserved but the tibialis anterior involved? This is a deep peroneal lesion usually below the fibular head.

Differential Diagnosis

Radial nerve injury

If there is involvement of other nerves, then it may be a **brachial plexus lesion**. If there is bilateral radial nerve damage, then ask about **lead poisoning**. Also, consider ruling out **myotonic dystrophy** as this can sometimes result in waste forearms and a bilateral wrist drop.

Median nerve injury

Think about whether there could be a **repetitive stress injury to a joint or tendon** (i.e. is this problem neurological or MSK in origin?). Rule out a **cervical root lesion** and **thoracic outlet syndrome**.

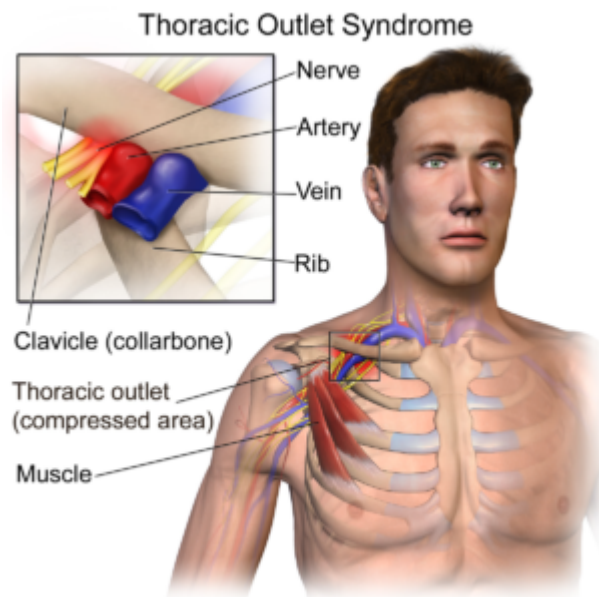


Image: "Thoracic outlet syndrome" by BruceBlaus - Own work,
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Ulnar nerve injury

Cervical root lesions of C8-T1 must be ruled out, but are usually associated with neck and arm pain not seen in ulnar nerve injuries.

In some cases, **ALS** (amyotrophic lateral sclerosis) should be ruled out. Its symptoms are in more areas than just that of the ulnar nerve or if they are accompanied by speech and swallowing issues.

Thoracic outlet syndrome should also be a consideration.

Common peroneal nerve injury

If symptoms are accompanied by bowel/bladder symptoms, then suspect **cauda equina lesion**. Suspect **ALS** if other muscles are involved and or fasciculations are present.

Myotonic dystrophy may cause weak, wasted legs and bilateral foot drop.

Therapy of Mononeuropathy

Radial nerve injury

It may be useful to get a **wrist/finger splint** for the patient to keep their fingers extended. You may also encourage the patients to **passively move their wrist/fingers** to maintain mobility.

Median nerve injury

Stop the cause of the problem. Treat the patient's underlying **diabetes** if they have it (peripheral neuropathies are a common side effect of diabetes).

Carpal tunnel syndrome

This is a common cause of a median nerve injury. Compression of the nerve in the carpal

tunnel, where 9 tendons run through, is common. **Wrist splints** can be used for a carpal tunnel syndrome. Potentially consider **steroid treatment**. **Carpal tunnel surgery** can be given in moderate or more severe cases.

Ulnar nerve injuries

Stopping or decreasing the cause is important (this may be an issue for some occupations). Surgery (**ulnar nerve transportation**) can be offered for severe lesions and for atrophy with active denervation in interossei.

Common peroneal nerve

Symptomatic treatment, i.e. brace (plastic) to maintain feet in dorsiflexion and prevents falls, and also to help prevent tightening of achilles tendon which will make recovery difficult.

Prognosis for Mononeuropathies

Common peroneal nerve

If the nerve is compressed against the head of the fibula, then recovery is common within a few months; however, it can invariably not take place and lifelong palsies do occur.

References

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