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CASE REPORT

Evaluation of sexual and fertility dysfunction in spinal cord-injured men in Jamaica

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INTRODUCTION: Sexual dysfunction and infertility are common in males with traumatic spinal cord injuries (SCIs). The objective of this study was to determine the prevalence of sexual dysfunction and infertility in males with traumatic SCI managed in Jamaica, as well as the therapeutic options offered.

CASE PRESENTATION: A cross-sectional study including males with traumatic SCI managed at the Sir John Golding Rehabilitation Centre, Kingston, Jamaica was carried out between 1 January and 31 December 2015. Sexual function was measured with the International Index of Erectile Function Questionnaire, and further information on social history, fertility desires and treatment options offered were collected. Data were analyzed using Stata 12 for Windows (College Station, TX, USA). The mean age of patients at the time of study was 38.8 ± 15.3 years (range 19–71) with a mean duration of injury of 3.7 ± 2.4 years (range 1.3–15.6). Of 45 patients with traumatic SCI surveyed, 90.7% had erectile dysfunction, with 62.8% being classified as severe and 73.3% of men were unable to ejaculate. Treatment for erectile and ejaculatory dysfunction was offered in only two patients, respectively. Most (71.1%) patients indicated that they wanted to have children in the future, however, no one had been referred for assisted reproductive techniques.

DISCUSSION: Men with traumatic SCI have high rates of severe erectile and ejaculatory dysfunctions, but have preserved interests in maintaining fertility. Adherence to guidelines for sexual education for men with traumatic SCI in Jamaica and the Caribbean is needed.

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INTRODUCTION

The global incidence of traumatic spinal cord injuries (SCIs) is 23 cases per million, with the highest population incidence rate of 40 cases per million documented in the United States.[1] It is estimated that the incidence in the Caribbean is 19 cases per million.[1] Unpublished reports from Jamaica suggest an incidence rate of 16 per million. Differences occur in the epidemiology of traumatic SCI worldwide.[2] Sub-Saharan Africa has the highest reported incidence rate of violence-related traumatic SCI worldwide.[2] Similarly, in Jamaica, most cases of traumatic SCI are due to violence by gunshot wounds. SCI typically affects males between the age of 15 and 30 years who are at the peak of their reproductive years.[3]

Sexual dysfunction and infertility are common complications seen in men with SCI.[4] These complications occur because of a combination of erectile dysfunction (ED), ejaculatory dysfunction and semen abnormalities.[4] A major priority of individuals with SCI is to regain sexual function.[5] Individuals with SCI associate improvement in sexual functioning with an improvement in quality of life.[6–8] Advances in medicine have increased the options for treatment of sexual dysfunction and infertility in men with SCI.[9] Oral phosphodiesterase inhibitors, such as sildenafil are highly efficacious in the treatment of ED in SCI.[10] Interventions to induce ejaculation have a success rate of 95% and pooled analyses reveal a pregnancy rate after advanced fertility treatments of 51%.[11]

Historically, education in sexuality was rarely carried out during rehabilitation after SCI due to lack of prioritizing these complications or physician discomfort.[12] We sought to determine the frequency and severity of erectile and ejaculatory dysfunctions and their correlates in a sample of men with SCI. We also sought to determine the fertility desires and treatment options offered for sexual and fertility enhancement in these men. To our knowledge, this is the first study of its kind in the English-speaking Caribbean.

CASE PRESENTATION

Setting

This study was conducted at the Sir John Golding Rehabilitation Centre in Kingston, Jamaica, a 60-bed facility of which 24 are for adult males. The Sir John Golding Rehabilitation Centre was established in 1954, primarily for the care of persons affected by polio. Currently, the facility is the only integrated treatment and rehabilitation center for the spinal cord-injured patient in the English-speaking Caribbean.

