Guidelines for the best use of Nerve Conduction Studies and Electromyography

These guidelines are intended for use by all referring practitioners including medics and extended scope practitioners, **to avoid significant delay for the patients who really need to have neurophysiology consultation timely** and to run the Clinical Neurophysiology **service efficiently**.

A useful investigation is one in which the result will alter the clinical management of the patient and give confidence of the clinician's diagnosis.

We have been facing **Wasteful uses** of neurophysiology such as Repeating investigations, Not providing the appropriate and relevant clinical information, Investigations when the results are unlikely to affect the patient management (Just for the sake of knowing is not a good reason to be referred) and Over-investigating.

1. NERVE CONDUCTION STUDY and NEEDLE ELECTROMYOGRAPHY

EMG and NCS are to identify and characterise the site and nature of the pathological processes affecting the peripheral nervous system. They are used to support the clinical diagnosis/to find the supporting evidence for the most probable differential diagnosis. However, they cannot be used to screen for all kinds of neuropathy.

Three groups of neurological conditions are shown below (for detail information, please see next page)

1.1 Clinical Indications for NCS/EMG (most likely to contribute to clinical diagnosis and help for management)

- **Polyneuropathy of unknown cause** -allowing classification into axonal or demyelinating types.
- **Mononeuropathy requiring localisation preoperatively** particularly when there is coexisting pathology such as CTS with cervical spondylosis and/or radiculopathy.
- **Mononeuritis multiplex**.
- **Disorders of the neuromuscular junction** i.e. myasthenia gravis or Lambert Eaton syndrome (after appropriate clinical exams done and provided the findings in the referrals)
- **Disorders of anterior horn cells** i.e. MND.

1.2 Clinical conditions where NCS are **not indicated** (when the results are unlikely to affect the patient management or conditions that often have no demonstratable neurophysiological abnormality)

- **Repeating investigations** which have already been done. Even for CIDP or any kind or GBS, NCS/EMG studies are not recommended for monitoring purposes, treatment guide or prognostication. Clinical assessment is the essence here.
- **Pain syndrome without neurology** (no signs of large fibre dysfunction) and negative imaging.
- **Certain 'controversial' entrapment mononeuropathies** including **meralgia paraesthetica**, **radial tunnel syndrome, tarsal tunnel syndrome**. These are technically difficult and meaningful data is difficult to attain.
- **Myalgia where there is no weakness or objective signs** and only mildly elevated CPK.
- **Endocrine, metabolic and a steroid myopathy**.
- **Fibromyalgia and poly myalgia rheumatica**.

1.2 Clinical Conditions where NCS/EMG are **not indicated, initially, only performing if symptoms persist. Timely referral is the essence.**

- **Polyneuropathy of known cause** such as complicating metabolic/systemic conditions (e.g. diabetes mellitus, alcohol abuse, uraemia, vitamin deficiency and neurotoxic drugs).
- **Suspected large fibre polyneuropathy**, but **no clinical signs** (in particular those with brisk reflexes).
- **Clinically isolated small fibre neuropathy**. NCS are usually normal in this case.
- **Radiculopathy when the diagnosis is secure, based on clinical and imaging findings** –clinical and imaging concordance (e.g. foot drop due to L4/5 radiculopathy).
- **Clinical and family history suggestive of genetic or metabolic myopathy**. Muscle MRI/biopsy and/or genetic tests provide a more definite diagnosis.
- **Chronic fatigue syndrome**.
- **Long Covid syndrome with non-specific neurological symptoms and normal neurological exam findings**
- **Isolated fasciculations and dementia** without lower motor neuron signs.
- **Post-polio syndrome**- unless new symptoms are raising an additional pathology. **Post-polio syndrome diagnosis does not need NCS/EMG.**

FULL Guidelines for the best use of Clinical Neurophysiology (NCS/EMG, including CTS, Ulnar neuropathy screen)

These guidelines are intended for use by all referring practitioners including medics and extended scope practitioners, to avoid significant delay for the patients who really need to have neurophysiology consultation timely and to run the Clinical Neurophysiology service efficiently.

The guidelines can lead to a reduction in the number of referrals for investigation and therefore a reduction in waiting times. Also, they can prevent the patient having potentially unnecessary and at times uncomfortable procedures. All patients going through the NCS/EMG do not enjoy the procedure and yet, they go through this unpleasant experience, some feel out of necessity upon referring teams advice.

There are few side effects to neurophysiological investigations, but NCS/EMG's involve electrical stimulation of peripheral nerves and needle examination of muscles, which can be at least unpleasant and so painful to a few. Cardiac pacemakers, defibrillators, anticoagulants, oedematous limbs, needle phobia can make investigations more complex.

Why are guidelines needed: - **A useful investigation is one in which the result will alter the clinical management of the patient and give confidence of the clinician's diagnosis**.

