

Topical Systematic and Synthetic Literature Review Regarding Men Sexual Dysfunctions after Spinal Cord Injury

SERBAN Diana-Elena¹, DAIA Cristina Octaviana^{1,3}, NEGOESCU CHEREGI Ioana², CIOBANU Vlad⁴,
ONOSE Liliana⁵, POPESCU Cristina¹, ONOSE Gelu^{1,3}

Corresponding author: Popescu Cristina, E-mail: cristina_popescu_recuperare@yahoo.com

1. Teaching Emergency Clinical Hospital “Bagdasar Arseni”, in Bucharest, Romania

2. Teaching Medical Rehabilitation Hospital in Baile Felix, Romania

3. University of Medicine and Pharmacy “Carol Davila”, in Bucharest, Romania

4. Computer Science Department, Politehnica University of Bucharest, Bucharest, Romania

5. Medical Service – Metrorex SA in Bucharest, Romania

Abstract

Introduction Spinal cord injury (SCI) is a life-altering event usually associated with loss of motor and sensory, as well as with bladder, bowel and sexual, functions impairment. Recovering sexual function is one of the most important function tightly coupled with the life quality. In this respect, in the related literature can be found data regarding mainly: diagnosis/evaluation issues therapeutic/assistive-rehabilitative interventions (including connected to fertility troubles) and of psychological and or educational specific counseling, kind.

Materials and methods. This paper presents a current systematic (of Preferred Reporting Items for Systematic Reviews and Meta-Analyses – PRISMA – type) and synthetic literature review on sexual dysfunctions and respected available management options in male subjects with SCI, using the following search keywords/ combinations of key words: “men”, “sexual dysfunction”/ “fertility” / “erectile dysfunction”/ “ejaculatory problems” / “sexual disorder”, “spinal cord injury”, “paraplegia”/ “tetraplegia”/ “paraplegic”/ “tetraplegic”, “management”/ “treatment”, by interrogating international renown data bases: NCBI/PubMed, NCBI/PMC, Elsevier, PEDro and respectively, ISI Web of Knowledge/Science – to check whether the selected articles are published in ISI indexed journals – considering publications from January 2009 to June 2019, written in English, open access articles and being “fair”/“high” quality on our PEDro inspired, customized quality classification of the selected papers – the basic criterion, being the weighted citations number per year.

Results. We have found initially 647 articles and eventually, after accomplishing the PRISMA stages (without meta-analysis), we have selected 16 articles matching all the above mentioned quest method’s requests (see further the figure representing our PRISMA type completed flow-diagram), covering (together with knowledge acquired from extra bibliographic resources, too).

Conclusions. Sexual dysfunctions after SCI are complex and strongly add to the severe and multimodal disability the affected people – in the case of our work: men – experience. Therefore, they worth being fathomed and periodically reappraised.

Keywords: *Spinal Cord injury (SCI), men sexual dysfunctions, systematic literature review, rehabilitation,*

Introduction

Spinal cord injury (SCI) is a life-altering (1) event usually associated with loss of motor and sensory, as well as with bladder (2,3), bowel and sexual (4,5), functions impairment – severely lowering the quality of life if not treated diligently (6,7,8,9).

After the acute stage of injury, recovering sexual function is important, especially because most of such patients are young and hence, previous to SCI, sexually active.

Consequently, approaches of the pathology domain we focus according to the title, are necessary. In this respect, in the related literature can be found data regarding mainly: diagnosis/evaluation issues therapeutic/assistive-rehabilitative interventions (including connected to fertility troubles) and of psychological and or educational specific counseling kind.

Materials and methods

This paper presents a current systematic (of Preferred Reporting Items for Systematic Reviews and Meta-Analyses – PRISMA – type) and synthetic literature review on sexual dysfunctions and respected available management options in male subjects with SCI, using the following search keywords/ combinations of key words: “men”, “sexual dysfunction”/ “fertility” / “erectile dysfunction”/ “ejaculatory problems” / “sexual disorder”, “spinal cord injury”, “paraplegia”/

“tetraplegia” / “paraplegic”/ “tetraplegic”, “management”/ “treatment”, by interrogating international renown data bases: NCBI/PubMed (10), NCBI/PMC (10), Elsevier (11), PEDro (12) and respectively, ISI Web of Knowledge/Science (13) – to check whether the selected articles are published in ISI indexed journals – considering publications from January 2009 to June 2019, written in English, open access articles and being “fair”/“high” quality on our PEDro inspired, customized quality classification of the selected papers – the basic criterion, being the weighted citations number per year.

