

DIURESIS AND MEDICAL EXPULSION THERAPY WITH EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY FOR CLEARANCE OF RENAL STONE- A CLINICAL STUDY

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ABSTRACT

BACKGROUND

Renal stone has a global problem. People of all country of the world more or less suffer from Renal Stone or Urinary Calculus. It is prevalent in about all age and sex groups. It carries significant morbidity, mortality and imposes heavy financial load. It causes tremendous financial burden on health and medical care delivery system with changing lifestyle, environment and climate. Its prevalence is rising. It requires stress on preventive and curative aspect. Various procedures like Conventional Operation, Endoscopic Method, PCNL, URS and Extracorporeal Shock Wave Lithotripsy are used in practice. The ESWL was invented in 1980. It has various type of generation machines. It is operated by Technician, Surgeon and Urologist. It is not invasive and has low-risk procedure, but has incidence of residual fragments, microparticles, dust and crystals despite many advancements in Technology. So, Diuresis with oral and parenteral water and fluid and Medical Expulsion Therapy and excretion through passage of urine causes clearance in same procedure sessions with no extra cost. In outdoor patients of less than 2 mm diameter stone, Medical Expulsion Therapy was given. In indoor hospitalised patients of more than 2 to 20 mm diameter, MET, ESWL with diuresis were performed.

MATERIALS AND METHODS

Study was performed between January 2015 and September 2015 in Lord Buddha Koshi Medical College and Hospital and Sri Krishna Salya Chikitsalaya, Saharsa (Bihar), after consent from Institutional Review Board and from patient for Examination, Investigation, Diagnosis, Treatment and Research and Study; 60 patients of various age and sex groups were undertaken. ESWL with Diuresis and Medical Expulsion Therapy and 10 patients of less than 2 mm diameter of stone under medical expulsion therapy.

RESULT

Outdoor- The medical expulsion therapy performed in less than 2 mm diameter stone of patient. The success rate is 98% and failure rate is 2%.

Indoor- Patient wise analysis was done. Stones were 2 mm diameter to 20 mm diameter. Number of shockwaves from 2500 to 3000 MA was given. Breaking rate are 65% to 75%. Character of stones were firm and hard. Presence of fragment- Nil. Followup patient- 75%. Forced diuresis by diuretics, hydrostatic pressure and osmotic pressure and Medical Expulsion Therapy were given. 95% was successful and 5% was failure. Need for reformation of stone- Nil. Session- Single. Cost- Same cost, no extra cost.

CONCLUSION

ESWL with Diuresis and Medical Expulsion Therapy to remove the concretion is an effective option for microparticles and crystal clearance. This is not an invasive therapy, might be a valuable alternative to the various invasive management modalities like Conventional Surgery, PCNL, URS and Endoscopy.

KEYWORDS

Diet - Drinking Water and Fluid - Intravenous Fluid - Medical Expulsion Therapy - ESWL - Diuresis - Renal Stone Clearance.

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BACKGROUND

Worldwide incidence of urinary tract stone disease is increasing. The renal stone is common and is associated with morbidity, mortality and health and medical care burden. The incidence of urinary tract stone disease is increasing according to the National Health and Nutrition Examination Survey as of 2012. Ksenia Roudakova¹ et al found that 10.6% of men and 7.1% of women in the United States are affected

by Renal Stone Disease compared to just 6.3% of men and 4.1% of women that were affected in 1994. Another alarming trend is the increasing incidence of renal stone in the children population. In the study by Novak² et al the girls are more susceptible than boys. Curhan³ et al sought to examine a relationship between dietary factors that had higher intake of dietary calcium decreased the risk of urinary stone disease, while supplemental calcium did not. Cappuccio et al found a clinical association between hypertension and renal stone; Najeeb⁴ et al examined the effects of obesity on urinary pH and urinary stone composition. Patients with higher BMI's were found to have lower urinary pH and higher occurrence rates of urination, calcium oxalate and calcium phosphate stones.

Increasing Incidence of Kidney Stone may be due to-

1. Change in Diet.
2. Change in Lifestyle.
3. Obesity.

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The use of combined calcium and vitamin D and grape fruit juice was found to increase the incidence of Renal Stone. The multiple factors are responsible for stone formation.

