Is Early Forceps Application Necessary In The Treatment Of Distal Ureteral Stone With Dye Laser And Pneumatic Lithotripsy?

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Citation

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Abstract

Objective: We want to present the success and complication rates of pulsed-dye laser and pneumatic lithotripsy methods as well as emphasizing the importance of early forceps application.

Material And Method: Ureterorenoscopy was performed due to distal ureter stones and evaluated retrospectively. Following the fragmentation, patients with stones 4mm in diameter and less were accepted as the stone-free and patients with stones over 4mm were removed by forceps.

Result: In the laser group, the rate of the patients with stone diameter 4mm or less, first stone-free rate was 56.90%. In this group, when forceps used for the patients after the fragmentation, total stone-free rate raised up to 96.80%. Likewise, while the first stone-free rate in the pneumatic group was 71.56%, total stone-free rate increased to 96.73% after the application of forceps.

Conclusion:Both success and complication rates were found to be significantly higher in the pneumatic litotripteur applied group.

INTRODUCTION

In the late 1980s ([1]), application of visual ureterorenoscopy was the threshold of a new era in the treatment of ureteral stones ([2]). Thanks to the technological development of the ureterorenoscopic devices, development of intracorporeal lithotriptors with various energies like electro-hydraulic, ultrasonic, dye-laser, Holmium:YAG laser increased the success rate in stone fragmentation ([3]). However, the need of forceps application is still continuing. In this study we present our experience with dye laser and pneumatic lithotripsy and emphasize the use of early forceps application.

MATERIAL AND METHOD

We performed ureterorenoscopy to 900 patients with distal ureteral stones between April 1996 and May 2004. Distal ureteral stones were defined as stones under the level of sacroiliac joint. Of these patients, 594 were treated with pulsed-dye laser, and 306 with pneumatic lithotripsy. These groups were statistically similar in terms of number, type, diameter, or being unilateral or bilateral. Male / female ratio was 12 / 1. Ages were between 16-75 (average: 46). Complete urinalysis, renal function tests, hemogram, and routine biochemical tests were performed before the procedure. We performed, intravenous pyelography to every patient, but ultrasonography whenever needed. All the manipulations were performed in lithotomy position and under general anesthesia. Endoscopy devices of 9.5 or 11.5 Fr Stortz were used. A Telemith pulsed-dye laser device with a wavelength of 595nm, having the characteristic of recognizing stones, and optic feedback mechanism was used for laser lithotripsy. For pneumatic lithotripsy, a lithoriptor of Calculiyth brand was used.

For the success criteria, we determined 4mm and less stone diameters as the first stone-free rate, and total stone-free rate if forceps used when diameters were bigger than 4mm. If even in the presence of stricture in the distal of the fragmented stones, forceps application was introduced.

In the presence of complications such as ureteral perforation,

ureteral mucosal laceration, and migration of the stone, these cases were treated with open surgical interventions or placing ureteral stents. Stone-free rates were determined under direct urinary system x-rays taken in the 1 st day and 1 st month postoperatively.

RESULTS

Locations and number of stones between two groups were similar (table 1). Average stone diameter was 12.5mm (7mm – 2cm) in the laser group, and 12.8mm (8mm – 2cm) in the pneumatic group. While the operation period was 13 – 42 min. (average 25 min.) in the laser group, it was 15.30 min. (average 27min.) in the pneumatic group. Hospitalization time was 1.3 days for both groups.

Figure 1

Table 1: Numbers and localizations of the stones in the ureter

Localization and number	Laser group	Pneumatic group
Right ureter	259	141
Left ureter	280	132
Bilateral	55	33
Multiple stones	125	56

The 1 st stone-free rate without any other intervention was 56.90% in the laser lithotripsy group (n = 338 patients). When forceps was used for fragmentations with diameters of 4mm and over, total stone-free rate increased to 96.80% (n = 575 patients). Likewise, the 1 st stone-free rate with pneumatic lithotripsy was found to be 71.56% (n = 219 patients). When forceps applied to this method for fragmentation of stones with diameters of 4mm and over, total stone-free rate increased to 96.73% (n = 296 patients).

