Is Combined Patelar Tendon Reflex-Motor Evoked Potentials to lower limb (T-MEP-LL) a useful tool to show corticospinal impairment and diagnose ALS?

a monocentric cohort

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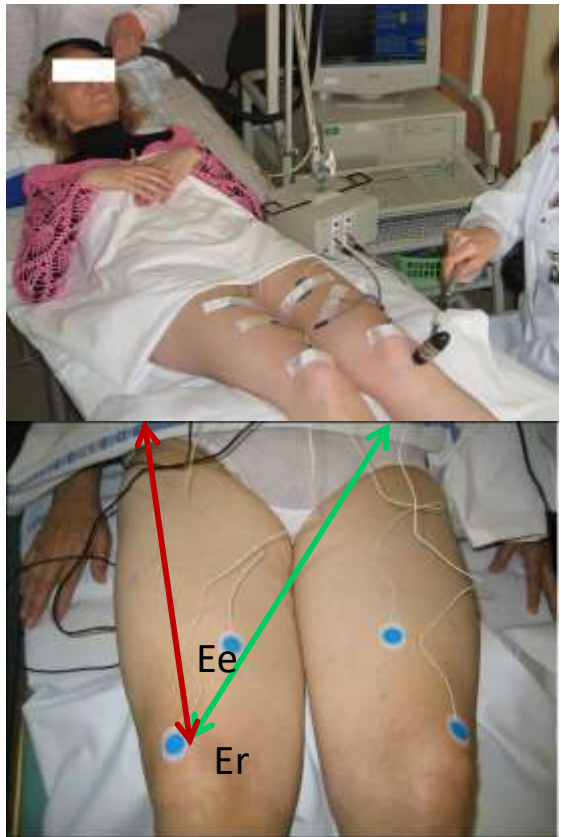
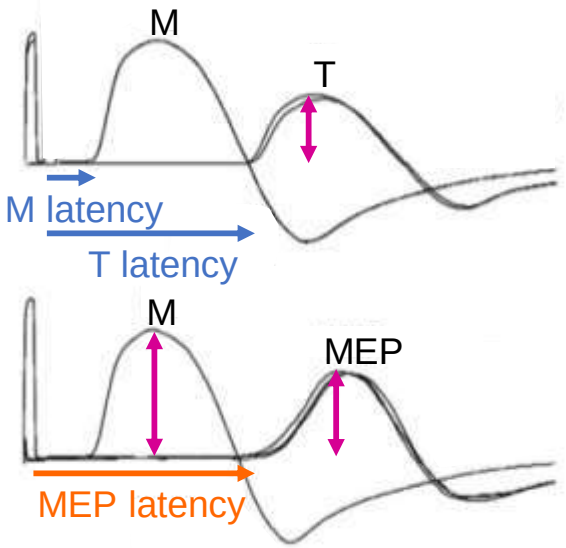
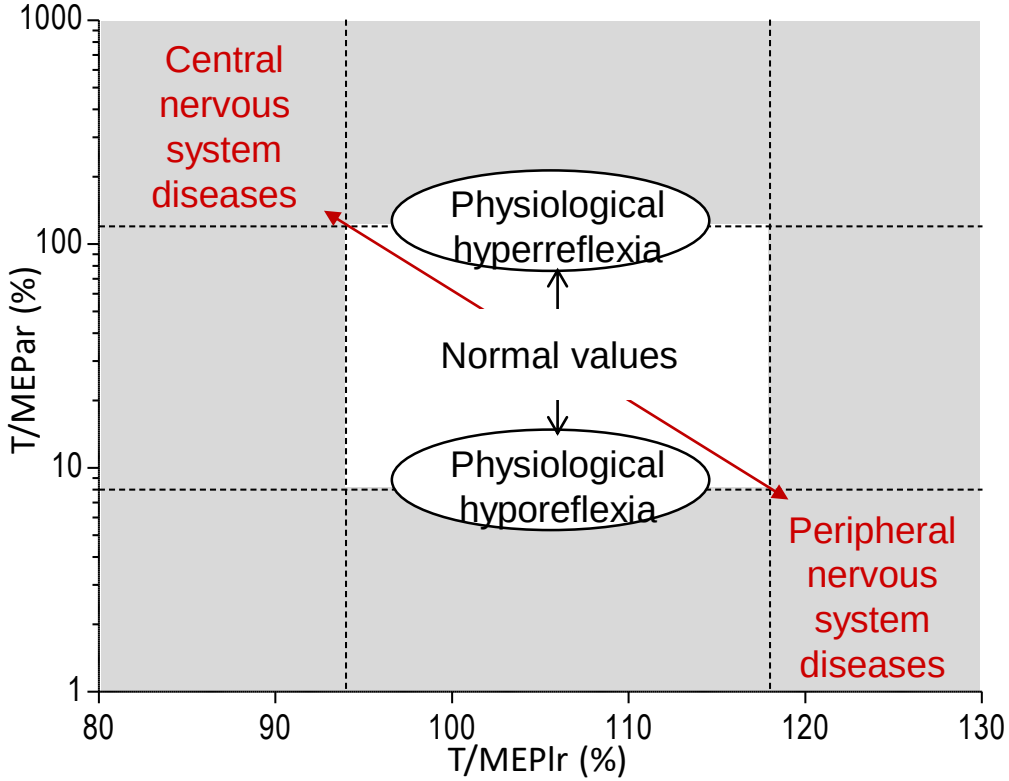
Introduction

