Peripheral nerve abnormalities: A pictorial review.

Award: Poster Prize 2015
Poster No.: P-0102
Congress: ESSR 2015
Type: Educational Poster
Authors: G. Delimpasis¹, E. Agianniotakis², M. Tzalonikou¹, O. Paxinos¹, A. Gyftopoulos¹, Athena/GR,² Sitia/GR
Keywords: Education and training, Diagnostic procedure, Ultrasound, MR, Neuroradiology peripheral nerve, Musculoskeletal system, Anatomy
DOI: 10.1594/essr2015/P-0102

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR’s endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

- To present characteristic cases of peripheral nerve pathology.
- To illustrate and discuss the imaging findings depicted by ultrasound as well as MRI.
Background

Color Doppler ultrasound is an invaluable tool for assessing peripheral nerves as it is cheap, available, offers the opportunity for dynamic examination, allows comparison with contralateral side and is suitable for examining different areas at the same appointment. MRI is better for depicting deep structures, it is reproducible and objective.

A good knowledge of the anatomy, clinical presentation and the ability to perform clinical examination, all contribute to the work up of peripheral neuropathies. Basic knowledge of electromyographic studies is also needed.

Most common pathology is due to compression, trauma or tumor.

Imaging findings of peripheral nerve pathology include enlargement or attenuation, the presence of vascularity, changes of the echogenicity or of the signal of the nerves as well as detecting extraneural causes of compression. Enhancing after contrast medium injection may be seen in abnormal MRI studies (MR neurography is not presented in this exhibit). MRI is also ideal for imaging allocation of acutely or chronically denervated muscles, thus giving clues for the peripheral nerve affected. It must be stressed that moderately high T2 signal is a normal finding, while on US peripheral nerves exhibit a striated appearance.
Imaging findings OR Procedure Details

Imaging findings of peripheral nerve pathology include enlargement or attenuation, the presence of vascularity, changes of the echogenicity or of the signal of the nerves as well as detecting extraneural causes of compression. Enhancing after contrast medium injection may be seen in abnormal MRI studies (MR neurography is not presented in this exhibit). MRI is also ideal for imaging allocation of acutely or chronically denervated muscles, thus giving clues for the peripheral nerve affected. It must be stressed that moderately high T2 signal is a normal finding, while on US, peripheral nerves exhibit a striated appearance.

Carpal tunnel syndrome (CTS) is by far the most common nerve entrapment syndrome which is actually a clinical and electromyocraphic study. Imaging studies may show compression of the median nerve at the level of transverse ligament (Fig. 1) and are useful to exclude the presence of tumors, ganglia and anatomic variations that may trigger median nerve (MN) symptomatology such as bifid MN (Fig. 2, 3) and persistent median artery. (Fig. 4) Postoperative changes can also be depicted. (Fig. 5) Compression of recurrent MN leads to thenar denervation, acutely seen as muscle edema. (Fig. 6)

Morton’s neuroma is the sequela of entrapment of an interdigital plantar nerve between the heads of two neighbouring metatarsals. (Fig. 7) It does not represent a true tumor, being often found in elderly women. Ultrasound is usually showing the lesion, especially after pressing with a finger the specific web space dorsally, thus pushing the neuroma closer to the probe. (Fig. 8) It may (Fig. 9) or not enhance after Gd injection and can be multiple.

Ulnar nerve (UN) is usually entrapped at the level of the cubital tunnel. Accessory anconeus epitrochlearis muscle has well been documented as a cause of compression. (Fig. 10) Comparison to contralateral side is always useful. (Fig. 11) As usually, the nerve is proximally swollen (Fig. 12) showing high T2 signal. (Fig. 13) Fibrous tissue around UN is a postoperative complication responsible for recurrent entrapment. (Fig. 14) If remain untrated, ulnar neuropathy may cause hypothenar atrophy.

Quadrilateral space syndrome reflects axillary nerve entrapment and usually affects teres minor muscle. (Fig. 15, 16) The cause may be masses as well as muscle hypertrophy, often in bodybuilders.

Supinator syndrome is a result of posterior intersosseous nerve (PIN) impingement by the leash of Henry or at the level of the arcade of Frohse. Aponeurotic changes may be evident regarding supinator muscle. (Fig. 17)
Tibial nerve (TN) may be compressed at the level of tarsal tunnel, usually because of the presence of ganglia (Fig. 18) or even excessive amount of subcutaneous adipose tissue. (Fig. 19)

Intraneural ganglia (common ganglia penetrating the epineurium, extending along the nerve) are rare but may involve even the lateral branch of the deep peroneal nerve. (Fig. 20, 21)

Common peroneal nerve is usually compressed by tibiofibular ganglia, but loss of weight may also lead to peripheral peroneal neuropathy (as the case of a 55y old patient with pancreatic cancer undergoing chemotherapy which is presented in this pictorial essay) (Fig. 22) Sometimes, peroneal neuropathy is idiopathic. (Fig. 23) Anterior muscle compartment of the tibia is affected. (Fig. 24)