Patient selection

Eligible patients who obtained care at the Sir John Golding Rehabilitation Centre from 1 January to 31 December 2015 were recruited. Cross-sectional data were collected from participating men who completed an interviewer-administered questionnaire. Eligible men had a history of traumatic SCI and were at least 18 years of age, living with permanent neurological deficits. All men were treated as inpatients or ambulatory patients at the Sir John Golding Rehabilitation Centre. Typically, patients with traumatic SCI are managed at the rehabilitation facility 1–3 months after the acute injury. Ethics approval was obtained from the Institutional Review Board, Faculty of Medical Sciences, University of the West Indies, Kingston, Jamaica.

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Demographic data

Of 109 males eligible for the study, 45 patients with traumatic SCI were contacted, consented and were surveyed. The mean age of patients at the time of study was 38.8 ± 15.3 years (range 19–71). The mean age at the time of injury was 35.5 ± 15.9 years (range 11–67 years) and mean duration of injury was 3.7 ± 2.4 years (range 1.3–15.6). A total of 33.3% (15) of patients had a cervical SCI and 46.7% (21) had a thoracic SCI (Table 1). Most men were unmarried (75.6%) and 8.9% were living in common-law unions (Table 1). A total of 66.7% of patients had a partner at the time of the survey.

Comorbidities

Most patients reported no comorbidities. However, 5 patients (11.1%) had hypertension and 1 patient (2.2%) had diabetes mellitus. Most (86.7%) patients did not report a history of substance use, however, 6 (13.3%) had used alcohol, 2 (4.4%) smoked and 5 (11.1%) used both substances (Table 1).

Measures

Sexual function was measured with the International Index of Erectile Function (IIEF), a validated 15-question instrument used to assess overall sexual satisfaction in five domains: erectile function, orgasmic function, sexual desire, intercourse satisfaction and overall satisfaction.[13] All items referred to the previous 4 weeks. In the IIEF questionnaire (erectile function domain—six questions), the score for each item ranges from five for normal erection to zero for no erection (total range 0–30). IIEF rates erectile function as absence of ED (score 25–30), mild ED (score 19–24), mild to moderate ED (score 13–18), moderate (score 7–12) and severe (score 0–6). In addition, demographic information and data on date of SCI, fertility desires, methods of treatment offered, level of SCI and social history were collected via a survey instrument. Neurologic levels of patients were classified per American Spinal Cord Injury Association protocol.

Analyses

Questions from the survey instrument were tabulated and summarized. The scores assigned using the IIEF were also tabulated and summarized. Bivariate associations with IIEF-diagnosed ED were calculated along with bivariate associations with self-reported ability to ejaculate and IIEF-diagnosed reduced sexual desires. Associations were calculated using Fisher's exact tests, χ^2-tests and *t*-tests as appropriate. Data were analyzed using Stata 12 for Windows.

Sexual function

Using the IIEF scoring index, most (62.8%) patients were diagnosed with severe ED, while 27.9% had mild, mild to moderate or moderate ED. Slightly more than three-quarters (76.8%) were diagnosed with severe orgasmic dysfunction. While most (75.6%) men were diagnosed with mild, mild to moderate or moderate dysfunction in their sexual desire. Approximately sixty percent (60.5%) of the patients were diagnosed with severe dysfunction in their intercourse satisfaction. Approximately one-third (31.7%) were diagnosed with severe dysfunction in their overall satisfaction, and slightly more than half (53.7%) were diagnosed with mild, mild to moderate or moderate dysfunction in their overall satisfaction, while 14.6% were diagnosed with no dysfunction in their overall satisfaction (Table 2). Only two patients had been offered treatment for ED.

Ejaculatory function

Twelve (26.7%) patients reported being able to ejaculate. Of those who had difficulties ejaculating, only two patients reported previously being offered treatment for lack of ejaculation by a member of the health-care team.

