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*Research Article / Araştırma Makalesi*

# Our results with flexible ureterorenoscopy in treatment of upper calyceal stones in obese patients

## *Obez hastalarda üst kaliks taşlarının tedavisinde fleksible üreterorenoskopi sonuçlarımız*

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**ABSTRACT**

**Aim:** Aim of the present study was to analyze the outcomes of obese patients treated with ureterorenoscopy for upper calyceal stones.

**Material and Method:** Data of obese patients who had flexible ureterorenoscopy for upper calyceal stones in January 2015-December 2018 period were analyzed retrospectively. Demographic features, stone sizes, stent use after the operation, operative time, hospital stay, complications, and stone-free rate were evaluated.

**Results:** The study included 30 obese patients (18 male and 12 female). Average age was 52.6±12.06 years. Average stone size was 19.46±6.6 mm. The average operative time was 72.1±16.8 minutes and hospital stay was 1.5±1.1 days. The success rate was 73.3%. Double J stent was placed in 76.6% of the patients after the operation. In postoperative follow-ups, three patients had severe colic pain, five patients had hematuria lasted less than 24 hours without need for blood transfusion and two patients had urinary system infection. No major complications that could lead to morbidity or mortality were observed in any patients.

**Conclusion:** Flexible ureterorenoscopy is an efficient treatment method with its higher stone-free and lower complication rates for the treatment of upper calyceal stones in obese patients.

**Keywords:** Flexible ureterorenoscopy, obesity, upper calyceal, stone

**ÖZ**

**Amaç:** Bu çalışmada üst kaliks taşı tedavisinde fleksible üreterorenoskopi uyguladığımız obez hastaların sonuçları analiz edilmiştir.

**Gereç ve Yöntem:** Ocak 2015-Aralık 2018 tarihleri arasında üst kaliks taşlarına yönelik fleksible üreterorenoskopi uygulanan obez hastaların verileri geri dönük olarak analiz edildi. Hastaların demografik verileri, taş boyutları, ameliyat sonrası stent kullanımı, ameliyat süreleri, hastanede kalış zamanı, komplikasyon ve taşsızlık oranı değerlendirildi.

**Bulgular:** Çalışmaya 18'si erkek, 12'u kadın olmak üzere 30 obez hasta alındı. Hastaların yaş ortalaması 52,6±12 yıl idi. Ortalama taş boyutu 19,4±6,6 idi. Ortalama operasyon süresi 72,1±16,8 dakika ve ortalama hastanede kalış süresi 1,5±1,1 gün olarak hesaplandı. Başarı oranı %73,3 olarak belirlendi. İşlem sonrası hastaların %76,6'sında d-j stent uygulandı. Postoperatif takiplerinde 3 hastada şiddetli kolik ağrı, 5 hastada kan transfüzyonu gerektirmeyen 24 saatten kısa süren hematüri ve 2 hastada üriner sistem enfeksiyonu görüldü. Hiçbir hastada morbite veya mortaliteye neden olacak major komplikasyon izlenmedi.

**Sonuç:** Obez hastalarda üst kaliks taşlarının tedavisinde yüksek taşsızlık ve düşük komplikasyon oranlarıyla fleksible üreterorenoskopi etkin bir tedavi yöntemidir.

**Anahtar Kelimeler**: Flexible üreterorenoskopi, obezite, üst kaliks, taş

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## INTRODUCTION

Urinary system stone diseases remain the major pathologies affecting public health considerably throughout the history of man. They rank third in terms of frequency after infections and prostate diseases in daily routine urology practice (1). Many factors such as age, gender, chronic diseases, genetics, eating habits, climate and socioeconomic factors play roles in its etiology. Therefore, considerable differences are observed between regions for the incidence rates of urinary system stone diseases. Akıncı et al. (2), carried out a study in 14 different areas of Turkey and found 14.8 and 2.2% of yearly prevalence and incidence rates for urinary system stone diseases. In another study carried out in our region in Turkey, lifelong prevalence of urinary system stone disease was reported to be 11.42% (3).

Obesity is defined as body mass index over 30 kg/m$^2$ and means an increase in fat tissue of body at a harmful level. Obesity is an extremely important public health problem of present day. Studies have shown that obesity diagnoses have increased three times in the last 20 years. Based on World Health Organization data, over a billion people are overweight while 300 million people are obese (4). Along with high obesity incidence rates, many associated metabolic problems are also on increase. Among the leading of these problems are urinary system stone diseases. A number of studies indicated that obesity is an independent risk factor for the formation of urinary system stones through increasing uric acid, sodium and calcium oxalate discharges in urine (5).

