Retrograde Intrarenal Surgery for Lithiasis in Calyceal Diverticulum

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Abstract

Introduction and Objectives. The aim of this study is to assess in retrospective manner the safety and efficiency of retrograde intrarenal surgery (semirigid and/or flexible ureteroscopy) with Holmium:Yttrium Aluminium Garnet (Ho:YAG) laser lithotripsy for calculi located in calyceal diverticulum.

Materials and Methods. The data of 6 patients diagnosed with renal lithiasis in calyceal diverticulum who underwent semirigid or flexible ureteroscopy with Holmium laser lithotripsy between October 2012 - March 2015 were retrospectively evaluated. The perioperative particularities, the stone free rates and occurring complications were analyzed.

Results. The mean age of patients was 57 years. The mean stone burden was 11 mm (range 7 – 18 mm). The mean operative time was 68.5 minutes (range 50 – 93.5 minutes). Direct access with the semirigid ureteroscope was possible in 66.6% cases (four patients). The average hospital stay was 3.3 days. The stone-free rate was 83.3% (5 out of 6 patients). Residual stones were successfully treated by second-look flexible ureteroscopy. Intraoperative complications were represented by bleeding (33.3%) and mucosal injury (16%). Postoperative complications included postprocedural pain (50%), transient hematuria (33.3%), fever (33.3%). No blood transfusions were required. All complications were managed in a conservative manner.

Conclusions. Retrograde intrarenal surgery for the treatment of calculi located in calyceal diverticulum is an efficient and safe minimally invasive method of treatment. Morbidity, complication rates and hospital stay are lower by comparison with more invasive methods like percutaneous nephrolithotomy or laparoscopic techniques.

Keywords: calyceal diverticulum, laser lithotripsy, retrograde intrarenal surgery, RIRS.
Introduction

Calyceal or pyelocalyceal diverticulum is a cystic cavity of the kidney filled with urine, lined up with transitional urothelium and surrounded by muscularis mucosae and which has or had an open communication with the pyelocalyceal system through an istm or an infundibulum (1). The term of pyelocalyceal diverticulum was first introduced by Prather in 1941 (2). There is no consensus on the causes of calyceal diverticula. Most of them are congenital, being formed by the incomplete regression of the ureteral bud of the Wolffian duct; the causes for the acquired calyceal diverticulum are divided in obstructive, neuromuscular, trauma or fibrotic. The incidence of this disease is 2.1 – 4.5:1000 intravenous urograms, but is probably higher because some diverticula fill up with contrast only during retrograde pyelography (3). The incidence of calyceal diverticula is low, but the frequency of lithiasis in this sites is high.

Usually there are two types of diverticula: type I who communicate with a minor calyx or an infundibulum and type II who communicate with renal pelvis or a major calyx. Type II diverticula are usually bigger, often symptomatic and located in the central area of the kidney.

Calyceal diverticula are incidentally diagnosed or can be symptomatic. Frequent symptoms include ipsilateral flank pain or hematuria (4). The indication for surgical treatment is imposed by chronic pain, hematuria, recurrent urinary tract infections or renal function impairment (5).

With the advance of imagistic methods and especially of computed tomography the detection of calyceal diverticula increased, although most calyceal diverticula can be diagnosed using a normal abdominal ultrasound (6). Intravenous or retrograde pyelography can be necessary to confirm the diagnosis.

There are a number of minimally invasive treatments available for the treatment of lithiasis in calyceal diverticulum: shockwave lithotripsy (SWL), percutaneous nephrolithotomy (PCNL), semirigid or flexible ureteroscopy and laparoscopy.

The aim of this study is to assess in retrospective manner the safety and efficiency of retrograde intrarenal surgery (semirigid and/or flexible ureteroscopy) with Holmium:Yttrium Aluminium Garnet (Ho:YAG) laser lithotripsy for calculi located in calyceal diverticulum.

Materials and methods

The data of 6 patients diagnosed with renal lithiasis in calyceal diverticulum who underwent semirigid or flexible ureteroscopy with Holmium laser lithotripsy between October 2012 - March 2015 were retrospectively evaluated. Three patients had diverticular lithiasis in the upper calyx, two diverticula were located in the middle calyx and one patient had a lower calyx diverticular calculus. Semirigid ureteroscopy alone was used in three cases, flexible ureteroscopy in the other three cases.