These Factors are-

1. Congenital- Abnormal urinary tract structure.
2. Acquired- Idiopathic.
3. Predisposing Factors- Diet and drinking water, obesity and low volume intake of water and fluid.
4. Exciting Factor- Infection - Debris, Metabolic-Disorder - Hypertension - Diabetes - Gout (High Uric Acid Level).

The invention of ESWL was in 1980. The management of Renal Stone is followed by under this procedure. These allow one-stage stone breaking and clearance with minimal morbidity. Innovative concept such as Emergency ESWL for urinary stone may be implemented on clinical routine. In clinical experience of Chaussy C⁵ et al found with extracorporeally-induced destruction of kidney stones by shock waves. The option of choice still remains a debatable issue. The desire to certain technique depends on ensuring a fine balance between the success rate in terms of stone clearance versus complication. ESWL is a low-risk procedure, but has incidence of residual fragment dust, crystal and sediments despite many advancements in technology.

In Ambit of this

The Diuresis Methodology and Medical Expulsion Therapy is opted for clearance of microparticles. Drugs are used for Dissolution, Propulsion and Expulsion with Forced diuresis to flush out of calculus. The Kidney Stone can be treated with multiple modalities. The Medical Expulsion Therapy is an adjuvant in stone removal. The MET is an excellent treatment modality in selected patients. Singh A⁶ et al also advocated the systemic medical therapy to facilitate passage of small renal calculi. The use of alpha blockers, calcium channel blockers, alkali and diuretics can improve stone expulsion rates. MET can decrease colic events, narcotic use and hospital visits. It also reduces medical costs and surgical operations with associated risk. MET is an adjuvant to other treatment modalities. Combined medications has more positive role, may improve stone passage rates with ESWL also.

There is growing evidence of Medical Expulsive Therapy. The administration of drugs to facilitate calculus passage is efficacious.

MATERIALS AND METHODS

This clinical study was undertaken between January 2015 to September 2015 in Lord Buddha Koshi Medical College and Hospital and Sri Krishna Salya Chikitsalaya, Saharsa (Bihar). The consents were taken from the concerned and the patient. This is a private medical college and its hospitals began as one of the tertiary care hospitals in the Suburban and rural setup. The Institution committed to whole person and population to health and medical care of those are disadvantaged, disabled and marginalised. This region is in the Catchment area of Koshi River. The disaster of flood disrupts the ecology during rainy season. Food and drinking water problems prevail during affected time and throughout the year. Persistence of such conditions lead to genesis of

Health and Medical problems. The incidence of sickness causes worst effect on Productivity and Economy.

The sediments are always found in the Well and the Tubewell water, which is consumed by people. These sediments may lead to the formation of concretion. The urinary tract is commonly associated with stone formation. The attendance and presence of patients with renal stone in the O.P.D and I.P.D of hospital reflect the entire scenario. The renal stone formation has predisposing external factors like diet and drinking water; environment and climate. The exciting internal factors are congenital-system structure abnormality and acquired are infection, metabolic disorder, obesity and lifestyle and living status; crystal and colloid imbalance leads to renal stone formation. Patients are reported in outdoor patient department as outdoor patients, and as per need patients were admitted in inpatient department of hospital as indoor patients. Patients were examined on complaints. History, clinical examinations laboratory investigations, x-ray of abdomen, KUB and Ultrasonogram (USG).

The management would be started on patients with renal stone of less than 2 mm. Diameter were grouped in outdoor patient and more than 2 to 20 mm diameter patients were grouped in indoor patient.

Outdoor Patients

Ambulatory patients of less than 2 mm diameter stone were given domiciliary treatment by prescription of Drugs (Medicine). Under Medical Expulsion Therapy (MET) randomly, 10 patients (7 Males and 3 Females) were given drugs. There are so many drugs available under MET. The combined oral alkali drugs and daily Indian kulthi water and pulse intake therapy was advised to the patients for 1 to 3 months and the patients were reviewed from time to time. Patients were reported after 3 months, were re-examined and found no complaints, discomfort or pain. On x-ray and USG, stone was not present in 98% cases. Patients were advised to do their work and drink kulthi water and eat kulthi pulse. Patients were also advised to take volumes of water daily to increase volume of urine output and urination.

