

## The Influence of Pain and Anxiety on the Pain Perception and Outcome of Extracorporeal Shockwave Lithotripsy

Ağrı ve Anksiyetenin Ağrı Algısı ve Ekstrakorporeal Şok Dalgası Litotripsisi Sonucu Üzerindeki Etkisi

Nihat Türkmen , Cemil Kutsal 

University of Health Sciences Sisli Hamidiye Etfal Training and Research Hospital Urology Department Istanbul, Turkey

### ÖZET

**Amaç:** Bu çalışmada ekstrakorporeal şok dalgası litotripsisi (ESWL) öncesi var olan depresyon ve anksiyetenin ESWL sırasında ağrı algısı üzerine etkisini araştırmayı amaçladık.

**Gereç ve Yöntemler:** Ekim 2019 ile Kasım 2020 tarihleri arasında ESWL uygulanan toplam 60 böbrek taşı hastası çalışmaya alındı. Hastaların yaşı, cinsiyeti, vücut kitle indeksi (VKİ) ve taş parametreleri kaydedildi. Hastanın anksiyete ve depresyon durumları ilk seans öncesi Hastane Anksiyete ve Depresyon Ölçeği (HADÖ) ile değerlendirildi. Ağrı düzeyi birinci seanstan sonra görsel analog skala (VAS) kullanılarak değerlendirildi.

**Bulgular:** Anksiyete, depresyon ve VAS puanları arasında istatistiksel olarak anlamlı fark yoktu ( $p>0,05$ ). Anksiyete ve depresyon puanları ile işlem başarısı arasındaki ilişki de değerlendirildi ve anlamlı bir ilişki bulunmadı ( $p>0,05$ ). Ayrıca VAS skoru ile hastanın yaşı, cinsiyeti, VKİ, deriden taşa uzaklığı ve taş boyutu arasında ilişki yoktu ( $p>0,05$ ).

**Sonuç:** Sonuçlarımız, ESWL öncesi depresyon veya anksiyete ile işlem sonrası ölçülen VAS skoru arasında anlamlı bir ilişki göstermemektedir.

**Anahtar Kelimeler:** anksiyete, ekstrakorporeal şok dalgası litotripsisi, ağrı algısı, üriner taş hastalığı

**Cite As:** Türkmen N, Kutsal C. The Influence of Pain and Anxiety on the Pain Perception and Outcome of Extracorporeal Shockwave Lithotripsy. Endourol Bull. 2023;15(2):46-51. doi: 10.54233/endouroloji.20231502-1283969

This study was approved by the Ethics Committee of Health Sciences University Şişli Etfal Hospital, dated 10.01.2023 and number 3779. All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

**Corresponding Author:** Nihat Türkmen, Halaskargazi Cad., Etfal Sk., 34371 Sisli, İstanbul / Turkey

**Tel:** +90 506 771 61 23

**e-mail:** n\_turkmen@yahoo.com

**Received:** April 15, 2023

**Accepted:** May 12, 2023



## ABSTRACT

**Objective:** In this study, we aimed to investigate the effect of depression and anxiety presented before extracorporeal shockwave lithotripsy (ESWL) on pain perception during ESWL.

**Material and Methods:** A total of 60 kidney stone patients who underwent ESWL between October 2019 and November 2020 were enrolled in the study. Patients' age, sex, body mass index (BMI), and stone parameters were recorded. The patient's anxiety and depression states were evaluated using the Hospital Anxiety and Depression Scale (HADS) before the first session. The pain level was assessed by using the visual analog scale (VAS) after the first session.

**Results:** There was no statistically significant difference between the anxiety, depression, and VAS scores ( $p>0.05$ ). The association between anxiety and depression scores and the procedure's success was also evaluated, and no significant association was found ( $p>0.05$ ). Furthermore, there was no association between VAS score and patient's age, sex, BMI, the distance from skin to stone, and stone size ( $p>0.05$ ).

**Conclusion:** Our results do not show a significant correlation between pre-ESWL depression or anxiety with the VAS score measured after the procedure.

**Keywords:** *anxiety, extracorporeal shockwave lithotripsy, pain perception, urinary stone disease*

## INTRODUCTION

Extracorporeal shockwave lithotripsy (ESWL) was introduced in the early 1980s and became the first-line treatment for renal calculi less than 20 mm in diameter (1). The most significant advantage of the procedure can be applied without general anesthesia in an outpatient clinic. However, the success rate varies range from 33% to 91%. It depends on the stone size, location, and hardness as well as lithotripter, operator, and patient (2).

