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ORIGINAL ARTICLE

Shock Wave Lithotripsy Versus Ureterorenoscopic Lithotripsi for Proximal Ureteral Stones <10 Mm

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Abstract

Introduction: While shock wave lithotripsy (SWL) was recommended as the first-line treatment method for proximal ureteral stones, today both SWL and ureterorenoscopy (URS) are the first-line treatment methods for proximal ureteral stones smaller than 10 mm in the European Urology Association's Urolithiasis guidelines. recommended. In the present study, we aimed to compare the effect of URS and SWL in proximal ureteral stones smaller than 10 mm.

Methods: We performed a retrospective analysis of 87 patients with proximal ureteral Stones <10 cm in our institution. Forty-three patients underwent SWL were labeled as Group I, and 44 patients underwent URS by semirigide ureteroscop were labeled as Group II. Success and complications of the two procedures were compared. All statistical analyses were performed using SPSS, version 21. While "t-test" was used for comparison the independent groups, paired t-test was used in the matched groups. Statistical significance was considered at $p<0.05$. Chi-square analysis was used for the countable variables. Mann-Whitney U test was used for comparing two independent groups.

Results: Mean age of the patients were 44.6±12.5 years and 44.3±15.1 years in group I and group II, respectively ($p>0.05$). Male/female ratio was about 4 and 2 in Groups I and II, respectively ($p>0.05$). The mean stone size of the patients was 7.8±1.3 mm and 6.8±1.5 mm in groups I and II, respectively ($p<0.05$). Any major complicatian and mortality were not experienced in both groups. The stone-free rates were 67.5% (n=29) and 81.8% (n=36) in group I and group II, respectively ($p>0.05$) (Table 1).

Discussion and Conclusion: According to our results, although the success rate of URS was higher in patients with proximal ureteral stones <10 mm compared to SWL, the difference was not statistically significant.

Keywords: Proximal ureteral stone; shock wave lithotripsy; ureterorenoscopy.

Urolithiasis is one of the common urological diseases with a prevalence of approximately 10% and a recurrence rate of approximately 50%.[1] There are various treatment options in ureteral stones according to the size and localization of the stone. These treatment methods are medical expulsive therapy, shock wave lithotripsy (SWL), rigid, semirigid, or flexible ureterorenoscopy (URS). The success of URS and SWL varies between 85% and 95% in both treatment methods.[2-4] Which of these treatment methods will be used as the first choice depends on the size and localization of the stone, the availability of devices or the experience of the surgeon. In the Urolithiasis guidelines of the European Association of Urology, it is reported that both SWL and URS can be chosen as the first-line treatment method in the treatment of proximal ureteral stones smaller than 10 mm.[5] With this study, we aimed to compare the effect of URS and SWL in proximal ureteral stones smaller than 10 mm.

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Materials and Methods

We performed a retrospective analysis of 87 patients with proximal ureteral Stones <10 cm in our institution. Forty-three patients underwent SWL were labeled as Group I and 44 patients underwent URS by semirigide ureteroscope were labeled as Group II. Success and complications of the two procedures were compared. The extracorporeal SWL (eSWL) procedure was performed using electrohydraulic generators (Dornier HM-3, Sonolith Technomed, Direx, Elmed, PCK) devices and at most 3 sessions at 1-week intervals. The shock wave per session was 80 impulses/min and the maximum number of shock waves was 2000. The eSWL failure was considered as the stone not breaking after 3 sessions of eSWL application.

URS procedure was performed under general and spinal anesthesia. Patients were administered 1 g of cefazolin sodium intravenously for prophylaxis. During the URS procedure, a 0.035-inch guidewire was introduced into the ureter and 7/9 Fr semirigid ureteroscopes (Karl Storz) were used. Holmium YAG laser system was used in all patients as an energy source for stone crushing. All statistical analyses were performed using SPSS, version 21. While "t-test" was used for comparison the independent groups, paired t-test was used in the matched groups. Statistical significance was considered at $p<0.05$. Chi-square analysis was used for the countable variables. Mann-Whitney U test was used for comparing two independent groups.

