Impact of neuro-cognitive reprogramming in spasticity rehabilitation.

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SUMMARY AND OBJECTIVES

Spasticity affects 40% of patients following a stroke. It has functional consequences for daily life and on the patients' suffering from anxiety and depression (1,2).
After a stroke, walking is probably the most coveted function by the patient and his family. It is ruled by the cohabitation of different signs of the pyramidal syndrome.

Neuronal plasticity after aggression leads to an hyperexcitability of the interneuronal and motoneuron circuits (3,4). **May modulation of these inhibitory-excitatory systems, by the inhibitory descending pathways, the reticulo-spinal pathway, the interneurons and the primary afferences be an answer to the neuro-proprioceptive and neuro-cognitive strategies triggered when neuromotor reprogramming of the spastic muscle ?**

EQUIPMENT AND METHOD

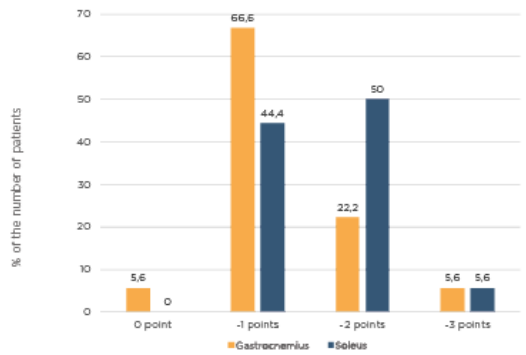
The neuromotor reprogramming method used is an innovative process combining proprioceptive sensations, motor imagery work and sequences of low frequency sounds performed by a medical device.

Retrospective observational study of a series of 22 patients following a stroke with sural triceps spasticity (TS), treated between February and November 2018. The assessment criteria were collected in daily practice before (T0) and after (T1) taking over : TS spasticity for all patients (modified Ashworth scale), with an evaluation after 1 month (T2) for 10 of them.

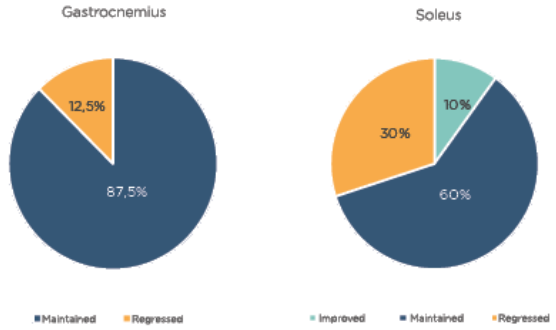
This analysis is completed by a 10-meter walk test, a video analysis of kinematic walking and impacts on life quality (SF12 scale) for 4 of them (P1, P2, P3, P4).

RESULTS

Ashworth score reduction before and after session (T0/T1) (n=22)



Ashworth score evolution after 1 month (T2) (n=10)



10-meters walk test

Speed (cm/sec)	T0	T1	T2	Evolution after 1 month
P1	43,97	44,48	54,14	**+23%**
P2	147,93	160	165,84	**+12%**
P3	126,58	135,13	146,63	**+16%**
P4	73,10	77,40	76,39	**+4,50%**

Step length (cm)	T0	T1	T2	Evolution after 1 month
P1	43,48	45,45	50	**+15%**
P2	62,50	66,67	66,67	**+7%**
P3	66,67	71,43	71,43	**+7%**
P4	55,56	58,82	58,82	**+6%**

Video analysis: foot placement to walk

SF12 results

Patient	Data	T0	T2	Δ (points)
P1	Physical score	42,54937	33,81623	**-8,73**
	Mental score	36,37023	47,04122	**+10,7**
P2	Physical score	35,79843	44,54077	**+8,74**
	Mental score	43,63644	51,71089	**+8,1**
P3	Physical score	30,46357	25,78743	**-4,68**
	Mental score	28,73025	34,71508	**+6**
P4	Physical score	41,01804	41,01917	**0**
	Mental score	46,12798	49,18449	**+3,05**

CONCLUSION

Modulation of mechanisms responsible for spasticity seems to give rehabilitation potential according to this neuromotor reprogramming process. Evaluation by **Ashworth scale** underlines an average spasticity diminution of patients by **1.41** points post session, with score maintenance after 1 month of **70%** of them.
Functional analysis on 4 patients shows an **increase of walking speed and stride length** obtained at the end of the session and confirmed, even improved after 1 month (10-meters walk test). 3 patients out of 4 find back a **physiological anterior half step** with a step by the heel (video analysis).

SF12 mental score after 4 weeks is **improved** for 4 patients out of 4, and physical score for 1 patient out of 2.

Complementary clinical studies would be relevant to objectify clinical performance of this new reprogramming approach.

(1) OMS. Maladies non transmissibles. OMS, Centre des médias ; aide-mémoire n° 355, Juin 2017.
(2) Gautier A, Kubiak C, Collin JF. Qualité de vie : une évaluation positive. Baromètre santé 2005/Atti tudes et comportements de santé. INPES 2005;45-64.
(3) Trompetto C, Marinelli L, Mori L, et al. Pathophysiology of Spasticity : Implications for Neurorehabi litation. BioMed Research International. 2014;2014:354906. doi10.1155/2014/354906.
(4) Jeannerod M. Plasticité du cortex moteur et récupération motrice. Motr Cer 2006;27(2):50-6.
(5) Klimesch W. EEG-alpha rhythms and memory processes. Int J Psychophysiol 197;26:319-40.
(6) Roll J-P, Roll R. La proprioception musculaire : sixième sens ou sens premier. Physiologie de la kinesthèse. Intellectica 2003;36-37:49-66. 9.
(7) Bohannon RW, SmithMB. Interraterreliability of a Modified Ashworth Scale of muscle spasticity. Phys Ther. 1987;67:206-7.