Use of Intravenous Furosemide to Prevent Febrile UTI Following Flexible Ureterorenoscopic Laser Lithotripsy

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ABSTRACT

Introduction: Flexible ureterorenoscopic laser lithotripsy is the preferred management option for renal stones less than 2 cm. However, flexible ureterorenoscopic laser lithotripsy is not without complications and urinary tract infection is the most common reported complication. Prophylactic antibiotic use, access sheath, low pressure irrigation are few methods to reduce incidence of urinary tract infection. We have studied whether routine use of intravenous furosemide reduces the incidence of febrile urinary tract infection.

Methods: A total of 70 patients were randomized into two groups where one received intravenous furosemide at the beginning of the procedure and another did not. Flexible ureteroscopic holmium laser lithotripsy was done and patients were followed up for development of febrile urinary tract infection within one week of the procedure.

Results: 14% of patients who received furosemide and 20% of patients who did not receive developed postoperative febrile urinary tract infection within one week. Two patients in each group had bacteriuria.

Conclusions: Although the incidence of febrile UTI is lesser with routine use of intravenous furosemide during flexible ureterorenoscopic laser lithotripsy, statistical significance could not be proved.

Keywords: flexible ureterorenoscopy; furosemide; laser lithotripsy; urinary tract infection.

INTRODUCTION

There have been tremendous developments in the management of renal stones, which have enabled higher clearance rate with minimal invasiveness and complications. With the introduction of fiber optics in urology, ureterorenoscopy soon became popular and introduction of holmium laser turned out to be a milestone. In the present urologic practice, flexible ureterorenoscopic laser lithotripsy is the preferred management option for renal stones less than 2 cm.

However, flexible ureterorenoscopic laser lithotripsy is not without complications, with reported complication rates from 9 to 25%. Urinary tract infection (UTI) is the most common reported complication. Urinary tracts, hematuria, renal colic are other common complications associated with the procedure. Furosemide has been reported as an agent that can reduce the reflow of inflammatory substances, and, at the same time, inhibit the absorption of bacteria and toxin, thus decreasing postoperative infection after endoscopic lithotripsy. This study helps to report the efficacy of use of intravenous furosemide in prevention of postoperative febrile UTI.

METHODS

The study was carried out at Nepal Police Hospital between February 2019 and December 2019. Seventy consecutive patients who underwent flexible ureterorenoscopic laser lithotripsy were
included in the study. In addition to routine preoperative investigations, a CT KUB was performed for characterization of renal system and stones. Routine double J stenting was done to the ipsilateral ureter two weeks prior to lithotripsy. Preoperative urine cultures were performed four days prior to lithotripsy and patients with bacteriuria were excluded.

Perioperative clinical information included age, gender, body mass index, comorbidity, previous stone surgery, stone characteristics (number, size, density, laterality, location), presence of hydronephrosis, and operative time. In case of multiple stones, the stone size was defined by the sum of largest diameters of all the stones.

One gram Ceftriaxone and 750 milligrams Amikacin were routinely given intravenously one hour prior to surgery. All procedures were done under general anesthesia in lithotomy position. In all cases, double J stents were removed and ureteral access sheath (11/13-Fr; Cook Urological Inc., Bloomington, IN, USA) was placed along guidewire up to proximal ureter under fluoroscopy guidance. Flexible ureteroscopy (9.9 Fr, COBRA vision, Richard Wolf, Chicago, USA) was done and all the calices were examined and stone location defined. Normal saline irrigation was done under gravitational flow.

All patients were randomized into two groups using computer generated numbers (www.randomizer.org). The patients in first group were given 40 milligrams Furosemide intravenously simultaneously with initiation of lithotripsy. Stones were fragmented using 200-µm fiber with holmium laser lithotripter (Lumenis Inc., Tel Aviv, Israel). At the end of the procedure, large fragments were removed with a 1.9 Fr nitinol stone basket (Zero-tip; Boston Scientific, Marlborough, MA, USA) and smaller fragments were left for natural drainage. A 6 Fr. double J stent were inserted at end of the procedure.

Post operatively, two more doses of ceftriaxone 1 gram were given twelve hours apart and one dose of 750 milligrams Amikacin was given to all patients on the next day. Oral cefixime 200 milligrams were given twice daily for next five days in addition to oral ketorolac 10 milligrams. The patients were routinely followed up for two weeks. Stone clearance was defined as no obvious radio-opaque shadow at two weeks after the procedure. A post operative febrile UTI was defined as occurrence of fever higher than 38°C within one week of procedure and without any infectious signs in other organs. Urine was sent for bacterial culture and sensitivity for these patients.

