Yonsei Medical Journal
Vol. 36, No. 5, 1995

☐ Original Article ☐

Sensory Evoked Potential and Effect of SS-cream in Premature Ejaculation

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The cause of premature ejaculation (PE) has been thought to be psychological in the majority of patients but we investigated penile hypersensitivity for an organic basis of PE. For another organic basis of PE, we have suggested hyperexcitability of the ejaculation center. SS-cream is a topical agent containing 9 oriental herbs for treating PE. Clinically SS-cream has been effective in the treatment of PE. Therefore, in order to implicate the organic basis of PE and realize the effect of SS-cream on PE, we investigated the somatosensory evoked potential (SEP) in patients with PE (16 cases) and the effects of SS-cream on SEP for treating PE.

The latencies and amplitudes of the evoked responses were measured by two different places in stimuli, one was on the penile shaft with ring electrode and the other on the glans penis with a surface electrode.

The latency of SEP stimulated at the glans penis was significantly longer than that stimulated at the penile shaft ($p<0.05$). The latency stimulated at the glans penis after applying SS-cream was significantly longer than before applying SS-cream ($p<0.05$), which was near the level of a normal potent man. But the latency stimulated at the penile shaft has no significant difference between before and after the application of SS-cream ($p>0.05$).

The amplitudes of the evoked responses stimulated at the glans penis were significantly higher than those stimulated at penile shaft ($p<0.05$). And both these amplitudes were significantly reduced with the application of SS-cream ($p<0.05$).

With these result, we can suggest that the patients with PE have glans penile hyperexcitability and it provides further implications for an organic basis of PE. SEP stimulated at the glans penis can be a very useful method to evaluate PE, along with SEP stimulated at penile shaft and SS-cream prolongs the sensory conduction and reduces the penile hyperexcitability of the patient with PE.

Key Words: SEP, Premature ejaculation, hyperexcitability, topical application

Premature ejaculation (PE) is an ejaculation that either precedes vaginal entry or occurs immediately after vaginal entry which is uncontrolled (Masters and Johnson, 1970; Murphy and Lipshultz, 1987). The cause of PE has been thought to be psychological in the majority of patients with PE. Proposed causes include performance anxiety, subconscious unresolved conflicts, marital difficulties, and infrequent intercourse (Kaplan, 1989; Strassberg *et al.* 1990). Treatment primarily has involved sex therapy and counseling, although the penile-squeeze technique often is helpful (Semans, 1956; Masters and Johnson, 1970). Psychotropic medications (phenothiazines and anxiolytics) are also tried, but its success is at best modest (Shilon *et al.* 1984; Stine and Collins, 1989). Little is known about the organic basis of PE, but we and other researchers have suggested that the hypersensitivity of

Received August 30, 1995
Accepted November 15, 1995
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the glans penis, and the excessive excitation of the ejaculatory center is the basis for the ejaculation that occurs earlier than desired (Godpodinoff, 1992; Choi *et al.* 1993; David *et al.* 1993; Xin *et al.* 1995).

The dorsal nerve of the penis is involved in sexual function. Until now, the somatosensory evoked potential (SEP) of the dorsal nerve of the penis has been measured by stimuli applied to the penile shaft (Goldstein, 1988). However, the exact and accurate recording of SEP from the glans penis cannot be acquired by this technique.

SS-cream is a newly developing topical agent containing 9 oriental herbs for treating PE. Clinically SS-cream has been proven effective in the treatment of PE (Choi *et al.* 1993; Xin *et al.* 1994).

Therefore, in order to implicate the organic basis of PE and realize the effect of SEP with SS-cream on PE, we investigated the SEP from the glans penis and penile shaft to check the afferent neural potentials of penile peripheral receptor to the cerebral cortex in patients with PE. And the effects of SEP from the glans penis and penile shaft with SS-cream was also evaluated.

MATERIALS AND METHODS

Materials

16 patients with PE visiting the Sexual Dysfunction Clinic of the Yongdong Severance Hospital, Seoul, Korea from October 1994 to March 1995 who agreed to participate in the clinical study of PE and possible treatment by experimental drug were enrolled in the study. Subjects did not exhibit general or neurologic disorders, and their mean age was 40.7 (30-57) years. The onset of PE was puberty in 12, newly onset PE after a period of normal sexual life in 4 patients, and 5 patients exhibited concomitant mild erectile failure. Time elapsed from intromission to emission was immediate in 5, within 1 minute in 7, and within 2 minutes in 4 patients (mean 1.2 minutes). Satisfaction of respective partners was under 30%.

Methods

To study SEP, we used an electrophysiograph with stimulator (Excel, Cadwell Lab. Inc., Kennewick, Washington, USA). Stimuli were uniform in all patients. The duration of stimuli was 0.05 msec and the frequency was set at 3 per second. Stimuli was increased from 0 volt up to 80~100 volt until the level of evoked pain. A reproducible response could be obtained in all cases.