Results

We have found initially 647 articles and eventually, after accomplishing the PRISMA stages (without meta-analysis), we have selected 16 articles (1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, 17, 18, 19, 20) matching all the above mentioned quest method’s requests, covering (together with knowledge acquired from extra bibliographic resources, too) the main sexual subject matters men living with SCI are facing: erectile dysfunction (ED), ejaculatory and/or fertility problems, and consequent (dis)satisfaction and respectively, the principal current methods to mitigate the respective impairments, including with appropriate coping strategies.

Keywords	Elsevier	PubMed	PMC	PEDro	Total
'men', 'ejaculatory problems', 'spinal cord injury', 'paraplegia', 'management'	0	0	0	0	0
'men', 'ejaculatory problems', 'spinal cord injury', 'paraplegia', 'treatment'	0	0	0	0	0
'men', 'ejaculatory problems', 'spinal cord injury', 'paraplegic', 'management'	0	0	0	0	0
'men', 'ejaculatory problems', 'spinal cord injury', 'paraplegic', 'treatment'	0	0	0	0	0
'men', 'ejaculatory problems', 'spinal cord injury', 'tetraplegia', 'management'	0	0	0	0	0
'men', 'ejaculatory problems', 'spinal cord injury', 'tetraplegia', 'treatment'	0	0	0	0	0
'men', 'erectile dysfunction', 'spinal cord injury', 'paraplegia', 'management'	0	0	38	0	38
'men', 'erectile dysfunction', 'spinal cord injury', 'paraplegia', 'treatment'	0	0	42	0	42
'men', 'erectile dysfunction', 'spinal cord injury', 'paraplegic', 'management'	0	0	28	0	28
'men', 'erectile dysfunction', 'spinal cord injury', 'paraplegic', 'treatment'	0	0	34	0	34
'men', 'erectile dysfunction', 'spinal cord injury', 'tetraplegia', 'management'	0	0	21	0	21
'men', 'erectile dysfunction', 'spinal cord injury', 'tetraplegia', 'treatment'	0	0	21	0	21
'men', 'erectile dysfunction', 'spinal cord injury', 'tetraplegic', 'management'	0	0	12	0	12
'men', 'erectile dysfunction', 'spinal cord injury', 'tetraplegic', 'treatment'	0	0	12	0	12
'men', 'fertility', 'spinal cord injury', 'paraplegia', 'treatment'	0	0	74	0	74
'men', 'fertility', 'spinal cord injury', 'paraplegia', 'management'	0	0	0	0	0
'men', 'fertility', 'spinal cord injury', 'paraplegic', 'management'	0	0	21	0	21
'men', 'fertility', 'spinal cord injury', 'paraplegic', 'treatment'	0	0	26	0	26
'men', 'fertility', 'spinal cord injury', 'tetraplegia', 'management'	0	0	19	0	19
'men', 'fertility', 'spinal cord injury', 'tetraplegia', 'treatment'	0	0	22	0	22
'men', 'fertility', 'spinal cord injury', 'tetraplegic', 'management'	0	0	7	0	7
'men', 'fertility', 'spinal cord injury', 'tetraplegic', 'treatment'	0	0	9	0	9
'men', 'sexual disorder', 'spinal cord injury', 'paraplegia', 'management'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'paraplegia', 'treatment'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'paraplegic', 'management'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'paraplegic', 'treatment'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'tetraplegia', 'management'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'tetraplegia', 'treatment'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'tetraplegic', 'management'	0	0	0	0	0
'men', 'sexual disorder', 'spinal cord injury', 'tetraplegic', 'treatment'	0	0	0	0	0
'men', 'sexual dysfunction', 'spinal cord injury', 'paraplegia', 'management'	0	0	47	0	47
'men', 'sexual dysfunction', 'spinal cord injury', 'paraplegia', 'treatment'	0	0	49	0	49
'men', 'sexual dysfunction', 'spinal cord injury', 'paraplegic', 'management'	0	0	35	0	35
'men', 'sexual dysfunction', 'spinal cord injury', 'paraplegic', 'treatment'	0	0	37	0	37
'men', 'sexual dysfunction', 'spinal cord injury', 'tetraplegia', 'management'	0	0	29	0	29
'men', 'sexual dysfunction', 'spinal cord injury', 'tetraplegia', 'treatment'	0	0	31	0	31
'men', 'sexual dysfunction', 'spinal cord injury', 'tetraplegic', 'management'	0	0	17	0	17
'men', 'sexual dysfunction', 'spinal cord injury', 'tetraplegic', 'treatment'	0	0	16	0	16
TOTAL	0	0	647	0	647

