Review article

Impact of spinal cord injury on sexuality: Broad-based clinical practice intervention and practical application

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Summary: This study focuses on the impact a spinal cord injury may have on achieving physical and emotional intimacy, and potential to maximize sexual ability and quality of life. Spinal cord injury is a traumatic, life-altering event that is usually associated with loss of motor and sensory function, as well as sexual impairment. At the time of injury, the individual is faced with devastating loss and an abundance of new information in a setting of extreme stress and challenge. In the acute rehabilitation setting, there is often a considerable void in providing education and resources regarding sexual concerns and needs. There is a positive relationship between sexual education and sexual activity. The impact of inadequate sexual counseling and education as a part of rehabilitation can be deleterious.

Keywords: Sexuality, Spinal cord injuries, Intervention, Best practice, Erectile dysfunction, Rehabilitation, Physical, Patient education, Tetraplegia, Paraplegia, Autonomic dysreflexia, Assistive devices

Spinal cord injury: a life event

Spinal cord injury is a traumatic, life-altering event for the injured individual that is usually associated with loss of motor and sensory function, and sexual impairment. The effect on the sexual response depends on the level and severity of injury, as well as personal attributes such as partnership status, pre-morbid sexual experiences and attitudes, and openness to sexual experimentation.[1–3] Sexuality education is often poorly integrated into the rehabilitation process[4,5] though the change and anticipation of loss may severely threaten a person's self-esteem and sense of value as a sexual being.[6] Together, these significant losses can lead to physical and emotional isolation, placing the person at risk for social and psychological withdrawal and depression.

Spinal cord injury and sexuality: who, what, where

The level and completeness of spinal cord injury are major determinants of sexual functioning[7,8] (Table 1). In the immediate post-injury period, both men and women lose ability to have reflexive sexual responses. Once reflexes return, reflexive arousal in men and women (erection in men and vaginal lubrication in women) can be achieved with genital stimulation if the sacral spinal segments and peripheral pathway conveying sensations (cauda equina) are intact.[9] However, these reflexive responses are usually short lived, limited to the duration of stimulation, and often do not achieve a fully satisfactory response.[10] If the injury is caudal to the 12th thoracic cord segment men and women can be expected to experience psychogenic arousal in response to visual, auditory, imaginative, tactile, and gustatory stimuli.[11] Even in the absence of physical manifestations of arousal, individuals with spinal cord injury describe subjective arousal similar to non-injured controls.[12,13]

For men, the ability to experience erections is preserved more frequently than the ability to experience ejaculation. Whereas up to 95% of men with spinal cord injury experience ejaculatory problems,[14] 80% regain some erectile function by 2 years after spinal cord injury.[15] The ability to achieve erections does not parallel a man's ability to become sexually aroused.[12] Therefore, the ability to obtain and maintain erections should not be used to gauge a man's

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Table 1 Potential for sexual response based on spinal cord injury

	Likely to experience, reflexive arousal: erection/vaginal lubrication	Likely to experience, psychogenic arousal: erection/vaginal lubrication	Orgasm	Recommendations
Complete upper motor neuron injury cephalad to T11	Yes	No	Yes	1 Genital stimulation 2 Stimulation of sensate erotic body parts
Complete upper motor neuron injury caudal to T11–L2 with sparing of sacral spinal segments	Yes	Yes	Yes	1 Genital stimulation 2 Stimulation of sensate erotic body parts 3 Audiovisual, tactile gustatory and imaginative stimuli/ fantasy
Conus injury/lower motor neuron injury (loss of sensation/ voluntary control S4–S5, loss of S4–S5 mediated reflexes)	No	Yes	Yes	1 Assisted lubrication (e.g. KY jelly) 2 Stimulation of sensate erotic body parts 3 Audiovisual stimulation/ fantasy
Incomplete injuries	• Ability to appreciate pin touch sensation in S2, 3, 4 dermatomes correlates with ability to attain psychogenic arousal and achieve ejaculation • Ability to perceive T10–L2 dermatomes correlates with the ability to attain psychogenic erection/lubrication, and the better the response to fantasy • Preservation of sacral sensation or voluntary sacral control of S4–5 correlates with ability to attain reflexogenic erection/vaginal lubrication • Regardless of level or completeness, approximately 50% SCI individuals experience orgasm			

