VIDEO AND TEMPORAL SPATIAL PARAMETER ASSESSMENT OF GAIT PRE/POST ABOBOTULINUMTOXINA TREATMENT

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INTRODUCTION

Hemiparesis from acquired brain injury (ABI) may impair mobility related to abnormal passive and active antagonist muscle resistance. Walking speed stabilizes at a low plateau level in most cases which is inadequate to sustain community ambulation.[1] Equinovarus and equinus ankle posture are the most common presentations observed in this population. [2] The deformity is difficult to asses because of the redundancy of muscles. Although botulinum toxin reduces muscle tone and improves spasticity-related features in the lower limb, muscle selection that results in improved walking velocity and symmetry has not been explored.[3] Improvement in velocity and symmetry will address challenges to dynamic balance, 2) gait inefficiencies and 3) reduced activity levels.

OBJECTIVES

Primary objectives: To evaluate the use of slow-motion video assessment in addition to physical examination to improve muscle selection for the injection of abobotulinumtoxinA to improve walking velocity at self selected (SSV) and as fast as possible (MV) .

Secondary objectives: To evaluate the effect on walking symmetry, ankle passive range of motion (PROM), Modified Ashworth Scale (MAS) and Tardieu Scale (TS).

METHODS

Participants: Convenience sample of 10 patients with ABI. To date six participants have completed the study: traumatic brain injury (TBI) n=2; stroke, n=4.

Setting: Gait & Motion Analysis Laboratory in a Tertiary Rehabilitation hospital.

Intervention: AbobotulinumtoxinA (Dysport, Ipsen) (aboBoNTA) dose range of 1000 to 1500 units, distributed to ankle plantar flexors (gastrocnemius and soleus), tibialis posterior and/or long toe flexors, knee extensors and knee flexors, at the discretion of the injector. Slow-motion video assessment reviewed prior to injection and post injection at follow-up (four weeks) under four conditions: SSV and MV with shoes and without shoes.

Main Outcome Measures: (1) SSV; MV; (2) walking symmetry (3) ankle and knee PROM; (4) MAS and (5) TS with knee flexed and extended measured four weeks post injection.

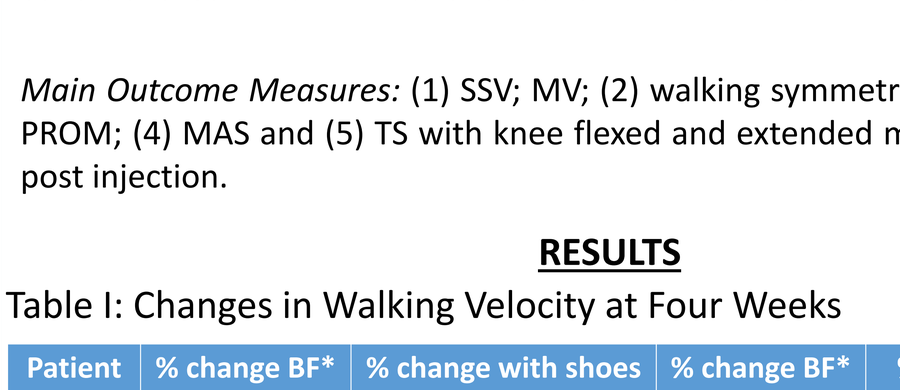
RESULTS

Table I: Changes in Walking Velocity at Four Weeks

Patient ID	% change BF* SSV	% change with shoes SSV	% change BF* MV	% change with shoes MV
001	14.7%	16.7%	11.3%	16.2%
002	-6.9%	-11.4%	-6.9%	6.1%
003	-5.3%	-3.7%	-18.9%	-6.4%
004	44%	25.7%	22.7%	22.0%
005	12.9%	2.4%	47.8%	5.6%
006	5.6%	15.4%	22.2%	27.8%

