Comparative Study of the Treatment of Renal Stones With Flexible Ureterorenoscopy in Normal Weight, Obese, and Morbidly Obese Patients

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OBJECTIVE To compare the efficacy and the safety of flexible ureterorenoscopy (f-URS) in the treatment of kidney stones according to the body mass index (BMI), which seems to be less influenced by weight compared with shock wave lithotripsy and percutaneous nephrolithotomy.

METHODS We conducted a retrospective monocentric study in patients with a known BMI who underwent an f-URS for kidney stones between 2006 and 2008. Success rates in the obese patients (OP) group (BMI $\geq$30 kg/m^2) were compared with success rates in the normal weight patients (NWP) control group (BMI <25 kg/m^2). Patients with a BMI $\geq$40 kg/m^2 were defined as morbidly obese patients (MOP), a subgroup of the OP group. The success was defined as a stone-free status (no or $\leq$2 mm residual stone) at the time of control, 3 months after the procedure assessed by kidneys-ureters-bladder radiography coupled with ultrasound (only in NWP with radiopaque stones), or computed tomography-scan.

RESULTS A total of 327 procedures were performed, including 97 f-URS in 87 OP (including 14 procedures in 13 MOP) and 230 procedures for 188 NWP. The overall success rate was 67.4% and 68% in the NWP and OP, respectively; $P = .91$ (71.4% in the MOP subgroup). Success rates decreased with an increasing stone size without any differences between the groups. Regardless of location and stone size (<10, 10-20, >20 mm), there was no statistical difference in the success rate. Postoperative morbidity was similar in both groups and occurred in 2.44% of cases.

CONCLUSION f-URS for kidney stones resulted in similar outcomes in NWP and OP, and even MOP, regardless of stone size and location and with equivalent morbidity. UROLOGY 85: 38–44, 2015. © 2015 Elsevier Inc.

The worldwide prevalence of obesity has more than doubled over the last 3 decades. It affected 10% of men and 14% of women in 2008. Obesity has been identified as an independent risk factor for both nephrolithiasis and stone formation.[1,2] Three main technical procedures are recommended in the treatment of kidney stones: shock wave lithotripsy (SWL), percutaneous nephrolithotomy (PNL), and flexible ureterorenoscopy (f-URS). The 2013 European Association of Urology guidelines recommend SWL or f-URS as equivalent first-line interventions for the treatment of kidney stones <20 mm. For stones bigger than 20 mm, PNL is considered as the first therapeutic option.[3] However, in obese patients (OP), the management of kidney stones remains a major challenge. Stone surgery in the OP implies risks and limitations inexperienced in normal weight patients (NWP). For treatment with SWL, success rates tend to diminish with a wider skin-to-stone distance because the distance between the point of shock wave generation (F1) and the shock wave focal point (F2) is limited. It may also be difficult to target the stone under fluoroscopic or sonographic guidance. Weight limitation of the table and attenuation of the signal due to an increased amount of body fat are also identified as specific problems with OP.[4,5]

PNL in OP presents a challenge for 3 main reasons: (1) the accuracy of real-time imaging that is required for a precise percutaneous puncture of a calyx is impaired, (2) the increased skin-to-stone distance makes performing a puncture, a dilation, or securing a tract harder than in non-OP, and (3) maintaining a proper access to the operation site is rendered more complicated with the use

Financial Disclosure: *Olivier Traxer is a consultant for American Medical Systems, Coloplast, Olympus, and ROCAMED. The remaining authors declare that they have no relevant financial interests.*

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Submitted: February 22, 2014, accepted (with revisions): August 18, 2014

http://dx.doi.org/10.1016/j.urology.2014.08.028
0090-4295/15

of sheaths, nephroscopes, and working instruments of inadequate length. In fact, previous studies have reported lower stone-free rates (SFRs) and longer operative times in OP.[6] Furthermore, the longer operative time with OP placed in the traditional prone position tends to increase the number of complications associated with anesthesia (respiratory compromise and impedes venous return). The incidence of various comorbidities (ischemic heart disease, diabetes, and hypertension) is higher in these patients; it results in a higher incidence of general postoperative complications.[7]

For these reasons, f-URS appears to be the treatment of choice for renal stones in OP. f-URS is known to be both more efficient than SWL and safer than PNL.[8-10] To assess the efficiency and safety of f-URS in OP, we wanted to compare the outcomes of f-URS for the treatment of renal stones between NWP and OP.