"Reflexogenic arousal" refers to erection/vaginal lubrication that occur as a result of genital stimulation. "Psychogenic arousal" refers to erection/vaginal lubrication that occur as a result of arousal in the brain (e.g. through hearing, seeing, feeling, or fantasy). "Orgasm" refers to the perception of a peak feeling of sexual release or climax.

sexual potential.[7] Even though orgasm is less common than in women,[16] approximately half of men with spinal cord injury can experience orgasms after spinal cord injury;[16,17] however, the quality of their orgasm may be different.[18] Orgasm can occur in men who are not capable of ejaculation and is not determined by completeness of the spinal cord injury.[18] Similarly, women can experience orgasm after spinal cord injury, even if their spinal cord injury is complete. Approximately one-half of women with spinal cord injury have been found to experience orgasm by self-report[19,20] and in the laboratory setting.[13] The latency to orgasm is increased, but the qualitative description of orgasm is indistinguishable from non-injured controls.[9] Audiovisual stimulation leads to similar subjective and autonomic responses found in women without injury,[21] and can be utilized in conjunction with other methods to facilitate arousal. Once orgasm is achieved, it is indistinguishable from non-injured counterparts.[9]

Vaginal lubrication is more likely to occur when sacral segments S2–S5 are spared, but can go unnoticed. Women with sacral preservation can utilize manual and vibratory self-stimulation to augment their sexual response.[9]

In general, frequency of sexual activity and intercourse declines after spinal cord injury.[3,17,22] Lack of overt sexual expression can result from the biological sequelae of the spinal cord injury or reflect psychological manifestation of emotional loss and detachment.[23] However, diminished or absent expression does not equal absent sexuality. The need for sexual expression and intimacy often remain.[24] With time after injury, sexual activity increases, and its expression often changes.[3,20,25] Individuals become more open and likely to engage in sexual fantasies.[26] The frequency of hugging, kissing, manual stimulation, and use of oral-genital stimulation is not statistically different than in couples without spinal cord injury.[3,27]

Relationship factors such as partner satisfaction and relationship quality as well as mood and independence appear to be more important predictors of sexual satisfaction than genital functioning in both men and women.[3,6,28] The reasons for pursuing sexual activity also may change with need for intimacy being the primary reason followed by sexual need, self-esteem, and keeping a partner.[29,30] Concern over not satisfying one's partner consistently ranks similarly to the lack of personal satisfaction. Both men and women report that a sense of intimacy and their ability to please their sexual partner are important determinants of their own satisfaction.[24,31–33] Women and men with spinal cord injury report better sexual satisfaction if

they are in an enduring relationship.[31,33–35] Therefore, rehabilitation team members need to foster open dialogue between the person with spinal cord injury and their partners, and support open communication and experimentation. Involvement of the partner in the rehabilitation process is critical.[25]

Spinal cord injury and sexuality in acute rehabilitation

In the acute rehabilitation setting, individuals with spinal cord injury are taught compensatory techniques to overcome physical limitations in order to maintain or maximize function. However, the person may receive much less information on the sexual implications of their injury and even less on related compensatory strategies. Studies have shown that there is a large void in addressing sexual rehabilitation despite continued acknowledged need for education and counseling.[4,5] Furthermore, a positive relationship between sexual education and sexual activity has been shown. Individuals with spinal cord injury evolve in their readiness to hear and process new information regarding their sexual functioning. Even though sexual education should be available in the acute rehabilitation period, the information should also be tailored to the individual's particular needs as they process the ramifications of their injury. A longitudinal study assessing the need for sexual education showed that individuals with spinal cord injury were more realistic about their sexual functioning in the first 6 months after the spinal cord injury and were better prepared to assimilate education.[36]

Interventions: what can be done?

