Do anxiety, stress, or depression have any impact on pain perception during shock wave lithotripsy?

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Abstract

Introduction: The most important adverse effect during shock wave lithotripsy (SWL) is pain perception. In this study, we evaluated the effect of anxiety, stress, and depression on pain perception during SWL.

Methods: From November 2013 to December 2014, 189 consecutive patients undergoing SWL for kidney stones were evaluated prospectively. Patient characteristics (age, sex, body mass index [BMI], urologic intervention history, the presence of a double-j catheter, and stone-related parameters) were also recorded. Anxiety, stress, and depression states were assessed before the first procedure using the Depression, Anxiety, and Stress Scales (DASS-42), which is a self-report scale. The degree of pain perception was evaluated with a 10-point Visual Analogue Scale (VAS) at the end of the first SWL session.

Results: There were no statistically significant differences in terms of VAS scores during SWL between patients with and without anxiety, stress, or depression ($p > 0.05$). Furthermore, no statistically significant relationships were found between VAS scores and patient age, sex, side of the stone, presence of a double-j stent, number of stones, and SWL experience ($p > 0.05$).

Conclusions: According to our findings, anxiety, stress, or depression seemed to have no impact on pain perception during SWL.

Introduction

The development of shock wave lithotripsy (SWL) in 1980 significantly changed the management of urinary tract stones.[1] It is currently accepted as the primary treatment option for urinary stones.[2]

SWL produces high-energy shock waves through an electrical discharge. The shock waves are transmitted through the tissues and focused onto a renal/ureteral stone to fragment it with the aid of fluoroscopy or ultrasound. Adverse effects of SWL are well known. The most important adverse effect during the procedure is pain perception, which has been suggested to be related to many factors (stone size, stone location, shock frequency or voltage, skin aperture of the shock wave, the type of the SWL device, etc.).[3,4]

The significance of anxiety, stress, and depression on pain perception during SWL is not clear. The aim of this study was to evaluate the effect of anxiety, stress, and depression on pain perception during SWL. Additionally, we evaluated the relationship between pain perception during SWL and the level of anxiety, stress, and depression.

Methods

Between November 2013 and December 2014, a prospective study was conducted with consecutive patients allocated in order of application, who underwent SWL for kidney stones. The sample size was calculated based on a previous study[5] by assuming an α error of 0.05, a 1-β error of 0.2 (power of 80%) and an effect size I pl:0.51. Power calculations determined that a total sample size of 20 patients would be sufficient. The study was approved by the local ethics committee and informed consent was obtained from all patients. Patient data, including age, sex, body mass index (BMI), urologic intervention history (previous SWL, operation), the presence of a double-j catheter, and stone-related parameters (size as maximum diameter, number) were recorded before the procedure.

Diclofenac sodium 75 mg (Dikloron™, Deva, Istanbul, Turkey) was administered intramuscularly 30–45 minutes before the SWL session for pain control. After the application of diclofenac sodium, the patient's anxiety, stress, and depression states were assessed using the Depression, Anxiety, and Stress Scales (DASS-42), a self-report scale administered before the first procedure. All patients underwent 1–3 sessions of SWL in relation to treatment responses

in our department using an ELMED Multimed Classic lithotripter (ELMED, Ankara, Turkey) electrohydraulic system. SWL treatment was initiated with at a 7 KV energy level and progressively increased to 16–21 KV while considering the pain perception of the patient. At a frequency of 60 shock waves per minute, 2500 shock waves were applied for each patient at every session. Additional analgesics were not administered during the procedure.

Exclusion criteria for this study were the presence of any untreated urinary infections, nonsteroidal anti-inflammatory drug intolerance or allergy, psychiatric drug consumption (such as antidepressants and anxiolytics), the inability to complete the DASS-42 form or evaluate pain with the visual analog scale (VAS), and absolute contraindications for SWL (pregnancy, bleeding diatheses).

The degree of pain perception was evaluated with a 10-point VAS at the end of the procedure.[6] Only the VAS results of the first SWL session were evaluated. Statistical analysis was performed using the Statistical Package for the Social Sciences version 12.0 software program (SPSS 12.0 for Windows; SPSS Inc., Chicago, IL, U.S.). Continuous variables were presented as a mean (±, standard deviation [SD]). The distribution of numerical variables was analyzed separately in each group to establish nonparametric requirements. We performed chi-square tests to compare categorical variables. The significance of differences between groups was estimated using the Mann-Whitney U test and differences were analyzed. Bivariate comparisons were examined using Kendall's correlation coefficients (r) and values were corrected for ties. Two-tailed hypothesis tests were used for statistical analysis and all of these differences were considered significant at $p < 0.05$.