Tumors of the peripheral nerves are most often benign. Schwannomas are typically painful and exhibit both continuity with the affected nerve and vascularity. (Fig 25)

Fibrolipohamartoma or nerve lipomatosis usually affects MN. Involvement of the sciatic nerve is rare. The clue for the diagnosis is the presence of adipose tissue interspersed between the nerve fibres, easily traced with the aid of MRI. (Fig. 26)

A plexiform neurofibroma is the hallmark of Neurofibromatosis type I (NFI). It may be accompanied by more plexiform or/and solitary neurofibromas showing both on MRI as well as on ultrasound "target sign" appearance. (Fig. 27, 28)

Stump neuroma (as Morton’s neuroma) does not represent a true neoplasm. It appears as a clump at the edge of an amputated nerve. (Fig. 29)

After trauma, if not dissected, peripheral nerves show marked enlargement and echogenicity. (Fig. 30)
Fig. 1: Compression of the MN at the level of the transverse ligament. (LS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 2: Bifid MN proximal scan.(TS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 3: Bifid MN distal scan. (TS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 4: Persistent median artery. (TS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 5: Postoperative changes (scar tissue) responsible for recurrent CTS symptoms (LS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 6: Thenar muscle edema due to recurrent branch of MN compression (T2fs, TRA).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 7: Hypogenic mass, continous with an interdigital nerve, representing Morton's neuroma (LS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 8:** Morton's neuroma pushed from the dorsum of the foot towards the probe (TS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 9: Enhancing Morton’s neuroma between the 3d and 4th metatarsal heads (T1fs, TRA).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 10:** Anconeus epitrochlearis muscle at the level of cubital tunnel (TS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 11:** Contralateral side lacks an accessory muscle. (LS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 12:** Diffuse swelling and hypogenicity of the proximal to the cubital tunnel part of the UN. (LS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 13:** UN showing high T2 signal proximally to compression. (T2fs SAG).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 14: Postoperative changes (scar tissue) around UN. (TS)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 15:** Quadrilateral space syndrome: Partial fatty atrophy of the teres minor muscle representing chronic changes (T1 COR).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 16:** Quadrilateral space syndrome: Mild edema of the teres minor muscle representing subacute changes (PDfs COR).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 17: Edema of the supinator muscle in the context of PIN entrapment syndrome (T2fs TRA).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 18:** Ganglion at the tarsal tunnel compressing the TN (TS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 19:** Excessive adipose tissue causing tarsal tunnel syndrome (TS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 20:** Ganglion of the talofibular joint extending into the lateral branch of the deep peroneal nerve. The latter is swollen proximally, exhibiting high T2 signal. (STIR SAG).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 21**: Ganglion of the talofibular joint extending into the lateral branch of the deep peroneal nerve. (STIR SAG).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 22:** Peroneal neuropathy due to weight loss. Common peroneal nerve is enlarged proximally (TS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 23: Marker shows area of complaint. Common peroneal nerve shows subtle enlargement and signal changes (T2fs COR)

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 24: Same patient with Fig.23. Aponeurotic changes of the anterior tibial muscle compartment (T2fs TRA).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 25: A Schwannoma in continuity with a peripheral nerve (LS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 26:** Left sciatic nerve is markedly enlarged with adipose tissue interspersed between neural fibres. The patient underwent neurolysis and is doing well (T1 COR).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 27:** Plexiform and solitary neurofibromas bilaterally in a patient with NFI. The "target sign" is well recognized in the bigger plexiform neurofibroma of the right leg (T2 fs TRA).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Fig. 28: Plexiform and solitary neurofibromas bilaterally in a patient with NFI. The "target sign" is well recognized in the bigger plexiform neurofibroma of the right leg (T2 fs COR).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 29:** Stump neuroma of the left sciatic nerve after lower limb amputation (T2 fs COR).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
**Fig. 30:** Contusion of the common peroneal nerve in a patient with posterolateral corner injury. The nerve is markedly echogenic and enlarged (LS).

© Radiology / MRI, 251 HAF and VA Hospital - Athens/GR
Conclusion

MRI as well as high frequency color Doppler ultrasonography are both invaluable tools in depicting peripheral nerve lesions. Deep knowledge of the anatomy though, is of paramount importance. Establishing the correct diagnosis is as always crucial for the therapeutic management of these patients.
References


4. S. Kim et al. Role of magnetic resonance imaging in entrapment and compressive neuropathy- what, where, and how to see the peripheral nerves on the musculoskeletal magnetic resonance image: part 1. Overview and lower extremity. Eur Radiol. (2007) 17: 139-149.
Personal Information

G, Delimpasis. gedelimbassis@hotmail.com