

Leading Article

Sexuality and women with complete spinal cord injury

Beverly Whipple¹ and Barry R Komisaruk²

¹College of Nursing Rutgers, The State University of New Jersey, 180 University Ave, Newark, NJ 07102;

²Psychology, Rutgers, The State University of NJ, 101 Warren Street, Newark, NJ 07102, USA

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Introduction

There is very little known about sexual response in women with SCI.¹ Although it is well documented that women with spinal cord injury (SCI) are able to menstruate, conceive and give birth,¹ the literature concerning orgasm in women with SCI is scant. Money² referred to orgasms that people with SCI reported during their dreams; he called these orgasms 'phantom'. The term 'phantom orgasm' is still used in the literature and rehabilitation settings today. However, this term is misleading, because it confuses perception of orgasm, which is real, with the absent or denervated peripheral sensory receptor, which is 'phantom'. For example, in the case of 'phantom limb pain', the pain is real but the limb is 'phantom'.

Szasz³ reported that in women with complete SCI 'although vaginal lubrication may still occur in response to either touch or mental stimuli, there can be no orgasmic response arising from or detected in the genitalia' (p 178). This report by Szasz and the label 'phantom orgasm' do not support the reports of women with SCI that they experience orgasm in response to genital and non-genital stimulation.

Bregman and Hadley⁴ interviewed women with SCI and reported that their descriptions of orgasm were not different from the orgasms that they experienced prior to their injuries. In another survey of 231 women with SCI,⁵ the authors reported that half of their subjects had experienced orgasms after their injury; most of the women reported orgasms in response to genital stimulation or a combination of genital and breast stimulation. Kettl *et al*⁶ reported the results of a survey of 74 women with SCI. In their study, 52% of the women reported that they experienced orgasms after their injury.

In the above-cited studies, the authors fail to report the level, nature and completeness of the SCI. If the spinal cord injury is incomplete, it is of course possible that there may still exist intact neural pathways that can carry sensory input from the sexual system to the

brain.⁷ However, women who have been diagnosed as having 'complete' SCI reported to us anecdotally that they experience orgasms.

This led us to hypothesize that in women with complete SCI, there may still exist intact genital sensory pathways from the peripheral sensory receptors to the brain. This hypothesis is based on studies in laboratory animals that demonstrate multiple sensory pathways from the genital system to different levels of the spinal cord as well as directly to the brain.

Nerve Pathways

Based on nerve recording experiments in laboratory rats that map the sensory field of the different nerves the pelvic nerve receives sensory input from the vagina and cervix, the hypogastric nerve receives input from the uterus and cervix and the pudendal nerve receives input from the clitoral region.^{8–10} Based on a neuroanatomical labeling method, the vagus nerve receives input from the uterus and cervix.¹¹

In women, the pudendal and pelvic nerves enter the spinal cord at the sacral 2–4 level,^{12,13} whereas the hypogastric nerve ascends in the sympathetic chain and enters the spinal cord at thoracic 10–12 levels.^{12,13}

Based on functional studies in laboratory rats, there is evidence that the hypogastric nerve mediates physiological responses to vaginocervical stimulation; that is, analgesia and ovulation can be elicited by this stimulation after the pelvic nerves are transected bilaterally. However, when the pelvic nerve transection is combined with hypogastric nerve transection, these responses are attenuated.^{14–16}

On the basis of these studies, we hypothesized that the hypogastric nerve could convey cervical stimulation-elicited activity to the brain in women with complete SCI below T-10, since the fibers of the hypogastric nerve enter the spinal cord at T-10 and below. Furthermore, we hypothesized that women with complete SCI above the level of entry of the hypogastric nerve (i.e. injury above T-10) would have no sexual response to vaginal or cervical self-

stimulation. Therefore, subjects diagnosed as having 'complete' SCI were divided into an 'upper-level' injury group (absence of sensation and voluntary movement below T-9 ($n=6$)) and a 'lower-level' injury group (absence of sensation and voluntary movement starting below T-10 ($n=10$)). Women without SCI comprised a control group ($n=5$).¹⁷

Study of sexual response in women with complete SCI

Three women with 'complete' SCI, one as high as T-7 and one woman without SCI self-reported orgasms during the laboratory study. One woman with a complete SCI at T-11 had two self-reported orgasms from vaginal self-stimulation and two self-reported orgasms from cervical self-stimulation. These were her first orgasms since her injury. A participant with complete SCI at T-8 self-reported six orgasms in the laboratory, two from vaginal self-stimulation, one from cervical self-stimulation, and three from breast stimulation. A participant with complete SCI at T-7 had one self-reported orgasm in the laboratory from cervical self-stimulation.¹⁷

During orgasm from vaginal or cervical self-stimulation, the blood pressure increased in all four women, to at least as great a magnitude in the women with SCI as in the non-injured woman, but there were only minor or no increases in heart rate in the three women with complete SCI.¹⁷

The vaginal or cervical self-stimulation also increased pain detection thresholds measured at the fingers (ie above the level of SCI) in the women in both the 'upper' and 'lower' SCI groups, as well as in the control group of women without SCI.^{7,18,19} This indicates that the sensory input from the sexual system can gain access to the brain, even in women in the 'upper' injury group.

