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EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY (ESWL) VERSUS URETERO-RENOSCOPIC LITHOTRIPSY (URSL) FOR MANAGEMENT OF UPPER URETERIC CALCULI, OUR EXPERIENCE AT TERTIARY CARE HOSPITAL.

Urology

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ABSTRACT

Background: Urinary stones are the third most common affliction of urinary tract, exceeded only by urinary tract infections and pathological conditions of prostate (BPH and Prostate cancer). Extracorporeal Shock Wave Lithotripsy (ESWL) and Uretero-renoscopic Lithotripsy (URSL) are among various treatment options available.

Aims and Objectives: To compare ESWL and URSL procedural and post procedural characteristics including outcome.

Methods: A Prospective study was conducted in the department of Urology, SKIMS, on 100 patients with proximal Ureteric stone, from September 2015 to July 2017.By random selection, fifty patients were subjected to ESWL and another fifty to URSL. Various parameters were recorded on preformed proforma designed for the comparative study.

Results: In our study, Parameters like Age and Gender distribution, symptoms at presentation and duration of symptoms, number of stones, laterality of stones (right/left) and grade of Hydronephrosis or Hydroureteronephrosis were uniformly distributed in the two groups (URSL VS ESWL). Spinal anaesthesia (SA) or General Anaesthesia(GA) was required in URSL group only, while as local anaesthesia and sedation was required in some patients in ESWL group. 72% and 88% patients achieved stone clearance in ESWL and URSL group respectively, (p=0.046). DJ stent was used in 20% of URSL patients and none in ESWL group. Procedure time was relatively less for URSL (p=0.001). Although statistically insignificant, Post procedure hematuria and urosepsis were higher in URSL group, where as pain/colic and fever was slightly higher in ESWL group. Steinstrasse was significantly higher in ESWL group (p=0.008). Hospital stay was significantly higher in URSL group (p<0.001). Cost involvement was higher in ESWL group (p=0.016).

Conclusion: Although ESWL is regarded as the preferred choice of treatment for upper Ureteric stone, URSL is a safe alternative, with an advantage of obtaining an earlier or immediate stone free status in patients with stone size >10mm. In patients with smaller stones (<10mm), ESWL may be considered a reasonable alternative to URSL.

KEYWORDS

Urinary stones, ESWL, URSL, Hydronephrosis (HDN), Hydroureteronephrosis (HUN), Steinstrasse, Spinal anaesthesia (SA), General Anaesthesia (GA).

Introduction: Urinary stones are the third most common affliction of urinary tract, exceeded only by urinary tract infections and pathologic conditions of prostate (BPH and Prostate cancer) [(1)]. In the last 20 years, the management of ureteric stones has radically changed [(2)]. The various options available for definitive management of ureteric calculus include ESWL, URSL, laparoscopic ureterolithotomy, open ureterolithotomy, basket retrieval. The choice of specific surgical treatment for a patient with ureteral calculi can be influenced by many factors, grouped into three broad categories: stone-related factors (location, size, composition, duration, and degree of obstruction), clinical factors (the patient's tolerance of symptomatic events, the patient's expectation, associated infection, single kidney, abnormal ureteral anatomy), and technical factors (equipment available for treatment, costs). The likelihood of spontaneous passage of stones of <5 mm diameter above the iliac vessels is less than for stones of <5 mm diameter below the iliac vessels [(2)]. With the development of minimally invasive techniques, open surgery is rarely indicated, and the ureter is more often now divided into two segments, proximal and distal; the point of division is the narrow part of the ureter where it crosses the iliac vessels, reflecting a technical impediment for rigid ureteroscopy [(3)]. Supporters of ESWL claim that it is effective and non-invasive, is associated with less morbidity, requires less anaesthesia than URSL, and seldom requires ureteral stents. Supporters of URSL claim that it is highly successful and minimally invasive, is associated with minimal morbidity, can be used with larger and multiple stones, and has high immediate stone-free rates [(3)]. At present, ESWL is favoured first-line therapy for most renal stones and proximal ureteric stones of <1.0 cm diameter. URSL is preferred to ESWL in patients with distal ureteral calculi, large (>1 cm) proximal ureteral calculi, impacted proximal ureteral calculi, morbidly obese patients and failed ESWL [(4)].We have prospectively studied the ESWL versus URSL for management of upper ureteric calculi.

