

## THE PERINEAL COMPOUND MUSCLE ACTION POTENTIAL AND SYMPTOM SEVERITY IN WOMEN WITH STRESS INCONTINENCE

### Aims of Study

Pudendal nerve stimulation and the recording of a response from a urethral ring electrode in female Urodynamic Stress Incontinence (USI) has been previously described (1,2) although these studies emphasised the latency of the response (Perineal Terminal Motor Latency). Recently however it has been proposed that the amplitude would be more meaningful (3), since the amplitude of a compound muscle action potential (CMAP) reflects the number of excitable motor units in a muscle. It was therefore hypothesised that the CMAP of the striated urethral sphincter (perineal CMAP) would provide information about the extent of denervation of the muscle and those women with a low CMAP would have more severe USI. Thus, we aimed to correlate the CMAP with the 24-h pad test, the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), a urinary diary, and pelvic floor strength on Oxford Scale.

### Methods

Prior to Perineal CMAP testing, pelvic floor strength was tested (Oxford Scale). Severity of USI was assessed using a 24-h pad test, urinary diary, and ICIQ-SF. Exclusions to entry were: detrusor overactivity, voiding dysfunction, >Grade 1 cystourethrocele.

Perineal CMAP testing: 14F Foley catheter with ring electrode 1cm from catheter balloon was inserted. A St Mark's electrode was applied to a gloved index finger inserted vaginally towards right ischial spine. A supramaximal pulsed stimulus at 1Hz was applied bilaterally (Stimulus duration 0.02ms; High frequency filter 5000Hz; Low frequency filter 5Hz; Neurosuite module; Duet Multi-P, Medtronic). Position of stimulating finger was adjusted to find a maximal and reproducible CMAP measurement. Recordings were analysed for latency and amplitude.

Perineal CMAP tests and Oxford scores were performed by one experienced investigator, who undertook a "learning curve" of 25 CMAP tests prior to this study. All tracings were reviewed by an expert clinical neurophysiologist. The quality of responses were classified into: 1) Technically Valid responses (i.e. measurable and suitable for analysis), 2) Invalid responses (not possible to analyse because of poorly formed potentials or abnormally slow risetimes or 3) Stimulus Artefact.

A subset of patients underwent repeat testing thereafter (repeatability tested by ANOVA). Correlation between CMAP amplitude, 24-hour pad test and ICIQ-SF was tested (Kendall's Rank). As Oxford scoring is an ordinal measure whose sensitivity to change has not been proven, only CMAP amplitudes of women with very low and very high Oxford scores were compared (Mann-Whitney U test).

### Results

Forty-six women -34 with primary (no prior surgery) and 12 secondary (prior surgery) USI were tested bilaterally (n=68 and 24). Mean age was 52 years (SD +/-11) and median parity 2 (IQR 1-3).

Twelve women underwent repeat perineal CMAP testing: 2 showed persisting invalid responses. In the remainder, repeatability was confirmed adequate (ANOVA p<0.001).

In the primary USI group only 50/68 tests showed measurable responses suitable for analysis (15/24 tests analysed in the secondary group). Invalid responses did not vary between left/right sides and between primary/secondary groups (Fisher's Exact P=0.6; P=0.5). Only three patients (1 primary and 2 secondary) showed bilateral invalid responses. The amplitude and latency of the measurable responses did not differ between USI groups or patient left/right side (Table 1).

Table 1. Subgroup Results of Valid Perineal CMAPs

		Right CMAP	Left CMAP	P	Right Latency	Left Latency	P
Primary USI	N Median IQR	28 39uV (20-60)	22 50uV (34-75)	.13	28 2.1ms (1.9-2.4)	22 1.9ms (1.9-2.4)	1.0
Secondary USI	N Median IQR	7 29uV (18-52)	6 54uV (36-91)	.21	7 2.0ms (1.9-2.6)	7 1.9ms (1.8-2.5)	.75
Mann-Whit		.33	0.8		1.0	0.9	

Both Right and Left measurable CMAPs failed to correlate with severity measures (24hPT-tau-b=0.02,P=0.02; ICIQ-SF-tau-b=0.03,P=0.33). However, CMAPs were significantly higher in women with Oxford scores of 4-5, versus those with low scores (Mann-Whitney P 0.001; P 0.01).

### **Conclusion**

If the degree of striated urethral sphincter denervation affects severity of leakage, the lack of correlation in this study (CMAP vs Pad Test) casts doubt as to the ability of CMAP to measure denervation at that site. While Perineal CMAP appears to have adequate repeatability, the overall quality of recordings was poor by clinical neurophysiological standards and the mean amplitude of even good quality recordings was extremely low. This and the number of invalid responses or traces marred by stimulus artefact makes this an unreliable clinical test. The association between lower CMAP readings with reduced pelvic floor strength may suggest Perineal CMAP represents transmitted responses from nearby levator muscles, which may explain the test's repeatability, but slow rise time and low amplitude.

### **References**

1. BJU 1984. 56(4):401-5.
2. BJOG 1989. 96(1):29-32.
3. Incontinence.2<sup>nd</sup> Edition, 2002. Chapter 8B:390-425.