*BF=barefoot

Figure I: Temporospatial Symmetry Ratios



* Superimposed Pre/Post swing Time Symmetry Ratio

RESULTS

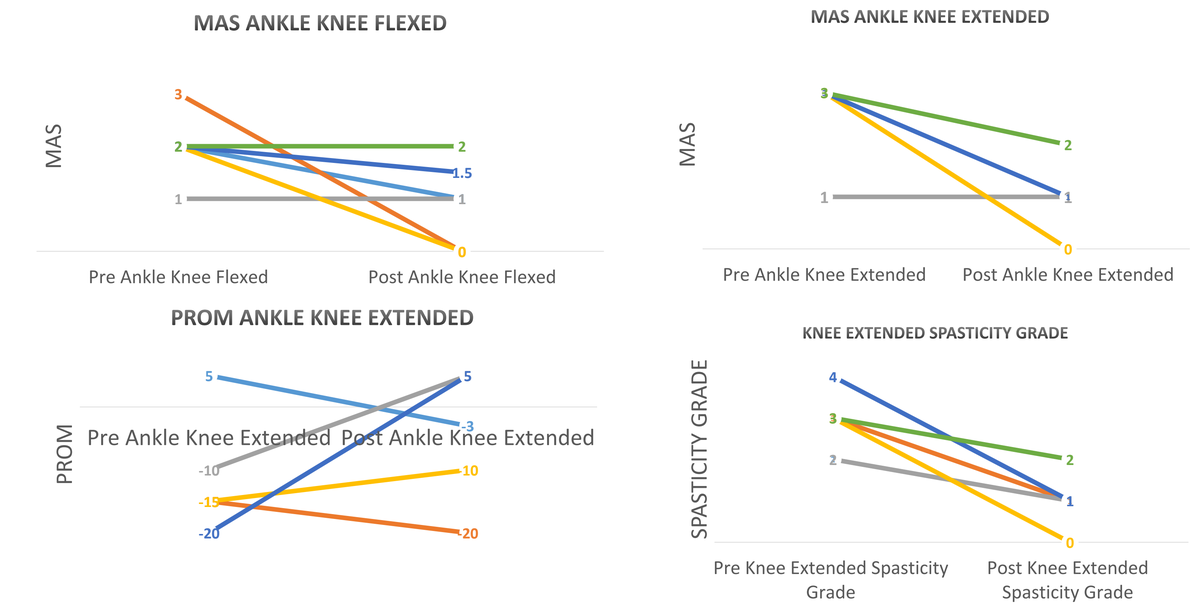


Figure II: Changes in Foot Posture and Gait Performance in a Sample Subject

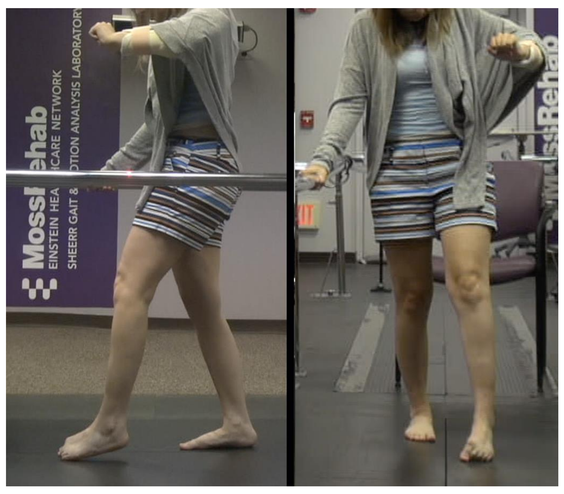


Figure IIa: Pre aboBoNTA Injection

Figure IIb: Post aboBoNTA Injection

Table II: Muscles Injected and Doses

Muscle	aboBoNTA Units Range	Frequency injected
Gastrocnemius	400-500	6
Soleus	200-300	2
Tibialis Posterior	100-250	6
Tibialis Anterior	50	1
FDL	150-350	5
EHL	50	1
FHL	50-150	2

FDL=flexor digitorum longus; EHL=extensor hallucis longus; FHL= flexor hallucis longus

Figure III: Increase in Step Length

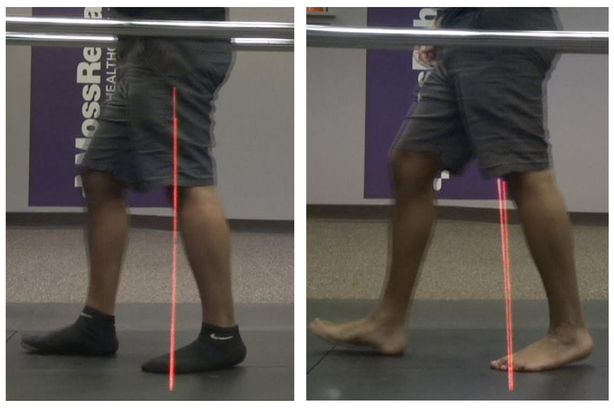


Figure IIIa: Pre aboBoNTA Injection

Figure IIIb: Post aboBoNTA Injection

CONCLUSIONS

Physical examination supplemented by video observation of walking is as an effective tool for muscle selection for treatment with aboBoNTA in the equinovarus foot deformity. An increase in step length and swing time symmetry as seen in Figure I and III resulted in improvement in walking. Changes in MAS, TS and PROM were observed and are indicative of the pharmacological effect of aboBoNTA. Gastrocnemius, TP and FDL muscles were more frequently injected. Velocity improved in most of the patients and gain was larger in the shoe condition. This occurred at the same time that foot posture, comfort and stability were perceived to improve.

REFERENCES

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TOXINS 2019
Basic Science and Clinical Aspects of Botulinum and Other Neurotoxins
16-19 January, 2019
Copenhagen, Denmark