Besides their higher tendency for urinary system stones, obese cases also constitute major problems for treatment approaches of clinicians because of their elevated cardiovascular, respiratory and metabolic comorbidities (6). Previously, open surgery methods were considered unrivaled for the treatment of urinary system stone disease, but these clinical approaches involved higher costs and complication rates. In parallel to developments in medicine and importance attached to public health, minimally invasive methods are gaining importance for many cases presenting with urinary system stone disease (7). With its high image quality, ease and use of natural body orifices, flexible ureterorenoscopy is among the favorable treatment modalities (6).

In the present study, obese patients who had flexible ureterorenoscopy for upper calyceal stones were analyzed retrospectively, and success and complication rates of this endourological procedure were evaluated.

## MATERIAL AND METHOD

Data of obese patients who had flexible ureterorenoscopy for upper calyceal stones in January 2015-December 2018 period were studied retrospectively. Cases with body mass index of 30 kg/m$^2$ and over were considered obese. Only the patients with upper calyceal stones were included. Patients with simultaneous stones in different localizations of urinary system were excluded. In addition, patients with kidney rotation anomaly or spinal deformity were also excluded. Pre-operation evaluations were carried out based on anamnesis forms recorded by surgeon, physical examination findings, routine blood tests and urine analyses. In addition, one or more radiological examinations specific to clinical condition of the patients were performed. Direct urinary system X-ray, urinary ultrasonography, intravenous pyelography and non-contrast computed tomography were the imaging systems used to evaluate the patients.

As the first step, bladder was evaluated in detail through cystoscopy. Then, guidewire with hydrophilic tip was advanced under fluoroscopic guidance. Semi-rigid ureterorenoscopy was performed over guidewire both to exclude ureteral pathologies such as ureter stone and to carry out dilatation. Then, access sheath was advanced over guidewire under fluoroscopic guidance (9.5 or 12 Fr) until proximal ureter. In patients for which access sheath could not be placed, kidney pelvis was reached by flexible ureterorenoscopy over guidewire. As lithotripter, energy provided by holmium yttrium-aluminum-garnet (Ho: YAG) was employed using a Lisa Laser Sphinx 60. Stones were fragmented using 0.2 mm diameter holmium laser probe with 0.6-1.0 J and 5-10 Hz energy interval until they were fragmented to a size which could spontaneously fall. Fragments over 3 mm were removed using a basket. In this endourological treatment modality, 7.5 Fr flexible ureterorenoscopy (Karl Storz Endoscopy, Flex-x2s, Germany) was used in all patients.

After the operation, a 4.7 Fr double J ureteral stent was placed in patients who had solitary kidney, ureteral pathology or multiple stones. All these procedures were performed under general anesthesia, in lithotomy position, on an endourology table under fluoroscopic control and sterile conditions. In addition, urine culture negativity was confirmed before the procedure and 1 g intravenous first-generation cephalosporin was administered before the operation. Balloon dilatation was used before ureterorenoscopy in patients whose distal ureteral narrowing. For cases in which kidney pelvis could not be reached during semi-rigid ureterorenoscopy due to ureteral narrowing, double j stent was placed and the procedure was postponed. The patients whose

endourological procedure were postponed, were re-operated within a month and data from the second operation were included in the study. Determination of residual calculi was performed a month after the operation through computed tomography. Complete postoperative stone clearance or presence of residual fragments smaller than 3 mm were considered successful.

Demographic features, stone sizes, stent use after the operation, operative time, hospital stay, complications and stone-free rate were evaluated. Data were given as mean ± standard deviation (minimum–maximum).

Statistical analysis were performed using SPSS software ver. 18.0 (Statistical Packet for Social Sciences, PAWS Statistics). Data of patients who did not come to regular follow-up visits or who did not give consent for scientific publication of their data were excluded.

**Ethics:** This retrospective study involving analyses of patient files were carried out in Helsinki.

## RESULTS

The study included a total of 30 obese patients (18 male and 12 female). All patients were in adult age group and average age was 52.6±12 years. Stones were located on the right kidney in 19 patients and on left kidney in 11 patients. Three of the patients (10%) had solitary kidney. Average body mass index of the patients was 32.4±2 kg/m$^2$. None of the patients had stones on both kidneys. Average size of the stones was 19.46±6.6 mm. Twenty-four patients had one stone while four patients had two and two patients had three stones.

