

Characterizing Muscle Spasticity Treated with Botulinum Toxin using Quantitative Ultrasound Techniques

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Objectives:

To examine biceps muscle composition that is being treated for spasticity with botulinum toxin using ultrasound

Results:

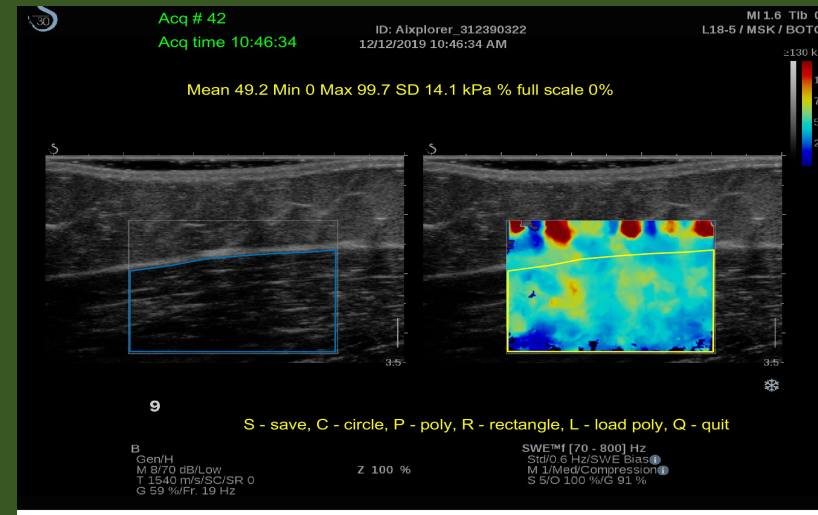
Echogenicity is consistently increased and statistically significant comparing spastic biceps brachii (50.9) to non-spastic biceps brachii (40.5) as an average of all participants with images in longitudinal view with arm flexed at the elbow at 90 degrees.

Although not statistically significant, correlation coefficients showed medium to strong correlation (0.33, P=.29 for echogenicity at 90 deg) between echogenicity and time since injury, toxin exposure. Shear Wave Elastography results show trends that are not conclusive statistically.

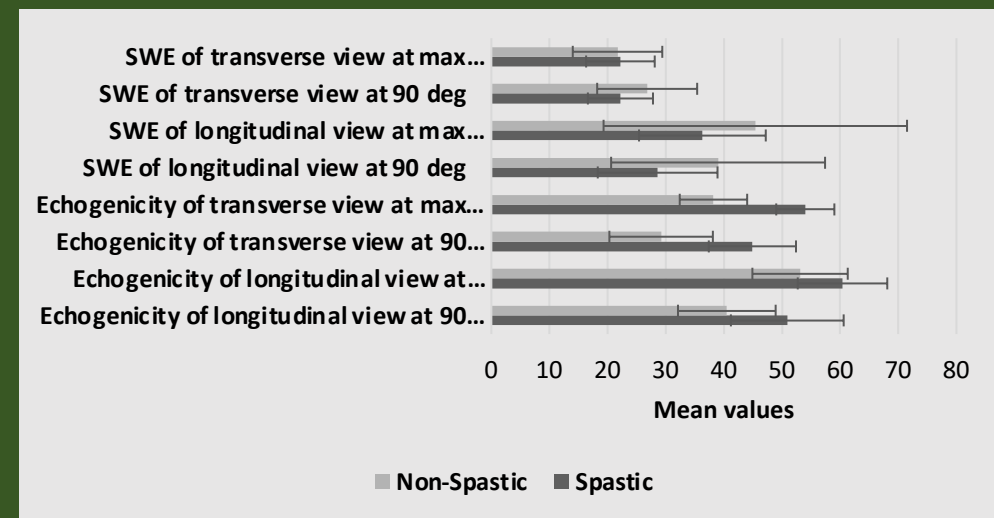
Conclusions:

Reliability was established with good to very good intra-rater and inter-rater reliabilities for the two raters of our study. Paired t-tests comparing spastic biceps brachii to non-spastic biceps brachii shows statistically significant increased fibrotic changes through echogenic values in the spastic muscle compared to the non-spastic muscle. Correlations show increased fibrosis through echogenic values with increased injury duration, increased toxin exposure and worsened functional impairments although not statistically significant. Differences in paired-t tests, as well as correlations, show results that are not statistically significant showing and generally inconclusive with regards to stiffness of muscle as measured by shear wave elastography.

Higher cumulative toxin dose associated with more muscle fibrosis



Age	Gender	Diagnosis	Injury Time	Side Affected	Hand Dominance	ArmA SecA	ArmA SecB	BMI	Cumulative Toxin Exposure	Toxin Type	Spasticity Meds	Seizure Meds	Max Ext Angle	MAS
56	female	stroke	250	Left	Right	16	52	28	1390	OnaBotA	None	None	145	2
49	male	stroke	39	Right	Right	12	47	28	720	OnaBotA	None	None	145	2
35	male	TBI	106	Left	Right	10	42	26	1130	OnaBotA	None	None	147	1+
62	male	stroke	15	Right	Right	16	29	30	60	IncoBotA	None	None	165	1+
63	male	TBI	55	Right	Right	3	43	24	90	IncoBotA	None	Depakote 750mg BID	165	1+
40	male	stroke	40	Left	Right	1	40	32	325	OnaBotA	10mg BID	None	150	2
29	male	stroke	120	Left	Left	20	48	27	800	OnaBotA	None	Lamotrigine 125mg BID	160	2



	Echogenicity At 90 deg	P	Echogenicity At max angle	P	SWE At 90 deg	P	SWE At max angle	P
Injury Duration	0.33	.29	0.43	.18	0.14	.65	0.62	.05
Toxin exposure	0.52	.10	0.43	.18	-0.23	.45	0.81	.01
Toxin exposure/ Injury Duration	0.23	.28	0.58	.05	0.03	.71	0.06	.61
ArmA SecA	0.49	.13	0.39	.22	0.39	.22	0.39	.22
ArmA SecB	0.52	.10	0.43	.18	-0.24	.45	0.81	.01