In the early years of ESWL, the procedure was needed general anesthesia to perform. Due to technical improvement, the pain levels were reduced. However, despite the improvement of the lithotripters, ESWL is still considered a painful procedure. Furthermore, many authors suggest that pain may affect the outcome of ESWL due to pain-induced movements and excessive respiratory excursions (3). Moreover, the unbearable pain levels can limit the optimal dose of energy (4).

The generally accepted opinion is that pain negatively affects the success of ESWL. It is thought that involuntary movements and irregular breathing caused by pain make it difficult for the operator to focus on the stone. Therefore, predicting the success of ESWL will prevent repetitive procedures and reduce hospital costs (5). However, there are no reliable data to confirm the direct effect of pain and anxiety on the success rate of ESWL. Therefore, we conducted a study to evaluate the impact of pain and anxiety on the stone-free rates of ESWL.

## MATERIAL AND METHODS

### Patient Selection Criteria

A total of 60 kidney stone patients who underwent ESWL between October 2019 and November 2020 were enrolled in the study. The sample size was calculated based on a previous study by assuming an error of 0.05, a 1-b error of 0.2 (power of 80%) (6). Informed consent was obtained from all patients, and the study was approved by the University of Health Sciences Ethical Committee with the reference number 3779. Patients' age, sex, body mass index (BMI), and stone parameters were recorded. The patients who cannot use non-steroidal anti-inflammatory drugs, have urinary tract infections, use psychiatric drugs, and have an absolute contraindication to ESWL were not included in the study. Furthermore, the patients with multiple or bilaterally stones were excluded from the study.

### Extracorporeal Shockwave Lithotripsy

For pain control, all patients received diclofenac sodium 75mg SR (Dikloron, Deva; Istanbul, Turkey) 15

mins before the procedure, intramuscularly. The patient's anxiety and depression states were evaluated using the Hospital Anxiety and Depression Scale (HADS) before the first session. The pain level was assessed using the visual analog scale (VAS) after the first session (7). All patients received 1-3 sessions of ESWL according to their response to treatment. ELMED Multimed Classic lithotripter (ELMED, Ankara, Turkey) electrohydraulic system was used for the procedures. The initial energy level was determined as 7 KV, and it was adjusted according to the patient and increased up to a maximum of 21 KV. Each patient was administered 3000 shock waves, delivering 60 shock waves per minute at every session.

### Statistical Analysis

Data were analyzed using software (SPSS, Version 23.0; IBM Corp, Armonk, NY). The Kolmogorov-Smirnov normality test was performed to determine the distribution. Afterward, Mann Whitney U test was used to evaluate the association between the success of the ESWL and the HADS scores. Furthermore, Kruskal-Wallis test was used to compare the anxiety, depression, and VAS scores, and the results were reported as the mean and the standard deviation ( $\pm$ SD). Spearman test was used to evaluate the correlation between VAS score, anxiety, and depression subgroups. The statistical significance was set at  $P < 0.05$ .

## RESULTS

A total of 60 patients were included in the study. Patients' characteristics, stone parameters, VAS, anxiety, and depression scores were shown in Table 1.

The correlation between the severity of anxiety, depression, and VAS score was shown in Table 2. There was no significant correlation between the subgroups. Moreover, there was no statistically significant difference between the anxiety, depression, and VAS scores ( $p=0.069$ ,  $p=0.802$ ) (Table 3). The association between anxiety and depression scores and success of the procedure were also evaluated, and no significant association was found ( $p=0.127$ ,  $p=0.809$ ). Furthermore, there was no association between VAS score and patient's age ( $p=0.362$ ), sex ( $p=0.201$ ), BMI ( $p=0.437$ ), the distance from skin to stone ( $p=0.98$ ), and stone size ( $p=0.442$ ).

**Table 1.** Patients and stone characteristics (n=60)

Age $\pm$ SD		44.5 $\pm$ 14.19
Sex (%)	Female	17 (28.3%)
	Male	43 (71.7%)
BMI $\pm$ SD		26.93 $\pm$ 5.37
Stone size (mm) $\pm$ SD		12.87 $\pm$ 5.71
Anxiety score $\pm$ SD		6.06 $\pm$ 4.03
Depression score $\pm$ SD		5.43 $\pm$ 3.12
VAS score $\pm$ SD		4.47 $\pm$ 2.91

