

## NORMATIVE MULTI-MUAP DATA FOR THE PUBOVISCERALIS MUSCLE GROUP

### Hypothesis / aims of study

The muscles of the pelvic floor closest to the vaginal opening are subject to the greatest degree of stretch during vaginal childbirth [1]. Only one previous manuscript delineated normative data of motor unit action potentials (MUAPs) for the levator ani, but those data were for deeper muscles within 1 cm of the ischial spine. [2] We aim to define normative MUAP parameters for the distal pubovisceralis muscle in nulliparous women.

### Study design, materials and methods

We studied the first 31 asymptomatic women enrolled in an ongoing prospective study evaluating the effect that pregnancy and childbirth have on the pelvic floor nerves and muscles using concentric needle electromyography (EMG). Using an index finger just inside the vaginal introitus, the distal pubovisceralis muscles were pinched between the thumb and index finger. Separately for the right and left sides, we inserted a 37 mm concentric needle electrode transvaginally until crisp EMG motor unit activity was heard. We recorded the EMG signal directly onto the Medtronic Keypoint EMG system equipped with the .NET software package. Bandpass filters were set at 5Hz – 10 kHz. The concentric needle was then sequentially moved approximately 5 mm in a standardized fashion 3-4 times (distal to proximal, perpendicular to muscle fibers) to sample unique motor unit territories. A new recording was created for each territory to avoid repeat sampling. Using the recorded signal and the multi-MUAP algorithm, motor units were identified and selected. This same technique was used for the external anal sphincter on these same subjects.

### Results

The study subjects were 31 (SD 4) years old with a BMI of 24.6 (SD 6). 91% were Caucasian. For the pubovisceralis and EAS muscles respectively, 765 (25 per subject) and 770 (25 per subject) MUAPs were sampled for this data set. The Kolmogorov-Smirnov Test demonstrated only Size Index to be normally distributed in both the PV and EAS muscles. MUP parameters for the EAS are similar to previously published data [3].

The MUAP parameter data for the pubovisceralis muscle is shown in the table below.

	PV Mean (SD)	PV 5 <sup>th</sup> - 95 <sup>th</sup> Percentile Limits (outlier)	EAS Mean (SD)	EAS 5 <sup>th</sup> -95 <sup>th</sup> Percentile Confidence Limits (outlier)	*p-value
Amplitude (mV)	412 (283)	(121, 940)	379 (294)	(116, 922)	< 0.001
Duration (ms)	6.2 (2.9)	(2.4, 11.3)	5.1 (2.6)	(1.8, 10.1)	< 0.001
Area (mV_ms)	326 (254)	(68, 817)	248 (240)	(57, 700)	< 0.001
Area/Amplitude (ms)	0.82 (0.39)	(0.35, 1.53)	0.66 (0.31)	(0.31, 1.29)	< 0.001
Size Index	-0.12 (0.64)	(-1.19, 0.95)	-0.37 (0.63)	(-1.32, 0.79)	< 0.001
Phases (n)	3.1 (1.4)	(2.0, 6.0)	3.1 (1.4)	(2.0, 6.0)	0.166
Turns (n)	2.8 (1.6)	(1.0, 6.0)	2.5 (1.6)	(1.0, 6.0)	< 0.001

\* PV compared to EAS (Mann-Whitney U)

### Interpretation of results

MUAP parameters for the pubovisceralis are larger and more complex than those for the EAS. All the parameters appear smaller than those previously published for a different location in the levator ani muscle.

### Concluding message

This pubovisceralis portion of the levator ani complex is electrophysiologically different than both the external anal sphincter and the deeper portion of the levator ani. This will prove to be important for research involving neuropathic changes associated with parturition.

### References

- LIEN KC, MOONEY B, DELANCEY JO, ASHTON-MILLER JA. Levator ani muscle stretch induced by simulated vaginal birth. *Obstet Gynecol* 2004;103:31-40
- WEIDNER AC, SANDERS DB, NANDEDKAR SD, BUMP RC. Quantitative electromyographic analysis of levator ani and external anal sphincter muscles of nulliparous women. *Am J Obstet Gynecol* 2000;183:1249-56
- GREGORY WT, LOU JS, STUYVESANT A, CLARK AL. Quantitative electromyography of the anal sphincter after uncomplicated vaginal delivery. *Obstet Gynecol* 2004;104:327-35

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<b>What were the subjects in the study?</b>	<b>HUMAN</b>
<b>Was this study approved by an ethics committee?</b>	<b>Yes</b>
<b>Specify Name of Ethics Committee</b>	<b>Institutional Review Board</b>
<b>Was the Declaration of Helsinki followed?</b>	<b>Yes</b>
<b>Was informed consent obtained from the patients?</b>	<b>Yes</b>