Electric stimuli were applied to two different places.

a) Somatosensory evoked potential of dorsal nerve (DNSEP)

Stimuli was delivered using a ring surface electrode placed at the penile shaft.

b) Somatosensory evoked potential of glans penis (GPSEP)

As a modification of DNSEP, stimuli was delivered using a round surface electrode placed at the glans penis.

Recording electrodes consisted of two needles. The active recording electrode was always placed on the scalp in the midline, 2 cm behind the Cz electroencephalographic recording site (according to the international 10~20 electrode placement protocol). This point was approximately located above the sensory cortex. The reference electrode was placed on the midline over the forehead at the Fpz EEG recording site.

In all patients with PE, DNSEP and GPSEP were performed and the potential from DNSEP and GPSEP was measured 1 hour after the application of 0.2g of SS-cream.

Results were recorded in latency and amplitude of SEP. The latency was measured at the time of stimulus to the first replicated cerebral response (the level of the first positive peak). The average normal latency of DNSEP was 33.8-42.6msec (Oh *et al.* 1987). The amplitude was measured from the first positive peak to the first negative peak points of the tracing (Fig. 1).

Statistics

Paired Student's t test and Wilcoxon signed rank test was utilized and the results were interpreted as statistically significant if the p

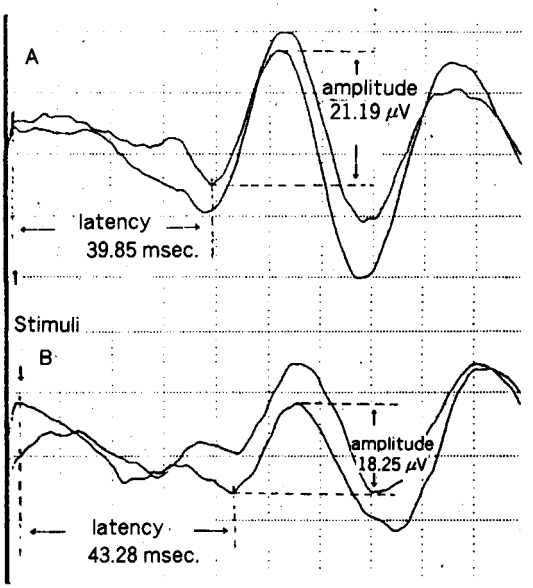

Fig. 1. *The results of SEP which was stimulated at glans penis. A: Before the application of SS-cream. The latency was 39.85 msec. and the amplitude was 21.19 μV. B: After the application of SS-cream. The latency was 43.28 msec. and the amplitude was 18.25 μV.*

value was under 0.05.

RESULTS

The mean latency of DNSEP (16 patients with PE) was 40.98±2.35 msec (normal 33.8~42.6 msec). No difference in the latency of pure PE patients and patients with mild erectile dysfunction was seen (41.12±1.65, 40.59±1.61 msec, $p>0.05$). The mean latency of GPSEP was 43.76±3.50 msec, which was statistically and significantly different from the mean latency of DNSEP (Table 1)($p<0.001$).

The mean amplitude of GPSEP (31.05±12.79 μV) was significantly higher than the mean amplitude of DNSEP (25.92±3.95 μV)(Table 2) ($p<0.001$).

The mean latency of GPSEP after the application of SS-cream was 45.12±3.85 msec, which was 2.36 msec longer than the preappli-

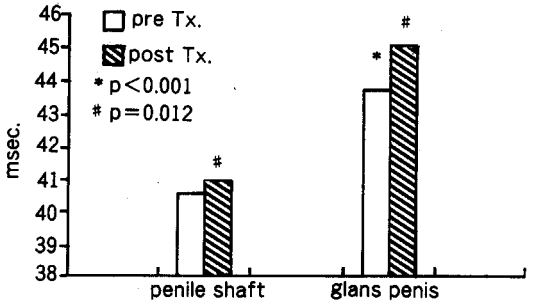

Fig. 2. *The latency of SEP stimulated at glans penis was significantly longer than that of stimulated at penile shaft($p<0.001$). The latency of SEP stimulated at glans penis was significantly prolonged after application of SS-cream($n=16$)*
**: Significantly different comparing with penile shaft*
! Significantly different comparing with before treatment

Table 1. Latencies of SEP stimulted at different place before and after the application of SS-cream(n=16)

	Penile shaft	Glans penis
Before Tx.	40.98±2.35	43.76±3.50
After Tx.	40.56±2.51	45.12±3.85
p value*	0.206	0.010

•: all values are in msec
*: p values are compared with the reslts of before and after treatment

Table 2. Amplitudes of SEP stimulated at different place before and after the application of SS-cream(n=16)

	Penile shaft	Glans penis
Before Tx.	25.92±3.95	31.05±12.79
After Tx.	19.92±7.63	18.05±2.52
p value*	0.001	0.001

•: all values are in μV
*: p values are compared with the reslts of before and after treatment