Indoor Patients

Diuresis with ESWL and MET procedure was applied on 60 patients, who had more than 2 to 20 mm diameter of renal stone during pre-, per-, post-period of ESWL session. The alpha blocker, CCB and alkali were given to the patients prior.

Under diuresis and MET, intravenous fluid - normal saline, Ringer's lactate, hypertonic IVF solution and diuretics were given to the patients for hydration and forced diuresis to flush out the fragment, dust-debris and microparticles during ESWL procedure. Shock wave 2500 - 3000 MA with frequency of 60 - 90 per minute were used in different position and percussion. In the clinical study of Abul-Fotouh Ahmed⁷ et al, diuresis and inversion therapy were used to improve clearance of stone after shock wave lithotripsy.

Stone free status were confirmed by x-ray and USG. Patients were discharged on the basis of no-complaints and non-visible stone; 95% of cases were stone free. Patients were advised to drink volumes of water and eat Kulthi Dal

regularly to excretion of volume of urine to prevent stasis and urinary stone formation.

Analysis

Outdoor Patients

Ambulatory and Domiciliary management were given to the patient. Drugs were prescribed and detailed instruction and direction were given to the patient about medication and followup and for reviewed time.

Paediatric cases were not taken in this clinical study, because the patients had irregular hospital visits. The patient of 20 to 60 years of age was taken in this clinical study.

I. Management Trends

Issue

Technology.

Diagnostics

Complaints, History, Clinical Examinations.

Investigation

CBC, HB, BTCT Urine- Routine and C/S.

Imaging

KUB, IVP, USG, CT.

Treatment Option

MET, ESWL, Diuresis.

II. Outdoor Patient

- Patient Details.
- Total Patients- 10
- Age- 20 to 40 yrs.
- Age- 40 to 50 yrs.
- Age- 50 to 60 yrs.

Sex

- Male- 7
- Female- 3
- Method- MET with intake of volume of water for excretion of volume of urine.
- Result- 98% clearance.
- Failure- 2% went under ESWL with Diuresis.

The above clinical study was based on conservative trial for desired output.

Indoor Patients

Patients of 2 to 20 mm diameter stone and failure cases of outdoor patients, which were tried under Medical Expulsion Therapy. All these patients were hospitalised. The MET, ESWL and Diuresis procedures were undertaken. The number of patients of different Age, Sex and having Stone of various diameters (2 to 20 mm) were managed in said methodology. The analysis of cases showed positivity of result of the tried method. The success rate was 98% to 95% and failure rate was 2% to 5% in these modalities of treatment.

I. Details of Patients.

Age in Yrs.	20 - 40	40 - 50	50 - 60	Total
Male	4	24	11	39
Sex	0	15	6	21
Total	4	39	17	60

II. Shock Wave Number per Patient

2500 to 3000 MA

III. Shock Wave Frequency

60 - 90 per minute.

IV. Breaking Rate

90% and more.

V. Complication

- Residual- Stone 5%.
- The blood in urine with discomfort and pain. Those patients were managed and fragments were taken out by Endoscopy.

RESULTS

- Diuresis and MET with ESWL- Procedures were applied in 2 to 20 mm diameter stone; 95% is the success rate and 5% failure rate with complication and presence of residual stone and fragments. These are removed by Endoscopy and medication.
- Character of Stone- Firm and Hard- on the basis of breaking time taken and presence of fragments in the excreted urine and felt by two fingers.
- Clearance of stone- Total clearance- 95% by Diuresis and MET with ESWL.
- Followup- 75% and more patients were reviewed.
- The reformation of stone was excluded by x-ray and USG- Nil.
- Session- single - 95% success and 5% failure.
- Low cost procedure with no extra cost in the session.

This clinical study showed economical, effective and safe methodology.