Table 1: Patients and stone characteristics (n=189)

Age ± SD	43.92 ± 13.98
Sex (%)	
Female	59 (31.2%)
Male	130 (68.8%)
BMI ± SD	27.22 ± 4.20
Side of stone (%)	
Right	89 (47.1%)
Left	100 (52.9%)
Double-J stent status (%)	
Yes	32 (16.9%)
No	157 (83.1%)
Stone number ± SD	1.41 ± 1.04
Stone size (mm) ± SD	10.5 ± 3.91
SWL session no ± SD	2.3 ± 0.86
VAS score ± SD	4.62 ± 1.45
Anxiety score ± SD	7.35 ± 7.05
Stress score ± SD	10.95 ± 8.84
Depression score ± SD	6.73 ± 7.96

BMI: body mass index; SD: standard deviation; SWL: of shock wave lithotripsy; VAS: Visual Analogue Scale.

Results

We included 189 patients in this study. Demographic data, stone-related parameters, and patients' characteristics including VAS, anxiety, stress, and depression scores are shown in Table 1.

The comparison of VAS scores and anxiety, stress, and depression statuses according to the DASS-42 scale are described in Table 2. There were no statistically significant differences in terms of VAS scores during SWL between patients with and without anxiety, stress, or depression ($p > 0.05$, Table 2).

The comparison of the severity of anxiety, stress, and depression, and VAS score are shown in Table 3. There was no statistically significant difference between the anxiety, stress, and depression subgroups according to VAS scores ($p > 0.05$, Tables 3, 4). Furthermore, no statistically significant relationships were found between VAS scores and patient age, sex, side of the stone, presence of a double-j stent, number of stones, and SWL experience. The VAS score seemed to increase with increasing BMI and stone size; however, statistical significance for this was not detected (Table 5).

Discussion

Pain during SWL is thought to be related to two different origins. First, is the effect of the shock waves on the cutaneous and subcutaneous structures (skin, muscle, ribs, and subcostal nerves). The second is related to the kidney and to increases in intrapyelic pressure, distention of the renal capsule, or obstructions caused by fragmented stones. The type of SWL machine, shock wave voltage and number, skin aperture, stone size, stone location, sex, age, and BMI are thought to affect pain perception during SWL.[1,3,4,7-12] However, published data on this subject are contradictory. Vergnolles et al,[13] Tokgoz et al,[7] and Berwin et al[3] reported that female patients have significantly higher pain perception and require more analgesic treatments. Alternatively, Salinas et al[4] and Tailly et al[11] reported that there was no

Table 2. The presence of anxiety, stress, depression, and VAS score

	Number (%)	VAS score ± SD	*p* value
All patients	189 (100%)	4.62 ± 1.45	
Anxiety			
No	115 (60.8%)	4.55 ± 1.37	0.458
Yes	74 (39.2%)	4.74 ± 1.57	
Stress			
No	136 (72.0%)	4.64 ± 1.47	0.786
Yes	53 (28.0%)	4.58 ± 1.41	
Depression			
No	140 (74.1%)	4.64 ± 1.48	0.995
Yes	49 (25.9%)	4.59 ± 1.38	

VAS: Visual Analogue Scale.

Table 3. Comparison between the severity of anxiety, stress, and depression, and VAS score

	Number (%)	VAS score ± SD	*p* value
Anxiety (n=74)			
Mild	22 (29.7%)	4.55 ± 1.85	
Moderate	26 (35.1%)	4.73 ± 1.46	0.402
Severe	26 (35.1%)	4.92 ± 1.47	
Stress (n=53)			
Mild	20 (37.7%)	5.05 ± 1.76	
Moderate	19 (35.8%)	4.53 ± 1.07	0.260
Severe	14 (26.4%)	4.00 ± 1.04	
Depression (n=49)			
Mild	16 (32.7%)	4.75 ± 1.34	
Moderate	21 (42.9%)	4.62 ± 1.50	0.831
Severe	12 (24.5%)	4.33 ± 1.30	

SD: standard deviation; VAS: Visual Analogue Scale.

significant relationship between pain perception and sex. Berwin et al[3] reported that BMI is related, while Vergnolles et al[13] and Tokgoz et al[7] reported that BMI in not related to pain perception. Tailly et al[11] reported that stone size and number are related to pain perception, unlike Berwin et al[3] who reported that there is no significant correlation between pain and stone size and the number of stones.

Pain is a subjective description. Other than pathophysiological factors, psychological and social factors may also affect pain perception.[14,15] The relationship between pain and anxiety in SWL patients has been evaluated in a few studies and the results were controversial.[12,13] Franceschi et al reported that anxiety cannot be predictive of pain.[12] Alternatively, Vergnolles et al investigated an anxiety and depression status effect on pain perception during SWL treatment in 164 patients and reported that depressed and anxious patients experienced more pain.[13] In the current study, we investigated the effect of existing anxiety, stress, and depression before the SWL treatment on pain perception during the SWL session. To our knowledge, this is the first study that has evaluated anxiety, stress, and depression at the same time in a large patient series; it is also the only study to evaluate the stress factor and its relationship to pain. In our study, no significant relationships were detected between pain perception and anxiety, stress, or depression among the subgroups.