Table 2. ISI articles matching all the above mentioned method's requests

No.	The articles that matched the our afore mentioned admission criteria	Bibliographic Index
1.	Hess MJ, Hough S. Impact of spinal cord injury on sexuality: broad-based clinical practice intervention and practical application. <i>J Spinal Cord Med.</i> 2012 Jul; 35(4):211–218. doi:10.1179/2045772312Y.0000000025	(6)
2.	Sezer N, Akkuş S, Uğurlu FG. Chronic complications of spinal cord injury. <i>World J Orthop.</i> 2015 Jan;6(1):24-33. Published 2015 Jan 18. doi:10.5312/wjo.v6.i1.24	(7)
3.	Nas K, Yazmalar L, Şah V, Aydın A, Öneş K. Rehabilitation of spinal cord injuries. <i>World J Orthop.</i> 2015 Jan ;6(1):8-16. Published 2015 Jan 18. doi:10.5312/wjo.v6.i1.8	(8)
4.	Taweel WA, Seyam R. Neurogenic bladder in spinal cord injury patients. <i>Res Rep Urol.</i> 2015;7:85-99. Published 2015 Jun 10. doi:10.2147/RRU.S29644	(2)
5.	Alexander MS, Anderson KD, Biering-Sorensen F, et al. Outcome measures in spinal cord injury: recent assessments and recommendations for future directions. <i>Spinal Cord.</i> 2009 Aug;47(8):582-591. doi:10.1038/sc.2009.18	(4)
6.	Sun X, Jones ZB, Chen XM, Zhou L, So KF, Ren Y. Multiple organ dysfunction and systemic inflammation after spinal cord injury: a complex relationship. <i>J Neuroinflammation.</i> 2016;13(1):260. Published 2016 Oct 6. doi:10.1186/s12974-016-0736-y	(1)
7.	Hubscher CH, Herrity AN, Williams CS, et al. Improvements in bladder, bowel and sexual outcomes following task-specific locomotor training in human spinal cord injury. <i>PLoS One.</i> 2018;13(1):e0190998. Published 2018 Jan 31. doi:10.1371/journal.pone.0190998	(5)
8.	Alwaal A, Breyer BN, Lue TF. Normal male sexual function: emphasis on orgasm and ejaculation. <i>Fertil Steril.</i> 2015 Nov;104(5):1051-1060. doi:10.1016/j.fertnstert.2015.08.033	(14)
9.	Partida E, Mironets E, Hou S, Tom VJ. Cardiovascular dysfunction following spinal cord injury. <i>Neural Regen Res.</i> 2016 Feb;11(2):189-194. doi:10.4103/1673-5374.177707	(15)
10.	Bauman WA, La Fontaine MF, Spungen AM. Age-related prevalence of low testosterone in men with spinal cord injury. <i>J Spinal Cord Med.</i> 2014 Jan;37(1):32-39. doi:10.1179/2045772313Y.0000000122	(16)
11.	Guertin PA. Preclinical evidence supporting the clinical development of central pattern generator-modulating therapies for chronic spinal cord-injured patients. <i>Front Hum Neurosci.</i> 2014;8:272. Published 2014 May 30. doi:10.3389/fnhum.2014.00272	(17)
12.	Ibrahim E, Brackett NL, Lynne CM. Advances in the management of infertility in men with spinal cord injury. <i>Asian J Androl.</i> 2016;18(3):382-390. doi:10.4103/1008-682X.178851	(18)
13.	Khazaeipour Z, Norouzi-Javidan A, Kaveh M, Khanzadeh Mehrabani F, Kazazi E, Emami-Razavi SH. Psychosocial outcomes following spinal cord injury in Iran. <i>J Spinal Cord Med.</i> 2014;37(3):338-345. doi:10.1179/2045772313Y.0000000174	(19)
14.	Herrity AN, Williams CS, Angeli CA, Harkema SJ, Hubscher CH. Lumbosacral spinal cord epidural stimulation improves voiding function after human spinal cord injury. <i>Sci Rep.</i> 2018;8(1):8688. Published 2018 Jun 6. doi:10.1038/s41598-018-26602-2	(3)
15.	Park SE, Elliott S, Noonan VK, et al. Impact of bladder, bowel and sexual dysfunction on health status of people with thoracolumbar spinal cord injuries living in the community. <i>J Spinal Cord Med.</i> 2017 Sep;40(5):548-559. doi:10.1080/10790268.2016.1213554	(9)
16.	Shridharani AN, Brant WO. The treatment of erectile dysfunction in patients with neurogenic disease. <i>Transl Androl Urol.</i> 2016 Feb;5(1):88-101. doi:10.3978/j.issn.2223-4683.2016.01.07	(20)