Table 1. Demographic data of men with spinal cord Injuries managed at the Sir John Golding Rehabilitation Centre, Kingston, Jamaica

Variables	n *(%)*
Level of spinal cord Injury	
Cervical	15 (33.3)
Thoracic	21 (46.7)
Lumbar	2 (4.4)
Level not indicated	7 (15.6)
Comorbidities	
Diabetes mellitus	1 (2.2)
Hypertension	5 (11.1)
Ischemic heart disease	0 (0.0)
Hypercholesterolemia	0 (0.0)
None	39 (86.7)
Social (substance use)	
Alcohol	6 (13.3)
Smoking	2 (4.4)
Both	5 (11.1)
None	32 (71.1)
Relationship status	
Single	34 (75.6)
Married	3 (6.7)
Divorced	1 (2.2)
Widowed	1 (2.2)
Other—common law	4 (8.9)
Other—separated	2 (4.4)
Do you have a partner currently?	
Yes	30 (66.7)
No	15 (33.3)

Fertility desires

Most (71.1%) patients indicated that they wanted to have children in the future and only 2 (4.4%) had gotten a woman pregnant since their injuries. No one reported being referred to the Fertility Unit or advised about artificial reproductive techniques.

Bivariate associations

There were no statistically significant bivariate associations of the level of SCI, presence of comorbidities, social history, relationship status or age with ED, or able to ejaculate (Tables 3 and 4).

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research.

DISCUSSION

Our study revealed that ~91% of men with traumatic SCI had ED, with ~63% being classified as severe. Over 70% of males had ejaculatory dysfunction, while 70% reported a desire for future fertility. However, very few men were offered treatment for sexual dysfunction and none were referred for assisted fertility treatments.

Traumatic SCI disrupts motor, sensory and autonomic pathways leading to ED. The reported rate of ED in our study is quite high. In a previous study assessing the long-term outcome of erectile function in men with SCI, 61% of respondents reported having erections without pharmacological or assisted devices, however, in most patients the quality of erections was poor (turgor and duration).[14] Akman reported that in 47 Turkish men with a history of a SCI, ~94% reported the presence of erections, however, 87%

Table 2. International Index of Erectile Function domains in men with spinal cord injuries managed at the Sir John Golding Rehabilitation Centre

Domains	n *(%)*
Erectile function (N = *43*)	
Severe	27 (62.8)
Moderate	2 (4.6)
Mild to moderate	3 (7.0)
Mild	7 (16.3)
None	4 (9.3)
Orgasmic function (N = *43*)	
Severe	33 (76.8)
Moderate	1 (2.3)
Mild to moderate	4 (9.3)
Mild	1 (2.3)
None	4 (9.3)
Sexual desire (N = *43*)	
Severe	8 (18.6)
Moderate	8 (18.6)
Mild to moderate	13 (30.2)
Mild	13 (30.2)
None	1 (2.3)
Intercourse satisfaction (N = *43*)	
Severe	26 (60.5)
Moderate	5 (11.6)
Mild to moderate	5 (11.6)
Mild	7 (16.3)
None	0 (0.0)
Overall satisfaction (N = *41*)	
Severe	13 (31.7)
Moderate	8 (19.5)
Mild to moderate	9 (22.0)
Mild	5 (12.2)
None	6 (14.6)

Table 3. Bivariate associations with erectile dysfunction

Variables	*ED—IIEF*	
	Yes (N = *39*) n *(%)*	*No* (N = *4*) n *(%)*
Level of spinal cord Injury	P = 1.000[a]	
Cervical	12 (85.7)	2 (14.3)
Thoracic	19 (90.5)	2 (9.5)
Lumbar	2 (100.0)	0 (0.0)
Comorbidities	P = 1.000[a]	
Yes	6 (100.0)	0 (0.00)
No	33 (89.2)	4 (10.8)
Social (substance abuse)	P = 0.075[a]	
Yes	10 (76.9)	3 (23.1)
No	29 (96.7)	1 (3.3)
Relationship status	P = 1.000[a]	
Single/divorced/separated/ widowed	32 (88.9)	4 (11.1)
Married/common law	7 (100.0)	0 (0.0)
Age	P = 0.945[b]	
Mean ± s.d.	35.4 ± 15.9	36.0 ± 18.4

Abbreviations: ED, erectile dysfunction; IIEF, International Index of Erectile Function.
[a]Fisher's exact test.
[b]*t*-test.