When the 1 st stone-free rates were compared for these two methods, there was a significant difference ($p<0.001$) (table 2). Additional forceps application was used with a rate of 39.89% (n = 237) in the laser group, and 24.83% (n = 76) in the pneumatic group ($p<0.001$). Complication rates were 7.9% (n = 147 patients) and 14.70% (n = 45 patients) in the pneumatic group ($p<0.001$). The reason for was due to this difference higher numbers of complications such as stone migration and ureter mucosal laceration in the pneumatic group. For the treatment of complications stent application was required in 6.06% (n = 36 patients) in the laser group, and in 13.07% (n = 40 patients) in the pneumatic group ($p<0.001$) (table 3).

Figure 2

Table 2: Success rates of the methods by themselves and with additional forceps applications.

Type of application	P	Stone free rate	Patient number
Only laser lithotripsy	P <0.01	-	338
Only pneumatic lithotripsy		-	219
Laser + forceps lithotripsy	P >0.5	96.80%	575
Pneumatic + forceps lithotripsy		96.73%	296

Figure 3

Table 3: Cause of complications and treatments.

Complications	In the laser group	In the pneumatic group	P values	Treatments
Ureteral perforation	11 (1.96%)	6 (1.96%)	P >0.5	Open surgery
Mucosal laceration	16 (2.6%)	16 (5.2%)	P <0.01	Ureteral stent
Stone migration	20 (3.3%)	24 (7.8%)	P >0.01	Ureteral stent

DISCUSSION

Stone free rate obtained with intracorporeal lithotriptors used in the treatment of ureteral stones differ throughout the literature. In the comparison studies of dye-laser lithotripsy and pneumatic lithotripsy, success rate differ between 78-99%, and in some studies dye-laser appears to be more successful ([4,5,6]), while pneumatic lithotripsy appears to be more successful in some others ([7,8]). We believe that numbers, diameters, locations, types of stones, as well as energy sources used are responsible from these differences.

Diameter of the fragmented stone effects most the total stone-free rate of the method used. Therefore, the total stone-free rate must be carefully defined. In literature concerning this issue, it is seen that total stone-free rate is defined as stones with diameters of 2mm or less ([7,9]), fragmentations capable of opening the ureteral passage ([4]), or rate of being free of stones after the additional forceps application following the lithotriptor treatment ([10]). It has also been reported in one study that, the diameter of the fragmented stone is less than 4mm it can spontaneously be fallen with a rate of 70%, and 15% if the diameter is 6-8mm ([7]), respectively and in another study ([6]), if repeated ureterorenoscopy could be required with a rate of 7%if the diameter is over 4mm and no additional treatment is applied. Secondly, it is known that ureter stones may cause strictures in 15 percent of the patients, and polyps in 21 percent of the patients ([11]). This will have an impact on the total stone-free rate, and being superior of one of the energy sources to the other will not be sufficient when evaluating the success of the lithotriptors.

In our study, when we compared both methods with respect to stone-free rate with the review of the literature, we observed that total stone-free rates were compliant with each other; however, the 1 st stone-free rates were low in both groups. Again, when the both methods were compared with respect to rate of using forceps additionally, we observed that it was less in the pneumatic group. The reasons for this may be due to more fragmentation obtained with pneumatic lithotripsy, and additional forceps being unnecessary in this group, because stone migration was higher.

Stone migration is because of from the ballistic effect of the pneumatic lithotriptors, and is seen in a rate of 7-12% ([4,5]). In the literature, it is reported that migration is more frequent especially in cases with dilated upper urinary system ([9]). Therefore, it has been emphasized in some reports that using of additional forceps should be the first approach in small distal stones ([10]). We believe that fragmentation process should not be continued in such cases, and forceps application could both increase the success rate, and decrease this complication. Statistically damage in the ureteral mucosa, is the second complication, seen with a rate of 2-5% ([4,5]). We believe that rate of damage in the ureteral mucosa, which we observe more frequently in the pneumatic group, will also diminish with use of additional forceps application. Another complication is ureter perforation, and is seen with a rate of 1-3% ([4,5]). In our study, we observed that this complication rate was not different in the both groups, and it could be attributed to the lithotriptor, or could happen during ureterorenoscopy. The rate of ureteral stent placement for the treatment of the complications was, higher in the pneumatic group. We also believe that additional forceps application lessen the complication rate significantly.

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