A detailed analysis of patients' anamnesis revealed that 12 of them had undergone surgical intervention for the stones of the urinary system in different locations over the past 10 years. In addition, seven patients had unsuccessful extracorporeal shock wave lithotripsy (ESWL) for upper calyceal stone in the last 30 days before the endourological procedure of the present study. In terms of main complaints of patients to present our clinic, 26 had flank pain, three had hematuria and one had recurrent urinary tract infection. Hydronephrosis was not evident in 21 patients before the procedure, while eight of them had grade 1 hydronephrosis. Only one patient had grade 2 hydronephrosis, and no patients had grade 3 or over hydronephrosis. Balloon dilatation was used before ureterorenoscopy in seven patients. Access sheath was used in 19 patients. On the other hand, in five patients whose renal pelvis could not be accessed because of ureter stricture during semi-rigid ureterorenoscopy, double j stent was placed, and the procedure was postponed.

Average operative time was 72.1±16.8 minutes and average hospital stay was 1.5±1.1 days. In post-operational controls carried out a month after the operation, operation was successful in 22 patients; i.e., the patients were completely free of stones or had some clinically negligible small residual stones. Our success rate was 73.3%. In five of eight unsuccessful cases, image was impaired due to bleeding, whereas operation was stopped because of technical malfunction in two cases and failure of ureterorenoscopy to reach to stone in one case. After the operation, double j stent was placed in 76.6% of the cases. In post-operative follow-ups, three patients had severe colic pain which was considered to develop as a result of obstruction caused by clots in ureteral lumen. Five patients had hematuria which healed themselves within less than 24 hours without needing blood transfusion and two patients had urinary system infection. Urine culture of these two patients were E. coli positive. They were hospitalized for five days and intravenous third-generation cephalosporin was administered. No patients had major complications that could lead to morbidity or mortality.

## DISCUSSION

Healthy eating refers to consumption of various foods at appropriate amounts to sustain life, increase life quality, protection and improvement of health and support growth and development. Dietary status of an individual is closely associated with many factors such as genetics, age, gender, physical activity level, social and environmental factors. Individuals with poor dietary habits have higher risks for cardiovascular disease, obesity and many metabolic disorders such as diabetes mellitus (8). Obesity term originated from Latin 'obezus' and is defined by World Health Organization as excessive fat accumulation in body which can impair health (9). Obesity brings individuals many health problems difficult to cope with. Among them is increased urinary system stone disease. It has been linked with elevated insulin resistance, high sodium uptake, hypercalciuria, lower urine volume and changes in urine pH (6, 10). Publications in literature show urolithiasis prevalence of 10-35% in obese cases (11).

Management of urinary system stone diseases could be difficult due to various reasons. First of all, diagnosis of urinary system stone diseases is difficult. Imaging methods have always been employed to evaluate the pelvicalyceal anatomy, size and localization of stones. These methods are critical in deciding the treatment planning. Due to anatomical differences of obese people, carrying out of radio-

logical examinations could be difficult. Excessive abdominal fat tissue leads to attenuation of both actual depth of insonation and efficiency of ultrasound beams during ultrasonography. This fact restricts the quality of image, making a clear interpretation of the data almost impossible by radiologists. Similarly, in computed tomography evaluations, resolution of images is seriously compromised by increasing fat tissue. A partial solution for this problem is to use higher dose radiation, which brings many extra problems especially in children and reproductive-age women. Based on 2008 data in the United States, clinicians could not get good quality imaging results from computed tomography in about one-fourth of people whose weight is 159 kg and over (12,13). Another difficulty with obese patients is their high risk for anesthesia. Laryngoscopy and intubation procedures are quite difficult in these patients due to larger tongue and higher amount of fat tissue around neck region compared to normal population. Besides, clinicians experience many difficulties with all stages of anesthesia including amnesia, excitation, surgery and bulbar paralysis due to metabolic effects of obesity (14). Surgical complications are also high in obese patients. These patients have elevated post-surgery infection risk associated with wound area secondary to many factors such as increased strain in suture line, changes in immune factors and impairments in tissue perfusion. In addition, obese patients could have many problems such as pulmonary emboli, deep vein thrombosis, metabolic disorders and cardiac arrhythmias (14-16).