Many persons use pharmacological interventions and adaptive devices to achieve sexual satisfaction. Often, masturbation can be effective in helping individuals rediscover what is sexually pleasing and develop confidence. Application of vibrators to erogenous areas can facilitate achieving sexual arousal and orgasm.[21] In men, vibrators with amplitudes of 2.5 mm and frequencies of 100 Hz are most likely to yield erections.[37] Erection may also be achieved with catheter manipulation, application of hot towels to the penile shaft and applying constrictive band at the root of the penis.[11,38]

Individuals should explore their bodies and use multiple senses to discover areas that are most sensual and pleasing. After spinal cord injury, different parts of the body, especially at the level of injury can become sexually pleasurable. For example, stimulation to the nipples, earlobes, or inner thighs may be perceived as erogenous and even evoke genital awareness in the absence of genital sensation. Genital stimulation itself can elicit sexual arousal and even orgasm in some women with complete spinal cord injuries.[39,40] When erections are inadequate for sexual intercourse, the "stuffing technique" can be employed to insert the flaccid or semi-erect penis in the partner's vagina. This technique may be sexually satisfying for the partner and also help stimulate and maintain reflexive erections in the partially erect penis. Perineal training exercises can improve penile rigidity and function in men who have some voluntary control of perineal muscles.[41]

Decreased lubrication is the female counterpart to erectile dysfunction in men. This decrease is caused by interruption of sympathetic innervations to the genitalia, and can result in excessive shearing during penetration.[13,42] Vaginal stimulation, even in the absence of sensation, can cause reflexive vaginal lubrication, although this method of lubrication may not be sufficient to allow penetration. Application of lubricant jelly to the genitalia can facilitate coitus, prevent tissue injury, and is well tolerated. If an individual does not have sufficient hand function, the partner can easily incorporate the application of a lubricant into foreplay. Water-based lubricants are generally well tolerated and do not interfere with condoms or silicone-based sex toys.[43]

Upper extremity function

A variety of positions for intercourse should be trialed to determine best comfort and efficacy. If individuals lack strong upper extremities to support their upper bodies, a side lying or inferior position can be assumed, which also frees up the upper extremities for touching and fondling. Individuals who do not have hand function can guide their partner in trialing various positions as well as stimulation delivery methods. For example, vibratory stimulation has been reported to be an effective method of enhancing sexual arousal in both men and women.[44] Individuals who lack hand function can be evaluated for assistive devices. Individuals with limited grasp may benefit from the addition of straps to vibrators, while others with minimal or no grasp can be prescribed custom wrist splints with adaptations to hold vibrators, dildos, or other appliances. In our opinion, an ideal candidate is someone who has good shoulder and elbow strength and range of motion but lacks intrinsic hand function. In the absence of functional arm capability, vibrators can be attached to various body parts such as the thigh or tongue with the help of straps. Individuals may choose to use dildos that can be strapped on to their pelvis with the help of a harness or can be worn around the thigh with Velcro straps (Velcro USA Inc., Manchester, NH, USA).[45]

The skin needs to be carefully inspected before and after use to not reinjure or contribute to skin breakdown.

Another frequently prescribed aid in achieving erections is the vacuum erection device, which causes penile engorgement by negative pressure.[46] Vacuum erection devices are bulky and require that the penis be virtually insensate. Even though the battery-operated devices require less hand dexterity than the manual option, some hand function is required. Pharmacological agents such as oral phosphodiesterase inhibitors or intracorporal injections of vasoactive substances are frequently used and very successful.[47] Intracorporal injections require intact hand function and rotation of injection sites. If self-administration is unrealistic, proper management can be performed by their partner or personal care attendant.

