DOI: 10.14744/ejmi.2020.00477
EJMI 2020;4(2):274–278

Research Article

The Relation Between the Bladder Drainage Types and Sleep Quality on Patients with Spinal Cord Injury

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Abstract

Objectives: Intermittent self-catheterization (IsC) improves self-care, independence, body image, and expression of sexuality, reducing the risk of urethral trauma and urinary tract infections. However, increased frequency of catheterization, especially nocturnal catheterization, may disturb the sleep process and reduce the quality of life (QoL).

Methods: Sixty patients with spinal cord injury (SCI), 29 of whom were tetraplegic and 65 were paraplegic, were included. The participants were divided into 4 groups based on the bladder drainage types as spontaneous voiding, IsCx4 (4 times a day), IsCx6 (6 times a day), and permanent catheterization. Pittsburgh Sleep Quality Index (PSQI) and Satisfaction with Life Scale (SWLS) were used to assess sleep quality and life satisfaction of the participants. PSQI and SWLS were compared between the groups.

Results: The mean age of the patients was 35.06±13.28 years. Median time from SCI was 22 (6-276) months. PSQI and SWLS values were similar among the groups based on the types of voiding (p=0.24, and p=0.68, respectively). In each group, the SWLS and PSQI were correlated with poor life satisfaction and poor sleep quality, respectively.

Conclusion: Although we thought that the increased frequency of IsC could affect the sleep quality and life satisfaction, the results of this preliminary study did not support this hypothesis.

Keywords: Intermittent self catheteterization, spinal cord injury, sleep quality

Cite This Article: *Karatas G, Metli NB, Akyuz M, Ozisler Z, Yalcin E. The Relation Between the Bladder Drainage Types and Sleep Quality on Patients with Spinal Cord Injury. EJMI 2020;4(2):274–278.*

Neurogenic bladder (NB) is an important cause of disability for patients with spinal cord injury (SCI). The main goal of treatment for NB is to find the best urine-draining method in order to prevent possible complications.[1] Urine-draining methods can be varied as follows; permanent catheterization, intermittent self-catheterization (IsC), and spontaneous voiding. Each method has positive and negative aspects. IsC is the optimal method to regularly empty the bladder, with the aid of a catheter. The frequency of IsC depends on the bladder's capacity and pressure and is performed at 4 or 6 hour intervals, with many advantages in terms of body image, sexuality, and independence.[1-3]

Frequent IsC, especially when it is assisted by another person, can negatively affect quality of life (QoL). IsC, when applied at 4-hour intervals, may result in some problems related to sleep patterns. Permanent catheterization is a method used in patients in whom the bladder capacity is very small and who cannot perform or refuse IsC, having negative effects on body image and sexual activity, with an

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Submitted Date: December 10, 2019 **Accepted Date:** March 04, 2020 **Available Online Date:** March 21, 2020

increased risk of infection, stone, and malignancy.[3, 4] Spontaneous voiding is the main goal. It has virtually no social and psychological burden, but may have a few disadvantages such as pollakiuria and incontinence.

Regardless of the level of SCI, sleep problems can be observed in 35% of the cases and have been reported to be approximately 4 times higher than that observed in normal population.[5, 6] The possible causes of sleep disorders in SCI may include the disruption of melatonin's circadian rhythm, lesion level, pain, spasticity, paranesthesia, inability to rotate in bed, and voiding problems; however, the exact mechanisms associated with sleep disturbances in patients with SCI have remained issue of debate.[7] 'Sleep' is very crucial for QoL and needs to be emphasized as an important consideration in terms of cardiovascular and metabolic risk factors.[8, 9]

There are many studies in the literature regarding the advantages and disadvantages of bladder emptying methods. The studies examining the association of life satisfaction and sleep quality with urine-draining methods have remained limited. We aimed to investigate as to whether the bladder drainage types affects sleep quality and life satisfaction.

Methods

Patient Enrolment

In total, 94 patients with SCI were included in the study. Patients were classified according to the American Spinal Injury Association Impairment Scale (AIS).[10] The inclusion criteria were as follows; age between 18 and 75 years, at least 6 months interval after SCI, and stable clinical and metabolic status. Patients with following criteria were excluded from the study; active infection such as urinary tract infection, simultaneous head trauma during SCI, severe respiratory distress problems, obesity, decubitus ulcers, and history of serious sleep problems including sleep apnea (AIS).

Data Collection and Design

Demographic data and types of bladder drainage of patients were noted. The duration of the event was defined as the time interval from the date of SCI to the date of inclusion in the study. The patients were divided into 4 groups according to the bladder drainage types as spontaneous voiding, IsCx4 (4 times a day), IsCx6 (6 times a day), and permanent catheterization.