Table 4. Bivariate associations with ability to ejaculate

Questions (N = *45*)	*Able to ejaculate*	
	Yes (N = *12*) n *(%)*	*No* (N = *27*) n *(%)*
Level of spinal cord Injury	P = 0.434[a]	
Cervical	4 (26.7)	11 (73.3)
Thoracic	3 (17.7)	14 (82.3)
Lumbar	1 (50.0)	1 (50.0)
Comorbidities	P = 1.000[a]	
Yes	1 (20.0)	4 (80.0)
No	11 (32.3)	23 (67.7)
Social (substance abuse)	P = 1.000[a]	
Yes	4 (33.3)	8 (66.7)
No	8 (29.6)	19 (70.4)
Relationship status	P = 0.172[a]	
Single/divorced/separated/ widowed	8 (25.0)	24 (75.0)
Married/common law	4 (57.1)	3 (42.9)
Age	P = 0.516[b]	
Mean ± s.d.	39.8 ± 13.8	35.1 ± 16.1

[a]Fisher's exact test.
[b]*t*-test.

reported severe ED.[15] Psychogenic and reflexogenic erections may be preserved in men with SCI, however, these erections are usually of poor quality and may not permit satisfactory intercourse. In fact, in our study, most men reported poor overall satisfaction with intercourse. Another study noted that the severity and level of the injury affect the presence and type of erections.[16] We were not able to report any bivariate association between spinal cord level and ED.

A recent systematic review and meta-analysis, including 6 studies and 963 patients with ED secondary to traumatic SCI concluded that phosphodiesterase inhibitors were very effective in the treatment of ED, with a standardized mean difference 0.71 (95% confidence interval 0.39–1.03) and with high heterogeneity ($I^2 = 74.4\%$).[17] Chochina *et al*.[18] also reported recently in a systematic review and meta-analysis that intra-cavernosal injections resulted in successful erections in 88% (95% confidence interval 83–92%) of men with ED and SCI. Alternatives to phosphodiesterase inhibitors and intra-cavernosal injections in men with ED secondary to traumatic SCI include vacuum constriction devices, perineal training, penile prosthetic implantation and sacral neuromodulation.[19,20] Various types of phosphodiesterase inhibitors, which are effective and widely accepted treatments for men with ED are available in Jamaica, such as sildenafil, vardenafil and tadalafil. The intra-cavernosal injection, Trimix (Bryce Laboratories, Stamford, CT, USA) (prostaglandin E1, phentolamine and papaverine) and vacuum constriction devices are also available in Jamaica. Despite this, very few men were treated for ED.

Because of the disruption of neurological innervation, most patients with SCI cannot ejaculate.[9] This was borne out in our study, where over 70% of patients were unable to ejaculate. Successful methods to produce antegrade ejaculation include penile vibratory stimulation and electro-ejaculation.[9] These procedures should be considered as first-line methods to retrieve sperm in the SCI patient.[4] Both procedures are performed infrequently in Jamaica, however, in a resource-constrained

environment, the procedure that is easily repeated offers lower costs than surgical harvesting.

Most men reported a future desire for fertility, however, in addition to an ejaculation, semen abnormalities impair fertility in men with SCI. Semen abnormalities in men with SCI include oligospermia, asthenospermia, increased reactive oxygen species, necrospermia and increased anti-sperm antibodies.[21–24] Sperm harvesting followed by assisted reproductive techniques have improved fertility in men with traumatic SCI. Early reports in 1987 revealed a pregnancy rate of 0% in partners of men with SCI.[25] This has increased to as high as a pregnancy rate of ~ 87% and live birth rate of 70% in more recent reports.[26] Assisted reproductive techniques with good outcomes are available in Jamaica at the Hugh Wynter Fertility Management Unit, which was established in 1979.[27]

The results of the study suggest the need for counseling regarding sexual health and fertility in men with traumatic SCI. Patients with SCI express dissatisfaction with sexual education after injury.[12] Akman reported that Turkish men with SCI preferred to have sexual education given by physicians after the completion of the rehabilitation period, yet in that study, only 8.5% of patients received sexual education after injury.[15] Though no consensus exists on the timing, methods and details of sexual education after traumatic SCI, we believe that a protocol for this aspect of management is warranted. Alexander made recommendations for discussing sexual health with patients with SCI by providing sensitive information and being available to answer questions.[28]

