Surgeons-Don't Forget To Calibrate!
Findings From A Sacral Nerve Test Stimulator

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Introduction:

Sacral nerve stimulation testing (TSNS) for chronic constipation is not accurately predictive of a long-term response[1]. The decision to implant a permanent device relies on these results.

Aim:

We recognised that the testing stimulator was an analogue device with potentially inaccurate dial settings. We sought verification of the output waveform.

Method:

19 test stimulators were connected to a cross-calibrated oscilloscope. The output Frequency (f), and Pulse Width (pw) of the waveforms generated were measured according to: run 1) the physician's best attempt to set the dials correctly (pw=210µSec, f=14Hz), and run 2) the closest dial increment to these settings (pw=200µSec, f=10Hz). Output Voltage (V) was measured in run 3 at dial increments of 0V, 1V, 2V, 5V, and 10V.

Results:

We assumed an acceptable margin of error of 20% in runs 1 and 2, and 0.5V in run 3.

There was a marked range of frequency values; run 1)10.6 to 29.0Hz(26% failed), and run 2)7.9 to 13.0Hz(11% failed).

Findings for pulse width were similarly variable; run 1)242 to 326µSec(89% failed), and run 2)215 to 274µSec(63% failed).

All devices had a residual positive voltage at zero(range:0.29 to 1.00V), and the failure rates at 0,1,2,5 and 10V were 53%, 100%, 100%, 68% and 47% respectively.

Conclusions:

All fields of clinical practice and research have their instrumentation which requires calibration to provide verifiable readings. Failure to calibrate during TSNS results in patients receiving variable stimulation, potentially reducing the clarity of research findings, and may be a factor in the poor predictive power of testing in chronic constipation.

References:

[1]Kamm M. et al; Sacral nerve stimulation for intractable constipation:Gut,2010;59:333-340.

Table 1: Results of oscilloscope measurements of SNS test box output waveforms.

	Box	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	FC
Run 1	f	12.2	12.9	11.2	12	12.1	10.8	12.3	18.6	14.3	11.7	13	11.3	12.5	29	14.4	13.3	13.6	17.4	10.6	**5 (26%)**
	Pw	259	292	278	281	295	242	255	283	283	278	283	290	311	307	326	296	272	247	281	**17 (89%)**
Run 2	f	8.7	10.2	8.8	8.8	9.3	8.9	10.1	9.6	10.9	9	9.3	9.1	9.1	13	10.9	10.2	9.9	11.4	7.9	**2 (11%)**
	Pw	215	241	222	244	257	221	228	248	247	243	237	251	274	261	265	259	229	215	246	**12 (63%)**

Run 1 expected waveforms**= 14 Hz, 210µSec**, **Run 2** expected waveforms**=10 Hz, 200µSec**
f= frequency(Hz) Pw= Pulse width (µSec) FC=failure count (<20%, >20% margin of error)