Wasteful uses of neurophysiology are as follows:

1. **Repeating investigations** which have already been done, either at another hospital just to obtain local baseline data, or to monitor the progress of chronic axonal polyneuropathy. Even for CIDP of any kind or GBS, NCS/EMG studies are not recommended for monitoring purposes, treatment guide or prognostication. One study is adequate if the tests are done in an appropriate time (for examples- obtaining NCS in first 2 weeks of GBS may show very little abnormalities, wrist drop or finger drop cases and any nerve injury cases, better time to investigate neurophysiologically is after 4-6 weeks of symptoms onset). If one wishes to know the extent of injury in earlier stage, ultrasonography and MRN are better alternatives. For the latter there are clinical methods of assessment (British Peripheral Nerve Society guidelines).
2. **Not providing the appropriate and relevant clinical information**, particularly lack of exam findings and questions that the investigation should answer. This could mean the patient is put into the wrong clinic or is offered the appointment unnecessarily (without obtaining any diagnostic yield). They will waste the clinician's and patient's time.
3. **Investigations when the results are unlikely to affect the patient management**. Just for the sake of knowing is not a good reason to be referred.
4. **Over investigating**. Some investigations are better than others at giving the desired information.

NERVE CONDUCTION STUDY and NEEDLE ELECTROMYOGRAPHY

Investigations Indicated/Not indicated.

1. **Indicated** – this shows an investigation that is most likely to contribute to clinical diagnosis and management.
2. **Not indicated initially** – Any symptoms of a few weeks or a few months duration. It is better treated clinically and wait until improved or worsening. Many patients with CTS came to the clinic were not even managed with wrist splints.
3. **Not indicated** – conditions that often have no demonstratable neurophysiological abnormality such as chronic fatigue syndrome or polymyalgia or ME or PMR.
4. **Specialised investigation** – these can be often complex, time consuming or resource intensive, which will often only be performed after discussion with the Consultant Clinical Neurophysiologist such as Single fibre EMG. In addition, SFEMG is rarely needed and false positive nature is there.

Clinical Indications for Nerve Conduction Studies (most likely to contribute to clinical diagnosis and help for management)

1. **Polyneuropathy of unknown cause** -allowing classification into axonal or demyelinating types. This should be only one time investigation. Once diagnosed or investigated, there is no reason to repeat the test. EMG/NCS are not like weighing machines to assess the weight, gain or loss. For example, patient's symptoms are worsening a

year later, if the test repeated and proved to be the case, how that information will help in management. If the test proves to be not worsening, will the patient be challenged as the study is indicating otherwise.

2. **Mononeuropathy requiring localisation preoperatively** particularly when there is coexisting pathology such as CTS with cervical spondylosis and/or radiculopathy.
3. **Mononeuritis multiplex**.
5. **Disorders of the neuromuscular junction** i.e. myasthenia gravis or Lambert Eaton syndrome. Patients with neuromuscular junction disorder should have clinical history and exam findings, including bed side tests, consistent with those diagnoses first (i.e., appropriate clinical exams need be done and provided the findings in the referrals).

   Disorders of anterior horn cells i.e. MND. A motor neuron disease needs more careful investigation, and it is only justifiable, if clinically unequivocal for that diagnosis.

Clinical conditions where NCS are **not indicated**.

1. **Pain syndrome without neurology** (no signs of large fibre dysfunction) and negative imaging.
2. **Certain 'controversial' entrapment mononeuropathies** including **meralgia paraesthetica**, **radial tunnel syndrome, tarsal tunnel syndrome**. These are technically difficult and meaningful data is difficult to attain. The sensory nerve action potentials such as a lateral femoral cutaneous and medial plantar are commonly unobtainable in asymptomatic individuals.
3. **Myalgia where there is no weakness or objective signs** and only mildly elevated CPK (less than 2 times upper limit of normal).
4. **Endocrine, metabolic and a steroid myopathy**.
5. **Fibromyalgia and poly myalgia rheumatica**.
6. **Vascular thoracic outlet syndrome**.

Clinical Conditions where NCS/EMG are **not** indicated, **initially.**

This includes situations where experience shows that the clinical problem usually resolves with time, or early investigation may produce false negative results. We therefore suggest deferring the investigation and only performing it if symptoms persist. Examples are CTS during pregnancy, or Neurapraxia after nerve compression such as "Saturday night palsy".

They are

1. **Polyneuropathy of known cause** such as complicating metabolic/systemic conditions (e.g. diabetes mellitus, alcohol abuse, uraemia, vitamin deficiency and neurotoxic drugs).
2. **Suspected large fibre polyneuropathy**, but **no clinical signs** (in particular those with brisk reflexes).
3. **Clinically isolated small fibre neuropathy**. NCS are usually normal in this case.
4. **Radiculopathy when the diagnosis is secure, based on clinical and imaging**. Patients should be referred to MSK and/or orthopaedic.
5. **Clinical and family history suggestive of genetic or metabolic myopathy**. Muscle MRI/biopsy and/or genetic tests provide a more definite diagnosis.
6. **Chronic fatigue syndrome**.
7. **Long Covid syndrome with non-specific neurological symptoms and normal neurological exam findings**
8. **Isolated fasciculations and dementia** without lower motor neuron signs.
9. **Post-polio syndrome**- unless new symptoms are raising an additional pathology. **Post-polio syndrome diagnosis does not need NCS/EMG.**
10. **Children with pes cavus, normal neurology and no family history of hereditary neuropathy**. However, foot and ankle orthopaedic surgeon is referring before corrective procedures, wanting to know the existence of neuropathy is a good referral for management purpose.

Timely referral is the essence.

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