Our study was limited by a small sample size and modest patient recruitment rate. However, we consider the use of the validated IIEF as a strength to improve the classification of erectile and sexual dysfunctions. Despite this, we acknowledge the limitation of the use of the IIEF in the SCI population where reflexogenic and psychogenic erections are not distinguished, and consideration to the lack of ejaculation in this population is not made.[29] In addition, the IIEF reports on sexual experiences in the 4 weeks prior to completion of the questionnaire. In our study, this may create a limitation, where 66.7% of patients had a partner and consideration was not given to consistency of partners, patient hospitalization or the impact of SCI on the possibility of sexual activity over the preceding 4 weeks. We consider this study meaningful as it represents the first report in the Caribbean region on sexuality and fertility desires in SCI men. The Consortium for Spinal Cord Medicine has published clinical practice guidelines on addressing sexuality in SCI patients during rehabilitation and lifelong.[30] Improved education and adherence to these guidelines are needed in Jamaica.

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COMPETING INTERESTS

The authors declare no conflict of interest.

REFERENCES

1 Lee BB, Cripps RA, Fitzharris M, Wing PC. The global map for traumatic spinal cord injury epidemiology: update 2011, global incidence rate. *Spinal Cord* 2014; **52**: 110–116.
2 Cripps RA, Lee BB, Wing P, Weerts E, Mackay J, Brown D. A global map for traumatic spinal cord injury epidemiology: towards a living data repository for injury prevention. *Spinal Cord* 2011; **49**: 493–501.
3 Singh A, Tetreault L, Kalsi-Ryan S, Nouri A, Fehlings MG. Global prevalence and incidence of traumatic spinal cord injury. *Clin Epidemiol* 2014; **6**: 309–331.
4 Ibrahim E, Brackett NL, Lynne CM. Advances in the management of infertility in men with spinal cord injury. *Asian J Androl* 2016; **18**: 382–390.
5 Anderson KD. Targeting recovery: priorities of the spinal cord-injured population. *J Neurotrauma* 2004; **21**: 1371–1383.
6 Anderson KD, Borisoff JF, Johnson RD, Stiens SA, Elliott SL. The impact of spinal cord injury on sexual function: concerns of the general population. *Spinal Cord* 2007; **45**: 328–337.
7 Reitz A, Tobe V, Knapp PA, Schurch B. Impact of spinal cord injury on sexual health and quality of life. *Int J Impot Res* 2004; **16**: 167–174.
8 Barbonetti A, Cavallo F, Felzani G, Francavilla S, Francavilla F. Erectile dysfunction is the main determinant of psychological distress in men with spinal cord injury. *J Sex Med* 2012; **9**: 830–836.
9 Ibrahim E, Lynne CM, Brackett NL. Male fertility following spinal cord injury: an update. *Andrology* 2016; **4**: 13–26.
10 Giuliano F, Hultling C, El Masry WS, Smith MD, Osterloh IH, Orr M *et al.* Randomized trial of sildenafil for the treatment of erectile dysfunction in spinal cord injury. Sildenafil Study Group. *Ann Neurol* 1999; **46**: 15–21.
11 DeForge D, Blackmer J, Garritty C, Yazdi F, Cronin V, Barrowman N *et al.* Fertility following spinal cord injury: a systematic review. *Spinal Cord* 2005; **43**: 693–703.
12 New PW, Seddon M, Redpath C, Currie KE, Warren N. Recommendations for spinal rehabilitation professionals regarding sexual education needs and preferences of people with spinal cord dysfunction: a mixed-methods study. *Spinal Cord* 2016; **54**: 1203–1209.