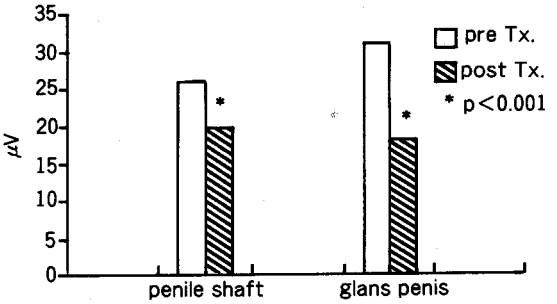

Fig. 3. *Both amplitudes of SEP stimulated at glans penis and penile shaft were significantly reduced with application of SS-cream(n=16).*
**: Significantly different comparing with before treatment*

cation value. This difference was statistically significant (Fig. 2)($p=0.01$). However, the mean latency of DNSEP after applying the SS-cream on the glans penis was 40.56 ± 2.51 msec, the difference of which was not statistically significant (Table 1)($p=0.206$).

The mean amplitude of GPSEP after the application of SS-cream was $18.05\pm2.52\,\mu V$, compared to $31.05\,\mu V$ of pre-application, the difference ($13.00\,\mu V$) was statistically significant (Table 2)($p=0.001$). The mean amplitude of DNSEP after applying the SS-cream on the glans penis was $19.92\pm7.63\,\mu V$, which was also statistically significant (Fig. 3)($p=0.001$).

DISCUSSION

Somatosensory evoked potential testing has been used for years in several different superficial peripheral nerves, such as the median, ulnar, radial, and posterior tibial. The application of this type of neurophysiologic evaluation to the study of the dorsal nerve of the penis is a logical extension of the principles of somatosensory testing.

Dorsal nerve somatosensory evoked potential (DNSEP) testing involves the same peripheral nerve stimulation utilized in bulbocavernosus evoked-potential and dorsal nerve conduction velocity testing (Vignoli, 1978; Padma-Nathan, 1988). The response is electroencephalographic instead of electromyographic after sending stimuli at the somatic sensory area of penile dorsal nerve. This study provides objective neurophysiologic data for the complete, peripheral and central, dorsal nerve afferent pathway. The indications for the study are the same as those for the other neurophysiologic tests except that of those patients with suprasacral pathology, suprasacral trauma, disc disease, tumors, demyelinating disorders, and transverse myelopathies (Opsomer *et al.* 1986; Goldstein, 1988). However, the exact and accurate recording of conduction from the hypersensitive glans penile receptors to the dorsal nerve cannot be acquired.

The results of DNSEP in premature ejaculation have been varied (Vignoli, 1978; Colpi *et al.* 1986; Fanciullacci *et al.* 1988). In our study, the DNSEP in these patients was within normal criteria. We have added another study in adjunct to DNSEP, a modification of DNSEP by sending stimuli at the glans penis in the same patient. In the variant testing of the glans penis the conduction was delayed 2.78msec compared to DNSEP. This delay is in part caused by the longer distance of conduction from the glans penis compared to the penile shaft, and from the different sensitivity of perception of each receptors. The modified GPSEP can evaluate the whole neural sensory pathway of penis, and moreover the pathway from the most sensitive portion of male genitalia, the glans penis to the dorsal nerve. Thus we suggest that the modified GPSEP can be a very useful method to evaluate the whole pathway from the sensory receptors of the glans penis to the cerebral cortex.

When the amplitudes of DNSEP and GPSEP are compared in premature ejaculation patients, the amplitude from the glans penis was higher than that from the penile shaft. With these results, we suggest that the patients with PE have a greater cortical representation of the sensory stimuli from the glans penis. This implies that along with glans penile hypersensitivity (Xin *et al.* 1995), the excessive excitation from the glans penis to the ejaculation centers in the spinal cord also plays a role in rapid, uncontrolled ejaculation. When the results of the DNSEP are combined

with the results from GPSEP, a valuable information can be added in the diagnosis of erectile dysfunction and premature ejaculation.

Then we investigated the results of SEP in the patients with PE and the effects of SS-cream on SEP for treating PE. The latency of GPSEP after applying SS-cream was 2.36 msec longer than before applying SS-cream, which was near the level of a normal potent man. But the latency at DNSEP had no significant difference before and after the application of SS-cream. It implies the possible delay of tactile sense from the glans penis to the dorsal nerves. The amplitudes at GPSEP were significantly higher than at the DNSEP. And both these amplitudes were significantly reduced with the application of SS-cream.

With these result, we can conclude that patients with premature ejaculation exhibit hypersensitivity of the glans penis and excessive excitation from the glans penis to the ejaculation center and it provides further implications for an organic basis of PE. A valuable information in the diagnosis of premature ejaculation can be added by combining the results of the SEP from the penile shaft with the results from the glans penis. SS-cream was shown to prolong the sensory conduction and reduce the glans penile hyperexcitability of the patient with PE thereby aiding in the voluntary control of ejaculation.

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