The Effects of Rectal Probe Electrostimulation on Spinal Cord Injury Spasticity

L. S. Halstead, MD, S. W. J. Seager, DVM
National Rehabilitation Hospital, Orlando, Florida, USA.

Summary

Spasticity is a common sequel of spinal cord injury (SCI) with well documented effects on daily activities and increased morbidity. In the course of our fertility studies using rectal probe electrostimulation (RPES) and SCI men to produce ejaculation, we observed that a majority of the men experienced significant improvement in their spasticity for many hours. This paper describes a preliminary effort to quantitate this phenomenon in 14 consecutive subjects treated for anejaculation on 65 occasions in our SCI Fertility Clinic. The effectiveness of RPES on spasticity was evaluated by pre- and post-RPES subject assessment and neurological examinations and follow-up self reports via telephone interviews. Six of the 14 patients (42%) experienced excellent relief following 30 of 33 RPES treatments; 4 (29%) had good to fair relief following 14 of 15 RPES treatments and 4 (29%) had no effect on all 17 RPES trials. The mean duration of relief was 9 hours (3-24). There was no relation between subject age, age of injury, level or completeness of injury or ejaculatory response with relief of spasticity. All men taking medications felt RPES was more effective than drugs in relieving spasms. No untoward effects were reported and 7 (50%) said they would use a home model for daily RPES, if available.

Key words: *Spinal cord injury; Spasticity; Disability; Electroejaculation.*

Spasticity is a common sequel of spinal cord injury (SCI) with well documented effects on daily activities and increased morbidity (Bedbrook, 1981; Trieschmann, 1988). Although there are numerous approaches to the treatment of spasticity, many patients are still unable to find a satisfactory method of managing their spasms with acceptable side effects (Merriitt, 1981). In the course of our fertility

studies using rectal probe electrostimulation (RPES) in SCI men to produce ejaculation, we observed that a majority of the subjects experienced significant improvement in their spasticity for many hours. This paper describes a preliminary effort to quantitate this phenomenon in 14 consecutive men treated for anejaculation on 65 occasions in our SCI Fertility Clinic.

Patients and methods

Patients eligible for RPES were any men with a history of traumatic SCI who were 18 years of age or older, medically stable, and interested in determining their fertility status. After providing informed consent, subjects had a complete medical history and physical examination with special attention to their neurological and urological status. Laboratory evaluations included a baseline urinalysis, urine culture and sensitivity, complete blood count, FSH, LSH, testosterone and HIV test. Subjects with urinary tract infections were treated with appropriate antibiotics and repeat urinalyses and urine cultures were performed on all subjects on a regular basis.

Rectal probe electrostimulation was performed in the outpatient clinic using the standard procedures we have employed for more than 6 years (Halstead *et al.*, 1987). In brief, these include using a 1½ or 1¼-inch diameter rectal probe precision machined from solid bars of PVC. The treatment variables ranged from 5 to 30 volts and 200 to 500 milliamperes, with a 60 cycles/second sine wave. The number of stimulations varied from 12 to 35 with each stimulation lasting approximately 1 second and the whole procedure lasted from 5 to 10 minutes. The effects of RPES were evaluated in subjects using the following methods: (1) *Observer assessment*: Neurological examination by one of the authors to assess the frequency of spasms using the Penn Spasticity Scale (Table, Penn, 1988) and the degree of muscle tone using the Ashworth Muscle Tone Scale (Table, Penn, 1988). Assessments were made with the subjects seated in their wheelchairs or on an examining table. (Deep tendon reflexes in the lower extremities and ankle clonus were also evaluated but not used in the final calculation of the effects of RPES on spasticity); and (2) *Subject assessment*: Subjects assessed the impact of the frequency of their spasms using the Penn Spasticity Scale (Table) and the impact

Table Definitions of Penn and Ashworth scales

Penn spasticity scale		Ashworth muscle tone scale	
Frequency of spasms		Degree of muscle tone	
Spasm Score		Muscle Tone Score	
0	No spasms	1	No increase in tone
1	Mild spasms induced by stimulations	2	Slight increase in tone, giving a 'catch' when affected part is moved in flexion or extension
2	Infrequent full spasms occurring less than once per hour	3	More marked increase in tone, but affected part easily flexed
3	Spasms occurring more than once per hour	4	Considerable increase in tone, passive movement difficult
4	Spasms occurring more than ten times per hour	5	Affected part rigid in flexion or extension

on selected self-care activities using a 5-point scale with zero being no interference from spasms and four being maximum interference which makes the activity impossible to perform.