We only evaluated anxiety, depression, and stress levels before the first SWL session and VAS was only evaluated in the first SWL session. In the previously mentioned studies, this topic was unclear. These previous studies suggested that anxiety and pain perception increased in accordance with the increase in SWL session numbers.[7] Therefore, the evaluation of anxiety, depression, and VAS status for every session, especially in the same patients, can cause conflicting results due to the cumulative experience.

In similar studies, the State-Trait Anxiety Inventory (STAI) or Hospital Anxiety and Depression Scores (HADS) form

Table 4. Correlation between anxiety, stress, and depression levels, and VAS score

	Number (%)	Mean ± SD	VAS score	
			r	*p*
Anxiety				
No	115 (60.8%)	3.04 ± 2.35	0.019	0.793
Yes	74 (39.2%)	14.04 ± 6.69	0.027	0.776
Stress				
No	136 (72.0%)	6.52 ± 4.52	0.067	0.309
Yes	53 (28.0%)	22.32 ± 6.93	-0.151	0.156
Depression				
No	140 (74.1%)	2.89 ± 2.77	0.107	0.110
Yes	49 (25.9%)	17.69 ± 7.78	-0.137	0.220

SD: standard deviation; VAS: Visual Analogue Scale.

was used to detect anxiety or depression.[13,16,17] The STAI is a self-report form, does not have a cutoff point for detecting the presence of anxiety, and only measures the level of anxiety.[18] HADS is also a self-report form and has a cutoff point,but it evaluates the level of anxiety and depression; however, subgroup evaluations are not possible.[19] Unlike these studies, we used the DASS-42 form in our study. The DASS-42 form is also a self-report form and includes 42

Table 5. Descriptive statistics for patient and stone characteristics

Variables	VAS Score (Mean ± SD)	*p* value
Age		
0–39	4.78 ± 1.65	
40–59	4.55 ± 1.20	0.402
>59	4.34 ± 1.40	
Sex		
Female	4.73 ± 1.50	0.308
Male	4.58 ± 1.43	
BMI		
18.5–24.9	4.31 ± 1.29	
25–29.9	4.69 ± 1.55	0.183
>30	4.85 ± 1.37	
Side of stone		
Right	4.76 ± 1.43	0.172
Left	4.50 ± 1.46	
Double-J stent status		
Yes	4.63 ± 1.48	0.950
No	4.60 ± 1.43	
Stone number		
1	4.56 ± 1.49	
2	4.52 ± 1.20	0.108
>2	5.21 ± 1.31	
Stone size (mm)		
<7 mm	4.41 ± 1.44	
8–14 mm	4.61 ± 1.50	0.240
>14 mm	4.91 ± 1.29	
Urologic background		
No	4.60 ± 1.35	0.941
SWL	4.65 ± 1.66	

BMI: body mass index; SD: standard deviation; SWL: of shock wave lithotripsy; VAS: Visual Analogue Scale.

questions. The advantage of this form is that it evaluates anxiety, stress, and depression simultaneously. Also, it has cutoff points for detecting the presence of anxiety, stress, and depression, and can evaluate their severity within subgroups.[20] Thus, we think that the DASS-42 form is a more precise and convenient method of assessing these subjects.

As mentioned above, the relationship between pain perception and patient age, sex, BMI, side of the stone, presence of a double-j stent, number of stones, and stone size is controversial.[1,3,4,7-13] In our study, no statistically significant correlation was found between VAS scores and these factors. Pain perception appears to increase according to increases in BMI and stone size; however, statistical significance was not detected, probably due to the insufficient number of patients (Table 5). The type of SWL device, shock wave voltage, and frequency are the commonly accepted factors related to pain perception during SWL.[3,4] In our study, these factors were not evaluated since we used the same device and performed the procedure with a standard shock wave voltage and frequency.

One of the limitations of our study is that VAS is a commonly used and easy, but subjective, method to evaluate pain perception. The second limitation is that the DASS-42 scale is a self-report form and this type of evaluation cannot take the place of a psychiatric examination performed by a psychiatrist. The third limitation concerns pain perception. Pain itself is a subjective sensation and can be related to many factors, including sex, age, education, social status, personality, degree of knowledge, and experience.[14,21] It can vary from patient to patient. Thus, pain evaluation and detecting the degree of pain can be extremely complicated.

Conclusion

Based on our findings, we can conclude that existing anxiety, stress, or depression before the SWL treatment may not be related to pain perception during the SWL session.

Competing interests: The authors declare no competing financial or personal interests.

This paper has been peer-reviewed.

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