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Section: MEDICAL SCIENCES

Issue: 1(19)/2020

Received: 16 January 2020	**Revised:** 05 February 2020
Accepted: 18 February 2020	**Available Online:** 15 March 2020

Paper available online HERE

RST Research and Science Today
WWW.RSTJOURNAL.COM
SPRING 2020
No. 1(19)/2020
ISSN-P: 2247-4455 / ISSN-E: 2285-9632

Medical Sciences

MODERN MANAGEMENT IN THE TREATMENT OF RENO-URETERAL CALCULI

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ABSTRACT:
THE PRESENT ARTICLE IS A REVIEW IN THE MODERN MANAGEMENT OF THE RENO-URETERAL CALCULI. SEPARATE REVIEWS OF THE LITERATURE AND GUIDELINES WERE PERFORMED FOR EACH SEGMENT OF THE RENAL SYSTEM, REGARDING ONE OF THE MOST COMMON PATHOLOGY OF THIS SYSTEM: STONES. MOST IMPORTANT, ALL OF THE RECOMMENDATIONS REGARDING THE TREATMENT OF THIS DISEASE WERE BASED ON THE GUIDELINES AND ON EXPERT REVIEW OF THE LITERATURE. WE COMPARED THE TREATMENT OUTCOME AND THE DIFFERENT TYPES OF TREATMENT FOR RENAL AND URETERAL STONES.

KEY WORDS: RENO-URETERAL CALCULI, PERCUTANEOUS NEPHROLITHOTOMY, ESWL, URETEROSCOPY

INTRODUCTION

One of the most common medical problems is represented by urinary calculus, with a prevalence of 2-3% in the general population. Almost 80% of all urinary calculi are represented by kidney stones. The most important aspect is the high recurrence risk, usually associated with metabolic abnormalities, malnutrition, and even environmental and dietary

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factors. The effect of the renal stones is represented by pain- the most common effect, followed by blood in the urine, infection, impaired renal function, and if left untreated even kidney failure[9].

There are many factors to consider regarding the best therapeutic approach regarding the patients with renal or ureteral stones. We can group them in 4 categories:

1. Stone factors – were we consider the size, location and the composition of the stone;
2. Clinical factors – were we consider all the factors regarding the patient (symptoms, associated infections, the particularities of the patient, etc);
3. Anatomical factors[10];
4. Technical factors – the available equipment for the treatment[11].

The best type of treatment must consider these factors, and of course the surgeon experience[12]. Regarding the ureteral calculi, the standard treatment is extracorporeal shock wave lithotripsy (ESWL) and semirigid ureteroscopy (URSR) lithotripsy[13]. When the stones are located in the kidney, depending of the size of the stone, we can use besides URSR, flexible ureteroscope, PCNL, mini PCNL, or in some cases open or laparoscopic surgery[14].

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NON-INVASIVE TREATMENT

There is also medical expulsive therapy using α-adrenoceptor antagonists (alpha-blockers), usually reserved for small distal ureteral stones that are non-obstructive or partial obstructive[15]. The conservative management is not recommended when there are infectious symptoms, or the patient presents intolerable pain, or the normal kidney function is threated. Numerous studies have showed that 95% of ureteral stones from 2 to 4 mm in size will pass spontaneously, even without symptoms. When the size reaches 5 mm or more, the probability of elimination drops to 50%[16]. A study included in the EAU and AUA showed a stone passage rate of 68% decreasing to 47% for stones 5 to 10 mm in diameter[17].

ESWL

This procedure remains a first – line treatment not only in renal calculi, but also in proximal ureteral calculi, due to its non-invasiveness, and high rate of effectiveness. Many studies indicated that a shock wave rate of 2 shocks/second can improve stone fragmentation, especially if the stone is larger than 1 cm. The optimal number of shocks applied in one session has not been exactly established. For ureteral stones, where the renal parenchyma is safe, treatment can safely be carried out up to 4000 or more shocks[18]. For upper stones it is recommended to use between 2000 and 3500 shocks (it has to be correlated with the intensity of the shocks).

URETEROSCOPY

There are a few types of lithotripsy commonly used with similar results: pneumatic, electro-hydraulic and Holmium:YAG laser**.** Studies demonstrated that holmium laser has the best results in lithotripsy (shortens the operation time and increases the effectiveness). A meta-analysis revealed that for calculi in the proximal ureter, the stone-free rates are the same between the URSR and the ESWL. Most of the ureteral stones are treated using the semi-rigid ureteroscope, because it provides an excellent flow of water and a good size regarding the working channel. Flexible ureteroscope is more reliable because of it's mobility. Usually a dilatation and access sheet is necessary.

A study performed by Jia-Sheng Hu et al, on a lot of 81 patients with upper ureteral calculi who underwent ureteroscope lithotripsy assisted by a guide sheath showed a stone clearance rate of 100%. From all of the patients, 63 were successfully treated with semirigid ureteroscope lithotripsy assisted by a ureteral access sheath, and 18 patients were successfully treated with flexible ureteroscope lithotripsy assisted by a guide sheath[19]. The guide sheath was necessary due to the local complication that a ureteral stone can produce: edema in the

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ureteric wall, chronic inflammatory diseases and inflammatory polyps and embedded stones[20].