The observer and the subject assessments were made prior to the stimulation, within 1 hour following stimulation and when possible at 3 hours following the stimulation. Additional assessments by the subject only were made throughout the day and then at the time of telephone contact 24 hours later. For the purposes of this preliminary study, we report only the maximum level of effectiveness (which invariably occurred during the first hour after stimulation) and the duration of effectiveness until the subject regained his usual level of tone and spasticity. The effects of RPES on spasticity were determined by calculating the per cent change in the total pre-stimulation scores (2 by the observer and 2 by the subjects) and the total post-stimulation scores. The overall per cent change was converted to an ordinal scale as follows: 80 to 100% = excellent; 60 to 79% = good; 40 to 59% = fair; 20 to 39% = poor; and 0 to 19% = none.

Results

Fourteen male subjects were treated for anejaculation on 65 occasions in our SCI Fertility Clinic. Six men were quadriplegic and 8 were paraplegic and the mean age was 31.7 years with a range of 22 to 49 years. Time from injury was 10.7 years with a range of 0.5 to 32 years. The level of completeness as reflected in the Frankel Class showed that 6 subjects were Frankel A, 7 Frankel B, and 1 was Frankel C. Six or 42% experienced excellent relief of their spasticity as judged by both their personal assessment and the neurological examination following 30 of 33 RPES treatments. Four or 29% experienced good reduction in spasticity following 14 of 15 RPES treatments and another 29% experienced no relief on all 17 trials.

The mean duration of effect was 9 hours with a range of 3 to 24 hours. On occasion, subjects experienced relief from several days up to a week. There was no relation of the effect of RPES on spasticity with the age of the subject, duration of injury, level of injury, completeness or ejaculatory success.

Of the 6 subjects who were taking spasticity medications, all 6 felt that RPES was more effective than their medications. Those patients who experienced good and excellent relief were essentially flaccid for a number of hours which was a level of relief that none of their medications ever achieved. In addition, subjects noted that RPES was more effective than stretching by physical therapists or use of Regys machine which produces a short term decrease of spasticity in some subjects.

Of the 10 subjects who experienced good to excellent reduction in their spasticity, 7 said they would be interested in using a home model on a daily basis if available.

Subjects who were at risk for dysreflexia all had an elevation of blood pressure but it was controlled within acceptable limits with a combination of sublingual procordia and/or sublingual nitroglycerine. There were no injuries to the rectal mucosa and subjects did not report any other unpleasant or unacceptable side effects.

Discussion

The present study builds on the unexpected observation that electrical stimulation

provided for another purpose, namely, to produce ejaculation also had a profound effect on the spasticity of the majority of men evaluated. What is of particular interest is the degree of relief experienced by many subjects—in some cases, total flaccidity for many hours—and the length of relief—typically 9 hours but in some subjects 24 hours or more.

Most men experience marked spasticity during the short interval of stimulation which may produce some transient muscle fatigue. However, it is unlikely that this explains either the depth or the duration of relief. There is a growing literature which reflects variable success by treating spasticity with electrical stimulation but usually only with short term effects (Bajd *et al.*, 1985; Franek *et al.*, 1988; Little, 1988; Shatin, 1989).

Why RPES should be so effective is not clear although there are several possible explanations: (1) is that there is a rich supply of nerves in the periprostatic area that feed into the lumbosacral cord—so not just a single nerve is being stimulated; (2) the stimulus is delivered closer to the cord than in more traditional forms of peripheral nerve stimulation; (3) the lumbosacral cord is rich in internuncials and short, inhibitory fibers that may enhance and prolong the anti-spasticity effect; and (4) the stimulation may provoke the release of a humoral agent that has anti-spasticity properties.

The major side effect was dysreflexia in subjects with injuries at T6 or above. Because even a small amount of stimulation would produce dysreflexia, we always pre-medicated subjects with sublingual nifedipine 40 to 60 mg and then supplemented this with sublingual nitroglycerine 1/150 mg as needed.

The procedure we have described with its beneficial effects on spasticity is clearly not a practical solution at the present time for the daily management of excessive spasms. However, the goal in stimulating the men in this study was ejaculation, not spasticity control. In preliminary trials with other subjects, we have found that lower levels of stimulation appear to be equally beneficial in relieving spasms. Further, the probes we have used so far were all designed to promote ejaculation. Other, smaller probes with different electrode configurations might be both more effective in treating spasticity and safer. With these and other modifications in the technique, we plan to study larger groups of men as well as women. If the preliminary results reported here are confirmed, we hope it may be possible eventually to design equipment for use at home on a regular basis by carefully selected and trained subjects.

Conclusions

In conclusion, we feel that RPES is effective in reducing spasticity in some spinal cord injured patients. In this group of 14 subjects, spasticity was absent or reduced for a mean period of 9 hours in 71% of the subjects. There was no relation of the effectiveness of the treatment to the patients' age, duration or level of injury, as well as degree of completeness or ejaculatory response. RPES was more effective than medications and there were no unexpected untoward side effects.

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