

MINIMALLY INVASIVE TREATMENT OF RENO-URETERAL LITHIASIS

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Keywords: renal stone disease, percutaneous nephrolithotomy, ureteroscopy

Abstract: Minimally invasive endoscopic procedures for reno-urethral lithiasis consist of either the anterograde approach - the percutaneous nephrolithotomy (PCNL) and antegrade ureteroscopy (US), which allows viewing the pielocaliceal system and proximal ureter, or the retrograde approach, thus allowing the retrograde ureteroscopy. The objective of the study is to evaluate the efficacy and safety of percutaneous nephrolithotomy and ureteroscopy in clinical, technical and managerial terms in the adults with kidney stones. During 2005 and 2013, I conducted a descriptive clinical study based on the clinical and imaging parameters. The study group consisted of 1235 adult operated patients, of both genders, respectively 1251 interventions, of which PCNL 787 cases and 464 US cases. The study results demonstrate that PCNL and the AU are safe and effective having as main advantages: fragmentation and extraction of stones regardless of size and hardness with stone free increased rate, without discharge symptoms (renal colic, stein strasse) with rapid recovery of the renal functionality altered by obstruction; association with pyeloureteral junction modelling interventions, affordable equipment, reduced hospital costs. Complications are low, less serious and can be dealt mostly conservative.

Cuvinte cheie: litiază renală, nefrolitotomie percutanată, ureteroscopie

Rezumat: Procedurile endoscopice minim invazive constau în abordarea litiazei renoureterale fie pe cale anterogradă - nefrolitotomia percutanată (NLP) și ureteroscopia anterogradă (US), care permit vizualizarea sistemului pielocaliceal și ureterului proximal, fie pe cale retrogradă, permițând urtero(reno)scopia retrogradă. Obiectivul studiului este de a evalua eficacitatea și siguranța nefrolitotomiei percutanate și a ureteroscopiei în termeni clinici, tehnici și manageriali la adulții cu patologii litiazică renală. În perioada 2005-2013 am efectuat un studiu clinic descriptiv, pe baza parametrilor clinici și imagistici. Lotul de studiu a fost compus din 1235 de pacienți adulți, de ambele sexe operați, respectiv 1251 intervenții din care: 787 cazuri NLP și 464 cazuri. Rezultatele studiului demonstrează faptul că NLP și US reprezintă metode sigure și eficiente, având ca principale avantaje: fragmentarea și extragerea calculilor indiferent de dimensiune și duritate, cu rată crescută de stone free, fără simptome de evacuare (colici renale, stein strasse), cu recuperarea rapidă a funcționalității renale alterate prin obstrucție; asocierea cu intervenții de modelare a joncțiunii pieloureterale, aparatură accesibilă ca preț, reducerea costurilor de spitalizare. Complicațiile sunt reduse, puțin grave și pot fi rezolvate conservator în cea mai mare parte.

INTRODUCTION

Minimally invasive endoscopic procedures for reno-urethral lithiasis consist of either the anterograde approach - the percutaneous nephrolithotomy (PCNL) and antegrade ureteroscopy (AU), which allows viewing the pielocaliceal system and proximal ureter, or the retrograde approach, thus allowing the retrograde reno-ureteroscopy.

Percutaneous nephrolithotomy (PCNL) and ureteroscopy (US) are both well known. Each has advantages and disadvantages; in their performance, one should take into consideration solid arguments.

PURPOSE

The objective of the study is to evaluate the efficacy and safety of percutaneous nephrolithotomy and ureteroscopy in clinical, technical and managerial terms in the adults with kidney stones.

METHODS

During 2005 and 2013, we conducted a descriptive

clinical study based on the clinical and imaging parameters in the Urology Clinic within the Clinical County Emergency Hospital of Sibiu. The study group consisted of adult patients of both genders, with renal lithiasis pathology. There were accomplished 1251 interventions, of which PCNL 787 cases and 464 US cases.