Materials and Methods: A Prospective study" was conducted in the department of Urology, SKIMS on 100 patients with proximal Ureteric stone, from September 2015 to July 2017. The upper or proximal ureter was defined as the portion of ureter between the UreteroPelvic junction and upper border of sacroiliac joint. Patients with Upper Ureteric stones causing some degree of obstruction, Stones size less than 15mm, and Patients with Chronic Kidney Disease Stage 1 and Stage 2 were included in the study; while as Patients with coagulopathy, active upper urinary tract infection and Patients with Chronic Kidney Disease Stage 3 and Stage 4 were excluded. The stone size was assessed by measuring its largest dimension in plain x-ray film while the degree of hydronephrosis was determined by excretory urography or USG and classified into grades as per Society of Fetal Ultrasound (SFU) classification. CT-abdomen and radio isotope scan, was done pre-operatively only if deemed necessary.

In URSL group, on the day of surgery an abdominal x-ray (KUB) was done to know the exact pre-operative stone status. All the patients were started on intravenous antibiotic prophylaxis given half hour prior to surgery. Most of the procedures were done under SA, except a few cases (6%) done under GA. 8/9.8 Fr Wolf semi-rigid ureteroscope was advanced over the teflon tipped guide wire into the ureteric orifice, preferably beyond the stone gently. In a few patients, dilatation of the intramural ureter using ureteric catheters was necessary to allow the ureteroscope advancement or removal of larger stone fragments. Intraoperatively. Larger ureteric stones require lithotripsy to permit the safe extraction of calculus fragments [(5)]. Stone fragmentation was done under camera vision using Swiss Lithoclast. Most of the time we used 0.8mm or 1mm probe. Stone fragments were removed using grasping forceps. Any adverse event during the procedure was noted. DJ stent was put in the ureter after stone fragmentation in selected cases only including severe mucosal edema, mucosal tear, ureteral perforation

and a few failure patients where stone could not be removed. D J stent was removed after 3 weeks. Stone fragmentation was considered successful if the stone could be fragmented to small (<2mm) passable fragments or small enough to be retrievable with forceps.

Post operatively, intravenous antibiotics were continued for 12 hours, and then shifted to oral antibiotics for 3-5 days. Postoperative pain was assessed using visual analogue scale, besides Pain was considered mild if it resolved by NSAIDs, or severe when the patient needed Opioids. Hematuria was considered mild if macroscopic and lasted < 8 hours post operatively, moderate to severe if the patient developed anaemia or altered hemodynamics to warrant blood transfusion. In patients with fever, Urinary tract infection (UTI) was considered only when it was documented by culture sensitivity report.

Patients were discharged once urine was grossly clear, per urethral catheter removed, had minimal pain, no fever. Patients were advised to take plenty of fluids, prescribed α-blocker for one week, followed at one week, 3 weeks and 3months. At one week, a follow up KUB (USG/x-ray) was done to know status of residual stone fragments. At 3 weeks an abdominal USG/IVP was obtained to determine stone free rate and degree of residual HDN/HUN. At 3 months patients were assessed with USG/IVP for the development of any complications like ureteral stricture.