RESULTS

The baseline characteristics of patients in two groups are shown in table 1. Thirtyfive patients were randomized into two groups. The two groups were homogenous with each other in age, gender, body mass index, presence of comorbidities, history of previous renal surgery, presence of hydronephrosis, stone characteristics. Since lower pole calyx stones present a unique situation, presence of stone in lower calyx was considered as a separate identity. Operative time was taken from the time of guide wire insertion for access sheath placement to exit strategy.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Furosemide Group</th>
<th>No Furosemide Group</th>
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</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Mean Age (Mean ± SD) years</td>
<td>41.3 ± 6.6</td>
<td>38.4 ± 8.4</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
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<tr>
<td>Male</td>
<td>21</td>
<td>18</td>
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<tr>
<td>Female</td>
<td>14</td>
<td>17</td>
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<tr>
<td>Body Mass Index</td>
<td>25.1 ± 9.2</td>
<td>23.3 ± 7.9</td>
</tr>
<tr>
<td>Comorbidities</td>
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</tr>
<tr>
<td>Diabetes</td>
<td>5</td>
<td>7</td>
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<tr>
<td>Hypertension</td>
<td>8</td>
<td>7</td>
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<tr>
<td>History of Previous Surgery</td>
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<td>3</td>
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<tr>
<td>Hydronephrosis</td>
<td>18</td>
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<tr>
<td>Stone Characteristics</td>
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</tr>
<tr>
<td>Laterality</td>
<td></td>
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<tr>
<td>Left</td>
<td>12</td>
<td>24</td>
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<tr>
<td>Right</td>
<td>23</td>
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</table>
Post operatively, these patients were followed up for a period of two weeks. Febrile UTI was defined as fever of 38°C or more within one week of procedure. Twelve patients in the study developed fever out of which five (14.29%) were of patients in the group that received furosemide and seven were (20%) of patients who did not receive furosemide intraoperatively. Although 6% more patients who did not receive furosemide intraoperatively developed febrile UTI, it was statistically not significant on chi squared test ($p = 0.5071$). Positive bacterial cultures were found in four patients, two each from either groups. All yielded E.coli and were treated with antibiotics according to sensitivity pattern.

![Figure 1. Comparison of incidence of febrile UTI](image)

### DISCUSSION

Although flexible ureterorenoscopic laser lithotripsy is the most recent and minimally invasive method of renal stone management, it is not without complications. Urinary tract infections are the most common complication encountered and is manifested by fever with chills and rigor with pyuria. It may or may not be associated with bacteriuria. Any intravasation of bacteria or endotoxins into the blood stream may lead to urosepsis, a potentially lethal complication. Careful consideration of any relevant clinical history and bacteriological status is, therefore, mandatory in patients undergoing active stone intervention.

CROES database has noted that postoperative fever was observed in 1.8% of the patients, urinary tract infection in 1.0%, and sepsis in 0.3%. Similarly, a recent multicenter review of infectious complications after URS noted a 4.4% risk of postoperative fever and 0.7% risk of sepsis with all patients receiving perioperative antibiotic prophylaxis. Other literatures have reported incidence of up to 25%. We had an incidence of 17.14% and bacteriuria in 5.71%. All our patients responded to a course of oral antibiotics.

Various techniques have been described to reduce the incidence of postoperative febrile UTI. Use of access sheath reduces the intrarenal pressure and thus pyelosinus and pyelovenous reflux. Irrigation at high pressure also causes increased hydrostatic pressure and bacterial and endotoxin translocation into the systemic circulation. European Association of Urology (EAU) guidelines have recommended use of prophylactic antibiotics for ureteroscopic procedures. We routinely used access sheath and gave prophylactic antibiotics to our subjects. To prevent raised intrarenal pressure, we used irrigation under gravitational drain, with the normal saline bottle suspended 60 centimeters above the upper edge of the operating table.

Although the use of intravenous furosemide during ureteroscopy and ureterorenoscopy is routine in many centers, there have been only few literatures describing its efficacy in preventing post operative infectious complications. Jianlei et al. from Qingdao University, in a study of 172 patients who underwent ureteroscopy for ureteral stones found significant ($p = 0.05$) reduction in postoperative infection. Kau et al. have also mentioned similar findings. However, in our study, although the incidence of postoperative febrile UTI was lesser by 6%, it was not statistically significant.
CONCLUSIONS

Although the incidence of febrile UTI is lesser with routine use of intravenous furosemide during flexible ureterorenoscopic laser lithotripsy, statistical significance could not be proved. Larger and multicentered study is recommended for further validation.

CONFLICT OF INTEREST: None

REFERENCES