Amyotrophic lateral sclerosis (ALS) diagnosis needs identification of upper motor neuron (UMN) and lower motor neuron (LMN) dysfunctions. Contrary to LMN, UMN signs are defined only by clinical examination regardless of the diagnostic criteria used. Clinical UMN signs are sometimes difficult to assess due to the combination with LMN signs which may mask them, but transcranial magnetic stimulation (TMS) techniques can help to assess it.

We describe a new TMS technique which could be another method useful in assessing dysfunction of UMN and peripheral conductions. T-MEP-LL combines motor evoked potentials (MEPs) recorded on the quadriceps and the recording of the patellar T reflex (PTR). We evaluate T-MEP-LL in a monocentric study in a large number of ALS patients at their diagnostic assessment







Peripheral motor conduction time (PMCT) = (Tlat-1)/2 - N≤11.8ms
Central motor conduction time (CMCT) = MEPlat-PMCT - N≤12ms
T/M amplitude ratio (Tar) - N≥ 8.5 and ≤ 72.0%
T/MEP amplitude ratio (TMEPar) - N≥ 8.0 and ≤ 120.0%
T/MEP latency ratio (TMEPlr) - N≥94.0 and ≤ 118.0 %

(Alisauskiene *et al.*, 2007)

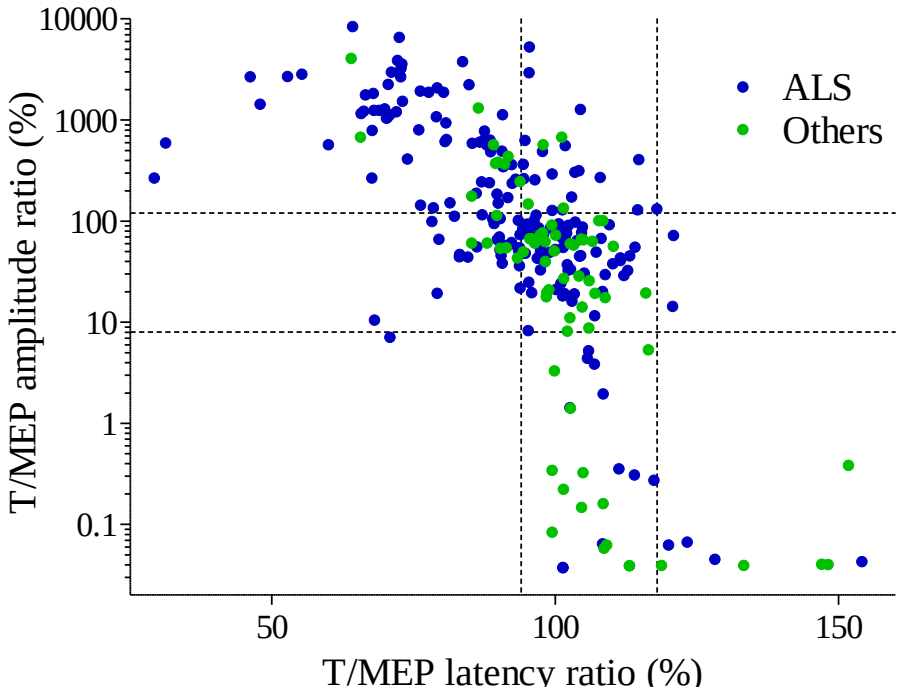
Methods T-MEP-LL was performed on 100 ALS patients and 35 patients with other neurological pathologies, during routine diagnosis explorations. Clinical evaluation of the patients included neurological examination, the revised ALS Functional Rating Scale (ALSFRS-R) and Medical Research Council (MRC) score. Awaji and Gold Coast criteria were determined for each patient.