In ESWL group, ESWL was performed on the machine Dornier Compact Delta II lithotripter with integrated triple imaging facility employed, which has a combined Ultrasonographic and fluoroscopic display, large energy density in order to obtain optimum focus (without damaging surrounding tissue) and minimal pain that on rare occasions requires for mild sedation. Number of maximum shock waves used by one ESWL treatment is 4000, while the energy was dependent on stone localization. Our appliance, like most modern appliances used electromagnetic source. The shock waves are transmitted to the body through the water, focused by acoustic lens system so that the released energy is reflected on the surface of the stone. Patients were discharged on the same day , patients were advised to take plenty of fluids, prescribed α-blocker for one week, followed at one week, 3 weeks and 3 months. At one week a follow up KUB was done to know status of residual stone fragments. At 3 weeks an abdominal USG/IVP was obtained to determine stone free rate and degree of residual HDN/HUN. Stone clearance was defined as complete passage of stone fragments or residual stone ≤ 4.0mm.The un-successful cases were again planned for ESWL second session or switched to other modality. The final data was recorded on a predesigned study proforma and analysed using SPSS software.

RESULTS

We studied 100 patients with age ranging from 16 to 65 years. The mean age in ESWL group and URSL group was 30.3 and 32.3 years, with a standard deviation of 10.74 and 9.29, respectively. Out of 50 patients in ESWL group and in 50 patients of URSL group, male to female ratio was 1.5and 2.3, respectively.

Most of the patients presented with flank pain (Pain alone in 56.60% patients and pain associated with other symptoms in 41.50% patient. Dysuria was present in 5 patients and 8 patients in ESWL group and URSL group, respectively; while hematuria in 26 patients and 8 Patients, respectively. 2% patients and 4% patients were asymptomatic in ESWL and URSL group, respectively. 9 patients had symptoms of less than 3 month duration in ESWL group and 7 patients in URSL group .13 patients had symptoms of 3-6 month duration in ESWL group and10 patients in URSL group, whereas 28 patients had symptoms of more than 6 month duration in ESWL group and 33 patients in URSL group.

In ESWL group 80% of patients had single stone while as in URSL group 96% had single stone. In ESWL group 42% and 58% had left sided and right sided stone, respectively; whereas in URSL group it was 46% and 54%, respectively. In ESWL group 60% patients had stone size of 6-10mm and 40% had stone size of 11-15mm, whereas in URSL group it was 30% and 70%, respectively.

In our study HUN was present in 96 patients, it was grade I in 16% and 22%, grade II in 54% and 56%, grade III in 18% and 12% and grade IV in 6% and 8% patients in ESWL and URSL groups, respectively. In our study, 80% of patients in ESWL group required no anaesthesia, 6% required local and 14% sedation whereas in URSL group, 94% patients required SA and 6% required GA. Statistically significant difference (P-value<0.05) was found between the two groups, in terms of requirement of anaesthesia.

In our study, 30% patients in ESWL group required single session, 50% required two sessions, 20% required three sessions. In URSL group 30% patients required DJ stent, while as no stent was used in ESWL group.

Procedure time was significantly more in ESWL group (p < 0.001).It was ≤ 30 minutes in 24% and 82 % patients in ESWL and URSL groups, respectively; and was ≥ 30 minutes in 76% and 18 % patients in ESWL and URSL groups, respectively. Stone clearance was in 72% and 88% patients in ESWL group and URSL group, respectively.

Post procedure complications included pain/colic (18% in ESWL and 16% in URSL groups), hematuria (6% in ESWL and 16% in URSL groups), urosepsis (2% in ESWL and 4% in URSL groups), fever (8% in ESWL and 6% in URSL groups) and Steinstrasse (20% in ESWL and 2% in URSL groups). Steinstrasse was significantly high in ESWL group (p=0.008).

In ESWL group 82% patients had day care procedure whereas 18% had 24hr stay. In URSL group 80% had 24hr stay whereas 18% had 48hr stay and 2% had more than 48hr stay. Statistically significant difference (p-value<0.001) was observed between the two groups.

In 40% of patients in ESWL group cost involved was <3000 INR per patient and 60% had cost involved >3000 INR per patient. Cost involved in URSL group was <3000 INR per patient in 64% and it was >3000 INR per patient in 36% patients, in whom DJ stents were used (p value 0.016).