Semirigid ureteroscopy with retrograde pyelography was routinely performed in all patients. All procedures were done under spinal anesthesia. Flexible ureteroscopy was used for the calculi who were inaccessible directly by semirigid ureteroscopy. Flexible ureteroscopy was performed with a Flex Xc Storz flexible ureteroscope or a P5 Olympus flexible ureteroscope. Lithotripsy was performed using a 20 W Ho:YAG Storz Calculise II laser until 2014 and then with a 30 W Auriga Ho:YAG laser until the stone fragments obtained were small enough to be passed out in the urine. The procedure’s success was defined by achieving stone fragments smaller than 3 mm; their size was assessed by comparison with the laser fiber diameter.

Stone fragmentation was performed with a 600 µm laser fiber for semirigid ureteroscopy and a 230 µm or 365 µm laser fiber for flexible ureteroscopy respectively. Stone fragments bigger than 3 mm were extracted using Dormia baskets. The incision of the infundibular neck was performed in four cases. In one case the dilation of infundibular neck was performed.

All patients were investigated with intravenous pyelography or computed tomography; hose with positive urine cultures were treated as out patient with appropriate antibiotics. The stone size was measured on a plain X ray and the longest diameter of the stone was measured; abdominal ultrasound was used to measure the size of radiolucent stones. Most of the patients (5 out of 6 cases) had double J stents inserted before surgery. A 14 F access sheet was used in patients who underwent flexible ureteroscopy. Double J stenting was used in all patients at the end of surgery and removed under local anesthesia after stone-free status was achieved.

Postoperative evaluation at 1 month included abdominal ultrasound, plain X ray or computed tomography to assess residual stones. All patients were symptom free at three months after surgery.
Results

The mean age of patients was 57 years. The mean stone burden was 11 mm (range 7 – 18 mm). The mean operative time was 68.5 minutes (range 50 – 93.5 minutes). Direct access with the semirigid ureteroscope was possible in 66.6% cases (four patients). The average hospital stay was 3.3 days.

The stone-free rate was 83.3% (5 out of 6 patients). Residual stones were successfully treated by second-look flexible ureteroscopy.

Intraoperative complications were represented by bleeding (33.3%) and mucosal injury (16%). Postoperative complications included postprocedural pain (50%), transient hematuria (33.3%), fever (33.3%). No blood transfusions were required. All complications were managed in a conservative manner.

Discussions

The efficient treatment of renal lithiasis in calyceal diverticulum presumes the stone treatment itself as well as improving the urinary drainage. These two key elements are absolutely necessary for symptoms relief and for the achievement of radiologic success.

Until the development of endourology, the treatment choice was limited to open surgery by surgical excision or the marsupialisation of the diverticulum with the closing of the infundibulum.

Symptomatic calyceal diverticulum with intracavitary calculi’s treatment can be difficult. Shockwave lithotripsy was performed with modest results due to the persistence of the narrow infundibulum (7,8). García and al. (9) reported a number of 13 cased treated in this manner, resulting only in the stone fragmentation without their passage from the diverticular cavity.

Percutaneous approach of calyceal diverticulum lithiasis showed better results than shockwave litho-
Thripsy, this technique allowing the surgeon to solve at the same time the urinary drainage problem by incising the diverticular istm (8,10). Turna and al. (11) reported a comparative study between shockwave lithotripsy and percutaneous nephrolithotomy for the treatment of calyceal diverticulum lithiasis with stone free rates and symptoms relief who were much better for the percutaneous approach.

The retrograde endoscopic surgery for lithiasis located in calyceal diverticulum became possible with the introduction of flexible ureteroscope and the Ho:YAG lithotripsy. Chong and al. (12) reported good results on a series consisting of 96 patients, with only 8% recurrence rate / symptoms in 8 years of follow-up. Also, Batter and al. (13) reported favorable results on a series of 26 cases with a 94% stone free rate.

Further randomized studies are required in order to decide if retrograde intrarenal surgery is a viable alternative to percutaneous nephrolithotomy for the treatment of calyceal diverticulum lithiasis.

Conclusions

Retrograde intrarenal surgery for the treatment of calculi located in calyceal diverticulum is an efficient and safe minimally invasive method of treatment. Morbidity, complication rates and hospital stay are lower by comparison with more invasive methods like percutaneous nephrolithotomy or laparoscopic techniques.

References