DYNAMIC CHANGES IN SOME FACIAL MUSCLES AFTER SUPERFICIAL VERSUS DEEP HYALURONIC ACID INJECTION: AN ELECTROMYOGRAPHIC STUDY

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Introduction

According to American Society of Plastic Surgeons (ASPS) 2020, among middle-aged females worldwide, soft tissue filler injection is the second most popular minimally invasive cosmetic procedure. The majority of injectable filler procedures seek to enhance local volume at a desired aesthetic location, but there is insufficient research or realization of the possible regional or panfacial effects.

Facial electromyography (EMG) is a technique for measuring facial muscle contractions. Unlike needle electrodes, surface electrodes do not cause discomfort or infection and do not require medical training. ,Dermal fillers are now used for more than just managing static rhytides and volume restoration; they can also be used to purposefully alter the balance and contractility of the facial musculature. In order to either enhance or impede muscle action, myomodulation involves carefully placing dermal filler in the area of the sphincter or facial mimetic muscles. Three fundamental elements, in addition to these traits, contribute to the function of muscle movement in facial expression: the length-tension relationship, muscle pulley and lever systems, and the action of functional muscle groups.

Aim of the work

Assessment of the electrophysiological changes in some facial muscle dynamics following hyaluronic acid filler injection after superficial versus deep level of injection.

Patients and Method

Thirty healthy females were subjected to injection of cross-linked hyaluronic acid fillers on both sides of the face in 3 different regions: temples, malar region and chin.Each female received the injection of 0.3 ml of 25mg/ml hyaluronic acid filler (Teosyal Ultradeep®, Teoxane, Geneve, Switzerland) in each particular facial region at superficial level to the muscle (subcutaneous) on the left side using a cannula (22G,50mm) and the same amount at deep level to the muscle (supraperiosteal) on the right side using a needle (27G,30mm).Each female underwentbaseline quantitative surface electromyography (QS-EMG) before injection, and Follow up QS-EMG one week after the injection using the parameters: activity (ms/s), turns/second, and amplitude/turn (mV).

Results

Table (1):Temporalis, zygomaticus major, and mentalis muscles force of contraction before and after superficial versus deep hyaluronic acid fillers injectionregarding the activity (ms/s) (n=30)

		Deep injection (Right side)	Superficial injection (Left side)	Test of Sig.	p
Temporalis muscle	Before injection				
	Min. – Max.	2.0 – 324.0	2.0 – 227.0	Z= 0.854	0.393
	Mean ± SD.	95.63 ± 66.16	82.80 ± 44.84		
	Median (IQR)	85.0 (59.0 – 115.0)	79.0 (55.0 – 92.0)		
	After injection				
	Min. – Max.	53.0 – 382.0	14.0 – 286.0	Z= 4.700*	<0.001*
	Mean ± SD.	223.4 ± 93.17	107.4 ± 79.46		
	Median (IQR)	221.0 (136.0 – 307.0)	89.0 (40.0 – 142.0)		
	Increase	127.7 ± 76.92	24.60 ± 71.44	Z=4.289	<0.001*
	Z0 (p0)	4.721* (<0.001*)	1.800 (0.072)		
Zygomaticus major muscle	Before injection				
	Min. – Max.	1.0 – 5.0	1.0 – 30.0	1.953	0.051
	Mean ± SD.	2.17 ± 1.62	4.0 ± 5.90		
	Median (IQR)	1.0 (1.0 – 3.0)	2.0 (1.0 – 4.0)		
	After injection				
	Min. – Max.	1.0 – 13.0	1.0 – 25.0	1.312	0.190
	Mean ± SD.	5.07 ± 3.29	6.57 ± 4.80		
	Median (IQR)	4.0 (3.0 – 6.0)	5.50 (3.0 – 8.0)		
	Increase	2.90 ± 3.14	2.57 ± 2.61	0.317	0.751
	Z0 (p0)	4.063* (<0.001*)	3.849* (<0.001*)		
Mentalis muscle	Before injection				
	Min. – Max.	6.0 – 163.0	11.0 – 175.0	Z= 1.420	0.156
	Mean ± SD.	55.63 ± 44.12	44.63 ± 39.68		
	Median (IQR)	40.0 (25.0 – 69.0)	24.0 (17.0 – 63.0)		
	After injection				
	Min. – Max.	1.0 – 35.0	1.0 – 41.0	Z= 0.433	0.665
	Mean ± SD.	12.17 ± 10.86	12.73 ± 11.14		
	Median (IQR)	8.50 (3.0 – 18.0)	8.50 (4.0 – 18.0)		
	Decrease	43.47 ± 44.03	31.90 ± 33.42	Z=2.058 *	0.040*
	Z0 (p0)	4.783* (<0.001*)	4.783* (<0.001*)		

IQR: **Inter quartile rang** SD: **Standard deviation** **t: Paired t-test**Z: **Wilcoxon signed ranks test**
p: p value for comparing between **Right** and **Left** in each period*: Statistically significant at $p \leq 0.05$
p_0: p value for comparing between **Before injection** and **After injection** in each side

HA fillers injection in the temples and the malar area was associated with significant increase in the temporalis and the zygomaticus major muscles force of contraction respectively after supraperiosteal injection and insignificant increase after superficial injection. On the other hand, injecting HA fillers in the chin was associated with significant decrease in the mentalis muscle force of contraction after superficial and deep supraperiosteal injection.

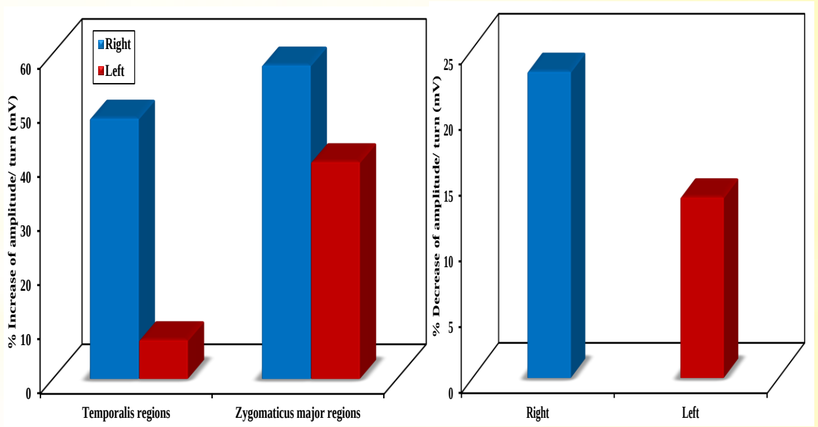

Figure (1): Percentage of increase in the amplitude/turn (mV) of the temporalis, zygomaticus major and mentalis muscles force of contraction after superficial (left side) versus deep (right side) hyaluronic acid fillers injection (n=30):

Conclusion

HA fillers injection in the temples and the malar area was associated with significant increase in the temporalis and the zygomaticus major muscles force of contraction respectively after supraperiosteal injection and insignificant increase after superficial injection. On the other hand, injecting HA fillers in the chin was associated with significant decrease in the mentalis muscle force of contraction after superficial and deep supraperiosteal injection.