The therapeutic indication was established following a preoperative evaluation consisting of: patient's history, clinical examination, laboratory investigations (complete blood count, coagulation tests, renal function tests, electrolytes, glucose, summary and urinary sediment, urine culture, EEG, imaging evaluation: ultrasound, plain renovesical radiography, intravenous urography (uiv), computed tomography (CT).

Group distribution according to diagnosis was: bilateral renal stones 139 cases (11.11%), radiopaque calculi 933 cases (74.58%) and radiolucent 318 cases (25.42%). Obstruction of varying degrees was manifested by hydronephrosis present in 956 patients (76.42%) and hydrocalycosis 59 patients (4.71%). Non-obstructive but symptomatic calculi have been identified in 379 symptomatic

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patients (30.29%).

Pathological junction required endopyelotomy during the same operative session in 62 patients (4.96%). Renal insufficiency was present in 71 patients (5.67%), of which of single kidney in 49 patients and bilateral lithiasis lesions in 22 patients.

RESULTS

Free stones were identified in 1135 cases (90.73%), hospitalization period ranging between 2-7 days (average length of stay was 3.6 days) and Rx exposure time decreased from 5 minutes to 1 minute.

Intraoperative incidents and accidents have been solved by reopening; rare cases required prolonged hospitalization.

The rate of conversion to conventional surgery was initially of 20% and now, it is down to 1% as a result of the experience gained.

Postoperative complications identified were: minimal remnants resolved by endoscopic reoperation, bleeding mastered with the help of the nephrostomy balloon probe and blood transfusion, lumbar fistula closed spontaneously without further intervention, urinary infections treated with antibiotics according to the antibiogram.

Identified early complications of PCNL were the following:

- fever lasting 1-2 days in 32 patients (4.1%), resolved under broad-spectrum antibiotics;
- bleeding in 4 patients requiring transfusion (0.51%);
- punching the renal collecting system in 24 patients (3%);
- bleeding in 22 patients (2.8%);
- urinary fistula in 2 patients (0.25%);
- urosepsis in 9 patients (1.14%);
- ureteral obstruction by migrated fragments in 15 patients (1.9%);
- renal vascular injury in 1 patient (0.12%).

The following late complications were identified in the studied group:

- recurrent urinary tract infections in 24 patients (3%) solved with antibiotics according to the antibiogram;
- chronic renal failure in 2 patients (0.25%);
- perirenal collections in 2 patients (0.25%);
- lithiasic relapse in 23 patients (2.9%).

Intraoperative incidents regarding the US consisted of:

- access failure at bladder and ureter level in 8 patients (1.7%);
- ureteral mucosal injury in 3 patients (0.64%);
- bleeding in 2 patients (0.43%);
- false ureteral ducts, ureter perforation with urinary extravasation, partial or complete ureteral avulsion in 1 patient (0.21%).

US postoperative complications:

- urinary infection in 2 patients (0.43%);
- urosepsis in 1 patient (0.21%);
- strictures of ureteral / urethral meatus in 1 patient (0.21%);
- vesicoureteral reflux in 1 patient (0.21%).

DISCUSSIONS

Endoscopic approach enables the extraction of calculi in full or after a previous fragmentation in situ, by various disintegration methods: electromechanical, electrohydraulic methods, laser, ultrasound, ballistic.(1)

However, endoscopy also allows auxiliary manoeuvres to relieve the treatment: renal push-back, installation of an internal or external drainage.

PCNL supposes the access of the nephroscope in renal cavities through a lumbar incision under 1 cm and extracting the calculi from the renal cavities.

Figure no. 1. Semirigid surgical nephroscope



Figure no. 2. Ureteroscope



Figure no. 3. Percutaneous puncture of the kidney



Figure no. 4. Ultrasound fragmentation of the calculus



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The standard procedure comprises two operative times:(3)

Cystoscopic time, during which the intervention is performed with patient in the gynecological position and involves fitting a ureteral probe in the renal cavities;

Nephroscopic time, which is done with the patient in ventral decubitus in prone position with the operator sitting in front of the lumbus to which the procedure is addressed.