Results

1) Demographic and clinical data

		ALS (n=100)
Mean age at examination (years)		60.6 ±13.1
Gender (male/female)		64/36
Mean age at disease onset (year)		59.4 ±13.1
Disease onset (%)	Spinal	63
	Bulbar	21
	Generalized	16
UMN signs (%)		60
Number of electroclinicaly	1	10
altered body regions (%)	2	31
	3	59
Awaji criteria (%)	Definite	38
	Probable	20
	Possible	2
	Suspected	40
Gold Coast criteria (%)		92
ALSFRS-R at examination (/48), n=94/100		38.8 ± 6.3
MRC at examination (/150), n=78/100		126 ± 22.1
Mean death age (years)		66.3 ± 12.5
Median disease duration (years)		2.33 [1.26-3.67]

2) TMEPar and TMEPlr in ALS patients (blue) and with other diagnosis (green)



T-PEM-LL has good sensitivity and specificity to detect ALS, with increased specificity in the absence of UMN sign

The three best parameters are CMCT, TMEPlr and TMEPar

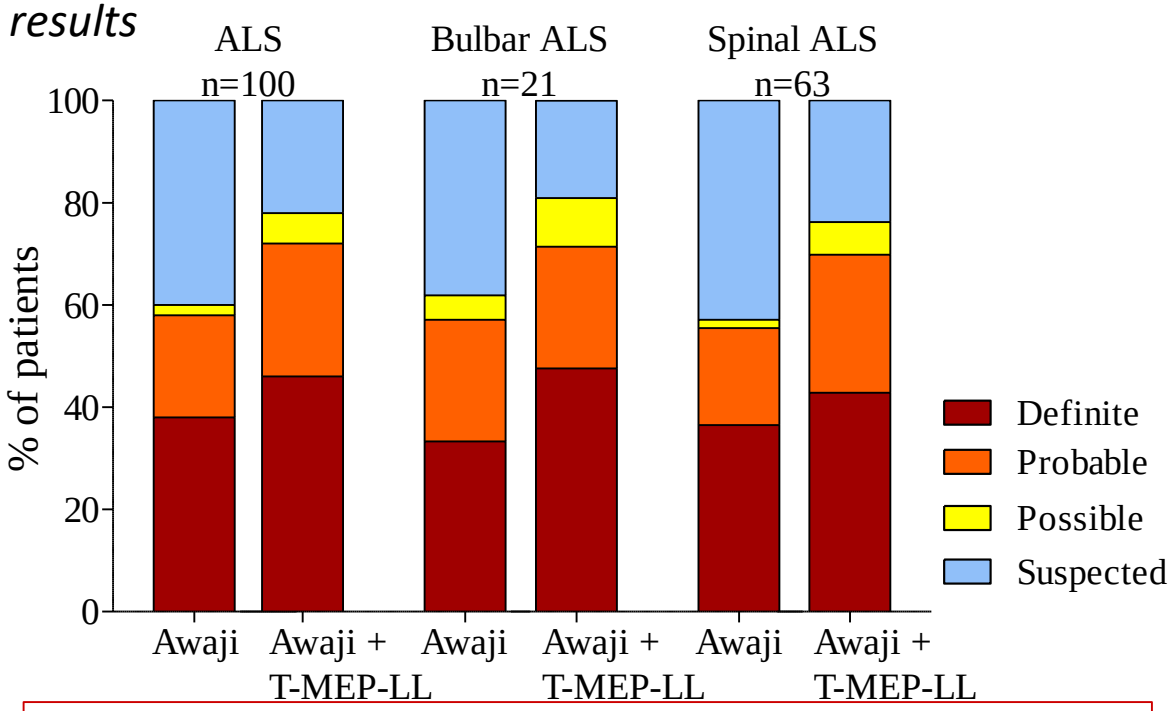
3) Sensitivity and specificity of T-MEP-LL to detect ALS