There are some cases where the ESWL and the URSR has it's limitations due to large impacted upper ureteral calculi. It is well known that laser based flexible ureteroscope can be used to treat most of the ureteral stones with a clearance rate up to 97%, there are very expensive instruments that may require multiple treatment sessions, so their global utilization is limited[21].

Laparoscopic ureterolithotomy is an advanced method of treatment regarding large impacted ureteral calculi and can be used in some selected cases, where the endoscope methods failed due to large stones, anatomic anomalies, etc. The advantage of this therapeutic method its is nearly 100% stone-free rate[22].

Jae Duck Choi et al performed a study on a batch of 100 patients with large upper ureteral calculi on which he compared the complications, success rate, patient characteristics, and the operation time between two groups: the first group of 48 patients received transperitoneal laparoscopic ureterolithotomy, and the second group of 52 patients received a combination of ureteroscopic lithotripsy with retrograde intrarenal surgery. The stone-free rate after a single procedure was 100% in the first group and 73.1% in the second group[23].

PERCUTANEOUS NEPHROLITHOTOMY

PCNL is a lithotripsy technique reserved for real stones of 2 cm or more. It has been demonstrated that it is a very efficient for treatment of large or staghorn pyelo-calyceal stones. This procedure can be performed with the patient in 2 positions: prone or supine, each of them with its advantages and disadvantages. This procedure require the use of 2 imaging devices: a fluoroscope and a ultrasound machine. The biggest disadvantage of this procedure is one of its complications which is hemorrhage, that sometimes can be severe and can lead to the loss of the kidney. Over the years, with the development of technology, other types of instruments were created, thus appearing mini PCNL, ultra-m-PCNL, super m-PCNL and micro PNL, where the instruments are getting smaller and smaller, so the complication rate is also smaller.

Brian R. Matlaga et al made a systematic review and meta-analysis regarding the treatment of ureteral and renal stones, comparing the outcome of the patients with reno-ureteral stones, treated by different methods: URSR, ESWL and PCNL. The study concluded that semirigid ureteroscopy performed on a stone located in the distal ureter has a 55% more chances of stone-free, than the treatment with the shockwave lithotripsy. Also, the need for a reoperation in patients who underwent URSR is less that those treated with ESWL. The study also concluded that the risk of complications is almost the same in both procedures. Of

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course, the best results in distal ureteral stones and renal stones of 1,5 cm or more was obtained with the flexible uretersocope[24].

DISCUSSION

Reno-ureteral calculi have many possible treatments, which makes comparative efficacy assessment particularly important. In the literature there are two main therapeutic options regarding the large ureteral distal stones: ESWL and URSR. Many studies compare the 2 treatment methods with various results[25], thus the first line of treatment is still a controversial issue. The success of both procedures is based on the size and the location of the stone, but also on comorbidities[26]. Regarding the medium and distal ureteral stones, URSR is the preferred approach, with the highest stone-free rate. ESWL is recommended as first-line treatment regarding renal and proximal ureteral stones, which are less accessible using a semi-rigid ureteroscope. A study performed by Verze et al, on 273 patients which he divided in 2 groups: ESWL and URSR, showed a 92,7% stone-free success rate in the ESWL group, compared with a 94,85 stone free success rate in the URSR group[27]. The difference between the studies are strongly correlated with the type of lithotripsy used in URSR but also with the surgeons experience with the ESWL/URSR. One of the drawbacks regarding the ESWL is that there is a relatively low stone clearance rate and that sometimes multiple procedures are necessary for complete stone fragmentation[28].

Percutaneos nephrolitothomy and flexible ureteroscopy have better results regarding large renal stones, but they are more invasive and have a significant morbidity rate[29]. One of its advantage is that is feasible and has a high success rate in one single step. Also, the risk of complications associated with this procedure can be significantly reduced by careful intra operative planning and by choosing the correct position for the patient. The surgeon must adapt his technique to the patient not the patient to his technique. One of the limitations and disadvantages of PCNL is its fairly higher morbidity rate, associated with complications as significant hemorrhage, sepsis and viscera trauma[30]. Also, to reduce the risk of major

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bleeding mini-PCNL can be solid option, but also by obtaining a perfect access for PCNL (from the skin to the collecting system) the risk decreases.

Usually most of the ureteral calculi can be managed well by URSR and ESWL, but a number of impacted ureteral stone, larger than 15 mm, may require the use of a more invasive method of treatment (open or laparoscopic ureterolithotomy)[31]. In fact, laparoscopic ureterolithotomy has the highest rate of stone free in a single session. Of course its indication is reserved for complicated cases associated with infection, technical difficulties and in cases where modern endoscopic treatment has its limitation. Often patients can prefer a single laparoscopic approach for a big ureteral stone, rather than 2 or more intervention using endoscopic procedures which also requires several more anesthetics and more days spent in hospital[32].

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ISSN-P: 2247-4455 / ISSN-E: 2285-9632

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