These findings are particularly surprising since there is no known genitospinal nerve (i.e. pelvic, hypogastric or pudendal) input above T-10, yet women with complete SCI above this level nevertheless showed responses including orgasm to vaginal and/or cervical self-stimulation.¹⁷

A qualitative component of this study identified a characteristic trajectory of changes in sexuality that were initiated by the SCI. Immediately postinjury, subjects reported a 'shutting down' or 'closing up' of their sexuality. The women believed that physical sexual pleasure was no longer possible for them. A cognitive awareness and conscious decision not to deal with their sexuality developed. We labeled this a phase of 'cognitive genital dissociation'.¹⁷

After the immediate postinjury period and continuing during the rehabilitative process, the women described a loss of their sexuality or a 'sexual disenfranchisement'. They felt 'robbed' of their sexuality and their sexual desirability. Next, a phase of 'sexual rediscovery' emerged. Relationships that were affirming, and characterized by open commu-

nication, creativity, and resourcefulness, played a key role in producing a positive sexual self-concept. In this phase of sexual rediscovery, reciprocity in relationships was critical in the shift from negatively to positively-perceived sexual readjustment.¹⁷

The phases of this sexual trajectory, which emerged from our study, can be concisely characterized with the sequence: cognitive dissociation, sexual disenfranchisement, and sexual rediscovery.¹⁷

Discussion

There are a number of possible explanations for the report of orgasm in women with 'complete' SCI. One explanation is that the diagnostic criteria themselves do not necessarily imply complete transection of the spinal cord. The American Spinal Injury Association (ASIA) criteria for 'complete' SCI are based on the complete absence of voluntary movement below the level of SCI as well as the complete absence of perception of pinprick, cotton wisp, and anal digital stimulation below the level of SCI.²⁰ This diagnosis is not based on direct assessment of the structural integrity of the spinal cord. Therefore, it is possible that the diagnosis of 'complete' SCI according to ASIA criteria could be valid even though genital and visceral sensory pathways remain functional, but undetected.^{17,18}

A second possible explanation for these findings is that in another study it was demonstrated that imagery-induced orgasm produced significant elevations in pain thresholds, heart rate, systolic blood pressure and pupil diameter that were not significantly different from the elevations in the same parameters produced by genital self-stimulated orgasms in the same individual women without SCI. That is, women in this study achieved orgasm from imagery alone, without any stimulation of their body.²¹ The women with spinal cord injury in the present study reported that they did not use imagery during the genital self-stimulation conditions.¹⁷

A third explanation is based on neuroanatomical and functional evidence of a sensory pathway from the sexual system to the brain that bypasses the spinal cord. We hypothesized that this pathway is the vagus nerve. In the rat, after injection of the tracer, horseradish peroxidase, into the wall of the cervix and uterus, the tracer was found in cell bodies of the nodose ganglion, which is the sensory ganglion of the vagus nerve.¹¹ To further test this hypothesis, we transected bilaterally either the spinal cord or all nerves known to respond to genital stimulation (ie the genitospinal nerves: pelvic, hypogastric and pudendal)²² and tested for responses to vaginocervical stimulation. These transections reduced the magnitude of brain-mediated responses to vaginocervical stimulation (ie vocalization threshold and pupil dilatation) leaving a significant residual response. Bilateral transection of the vagus nerves at the subdiaphragmatic level was then performed; this procedure abolished these residual responses.²²

These findings provide the first evidence that at least in the rat, the vagus nerves convey significant vaginocervical input directly to the medulla oblongata of the brain, completely bypassing the spinal cord. The findings based on transection of the genitospinal nerves, the spinal cord and the vagus nerves, indicate the existence of multiple sensory pathways from the genital system to the brain.

Perhaps in women with complete SCI with no input from the genitospinal nerves, the sensory vagus nerve may play a role in stimulating orgasm. To test this hypothesis, we are currently utilizing PET-MRI methodology during orgasm in women without SCI and women with complete SCI who participated in our previous study.

Based upon the above findings, it seems likely that there can exist nerve pathways from the sexual system to the brain that are functional in women with 'complete' SCI and that these may mediate orgasm in response to genital stimulation.

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