13 Rosen RC, Riley A, Wagner G, Osterloh IH, Kirkpatrick J, Mishra A. The international index of erectile function (IIEF): a multidimensional scale for assessment of erectile dysfunction. *Urology* 1997; **49**: 822–830.
14 Anderson KD, Borisoff JF, Johnson RD, Stiens SA, Elliott SL. Long-term effects of spinal cord injury on sexual function in men: implications for neuroplasticity. *Spinal Cord* 2007; **45**: 338–348.
15 Akman RY, Coskun Celik E, Karatas M. Sexuality and sexual dysfunction in spinal cord-injured men in Turkey. *Turk J Med Sci* 2015; **45**: 758–761.
16 Ramos AS, Samso JV. Specific aspects of erectile dysfunction in spinal cord injury. *Int J Impot Res* 2004; **16**(Suppl 2): S42–S45.
17 Garcia-Perdomo HA, Echeverria-Garcia F, Tobias A. Effectiveness of phosphodiesterase 5 inhibitors in the treatment of erectile dysfunction in patients with spinal cord trauma: systematic review and meta-analysis. *Urol Int* 2016; **98**: 198–204.
18 Chochina L, Naudet F, Chehensse C, Manunta A, Damphousse M, Bonan I *et al.* Intracavernous injections in spinal cord injured men with erectile dysfunction, a systematic review and meta-analysis. *Sex Med Rev* 2016; **4**: 257–269.
19 Lombardi G, Musco S, Wyndaele JJ, Del Popolo G. Treatments for erectile dysfunction in spinal cord patients: alternatives to phosphodiesterase type 5 inhibitors? A review study. *Spinal Cord* 2015; **53**: 849–854.
20 Moemen MN, Fahmy I, AbdelAal M, Kamel I, Mansour M, Arafa MM. Erectile dysfunction in spinal cord-injured men: different treatment options. *Int J Impot Res* 2008; **20**: 181–187.
21 Perkash I, Martin DE, Warner H, Blank MS, Collins DC. Reproductive biology of paraplegics: results of semen collection, testicular biopsy and serum hormone evaluation. *J Urol* 1985; **134**: 284–288.
22 Brackett NL, Abae M, Padron OF, Lynne CM. Treatment by assisted conception of severe male factor infertility due to spinal cord injury or other neurologic impairment. *J Assist Reprod Genet* 1995; **12**: 210–216.
23 Mallidis C, Lim TC, Hill ST, Skinner DJ, Brown DJ, Johnston WI *et al.* Necrospermia and chronic spinal cord injury. *Fertil Steril* 2000; **74**: 221–227.
24 Hirsch IH, Sedor J, Callahan HJ, Staas WE. Antisperm antibodies in seminal plasma of spinal cord-injured men. *Urology* 1992; **39**: 243–247.
25 Iwahata T, Shin T, Shimomura Y, Suzuki K, Kobayashi T, Miyata A *et al.* Testicular sperm extraction for patients with spinal cord injury-related anejaculation: a single-center experience. *Int J Urol* 2016; **23**: 1024–1027.
26 Halstead LS, VerVoort S, Seager SWJ. Rectal probe electrostimulation in the treatment of anejaculatory spinal cord injured men. *Paraplegia* 1987; **25**: 120–129.
27 Foster R, DaCosta V, Everett D, Christie L, Harriott J, Wynter S *et al.* Successful treatment of severe male factor infertility in Jamaica with intracytoplasmic sperm injection. *West Indian Med J* 2011; **60**: 41–45.
28 Alexander MS, Alexander CJ. Recommendations for discussing sexuality after spinal cord injury/dysfunction in children, adolescents, and adults. *J Spinal Cord Med* 2007; **30**(Suppl 1): S65–S70.
29 Alexander MS, Brackett NL, Bodner D, Elliott S, Jackson A, Sonsken J *et al.* Measurement of sexual functioning after spinal cord injuries: preferred instruments. *J Spinal Cord Med* 2009; **32**: 226–236.
30 Consortium for Spinal Cord Medicine. Sexuality and reproductive health in adults with spinal cord injury: a clinical practical guideline for health-care professionals. *J Spinal Cord Med* 2010; **33**: 281–336.