	Normal values	To detect ALS (n=100)		To detect ALS if no UMN sign (n=40)	
		Sensitivity	Specificity	Sensitivity	Specificity
CMCT (ms)	≤12	76.0	57.1	65.0	66.7
T/MEP latency ratio (%)	≥94 et ≤118	58.0	74.3	37.5	85.2
T/MEP amplitude ratio (%)	≥8 et ≤120	46.0	77.1	22.5	81.5
Altered T-MEP-LL		66.0	68.6	45.0	77.8

Results

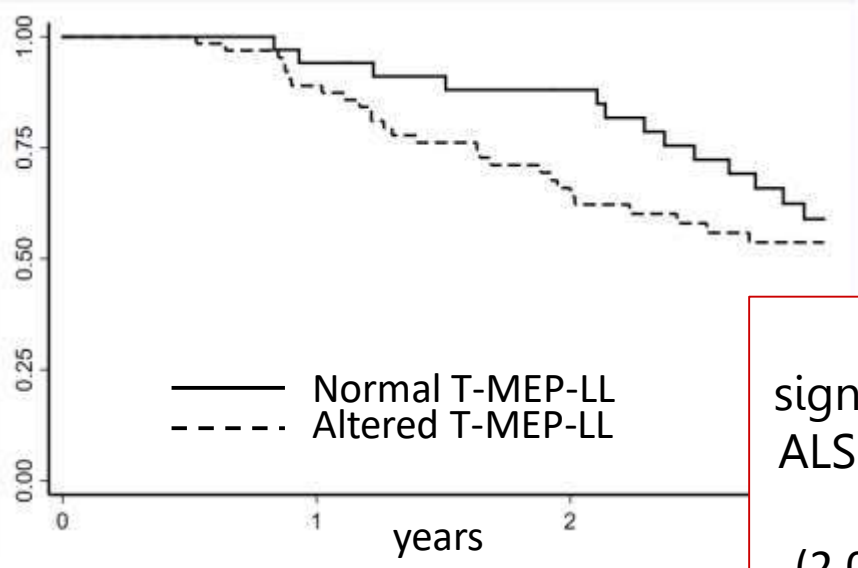
T-MEP-LL results are not correlated to ALSFRS-R and MRC scores.

4) ALS diagnosis depending on Awaji criteria and T-MEP-LL results



ALS certainty diagnosis is increased if T-MEP-LL results are included in diagnosis criteria

5) Kaplan Meier curves of ALS patients (n=62) depending on T-MEP-LL results



Time to death is significantly decreased in ALS patients with altered T-MEP-LL (2,03 years [1,26-4,80] vs 3,16 [2,29-4,59], p=0.04).

Conclusion Aside satisfactory sensitivity and specificity, the advantage of T-MEP-LL is the exploration of the whole corticospinal track by recording the responses on the quadriceps. Moreover, considering the three most sensitive and specific values CMCT, TMEPlr and TMEPar, there is no need to record the CMAP peripheral (M) response on femoral nerve, which can be technically difficult and painful, and whose results may fluctuate depending on the target muscles. Then, this approach could be easier, quickly performed and painless.

T-MEP-LL, by the combination of patellar tendon reflex study (T amplitude and latency) to MEP to lower limb (MEP latency, CMCT, MEP amplitude), is simple and could improve diagnosis of ALS, especially when clinical UMN sign is lacking.