Spasticity

Spasticity occurs in 65–78% of people with chronic spinal cord injury.[48,49] Spasticity commonly results in typical postures, such as thigh adduction, hip and thigh flexion that can negatively impact positioning conducive to intimacy and sexual functioning. If an individual has significant thigh adduction, determination must be made as to whether the adduction deformity is fixed or not. If the muscle is contracted in a shortened position, the limb cannot be stretched passively beyond a fixed point (fixed deformity). When there is sufficient pelvic access with passive range of motion, the adductor tone may be amenable to nonsurgical treatment. Sometimes gentle stretching of the affected muscles prior to positioning is sufficient and can easily be incorporated into foreplay. Positioning a pillow or wedge under the individual's pelvis and legs can minimize the stretch on spastic muscle and allow comfortable positioning. If an individual has severe adductor spasticity in the thighs, pillows should be placed between the knees to prevent rubbing and skin breakdown. Often, however, pharmacological treatments need to be considered.[49–51]

The individual and partner may consider carrying out sexual activities in a wheelchair when hip and knee flexion spasms are pronounced. This is a viable option for individuals who have sufficient truncal strength and balance to maintain a seated position without significant external support and in whom sitting does not trigger more spasms or spasticity. A seated position can be more energy consuming and may not be an option in persons with severe cardiopulmonary compromise. Removable arm rests can facilitate positioning and movement of both partners. Sexual activities such as genital penetration can precipitate spasms that either cause or interfere with positioning.[50,51] In a survey studying the impact of spinal cord injury on sexual function 28.7 % of respondents reported their spasticity was severe enough to require medication.[29] When noninvasive strategies are insufficient, pharmacological and neuroablative methods can be considered.[52]

Taking spasmolytics prior to sexual activity may reduce the disruptive effects of spasticity.[53–56] Although intrathecal baclofen pump delivery is an effective method of achieving spasticity control while minimizing systemic side effects,[57] it may have negative effects on sexual functioning. Reduced libido, difficulty achieving erections and ejaculations have been reported and appear to be dose related with reversal of symptoms with dose reduction.[58]

Neurogenic bowel and bladder

Spinal cord injury is often associated with decreased bowel and bladder sensation with poor or no voluntary control of evacuation that can lead to incontinence. Urinary and stool leakage can interfere with sexual activity and can present a major concern for individuals with spinal cord injury.[29,30] Affected individuals should be on an evacuation program to achieve predictably timed bowel and bladder activities with minimal accidents. Some individuals empty their bladder and bowel prior to sexual activity and decrease fluid intake several hours prior to intimacy. Bladder relaxants can be prescribed to reduce bladder spasms that cause inconvenient urinary leakage.[53] If an indwelling catheter is used for bladder management, it can either be removed before intercourse or taped to the side in a slack position to allow for penile engorgement. Alternatively, a condom can be slipped over the penis and catheter, but continued drainage must be ascertained. Suprapubic catheters are preferable to indwelling catheters because they cause less urethral trauma, are associated with better self-image and are conducive to sexual activity requiring less preparation.[53] Continent diversion, a technique used to maintain continence by diverting urine cutaneously via a bowel segment, has been shown to have a positive impact on body image and sexual frequency in a small sample of women with tetraplegia.[54]

Autonomic dysreflexia

Autonomic dysreflexia is an abnormal, unabated sympathetic response to noxious or non-noxious stimuli below the level of injury in individuals with a spinal cord injury level at T6 and above.[55,56,59] It is considered a medical emergency because it can lead to severe blood pressure elevations that can be life threatening.

Ejaculation is a well-known trigger for this condition,[60] but erections and sexual stimulation can also precipitate autonomic dysreflexia.[13,61] Usually the rise in blood pressure and related symptoms are limited to the stimulus exposure, but malaise and blood pressure variability may sometimes persist after the stimulus is removed,[62] and rarely, protracted, persistent, and debilitating autonomic dysreflexia associated with sexual activity has been described.[60] Some individuals do not experience any symptoms with autonomic dysreflexia while others develop vasomotor headaches in the absence of significant blood pressure elevations.[63] Therefore, it is advisable to check blood pressure during any symptoms and prior to the initiation of pharmacological intervention.

When autonomic dysreflexia develops, the initial management involves placing the patient in an upright position to take advantage of an orthostatic reduction in blood pressure and removing the trigger. As recommended in the *Guidelines of the Consortium for Spinal Cord Medicine* for the management of autonomic dysreflexia,[64] pharmacological agents should be used if systolic blood pressure continues to be at or above 150 mmHg in an adult despite nonpharmacological interventions. In individuals who have blood pressure elevations beyond sexual activity, other sources of blood pressure elevation need to be investigated, such as bladder retention and pressure points.