METHODS

Setting, Design, and Participants

We have conducted a retrospective cohort study, including all consecutive patients >18 years of age with a known record of body mass index (BMI), who underwent a retrograde f-URS procedure for kidney stone disease between 2006 and 2008. Overweight patients (BMI between 25 and 30 kg/m^2) have not been included in the study because they would not have helped prove our primary hypothesis.

The following data were collected as part of the preoperative assessment: gender, age, BMI, stone side, preoperative drainage, renal abnormalities, characteristics of stones (ie, nature, location, and size of the stone; the size was defined as maximal diameter after computed tomography [CT] scan measurement), and operative time. Staghorn calculi were defined as branched calculi occupying the renal pelvis and containing a substantial caliceal extension. Patients were stratified into 2 principal groups based on the World Health Organization classification of BMI: normal weight patients (BMI <25 kg/m^2) and obese patients (BMI ≥30 kg/m^2). We also proceed to a subgroup analysis on morbidly obese patients (MOP; BMI ≥40 kg/m^2). During the preoperative urologic consultation, patients were informed and offered the alternative procedures to f-URS (SWL or PNL according to the indications of the European guidelines) and the advantages or disadvantages of each surgical technique were exposed. Patients were informed of the possibility of multiple f-URS procedures. f-URS was the preferred therapeutic option because patients had comorbidities (anticoagulation and so forth) or contraindications to other procedures, either for patient preference or because f-URS was considered as the first-line option according to the international guidelines. Consent was obtained for all patients. The local institutional review board approved of the study protocol.

Procedures

All procedures were performed under general anesthesia by a single senior urologist experienced in endourology. Each procedure began with the placement of a 0.035-inch polytetrafluoroethylene-coated guidewire placed in the renal pelvis. Then, the insertion of an access sheath (9.5/11.5-Fr or 12/14-Fr, at the physician's preference) was attempted over the guidewire under fluoroscopic control and placed below the ureteropelvic junction. If the placement failed, a double J stent was placed, and the patient was rescheduled in 1 or 2 weeks for an f-URS procedure with insertion of a ureteral access sheath.

All the calyces were inspected and stones identified. When possible, lower pole stones were displaced to a more favorable location before fragmentation. The treatment consisted in stone fragmentation or dusting, performed with a holmium: yttrium-aluminum-garnet laser (273 μm fibers). Once the fragmentation was complete, significant fragments were extracted with a nitinol stone basket on each occasion. At the end of the procedure, at the physician's preference, either a 7-Fr silicone double J stent or a 7-Fr ureteral catheter was placed.

Study Outcomes and Evaluation Criteria

We performed a primary analysis comparing NWP and OP (BMI >30 kg/m^2). We also performed a secondary analysis in which OP were divided in 2 subgroups consisting of patients with 30 kg/m^2≤ BMI <40 kg/m^2 and BMI ≥40 kg/m^2 and were compared with NWP.

The primary outcome of the study was the success of f-URS procedure, defined by the stone-free status. Stone-free status was established if no or residual fragments ≤2 mm were present at the postoperative control, 3 months after the procedure. Assessment was performed using either a kidneys-ureters-bladder radiography coupled with ultrasound (only used in cases of radiopaque stones in NWP), or CT scan. The secondary outcome was the success of f-URS depending on location and/or size. Postoperative complications were also recorded and classified according to the Clavien-Dindo Classification.[11]

Statistical Analysis

Qualitative variables were described as numbers and percentage. Univariate analysis was conducted using the chi-square test (when the attempt population was >5) or the Fisher exact test in case of qualitative explaining variables. Continuous variables were analyzed with the Mann-Whitney U test. All tests were conducted using Stata 12 for Windows (StataCorp). A P value of <.05 was considered significant.

RESULTS

Primary Analysis

Patient Characteristics. During this period, a total of 327 f-URS were performed in 1 center. Ninety-seven procedures were performed in 87 OP (10 bilateral procedures), including 14 procedures in 13 MOP (1 bilateral procedure), and 230 procedures were performed in 188 NWP (42 bilateral procedures).

The study included 161 men (58.5%) and 114 women (41.5%). Mean BMI was significantly higher in OP compared with NWP (34.3 ± 4.6 vs 22.4 ± 2.1 kg/m^2, respectively; P <.0001). Mean stone size was 15.2 ± 8.7 mm (range, 3-50 mm) in NWP and 18.3 ± 13.1 mm (range, 2-50 mm) in OP; P = .31. There were no statistically significant differences among the groups for any of the evaluated variables, except for an older age and a higher proportion of staghorn stones in the OP group in comparison with the NWP group (22.7% vs 11.3% in the OP and NWP, respectively; P = .008). The patient characteristics are summarized in Table 1. No patient had