The Pittsburgh Sleep Quality Index (PSQI) was used to assess the quality and patterns of sleep. PSQI differentiates "poor" from "good" sleep quality by measuring seven components including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction in the last month. Total score equal to or greater than 5 shows poor sleep quality (≥5; poor SQ).[11] The Satisfaction with Life Scale (SWLS) was carried out to evaluate the life satisfaction levels of patients. The SWLS measures the life satisfaction level of each affected individual and consists of 5-items. Total score less than 20 indicates dissatisfaction.[12] The study was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

Statistical Package for Social Sciences v.22.0 (IBM Corp., Armonk, NY) was used for statistical analysis. Kolmogorov smirnov test was performed to determine whether or not the data were normally distributed. Student t and Anova tests were used to compare normally distributed data, whereas Mann Whitney U and Kruskal Wallis were used for the comparison of non-normally distributed data. Pearson and spearman tests were used for correlation analysis. $P<0.05$ was considered statistically significant.

Results

Of the 94 patients, 29 were tetraplegic and 65 were paraplegic. The mean age of the patients was 35.06±13.28 years and the median duration from the SCI was 22 (6-276) months. The rate of incomplete patients was 52.7%. There was no significant difference between paraplegic and tetraplegic patients in terms of complete-to-incomplete ratio ($p=0.81$). Demographic data are shown in table 1 and types of bladder drainage are demonstrated in table 2.

The median SWLS value of all patients was 13 (5-30) and the median PSQI was 5 (1-19). The median PSQI and SWLS

Table 1. Demographical data

Variables	n	%
Gender		
Female	31	33
Male	63	67
Tetraplegic	29	30.1
Paraplegic	65	69.1
Marital status		
Married	54	57.4
Single	40	42.6
Etiology of SCI		
Traffic accident	33	35.1
Fall	28	29.8
Firearm injury	8	8.5
Other	25	26.6

SCI: spinal cord injury.

Table 2. Types of bladder drainage

	n	%
Spontaneous voiding	16	17
IsCx4	28	29.8
IsCx6	37	39.4
Permanent Catheterization	13	13.8

values of the patients were consistent with poor sleep quality and poor life satisfaction, with 59.6% of patients having poor sleep quality and 71.3% having poor life satisfaction. SWLS and PSQI values were similar between the genders (p=0.56 and p=0.67). SWLS and PSQI values were similar between tetraplegic and paraplegic patients (p=0.39 and p=0.84, respectively).

While 'age' had a positive correlation with SWLS (r=0.25, p=0.14), it had no correlation with PSQI (r=0.12, p=0.23). No significant relationship was observed between the 'duration of event' and 'SWLS or PSQI' (r=0.08, p=0.43 and r=-0.007, p=0.94, respectively). There was a negative correlation between SWLS and PSQI values; those with better life satisfaction were sleeping better, conversely, those with good sleep quality had higher life satisfaction (r=-0.27, p=0.01).

According to the bladder drainage types, PSQI and SWLS values were similar among the groups (p=0.24 and p=0.68, respectively). In each group, the SWLS and PSQI were compatible with poor life satisfaction and poor sleep quality, respectively. The mean ages of the groups were similar according to the bladder drainage types and there was no significant difference in terms of pain-spasticity (p=0.55, p=0.25, and p=0.70, respectively). Table 3 indicates the PSQI and SWLS values by bladder drainage types. In patients performing IsC, there was no statistically significant difference between the genders in terms of SWLS and PSQI (p=0.32 and p=0.69, respectively).

When the sub-parameters of PSQI were analyzed, the most common problem was increased sleep disorders (92.6%), followed by increased sleep latency (76.6%) and impaired sleep quality (67%). The least observed problems in PSQI were 'the use of sleeping medications' (10.6%) and 'daytime dysfunction' (39.4%). Among the PSQI parameters, there was a significant difference only in 'the use of sleeping medication' parameter and no patient with permanent catheter was using a medication to sleep (p=0.036).

Table 3. The differences in PSQI and SWLS by bladder drainage types

Variables	Spontaneous (n=16)	SclX4 (n=28)	SclX6 (n=37)	Permanent (n=13)	p
SWLS (min-max)	17.5 (5-27)	12.5 (5.28)	14 (5-30)	13 (5.27)	0.68
PSQI (min-max)	6.5 (1-18)	5 (1-19)	5 (1-15)	4 (1-12)	0.24

SWLS: satisfaction with life scale; PSQL: Pitshburg sleep quality index.

