PolyNeuro exchange

Electrophysiologic Findings in Multifocal Motor Neuropathy

Multifocal Motor Neuropathy

- Multifocal motor neuropathy (MMN) is a rare asymmetric motor neuropathy without major sensory loss that affects mainly distal extremities[1]
- Diagnosis of MMN is based on clinical and electrodiagnostic criteria[2]
- Here we explore electrophysiologic findings of MMN in addition to the classical electrophysiological conduction block (CB), considered the defining hallmark of MMN[1,2]

1. Umapathi T *et al*. Cochrane Database Syst Rev. 2012;18(14):CD003217.
2. EFNS-PNS Joint task Force. J Peripher Nerv Syst. 2010;15:295-301.

Electrophysiologic Analysis in MMN Patients (I)[1]

- Electrophysiologic findings in MMN were assessed in a retrospective analysis of patients who met a clinically-based diagnosis of MMN
  - Inclusion criteria, designed to find patients with a pure motor involvement in multiple nerves:
    - Age ≥20 years at onset
    - Weakness in the distribution of ≥2 peripheral individual motor nerves
  - Exclusion criteria, designed to ensure that patients with ALS and MADSAM were not included:
    - Facial weakness, bulbar weakness, respiratory difficulty, upper motor neuron signs, weakness not localized to individual peripheral nerves, no longer met the study criteria after a follow-up period of at least one year
    - Only minimal sensory involvement was permitted

ALS, amyotrophic lateral sclerosis; MADSAM, multifocal acquired demyelinating sensory and motor neuropathy

1. Katz JS *et al*. Neurology. 1997;48:700-7.

Electrophysiologic Analysis in MMN Patients (II)[1]

- A total of 16 patients met the clinical criteria for inclusion

Clinical characteristic	
Sex, N Male Female	 12 4
Average age, years	48.1
Average duration of symptoms, years	7.6

1. Katz JS *et al*. Neurology. 1997;48:700-7.

Electrophysiologic Findings in MMN[1]

- Of the 16 MMN patients defined clinically:
  - 31% had evidence of CB in at least one nerve
  - 44% had evidence of temporal dispersion in at least one nerve
  - 94% had other demyelinating features with superimposed axonal degeneration

Total patients, N	CB	Possible CB	Temporal dispersion	Slowing conduction velocity	Prolonged distal latency	Prolonged F wave	Pure axonal involvement
16	5	15	15	5	9	8	13

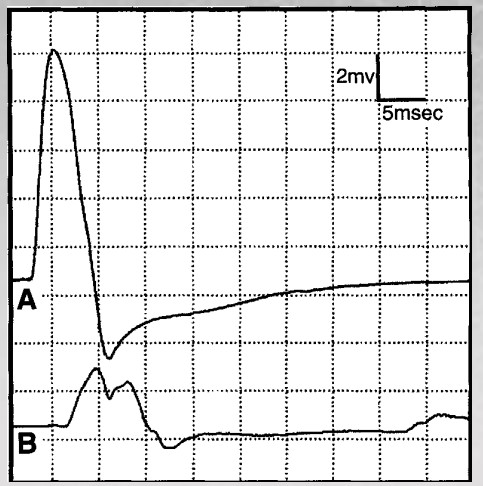
- The ulnar nerve was affected most often in nerve conduction studies
  - Segmental demyelination occurred in 7 proximal, 2 intermediate and 8 distal ulna sites

1. Katz JS *et al*. Neurology. 1997;48:700-7.

Conduction Block

- CB is defined as a reduction of compound muscle action potential amplitude on proximal compared with distal nerve stimulation[1]

- In MMN, CB does not affect sensory fibers and can happen at non-compressible sites along the nerve axons[2]



CB on a motor nerve conduction study stimulated at
(A) wrist
(B) elbow
showing an amplitude reduction of 75% and area reduction of 69%. Duration of the negative peak increased by 23%[3]

1. Meuth SG *et al*. Eur Neurol. 2010;63:193-204.
2. Lawson VH, Arnold WD. Neuropsychiatr Dis and Treat. 2014;10:567-76.
3. Katz JS *et al*. Neurology. 1997;48:700-7.