DISCUSSION

A followup prospective study by Taylor⁸ et al examined the effect of obesity and weight gain on the incidence of renal stone in subject based on gender and age over 46-year-old span. The authors concluded that both obesity and weight gain conferred an increased risk of renal stone, having a greater impact on women than men.

In the background of the review of literature, the Renal Stone is common in any age and sex group. The incidence of paediatric patients is also increasing. Paediatric cases constitute about 4% of all the patients. A long-term ingestion of antacid, calcium and magnesium are the risk factors in the causation of renal stone. The urinary tract infection, poor protein diet, malnutrition and warm temperature are the contributing factors to the prevalence of stone formation. Management of renal stone in children requires complete clearance, eradication of urinary tract infection, correction of any metabolic or anatomical or other abnormalities. The first line of treatment option is shock wave lithotripsy.

The profound knowledge on evolving epidemiology of stone disease and another important issue in stone management is essential, the medical expulsion therapy and diuresis with ESWL. Diet indiscretion, ageing demographics and global warming are all likely to play a role in renal stone. All these parameters point to a rise in risk, the stone-age upon us.

Paediatric cases are not taken in this clinical study due to irregular visits of the patient in the hospital. Hence, outdoor patients and indoor patients were taken in this clinical study.

In 2012, a 25-year population-based study by Dwyer⁹ et al was published. They reported a 4% increase per year in the incidence rate during the period of 25 years. The incidence rate within this age group was found to increase 6% each year.

A prior study by Chou et al¹⁰ found no correlation between obesity and prevalence of calcium phosphate stones. However, the percentage of uric and calcium oxalate stones was also found to be higher in obese than non-obese patients.

The combination of treatment with diuresis MET is an effective option in improving stone clearance with ESWL.

Since 1980, the ESWL has undergone the major change in the treatment of Renal Stone. ESWL is the selective management method for most renal small stones of 2 to 20 mm in diameter. It is non-invasive and accepted by patient and practitioner. Residual fragments have been the cause of concern. Medical Expulsion Therapy and Urinary Diuresis were jointly used to facilitate stone clearance with ESWL. It has good success rate and minimum management cost.

Drugs for medical dissolution of renal stone in ambulatory patients were given with advice to drink water orally to increase excretion of urine to facilitate removal of stone randomly. The results were positive.

There was no complaint of pain, discomfort and evidence of stone on x-ray and USG. This was the conservative management. Patient reported no complaints and was features free.

The main aim of this procedure is to evaluate the forced diuresis as a method for enhancing clearance of small renal stone and stone fragments with ESWL and MET.

Diuresis is an effective medication in improving stone clearance. Diuretics were given pre-, per-, post-period of session. This therapeutic procedure is non-invasive and non-operative. In this procedure- fragment, crystal, dust debris were flushed out by forced diuresis avoiding the morbidity and mortality of the invasive procedures.

To overcome the gravity, it was prevented by change in different position and also promotes the liberation of residual stone materials. There is low re-treatment rate. We based mainly on USG stone localisation. Fragility and dispersion of stone material is important for diuresis and MET to flush them out during ESWL. It is an adjuvant procedure.

Summary

Outdoor Patients

1. MET- 10 Patients, 98% Success rate, 2% Failure.
2. Failures were taken under ESWL with Diuresis.
3. Diuresis with MET ESWL.

Indoor Patients

1. Diuresis MET and ESWL, Success rate 95% and Failure 5%.

2. 5% Failure cases associated with Blood in urine, pain and residual fragments. These cases were managed and fragments were removed by endoscopy and URS.

CONCLUSION

This study shows to be a safe, economical and effective procedure for the management of renal stone. The results are promoting enough to suggest this procedure as an adjuvant to the other procedure with high stone free rates and less complications. The diuresis forced and medical expulsion therapy propel, expel and remove the renal stone with flushing excretion of urine. It seems to be non-invasive and effective option to improve the clearance of re-stone formation and microparticles and small renal stone. This non-invasive therapy might be a valuable methodology to the invasive treatment modalities like PCNL, URS and Endoscopy Surgery. There is no extra treatment cost in the same session leads to satisfaction.

Ancient Methodology

Water in, Water out.

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