Along with the developments in medical science, many open surgery methods previously used for urinary system stone diseases have been replaced with minimally invasive procedures (7). However, success and complication rates of these minimally invasive methods in obese patients are different from those in normal population. ESWL method have been introduced in 1950s with the idea that shock waves could produce power which can break solid bodies and these waves could be used for treatment of urinary system stones. This method has been frequently used in urolithiasis treatment. Basic principles of ESWL is the fragmentation of urinary system stones through directing shock waves produced with sound waves from outside sources to these stones (17). ESWL tables are produced so as to withstand heavy weights. However, longer distance to skin in obese patients considerably hamper the focusing and impact power of shock waves. These problems have a deterring effect on surgeons to use ESWL approaches in obese patients for urinary system stone diseases (5). There is a limited number of studies on this area. Dede et al. (18), carried out a study into the success rate of ESWL in upper ureteral stones in which they studies 40 morbidly obese and 94 normal weight patients. They found a success rate of 82% for normal weight patients whereas success rate was only 67% for morbid obese group (18). In another similar study, Olive et al. (19) analyzed outcomes of ESWL used in 98 patients who had body mass index over 30 kg/m$^2$ and found a total stone-free rate of 56.3%. In the series of Thomas and Cass dealing with 81 morbid obese patients with nephrolithiasis, stone-free rate in three or more months after ESWL was 68% (20). Percutaneous nephrolithotomy is another minimally invasive treatment modality commonly used for kidney stones. This treatment is based on entering through a small hole between skin and kidney and removal of stones. It was first described by Fernstrom and Johansson in 1976 (21). Although this method has been commonly used in many centers for kidney stones, its use in obese patients brings a number of undesired effects. The first problem with the use of the method in obese patients involves general anesthesia. As a result of prone position in obese patients, considerable decreases are observed in total lung capacity, inspiratory lung volume and functional residual capacity. Another disadvantage of this treatment modality is technical limitations due to greater distance to be traversed to reach stones and kidney as a result of increased fat tissue under the skin (22,23).

Along with the developments in endourological approach and laser technology, there has been an enormous increase in clinical use of flexible ureterorenoscopy. Studies have shown that retrograde intra-renal surgery is an effective treatment for stones smaller than 2 cm (24). There are various types of lasers such as Potassium-Titanyl-Phosphate laser, Indigo laser, Carbon Dioxide Laser, Erbium: Yttrium-Aluminum-Garnet laser, but Ho: YAG is the most commonly used laser type in urology practice. Wave length emission of 2120 nm is quite similar to absorption peak of water, which is the main reason why it is used as effective energy sources effectively absorbed in water without causing major trauma to surrounding tissues (25). Because of these characteristics of it, Ho: YAG was the laser type preferred in the present study. A careful analysis of literature about urinary system stones would show that studies analyzing the use of flexible ureterorenoscopy for obese and morbid patients are rare. Sarı et al. (26) examined 502 cases who had flexible ureterorenoscopy and grouped the patients as normal weight, overweight, obese and morbid obese. They found no difference for stone-free rate among the study groups. Küçük et al. (6), evaluated 103 cases including 28 obese ones and found that ureterorenoscopy had success rates of 71.2 and 70.1% in normal weight and obese patients, respectively. They reported a general complication rate of 7.7%. In another clinical study, Chew et al. (27) found similar complication

rates for obese and non-obese patients in flexible ureterorenoscopy. Also, Doluoglu et al. (28) found similar success rates of flexible ureterorenoscopy in treatment of urinary system stone diseases for normal weight and obese patients. In addition, the authors found a stone-free rate of 85.7% in their patient follow-ups. In this study, the success rate of the upper calyx stones in obese patients was determined as 73.3%.

The major limitations of the present study were that it was a single-centered and retrospective study with limited number of cases. In addition, lack of stone analyses, absence of calculation of length of time for fluoroscopy and stone to skin distances were other limitations.

Results of the present study showed that flexible ureterorenoscopy is an effective treatment modality with low complication and high success rates for the treatment of upper calyceal stone in obese patients. However, multi-centered, randomized and prospective studies are needed to support our findings.

## DECLARATION OF CONFLICTING INTERESTS

The author declared no conflicts of interest with respect to the authorship and/or publication of this article.

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