DISCUSSION: We studied 100 patients with age ranging from 16 to 65 years. The age distribution (16-65 years) in our study was consistent with the study conducted by Ihsan ullah Khan (2014) [6]. In our study, male to female ratio was 1.5 and 2.3 in ESWL and URSL groups, respectively. This agrees with the study conducted by Zakir Hussain Rajpar et al (2012)[7].

The clinical presentation in our study, as described in results, is the usual presentation seen in ureteric stone disease patients[8].

In our study, 56 % patients had stone in the right ureter while 44% had left ureteric stone. These findings are similar to the study conducted by Zakir Hussain Rajpar et al (2012) [7]. In terms of stone size, as described in results, our study is similar to the Studies conducted by Khairy-Salem H et al (2011) [9]and N.K. Mohanty et al (2012)[10].

With regards to hydroureteronephrosis, as described in results, our study is in agreement with the study conducted by Khairy-Salem H et al (2011) [9].

80% of patients in ESWL group required no anaesthesia, 6% required local and 14% sedation whereas 94% patients required SA in URSL group and 6% required GA. Salem HK (2009) [11], concluded in his study that URS with intracorporeal lithotripsy is an acceptable treatment modality for all proximal ureteral calculi, particularly > 1cm. ESWL should remain the first line therapy for proximal ureteral calculi (≤1cm) because of less invasive nature and lower anaesthesia (intravenous sedation).

Procedure time was significantly more in ESWL group (p < 0.001).It was ≤ 30 minutes in 24% and 82 % patients in ESWL and URSL groups, respectively and was ≥ 30 minutes in 76% and 18 % patients in ESWL and URSL groups, respectively. It clearly shows URSL superior in terms of procedure time. Yang C, et al, (2017)[12] concluded in their study that both URSL and ESWL have its own advantages and drawbacks, URSL is relatively a more efficient and safe method to treat ureteric stones, since it has shorter operation time and a better stone-free rate which is consistent with our study.

In terms of Post operative complications as described in results, most of our results are fairly comparable with other studies in this regard, like studies by Mohammad Reza Nikoobakht et al (2007)[13]and Kwon Hong et al (2009)[14]

Hospital Stay was significantly more in URSL group (p-value<0.001).

In a study, conducted by Roberto Giulianelli et al (2014) [15], the mean hospital stay was 34 hours (26-42hrs).

Cost in our study as described in results was more in ESWL group. Complications which needed hospital stay and the other methods used to manage the failure cases were the important factors influencing the cost involved. Most important cost influencing factor in our study was the use of D J stent in URSL group. This is similar to the studies conducted by Izamin I et al (March 2009) [16]. More number of sessions required in many cases of ESWL, as described in results, also adds to the cost, besides time, involved in the procedure.

Overall success of the procedure, In ESWL group 72% patients achieved stone clearance whereas 88% patients in URSL group achieved stone clearance. Failures were mainly related to failure to reach the stone, poor visualization of stone due to severe tissue edema and stone migration. The results of our study are fairly comparable with other studies done previously like by Mohammad Reza Nikoobakht et al (2007) [13].

Manzoor S, et al, (2011) [17] concluded that ESWL is regarded as the preferred choice of treatment for proximal ureteric stone. Cui X et al [18] conducted a study in 2015, Comparison between ESWL and URSL for treating large proximal ureteral stones. They concluded that for treating large (>10mm) proximal ureteral stones, URSL tends to be more effective than ESWL, yet without adding significant risk. Our study suggests that URSL is a safe alternative, with an advantage of obtaining an earlier immediate stone free status.

CONCLUSION: Although ESWL is regarded as the preferred choice of treatment for upper ureteric stone due to its non-invasive nature, less anaesthesia requirement, the present results suggest that URSL is a safe alternative, with an advantage of obtaining an earlier or immediate stone free status in patients with stone size >10mm. In patients with smaller stones <10mm, ESWL may be considered a reasonable alternative to URSL.

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