Conduction Block in MMN[1]

- CB was reported in 5/16 patients
- Other abnormalities were also found in these patients, as follows:

Possible CB	Temporal dispersion	Slowing conduction velocity	Prolonged distal latency	Prolonged F wave
3	3	3	2	1

- All patients with CB also had low distal motor amplitudes
- Overall CB was less common than other features

1. Katz JS *et al*. Neurology. 1997;48:700-7.

MMN Without Conduction Block

- Patients without CB presented the following features:[1]

Possible CB	Temporal dispersion	Slowing conduction velocity	Prolonged distal latency	Prolonged F wave
6	4	10	4	7

- MMN without CB can be due to:[2]
  - Difficulty in confirming CB due to the proximal location of the CB
  - Activity-dependence of these blocks
- CB is not specific for MMN as it can be seen with other types of inflammatory neuropathies, such as CIDP and MADSAM[2,3]

CIDP, chronic inflammatory demyelinating polyneuropathy; MADSAM, multifocal acquired demyelinating sensory and motor neuropathy

1. Katz JS *et al*. Neurology. 1997;48:700-7.
2. Dimachkie M *et al*. Neurol Clin. 2013;31:533-55.
3. Meuth G *et al*. Eur Neurol. 2010;63:193-2040.

Other Electrophysiologic Features of MMN

- Other electrophysiologic features of MMN can include:[1]

Slow conduction velocity	Temporal dispersion	Prolonged distal CMAP latencies	F-wave abnormalities

- Pure axonal features have also been reported in MMN[2,3]
  - Clinically defined MMN with no demyelinating features has been referred to as multifocal acquired motor axonopathy, or MAMA

1. Dimachkie M, *et al*. Neurol Clin. 2013;31:533-55.
2. Katz JS *et al*. Neurology. 1997;48:700-7.
3. Katz JS *et al*. Neurology. 2002;58:615-20.

Axonal Features in MMN[1]

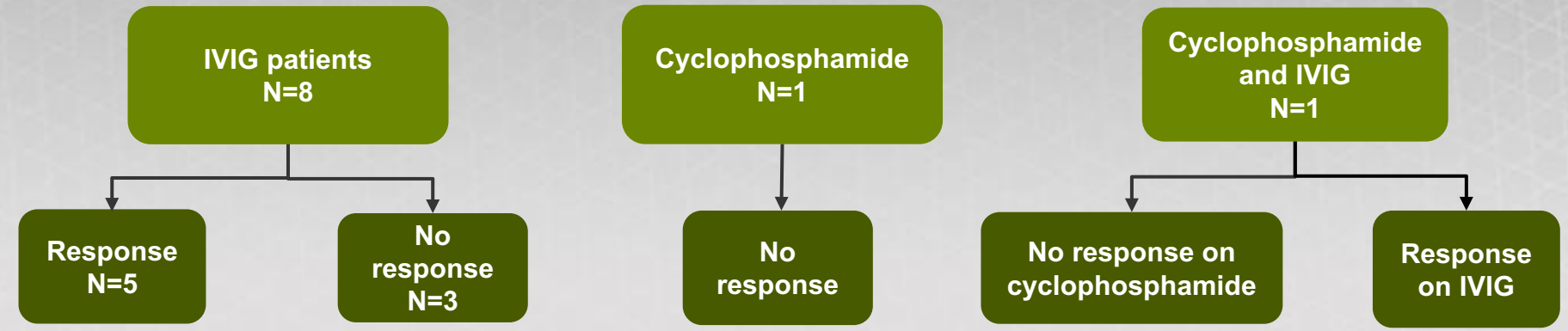
- Motor amplitudes were reduced on distal stimulation in at least one nerve in 14 patients
  - Of these, 8 patients had at least one nerve with pure axonal features

