



ESWL SHINES IN COVID CRISIS: A BOON FOR PATIENTS.

Urology

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ABSTRACT

Background: When compared to other definitive stone treatments like ureteroscopy (URS) and percutaneous nephrolithotomy, ESWL is the only interventional option that is non-invasive, making it crucial in the management of urinary tract stones. Yet, due to its non-invasive outpatient nature and ease of performance without anaesthesia, ESWL is still not favoured by many authors as a therapy option for renal pelvic stones of intermediate size. The COVID-19 outbreak encouraged many centres to utilise ESWL because it spares patients with the infection from general anaesthesia and any potential consequences that could result from it. The optimization of ESWL requires careful patient selection, committed staff, and post-treatment imaging assessment. **Methods:** It is a retrospective study in which the patients treated with ESWL in the COVID times (from March 2021 to December 2022) were compared to patients that were treated with mini-PCNL after the pandemic was controlled. 50 patients in each group were studied and renal stones up to 1.7 cm in size were considered. **Results:** The re-treatment rate and total number of procedures were significantly higher in the ESWL group. The incidence of complications was significantly higher in the PCNL group. The mean hospital stay for PCNL was significantly higher than ESWL. The mean total cost was significantly higher for PCNL. ESWL was better tolerated in terms of pain as compared to PCNL. **Conclusion:** Despite the great suffering caused by COVID, we had once in a generation opportunity to fundamentally re-examine our health care models. With the declaration of the national emergency and restriction on non-essential medical care, our health care was under great strain. Urinary stone disease accounts for a considerable portion of the clinical workload faced by urologists. ESWL had emerged as a blessing in the pandemic by not only providing effective, uncomplicated clearance of renal stones but also by reducing the exposure to health care workers and decreasing the workload on already overburdened anaesthesiologists.

KEYWORDS

Extra corporeal shock wave lithotripsy (ESWL), Mini-Percutaneous Cutaneous Nephrolithotomy (mini-PCNL), renal stones, COVID.

INTRODUCTION:

When compared to other definitive stone treatments like ureteroscopy (URS) and percutaneous nephrolithotomy, ESWL is the only interventional option that is non-invasive, making it crucial in the management of urinary tract stones. Due to its non-invasive outpatient nature and ease of performance without anaesthesia, ESWL is still favoured by many authors as a therapy option for renal pelvic stones of intermediate size.

The COVID-19 outbreak encouraged many centres to utilise ESWL because it spares patients with the infection from a general anaesthetic and any potential consequences that could result from it. The optimization of ESWL requires careful patient selection, committed staff, and post-treatment imaging assessment. Most studies report ESWL stone-free rates (SFRs) of between 70% and 80%. Harder stones (such as cystine, brushite, and calcium oxalate monohydrate) are more resistant to ESWL.

When stone density was taken into account, El-Assmy et al discovered that ESWL for stones with >900 HU on low-dose CT KUB was less effective. Measurements of HU using the mean value for the entire stone may be misleading because renal calculi have different compositions.

Shock waves cause temporary renal parenchyma injury despite being minimally intrusive. Lately, new therapy approaches have been developed that use a low-energy shockwave pretreatment, followed by the customary high-energy therapeutic treatment, to lessen tissue stress. Stone breakdown is improved and tissue injury is decreased when the shock-wave rate is lowered to 60/min.

The inspiration for this study was the COVID pandemic itself. COVID had an unparalleled global impact on how we live, work and do our daily activities. With the declaration of national emergency and restriction on non-essential medical services, our health care system was under great strain. Urinary stone disease forms a major clinical workload for urologists and a certain way had to be found out to deal with this workload. The purpose of this study is to find strengths,

weaknesses and opportunities to the future of renal stone care after the COVID pandemic.

MATERIALS AND METHODS:

A) Study Design- Comparative and Retrospective study.

B) Study Area- Tertiary Care Hospital.

C) Study Timeline- Patients treated during the COVID pandemic and in months immediately after it was controlled (approximately 2 years' time period)

D) Selection Criteria-

Inclusion Criteria:

• Comparing 2 Groups Of Renal Calculus-

1. Patients treated with ESWL in the COVID times (March 2021 to December 2022).
2. Patients treated with Mini-PCNL after the pandemic was controlled.
- 50 patients in each group were studied.
- Renal stones up to 1.7cm in size were considered.
- Radiological examination included plain abdominal radiograph and NCCT- KUB for the measurement of renal stones.

Exclusion Criteria:

- Patients aged <18 years.
- Branched stone.
- Advanced hydronephrosis.
- Solitary kidney.
- Anatomical renal abnormality.
- Surgical intervention within past 6 months.