Variations of patient positioning: supine position, lateral decubitus, reversed lithotomy, gynaecological, ventral decubitus from the start.(4)

The first stage of percutaneous nephrolithotomy consists of pyelocaliceal system puncture, which is performed under fluoroscopic control on the posterior axillary line between the iliac crest and the twelfth rib.(5)

Puncture site is made taking into account the location of stones and stones complexity, which can be subcostal, supracostal or mixed.(6)

The approach for puncturing the pyelocaliceal system is achieved through the papilla of a posterior calix, thus avoiding the major vascular structures of the kidney.

Percutaneous puncture is performed with a 18-22 G needle with mandrel under fluoroscopic control. Puncture is certified by the externalization of urine and / or methylene blue placed in the ureteral probe.

Through the puncture needle, a guidewire is inserted, which must be sufficiently rigid to allow its advancing up to pelvis.

The guidewire is left in place and the puncture needle is extracted. On the guidewire, Alken metal dilators will be successfully inserted and on the last dilator, the Amplatz sheath will be positioned, sheath which will provide the access of the nephroscope into the renal cavities.

Once obtained this path, the nephroscope will be inserted and through its working channel, forceps are inserted with the help of which the stones will be extracted in one piece or pieces of stones.

At the end of the procedure, on the Amplatz sheath, a nephrostomy catheter will be placed with the point towards the pelvis, skin anchored and adapted to a collection bag.

Percutaneous nephrolithotomy has a success rate in resolving urolithiasis appreciated at a remarkable percentage of 95-98%.

Ureterscopy allows the visualization of the lumen of the ureter, from the ureteral orifice up to the pyeloureteral junction and pelvis (in retrograde manner) or from the pelvis up to the juxta-vesical ureter (in antero-grad manner).

Depending on the way of access, US can be retrograde or ascending accomplished in trans-uretro-vesical approach or through a percutaneous nefroureterostomy orifice; either antero-grad or descending, performed by percutaneous transrenal approach.(7)

Patient's position is the standard lithotomy position, in supine with the pelvis limb ipsilaterally to the ureter to be operated, in hyperabduction and a slightly lifted, while the pelvic limb in neutral position.(8)

The most feared complication of endoscopic renal surgery is the intra- and postoperative bleeding. It is often produced through the arcuate intrarenal artery lesions. It should be recognized and addressed immediately intraoperatively because large blood losses can lead to hemorrhagic shock.(9) In our casuistry, 2 patients (0.43%) required ceasing the procedure and performing hemostasis with lumbus mesh.

CONCLUSIONS

- PCNL and US are minimally invasive procedures to approach the reno-ureteral lithiasis.
- PCNL and US represent safe and efficient methods having as main advantages: fragmentation and extraction of stones regardless of size and hardness with stone free increased rate, without discharge symptoms (renal colic, stein strasse) with rapid recovery of the renal functionality altered by obstruction; association with pyeloureteral junction modelling interventions, affordable equipment, reduced hospital costs.
- Complications are reduced, less serious and most of them can be solved conservatively.

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Sclerosing treatment of hemorrhoids was applied even in the XIX century. Currently, sclerosing treatment of hemorrhoids is used rather widely. Effective and safe implementation of this technology is based not only on a thorough development of the methodology by a doctor, but also on the use of modern drugs and special accessories (anoscope with lighting, special syringe, needle, etc.).¹ With well defined external component, it is necessary to take a very strict approach to the choice of minimally invasive treatment, including sclerotherapy. In rare cases of non-compliance with the manipulation techniques and due to getting the drug into the subcutaneous tissue, an acute subcutaneous submucosal paraproctitis may develop.