Hormonal changes

Spinal cord injury results in hormonal changes that can affect sexual behavior and function in both men and women. Women with spinal cord injury often experience transient amenorrhea after spinal cord injury lasting 6 months in the majority of cases. Elevated prolactin has been reported in both sexes and should be suspected in women with galactorrhea, or prolonged amenorrhea. These symptoms can be managed with a short course of bromocriptine. In most women, other sexual hormones remain in normal ranges and do not correlate with sexual functioning.

A higher incidence of testosterone deficiency exists in men with spinal cord injury compared with matched control subjects.[65] Low serum testosterone levels correlate with spinal cord injury severity and length of time since injury.[66–68] In a few small studies, hormone-replacement therapy in men with spinal cord injury has shown modest results on body composition,[69,70] but the effect on sexual function and libido in this population has not been established. Currently, there is insufficient information to make recommendations regarding routine hormone replacement in men with spinal cord injury.

Positioning

Positioning can be greatly affected by a spinal cord injury due to spasms, spasticity, contractures, and pain. Limitation in hip extension, abduction, and external rotation can adversely affect genital stimulation and coital penetration.[71] If spasticity has not led to permanent, fixed contractures, antispacticity agents such as baclofen, tizanidine, or benzodiazepines can be helpful when coupled with a range-of-motion exercise program.[48]

When counseling a couple following a spinal cord injury, special consideration should be given to the effect positioning may have on the respiratory status and the musculoskeletal and integumentary system of the individual with spinal cord injury. The weight of the partner can impede chest wall excursion causing respiratory distress and cause limb fractures in severely osteoporotic or osteopenic limbs. Persistent, unrelieved pressure caused by the combined weight of the couple against bony prominences can lead to skin damage and breakdown. Couples can adjust positioning such that both partners are either side lying (spooning) or face to face to maximize pressure distribution and minimize balance problems.[72] Pillows or similar supports can be very useful in lifting the pelvis or sustaining contracted or spastic limbs to allow for physical intimacy. Proper positioning can be performed by the partner if hand function is limited, but skin integrity needs to be closely monitored. Slings that wrap around the neck and keep the thighs in a flexed and abducted position can be applied, but should not cause increased spasticity or pressure. If an individual with spinal cord injury lacks pelvic movement, a side lying position can be conducive to thrusting movement and penetration. If an individual has good upper extremity and truncal strength a gliding seat that glides back and forth can also be considered.

Individuals who lack hand function can be evaluated for assistive devices. Individuals with limited grasp may benefit from the addition of straps to vibrators, whereas others with minimal or no grasp can be prescribed custom wrist splints with adaptations to hold vibrators, dildos, or other devices.[45] An ideal candidate is someone who has good shoulder and elbow range of motion but lacks intrinsic hand function. Individuals who have no hand function can pleasure their partner through creative means. For example, highlighting the areas with sensation such as the back of the ear and using that sensation for excitement and satisfaction. In men whose sacral spinal cord segments and nerve roots are preserved, vibratory stimulation to the penis can greatly augment reflexive penile erections. This is particularly true for men with high complete lesions.

Skin wounds and pressure sore

Close monitoring of the skin remains very important, especially if one of the partners is completely insensate. The skin should be checked after intimacy for redness and induration. If the individual cannot inspect their skin with a mirror or video technology, a partner or care attendant should be instructed in visualization and palpation of the skin. If an individual applies an aid such as a vacuum device or a dildo, the skin needs to be carefully inspected after use for redness or induration. Use of satin sheets and pillows may decrease friction and risk for abrasions.

If a person has a pre-existing ulcer, one must be careful to avoid positions that would further compromise the ulcer by generating pressure or friction. For example, persons with trochanteric ulcers should avoid side lying positions, with ischial ulcer avoid seated positions, and with sacral ulcers avoid supine positions. Superficial ulcers that may come in contact with the partner can temporarily be covered with a self-adhesive hydrocolloid dressing.