Results

The mean age of the patients was 44.6±12.5 years and 44.3±15.1 years in group I and group II, respectively ($p>0.05$). Male/female ratio was about 4 and 2 in Groups I and II, respectively ($p>0.05$). The mean stone size of the patients was 7.8±1.3 mm and 6.8±1.5 mm in groups I and II, respectively ($p<0.05$). Any major complication and mortality were not experienced in both groups. The stone-free rates were 67.5% (n=29) and 81.8% (n=36) in Group I and Group II, respectively ($p>0.05$) (Table 1).

Discussion

Both URS and SWL are indicated for the surgical treatment of ureteral stones in all localizations.[6] In proximal ureteral stones, the success rate of SWL is between 85% and 95% when a temporary double-J stent is applied before procedure.[7] Stone-free rates after the first, second, and third sessions of SWL were 64%, 77.3%, and 94.7%, respectively.[4] In the present study the stone-free rate in SWL group is 67.5%. While SWL was applied with 90 impulses in the Ur Rehman et al.[4] studies, we applied with 80 impulses in our study. SWL has been shown to be effective in proximal ureteral stones smaller than 10 mm. However, SWL provides low success for large impacted stones.[8] Fragments remaining after SWL may enlarge and require repeat procedures.[9] URS has a higher success rate than SWL for rapid stone fragmentation and rapid treatment of obstruction.[10]

In proximal ureteral stones, URS limits the procedure due to anatomical difficulties. The procedure is more complex than for distal stones and approaches such as double-j stenting may be necessary. Ur Rehman et al.[4] in a study conducted on 150 patients in 2019, the stone-free rates of SWL and URS were measured as 71% and 75%, respectively, and were found to be significantly higher in patients with proximal ureteral stones. In this study, mean stone sizes were determined as 10.5 mm in the SWL group and 24.5 mm in the URS group. In our study, the stone-free rate of URS was measured as 81.8%, and the stone size being <10 mm leads to the conclusion that the stone-free rate increases.

In the meta-analysis of Drake et al.[11] in 2017, 47 studies were evaluated, and compared to SWL, it was seen that URS had a higher stone-free rate at 1 month. In the studies

Table 1. Demographic distribution and stone-free rates between groups

	Group I		Group II		Statistical analysis, p-value
Average age (years)	44.6±12.5		44.3±15.1		Mann-Whitney U
					0.111
	n	%	n	%	Chi-square
Gender					
Male	34	79.1	28	63.6	0.112
Female	9	20.9	16	36.4	
Stone-free rate (%)	29	67.5	36	81.8	0,123
Stone size (mm)	7.8±1.3		6.8±1.5		0.001

reviewed, it was found that URS was associated with less need for reoperation, but with higher complications and longer hospital stays.

In a study conducted by Aboutaleb et al.[12] on 147 patients in 2016, URS achieved a higher stone-free rate in patients with proximal ureteral stones larger than 15 mm. They reported that they do not recommend SWL as the first choice for proximal ureteral stones larger than 15 mm because of less stone-free rate and reprocessing. Although the stone sizes of the patients included in our study were smaller than 10 mm, the stone-free rate of SWL was found to be lower than that of URS.

Manzoor et al.,[13] in their study on 398 patients in 2013, showed that URS had a faster and more effective stone-free rate than SWL. In this study, mean stone sizes were >10 mm, and stone-free rates were 49.2% and 57.8% for SWL and URS, respectively. Although there were similar demographic changes in this study, stone sizes were handled differently from our study, but URS was found to be higher in stone-free rates, although it was not statistically significant.

Salem[14] in their study on 200 patients in 2009, reported that URS is an ideal treatment method for all proximal ureteral stones. They recommended that SWL should be the first-line treatment for proximal ureteral stones smaller than 10 mm, as it is less invasive and requires minimal anesthesia. It has been reported that complications such as extravasation and fever are more common in patients who have undergone URS compared to SWL. In our study, these complications were found to be similar in both groups. While 11F URS was used in the study of Salem complications in URS were less likely to develop due to the use of 9F URS in our study.

Conclusion

According to our results, although the success rate of URS was higher in patients with proximal ureteral stones <10 mm compared to SWL, the difference was not statistically significant.

Ethics Committee Approval: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: E.D., U.O.; Design: E.D., U.O., E.Ö.; Data Collection or Processing: E.D., M.A., M.K.; Analysis or Interpretation: U.O., E.Ö.; Literature Search: E.D., M.A., M.K.; Writing: E.D.

Conflict of Interest: None declared.

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