**SD:** standard deviation; **BMI:** body mass index; **VAS:** Visual Analogue Scale

**Table 2.** Correlation between the severity of anxiety, depression, and VAS score

		Number (%)	VAS score $\pm$ SD	p-value	r value
All patients		60 (100%)	4.47 $\pm$ 2.91		
Anxiety	Mild	39 (65%)	3.90 $\pm$ 0.457	0.883	-0.024
	Moderate	11 (18.3%)	4.91 $\pm$ 0.899	0.519	0.218
	Severe	10 (16.7%)	6.20 $\pm$ 0.800	0.667	-0.156
Depression	Mild	47 (78.3%)	4.43 $\pm$ 0.430	0.66	0.112
	Moderate	10 (16.7%)	4.90 $\pm$ 0.994	0.452	0.627
	Severe	3 (5%)	3.67 $\pm$ 1.20	N/A	N/A

**SD:** standard deviation; **VAS:** Visual Analogue Scale.

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

		Number (%)	VAS score ± SD	p-value
All patients		60 (100%)	4.47 ± 2.91	
Anxiety	Mild	39 (65%)	3.90 ± 0.457	0.069
	Moderate	11 (18.3%)	4.91 ± 0.899	
	Severe	10 (16.7%)	6.20 ± 0.800	
Depression	Mild	47 (78.3%)	4.43 ± 0.430	0.802
	Moderate	10 (16.7%)	4.90 ± 0.994	
	Severe	3 (5%)	3.67 ± 1.20	

*SD: standard deviation; VAS: Visual Analogue Scale.*

## DISCUSSION

Pain perception is an objective condition that depends on physiological as well as psychological factors (7,8). Therefore, some authors aimed to investigate the effects of anxiety and depression on pain perception in ESWL patients (4,9,10). However, these studies contradict each other. For example, Franceschi et al. (9) showed that anxiety does not affect pain perception. However, Vegnolles et al. (4) reported that patients who are more prone to depression and anxiety have lower pain thresholds. On the other hand, the results of our study showed that depression and anxiety, which were presented before ESWL, did not have a significant effect on the VAS score.

In the literature, similar studies used various forms to evaluate depression and anxiety. Spielberger et al. (11) used the State-Trait Anxiety Inventory (STAI), Zigmond et al. (12) used Hospital Anxiety and Depression Scores (HADS), and Altok et al. (13) used Depression, Anxiety and Stress Scales (DASS-42) form. We used the HADS form in our study, which is a self-reported form and includes 14 questions. With this form, we could evaluate anxiety and depression simultaneously. It also has cut-off values to assess the severity of anxiety and depression. Therefore, we suggest that the HADS form is a convenient method to evaluate these subjects.

The feeling of pain that occurs during ESWL occurs in two ways. The first is due to the shock waves hitting the cutaneous and subcutaneous structures and generate pain. The second is due to distension of the kidney capsule or obstruction of the ureteropelvic junction by fragmented stones. Furthermore, the type of ESWL machine, shockwave voltage and number, stone size and location, age, sex, and BMI may affect the severity of the pain during ESWL (8,9). Moreover, anxiety and pain perception might increase with the number of ESWL sessions (10).

Therefore, in this study, we evaluated VAS and HADS scores based on the first session. However, literature has contradictory data about this topic. Vegnolles et al. (4), Tokgoz et al. (10), and Berwin et al. (14) reported that female patients felt more pain than male patients and therefore needed higher doses of analgesia. However, Salinas et al. (15) and Taily et al. (16) did not find any significant relationship between sex and pain perception. Vegnolles et al. (4) and Tokgoz et al. (10) suggested no significant relationship between BMI and pain perception. However, Berwin et al. (14) reported that the higher the BMI value, the more pain the patients felt.

Moreover, while Berwin et al. (14) showed that the pain felt did not increase with increasing stone size, and number, Taily et al. (16) suggested that these two variables significantly affected pain perception. In addition to all these findings, we found that VAS scores tend to increase with the BMI and stone size; however, there was no statistically significant correlation between VAS scores and these factors. Previous studies evaluated the correlation between the frequency, shock wave voltage, and pain perception (14,15). However, we did not investigate these factors because we use the same machine at the same frequencies and energy.

The study has several limitations that need to be addressed. First, VAS is a subjective method to assess pain perception. Therefore, reliability is low. The second is that the HADS scale, which is self-reported form and has low reliability. The last limitation is pain perception itself. Pain perception is highly subjective and depends on many independent factors (17). Therefore, the investigation of pain is exceptionally complicated.

## CONCLUSION

Contrary to some studies in the literature, our results do not show a significant correlation between pre-ESWL depression or anxiety with the VAS score measured after the procedure. However, although there is no significant correlation, it is seen that there is an increase in the VAS score as anxiety and depression increase.