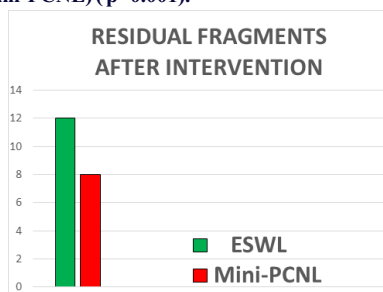
E) Evaluation:

- Post intervention stone free rates (SFR).
- Complications
- Retreatment rate
- Hospital stay.
- Cost effectiveness.
- 'Success' included patients who became stone-free or had

insignificant (<4mm) residual fragments.

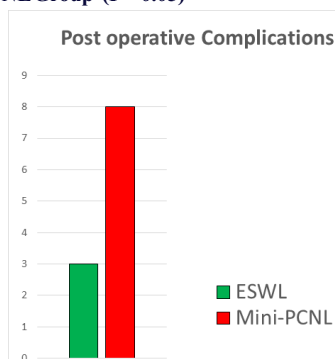
RESULTS

- 1) Re-treatment rate and total number of procedures were significantly higher in ESWL group (2 procedures in ESWL vs 1 in Mini-PCNL) ($p < 0.001$).



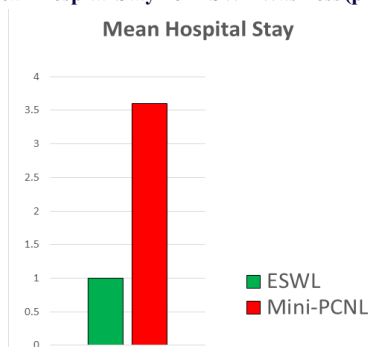
- 12 Residual fragments in ESWL were treated with secondary ESWL(8), PCNL (2) and URS (2).
- 8 Residual fragments in Mini PCNL were treated with ESWL (100% success).

- 2) The Incidence Of Complications Was Significantly Higher In Mini-PCNL Group ($P = 0.05$)



- 3 complications in ESWL, in the form of Stein-Strasse, were treated with analgesics and alpha blockers in 2, and ureteroscopy in 1.
- Complications in the Mini-PCNL group included intraoperative bleeding and post operative haematuria in 8 patients, which were managed with nephrostomy tube clamping and conservative measures.

- 3) The Mean Hospital Stay For ESWL Was Less ($p < 0.001$)



- Mean hospital stay for Mini-PCNL was 3.6 days, whereas ESWL was done on OPD basis.

- 4) The mean total cost was significantly higher for Mini-PCNL group.

- 5) ESWL was better tolerated in terms of pain characteristics as compared to Mini-PCNL.

DISCUSSION

In 1984, Chaussy and colleagues first published their experience using extracorporeal shock wave lithotripsy (ESWL) in 852 patients. They projected that ESWL would alter the management for urinary tract calculi by shifting surgical management of stones from endoscopic or

open techniques to non-invasive procedures. Over the next 32 years, ESWL has evolved with the further development of lithotripters and incorporation of imaging modalities to maximize efficiency and accuracy.

Turney et al. reported that use of ESWL for renal stones has increased by 69% in the last decade.

In 2014, Yu et al. completed a systematic review and meta-analysis that failed to demonstrate a causal relationship between the development of hypertension and ESWL. Fankhauser et al. completed an even more extensive review and also concluded that the currently available data suggests no association between ESWL and HTN.

In the present study, ESWL was safer than PCNL, with a lesser complication rate, which is why many patients prefer ESWL for treating their renal stones. The other advantage of ESWL in the present study was the lower cost than for PCNL. This is very important for healthcare authorities, because of the increasing number of patients with renal calculi and its effect on the total healthcare budget. The costs of PCNL were higher than for ESWL because of inpatient hospitalisation and the higher costs of disposables for PCNL. However, the need for multiple sessions to render patients stone-free in those treated by ESWL might make PCNL equally cost-effective. In the present study and despite the greater need for re-treatment and secondary procedures, ESWL was still more cost effective than PCNL. This might be attributed to differences in treatment costs among different countries.

To reduce renal parenchymal injury associated with standard PCNL, minimally invasive PCNL with a smaller tract size has been developed. PCNL and Mini-PCNL were associated a higher risk of complication than the other interventions although it did not reach a statistical significance. Mini-PCNL and PCNL were associated with a lower retreatment rate and auxiliary procedure rate than ESWL.

Subgroup analysis further demonstrated that ESWL was associated with a higher retreatment rate and the occurrence of auxiliary procedures than other interventions. ESWL is a non-invasive treatment for nephrolithiasis, which is often favoured by patients and is the treatment of choice for stones.

CONCLUSION

ESWL has a lower stone free rate and a higher retreatment rate, but it has a shorter operative time and hospital stay, better patient acceptance and minimal anaesthesia requirement, making it the treatment of choice in the COVID pandemic.

When the entire world was fighting against COVID, every department wanted to contribute in their own ways to provide services to humanity, and this study can be considered as a contribution of Urologists to the world during COVID pandemic. ESWL has proved to be a blessing during the pandemic by not only providing effective and uncomplicated clearance of renal stones, but by also reducing the exposure to health care workers and workload on already overburdened anesthesiologists.

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