Emotional adjustment issues

Depression, anxiety, and overall adjustment to spinal cord injury within the context of one's personalized life experience impacts on one's sense of sexuality with oneself and with others.[73,74] Personality traits, personality disorders, and character developed through life events impact on expression of sexuality and relationships. Grieving and working toward re-establishing one's life and self-meaning take center stage during recovery efforts. The awareness and perception of sexuality may take a seat near the back of the room, but never really leaves the room. Sexuality rejoins the recovery efforts to varying degrees based on opportunity, culture, and environmental climate, and individuality. The readiness for education, assessment, and intervention relies on the status of the medical condition as well as the individual's life situation (e.g. married, single, divorced, significant partner. or partners/relationships), persona, emotional state of the individual, and the reality of access and opportunity.

Following the spinal cord injury event, there is a shift of focus from emergency crisis to living life. Moving across the continuum of healthcare, the life tasks, demands, and opportunities for quality living becomes a spotlight on how well and how long one can function at optimal level. Within the larger picture of healthcare outcome, it is critical how well health providers address issues relate to the comfort level, potential bias, and preference, resources available, and environmental support from the organization and community. The focus of sexuality for some may be one of "if it is not broken, don't fix it" and "let sleeping dogs lie." Others see the issue as one of responsibility to address holistic rehabilitation healthcare.

Cultural values, mores, and personal comfort are a shared dynamic within a relationship, applying the individual with injury and the professional helper.[75] In addition to the heightened imitate exposure on both a physical and emotional level, professional boundaries may become blurred at times related to normal human attraction and life circumstance. In instances of discomfort or concern, awareness, self-monitoring, communication, supervision, or consultation, and adherence to professional standards and process are critical to ensure quality care and safety for both parties.

The individual may have feelings of sexuality that are activated and find expression within a necessary environment related to the level of function and ability such as in a long-term care or residential setting. Opportunities for email, visits, internet chat, social gatherings, and privacy occasions are critical resources for the individual to have access for even the basic aspects of human relationship. However, such resources may be encumbered related to medical condition and functioning, settings resources, philosophy, and policy. For individuals living more independent in the community, readiness, access, and personal choice join forces as is the standard in life. Productive and enjoyable relationship building can be a challenge for anyone. Here, there is the additional burden of injury and related needs. The most important ingredients are self-esteem, motivation, confidence in oneself, and support. Dating and social clubs, internet websites, and making oneself available in order to have an active outgoing life promote opportunities for contact.

The age at onset of dysfunction and injury, active developmental themes, culture, sexual life experience, and personal perspective are important considerations to guide inquiry and intervention. Following injury, many medications are used to address the difficulties stemming from spinal cord injury and other medical conditions. The medication to assist with erectile dysfunction is generally offered or requested by the individual or couple. However, consideration must be given to the emotional response to medication such as the potentially perceived shift in locus of control from internal to external causality. For example, "I am functioning because of external aids." Such a response can impact on self-esteem and feelings of empowerment where one's sense of internal drive is given over to a physiological response and away from the heart. There are also the advance life-functioning activities following injury that

includes dating, maintaining relationships, developing new relationships, communication skills, and application for mutual and open dialogue. Education and information, counseling, psychotherapy, peer mentorship, and activities that promote socialization may be helpful to address such concerns.

Conclusion: best clinical practice

The opportunity to further one's knowledge about sexuality in general may be obtained in books such as the *Guide to getting it on.*[76] Resources specific to maximizing ability after injury can be found in books such as *pleasureABLE: Sexual Device Manual for Persons with Disabilities.*[45] However, we must go beyond the sole focus of sexual dysfunction, medications, and devices[77] such as vacuum constriction device, penile implants, or prostheses to "fix it." Staff and organizational sensitivity training, ethics consultation, and development of appreciation for diversity within the setting may prove beneficial to broaden rehabilitation focus and address the clinical needs and utilize resources available.[78,79] There remains a need to increase the comfort level of staff and trainees in the provision of education during screening, assessment, intervention, and discussion of techniques. Applied education with realistic strategic intervention to address sexuality as a relationship with one's self and with others is a direction for best clinical practice development, deployment of services, efforts to optimize utilization, and enhancement of rehabilitation outcome.

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