**Conflict of Interest:** The authors declare to have no conflicts of interest.

**Financial Disclosure:** The authors declared that this study has received no financial support.

**Ethical Approval:** The study was approved by the Ethics Committee of Health Sciences University Şişli Etfal Hospital, dated 10.01.2023 and number 3779. The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

**Author Contributions:** Conception and design; Türkmen N, Kutsal C, Data acquisition; Türkmen N, Kutsal C, Data analysis and interpretation; Türkmen N, Kutsal C, Drafting the manuscript; Türkmen N, Kutsal C, Critical revision of the manuscript for scientific and factual content; Türkmen N, Kutsal C, Statistical analysis; Kutsal C, Supervision; Kutsal C.

## REFERENCES

1. Türk C, Petřík A, Sarica K, et al. EAU Guidelines on Diagnosis and Conservative Management of Urolithiasis. *Eur Urol*. 2016 Mar;69(3):468-74. [Crossref]
2. Torricelli FC, Danilovic A, Vicentini FC, et al: Extracorporeal shock wave lithotripsy in the treatment of renal and ureteral stones. *Rev Assoc Med Bras* 2015;61:65–71. [Crossref]
3. Ucer O, Ceylan Y, Ekren F, Ozan E, Muezzinoglu T: Effect of anxiety and pain on success of shockwave lithotripsy (SWL) for treatment of proximal ureteral and renal pelvic stones. *Urolithiasis* 2016;44:559–564. [Crossref]
4. Vergnolles M, Wallerand H, Gadrat F, et al: Predictive risk factors for pain during extracorporeal shockwave lithotripsy. *J Endourol* 2009;23:2021–2027. [Crossref]
5. Hwang I, Jung SI, Kim KH, et al: Factors influencing the failure of extracorporeal shock wave lithotripsy with Piezolith 3000 in the management of solitary ureteral stone. *Urolithiasis* 2014;42:263–267. [Crossref]
6. Torrecilla Ortiz C, Rodriguez Blanco LL, Diaz Vicente F, et al. [Extracorporeal shockwave lithotripsy: Anxiety and pain perception]. *Actas Urol Espan* 2000;24:163-8. [Crossref]
7. Fillingim RB. Individual differences in pain responses. *Curr Rheumatol Reports* 2005;7:342-7. [Crossref]
8. El-Nahas AR, El-Assmy AM, Mansour O, et al. A prospective multivariate analysis of factors predicting stone disintegration by extracorporeal shock wave lithotripsy: The value of high-resolution noncontrast computed tomography. *Eur Urol* 2007;51:1688-93. [Crossref]
9. Franceschi A, Rozada P, Galerneau V, et al. [Pain and extracorporeal lithotripsy for calculi of the upper urinary tract]. *Ann Urol (Paris)* 1991;25:131-7.
10. Tokgoz H, Hanci V, Turksoy O, et al. Pain perception during shock wave lithotripsy: Does it correlate with patient and stone characteristics? *J Chin Med Assoc* 2010;73:477-82. [Crossref]
11. Spielberger CD, Gorsuch RL, Lushene R, et al. *Manual for the State-Trait Anxiety Inventory*. Consulting Psychologists Press. 1970.

12. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand* 1983;67:361-70. [\[Crossref\]](#)
13. Altok M, Akpınar A, Güneş M, et al. Do anxiety, stress, or depression have any impact on pain perception during shock wave lithotripsy? *Can Urol Assoc J*. 2016 May-Jun;10(5-6):E171-E174. [\[Crossref\]](#) <https://doi.org/10.5489/cuaj.3445>
14. Berwin JT, El-Husseiny T, Papatsoris AG, et al. Pain in extracorporeal shock wave lithotripsy. *Urol Res* 2009;37:51-3. [\[Crossref\]](#)
15. Salinas AS, Lorenzo-Romero J, Segura M, et al. Factors determining analgesic and sedative drug requirements during extracorporeal shock wave lithotripsy. *Urol Int* 1999;63:92-101. [\[Crossref\]](#)
16. Tailly GG, Marcelo JB, Schneider IA, et al. Patient-controlled analgesia during SWL treatments. *J Endourol* 2001;15:465-71. [\[Crossref\]](#)
17. Kim H, Neubert JK, Rowan JS, et al. Comparison of experimental and acute clinical pain responses in humans as pain phenotypes. *J Pain* 2004;5:377-84. [\[Crossref\]](#)