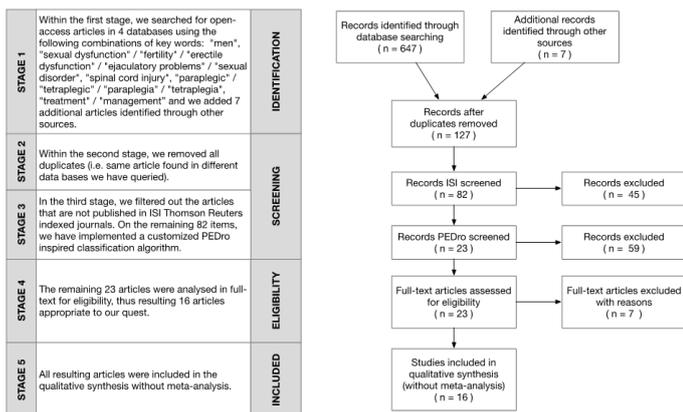


Fig.1: Our completed PRISMA Type-flow diagram

The current systematic analysis of the literature was possible by applying the PRISMA algorithm (without meta-analysis) (21, 22). This flow-diagram depicts the related of information through the different phases of a systematic review without meta-analysis. It maps out the number of records identified, included and excluded, and the reasons for exclusions, out of the total number of 647 articles that were identified only 16 as being of interest, (matching the our afore mentioned admission criteria, the rest of the articles being excluded due to the non-inclusion criteria mentioned above).

Discussion

For this reason, the central question around which the whole work is articulated is: "How is SCI affecting men sexual function?" Sexual dysfunctions (SD) is caused by spinal cord lesions in the neurological pathways related to sexual function, depending on the level and severity of injury (15). After a SCI, men may get erections in one of three ways: psychogenic, reflexogenic and spontaneous (14). The following three factors contribute to infertility in men with SCI: erectile dysfunction, ejaculatory dysfunction (anejaculation or retrograde ejaculation) and semen abnormalities (fertility) (23).

One of the psychological and psychosocial impact of SD is the negative changes occur in the patient's perception of health due to complications resulting from SCI such as motor/mobility deficits, pressure ulcers, spasticity, contractures, bladder and bowel problems especially cause delay of integration with society and psychosocial distress for patients. (2,4,5)

Another effect is low self-esteem can also occur as a result of the decrease in sexual dysfunction, negatively affecting the patient's self image and quality of life (9,19,24)

Sexual education should be available in the postacute 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 (6, 25).