Discussion

Sleep disorders are common in patients with SCI. Theoretically, sleep disorders in SCI may be related to the involvement of respiratory muscles, especially in patients with upper cervical injuries,[7] but in our study, there was no significant difference between paraplegic and tetraplegic patients in terms of sleep problems or sleep quality. However, patients who had complete tetraplegia with upper cervical injury suffering severe respiratory problems were not included in the study. Similarly, Verheggen et al. could not find any significant differences in the prevalence of sleep disorders between paraplegic and tetraplegic patients who were evaluated by PSQI.[13] In one study, it was stated that one of the important causes of sleep problems may be due to permanent supine position in bed, which may be predisposing to a serious sleep disorder known as sleep apnea syndrome.[14, 15]

While the rate of poor sleep quality was observed to be 85.71% in one study with SCI, another study reported that 35% of patients with SCI had sleep problems.[16, 17] In our study, the majority of the patients (59.6%) had poor sleep quality and this result was consistent with literature.

It is widely accepted that intermittent self-catheterization (IsC) is the closest method to normal body physiology among the bladder emptying methods, with the advantages of less risk of infection, stone, and malignancy development; therefore, IsC is most preferred method to empty bladder completely in the majority of SCI patients.[2-4, 18] Based on the findings in our study, IsC (69.2%) was the most used method for bladder drainage.

Despite all these advantages, we had hypothesized that the sleep pattern and sleep quality of these patients might be impaired by staying awake or waking up at night since patients who performed IsC would ultimately need nocturnal catheterization. However, in our study, although the median sleep quality was low in all groups according to the bladder drainage types, no significant difference was found between the bladder drainage types and sleep quality of the patients. Similar to our findings, Ge et al.[19] found the rate of sleep disturbance to be very high in patients with overactive bladder related to many different reasons including the NB and this negatively affected the QoL. In a study evaluating sleep quality in patients with SCI, 19.5% of

sleep disorders were found to be related to voiding problems.[16] Another study emphasized that sleep disorders caused by voiding problems in patients with SCI were associated with frequent awakenings overnight due to incontinence or need of drainage.[20]

We had also hypothesized that IsC would have positive effects on QoL because it facilitates social integration as well as having many advantages. However, in our study, no significant difference was found in patients' life satisfaction according to bladder drainage types. Similarly, in the study of Hagen et al.,[18] bladder emptying methods did not affect life satisfaction. In another study, as far as QoL and patients' life satisfaction were concerned, IsC was not superior to other interventional bladder drainage methods.[21] Previous studies have demonstrated that bladder dysfunction is closely associated with QoL as well as depression after the spinal injury.[22-24] In our study, patients also had a low life satisfaction rate (72.5%).

It has been reported that type and severity of spinal lesion do not have a significant effect on life satisfaction in patients with SCI,[25] as shown in our study that no significant difference was present between tetraplegic and paraplegic patients. There was a significant relationship between life satisfaction and sleep quality in our study; those who slept well were more satisfied with their lives and those who were satisfied with their lives slept better. Not surprisingly, a supportive study found a significant relationship between sleep quality and QoL in patients with SCI.[6]

There are very few studies evaluating both sleep quality and life satisfaction in SCI patients with NB. The major limitations of our study were its small sample size and subjective questions, which required sincerity and integrity of the patients during answering the questions. In addition, although an anticholinergic agent was used in all patients, subgroup analysis by anticholinergic types could not be performed.

Summing up, sleep disorders and decreased life satisfaction are frequently observed in patients with SCI. In terms of both life satisfaction and sleep quality, the bladder drainage types did not appear to have superiority to each other. Although we thought that the increased frequency of IsC could affect the sleep quality and life satisfaction, the results of this preliminary study did not support this hypothesis and nocturnal catheterization do not appear to have a significant impact on sleep quality and sleep process. Even if the most suitable method is determined for patients, the fact that the applied methods do not have a remarkable effect on life satisfaction and sleep quality will facilitate physicians' choice of bladder drainage method during the rehabilitation process.

Disclosures

Ethics Committee Approval: Author declare, originality and ethical approval of research. The study was conducted under defined rules by the Local Ethics Commission guidelines and audits. decision number 83894237/900-773.99.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – G.K., M.A.; Design – M.A., G.K., N.B.M.; Supervision – Z.O., G.K.; Materials – Z.O., G.K., N.B.M.; Data collection &/or processing – G.K.; Analysis and/or interpretation – G.K.; Literature search – G.K., Z.O., N.B.M.; Writing – G.K., Z.O.; Critical review – M.A.

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