- Lower-extremity weakness was more commonly associated with axonal features in the study of 16 MMN patients, and was seen in:

All nerves with CB	All nerves with prolonged F waves	9/11 nerves with possible CB	5/10 nerves with temporal dispersion

1. Katz JS *et al*. Neurology. 1997;48:700-7.

Treatment Efficacy[1]

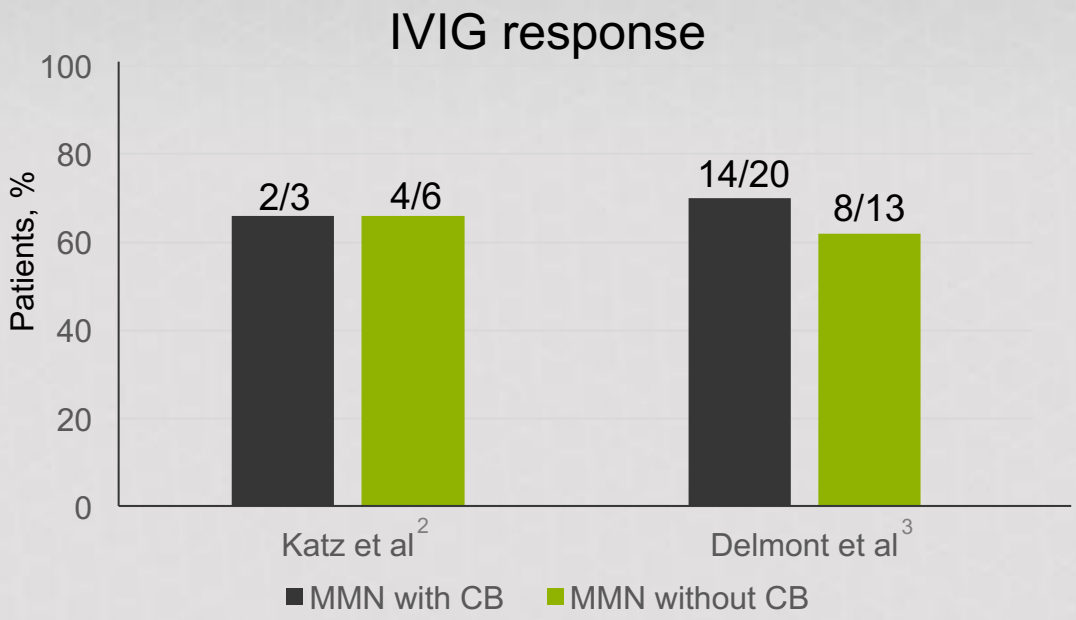


- Response was classed as improvement of at least one Medical Research Council score grade in any muscle group or 30% improvement in handgrip dynamometry
- Response to immunotherapy was variable in patients with distal lower motor neuron weakness without CB

1. Katz JS *et al*. Neurology. 1997;48:700-7.

IVIG Efficacy for MMN With or Without CB

- IVIG is a standard treatment for MMN[1]
- IVIG has been shown to be effective in MMN with and without CB[2]



1. EFNS-PNS Joint task Force J Peripher Nerv Syst. 2010;15:295-301.
2. Katz JS *et al*. Neurology. 1997;48:700-7.
3. Delmont E *et al*. Neurology. 2006;67:592-6.

Summary[1]

- Although considered an electrophysiological hallmark of MMN, some MMN patients have been reported to have a typical clinical presentation and good response to IVIG even when CB is not found[2]
- Diagnostic criteria for MMN requiring CB may therefore result in underdiagnoses
- Other electrophysiologic features that appear associated with MMN include:
  - Prolonged distal latencies
  - Temporal dispersion
  - Slow conduction velocity
  - Delayed or absent F-waves
- Awareness of this spectrum of features in MMN is important to increase recognition of this neuropathy

1. Katz JS *et al*. Neurology. 1997;48:700-7.
2. Meuth SG *et al*. Eur Neurol. 2010;63:193-204.