Among the priorities of rehabilitation in men with SCI, sexual recovery was considered the most important aspiration for paraplegic men, followed by overcoming the desire for lower limb motor recovery and recovery of bladder function. For tetraplegic subjects, sexual rehabilitation was considered less important than recovery of upper limb function (24).

Different reports in men with SCI have shown abnormalities of hormones and function of the hypothalamic-pituitary-gonadal

axis (16). Several treatments are available and some of them have great results increasing the quality of life, there are some methods to stimulate erection and ejaculation.

Erectile dysfunction (ED)

Most spinal cord injuries leave intact the S2-S4 segments of the spinal cord, thus making it possible for reflex erections to occur. Reflex erection is preserved in 95% of males with upper motor neuron lesions and 25% of those with lower motor neuron lesions. Oral medications such as PDE-5 inhibitors, i.e. sildenafil citrate (Viagra), vardenafil hydrochloride (Levitra) and tadalafil (Cialis) have been proven to be a valuable and safe (20) medication in the management of ED in male SCI patients that is simple to administer and monitor, because the basic vascular mechanisms are usually intact, When an erection has been achieved through stimulation, these medications help to maintain the erection during sexual activity (18,26).

At patients with absence of both psychogenic and reflexive erections, intracavernous injection (ICI) of prostaglandin E1 (alprostadil)- also a combination of phentolamine and papaverine (Bimix); or combination of prostaglandin 1, phentolamine and papaverine (Trimix), provides a reliable and safe alternative, but the patient should be counseled with regard to side effects, such as hematoma and priapism that may occur with the use of intracavernous injections.

Variable success rates and variable patient satisfaction rates have been reported for three other methods of ED management in men with SCI, which include:

- intraurethral application of alprostadil (MUSE).
- vacuum constriction devices.
- surgically implanted penile prosthesis. Satisfactory results are reported using both the inflatable three-piece device, as well as the semi-rigid penile prosthesis. Lack of penile sensation can result in penile erosion if early signs are not observed by the patient and for this reason, the inflatable devices are not favored in the SCI population (18,26).

Ejaculatory dysfunction

The majority of men with SCI cannot ejaculate with sexual intercourse and will require medical assistance to induce an ejaculation (3,18). Patients with a level of injury at or upper to T10 are more likely to respond to penile vibratory stimulation (PVS), than patients with a level of injury T11 or caudal.

Enough integrity of sympathetic and parasympathetic components of the ejaculatory reflex, as well as the integrity of the dorsal nerve of the penis, to be able to respond to PVS.

The method of PVS is recommended as the first line of treatment for obtaining the ejaculate in anejaculatory men with SCI (17,18,26,27).

Semen abnormalities (infertility)

Ejaculates retrieved from men with SCI typically are characterized by normal sperm concentration, but abnormally low sperm motility and viability.

Despite impaired sperm parameters, pregnancy outcomes from ART (assisted reproductive technology) using sperm from men with SCI are similar to those using sperm from non-SCI men.

Sperm can also be retrieved from the testicles for use with in-vitro fertilization (IVF).

Future studies should focus on improving methods of assisted ejaculation, exploring causes of abnormal semen analysis parameters including immunological factors, and exploring methods to improve semen quality in men with SCI (18).

Conclusions

Sexual dysfunctions after SCI are complex and are strongly adding to the severity and multimodal disability of the affected people – in our case: men after SCI.

After the literature review of specialty analysis male subjects, it was found that sexual activity is one of the most important aspects that medicine must consider after SCI. The studies are showing that sex life can continue with proper care and right approach. But obviously with some limits in many cases needing both special attention from the patient and his/her partner and also special monitoring, with adjustments including both psychological kind, as well.

Applied education with realistic strategic intervention to address sexuality is a method for best clinical practice development, and enhancement of rehabilitation outcome and increase quality of life at men with ED and SCI.

In terms of fertility, science and medicine have reached a level where solutions can be found in almost all cases, therefore, they worth being fathomed and periodically reappraised.

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