

Extracorporeal Shock Wave Lithotripsy in Pediatric Urolithiasis: A Single Institution Experience

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Abstract

Purpose: This retrospective study evaluated the presentations of urolithiasis and effectiveness of ESWL for urolithiasis in pediatric population. *Materials and Methods:* We analyzed the records of 68 children treated with ESWL for urolithiasis in our hospital during the year 2012 to 2017. *Results:* Among the 68 children, 49 are males and 19 are females. Common presenting symptoms are abdominal pain or flank pain, nausea or vomiting, microscopic or macroscopic hematuria and fever. Stone clearance rate of 95.6% is noted after the first sitting of ESWL. *Conclusion:* ESWL is effective and safe method in pediatric urolithiasis in our hospital.

Keywords: - ESWL; Pediatric Urolithiasis; Symptoms; Complications;

Introduction

Urinary system stone disease increase steadily all over the world is called as "stone wave" and geographically high incidence places are called as "stone belt". India belongs to the Afro-Asian stone belt. Risk factors blamed for stone formation are metabolic factors like hypercalciuria, hypocitraturia and hyperoxaluria, urinary tract infection, familial and inheritance factors, ethnicity and male gender, dietary habits, malnutrition and over weight, season

and climate, and deficient colonization of Oxalobacter formigenes in the intestine, etc.[1].

With advancing technology shock wave lithotripsy plays an important role in pediatric urolithiasis. In children since the first successful use in 1986, Extracorporeal shock wave lithotripsy (ESWL) is the standard first line therapy for the renal stones and ureteric stones in pediatric population [2,3]. ESWL is safe and effective in children with stones less than 2 cms and they require less energy shock waves, particularly in renal and upper ureteric stones [4]. Here we analyzed the records of children treated with ESWL retrospectively over a period of five years in the department of pediatric surgery, Government Rajaji Hospital, Madurai, India.

Materials and Methods

During the year 2012 to 2017, 68 children treated with ESWL in the department of pediatric surgery, Government Rajaji Hospital, Madurai, India were included in our study. All the children were evaluated with urinalysis, urine culture, renal function tests, coagulation profile, serum calcium, X-Ray Kidney Ureter Bladder (KUB), Ultrasonography (USG), Intravenous Urography (IVU) and Computed Tomography (CT) scan in few cases.

Under General Anesthesia, DJ stenting was done in all cases by using 3.5 or 4 French stents. After stenting, children are subjected to lithotripsy under fluoroscopic guidance by using up to 3000 shocks for duration of 30 to 40 minutes. Anesthesia used is intravenous sedation in children, usually those below the age of 8 years. The others received intravenous sedation or analgesia. No general anesthesia was used or required during the procedure.

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Post ESWL follow up done with X-ray KUB, USG. DJ Stents were removed after 6 weeks, further follow up done after a month and after three months.

Results

Total number of children treated with ESWL is 68. Among them 49 are male children and 19 are female children. Number of children belongs to 2 -6 years are 33 and the remaining 35 belongs to 7 -13 years of age [Figure 1]. Mean age of the children treated by ESWL was 7.22 years.

Left side calculi treated with ESWL are 36 and the Right Side calculi treated with ESWL are 32 [Figure 2]. Calculus size of the ESWL treated children belongs to 8 to 25 millimeter in size. Renal pelvis calculi treated are 61 and upper ureter calculi are 7. Common clinical presentations are abdominal pain or flank pain 61.8% (42), nausea and vomiting 14.7% (10), microscopic hematuria 13.2% (9), gross hematuria 5.9% (4) and fever 5.9% (4) [Figure 3].

Single calculi during treatment are 59 and 9 had multiple calculi. Unilateral stones during treatment are 58 and bilateral stones during treatment are 10.

Among the 10 bilateral stones 3 children needed bilateral ESWL, which was done in 4-6 weeks gap.

Out of 68 ESWL in the first sitting 65 children successfully cleared from stone disease with the success rate of 95.59% at the end of 3 months. Three children needed 2nd sitting of ESWL, among them one was not cleared from the stone disease and the Computerized Tomography scan revealed a stone of 950 Hounsfield Units (HU), then we proceeded with an open pyelolithotomy. All the three children who required 2nd sitting ESWL had a stone size of more than 15 mm. One successfully stone cleared patient lost to follow up with DJ stent in situ for two years, presented with recurrent stones, forgotten stent and concretions around it removed by open method.

Common complications noted after ESWL are flank pain 11.76% (8), hematuria after ESWL or during stone clearance 7.35% (5), Fever 2.94% (2) and flank petechial or skin ecchymosis 2.94% (2) [Figure 4]. Children who developed flank pain or abdominal pain were managed with the use of analgesics.

There is no association between sex of the children and side of the calculus or age group. There is also no association was made between age group and side of the calculus [Table 1].

Table 1: Association between sex, side of calculus and age group

Sex	Left side calculus	Right side calculus	P Value
Male	28	21	P Value=0.2918
Female	8	11	
Sex	Left side calculus	Right side calculus	P Value
Male	25	24	P Value=0.5938
Female	8	11	
Age Group	Left side calculus	Right side calculus	P Value
2 to 6 yrs	17	16	P Value=1.0000
7 to 13 yrs	19	16	

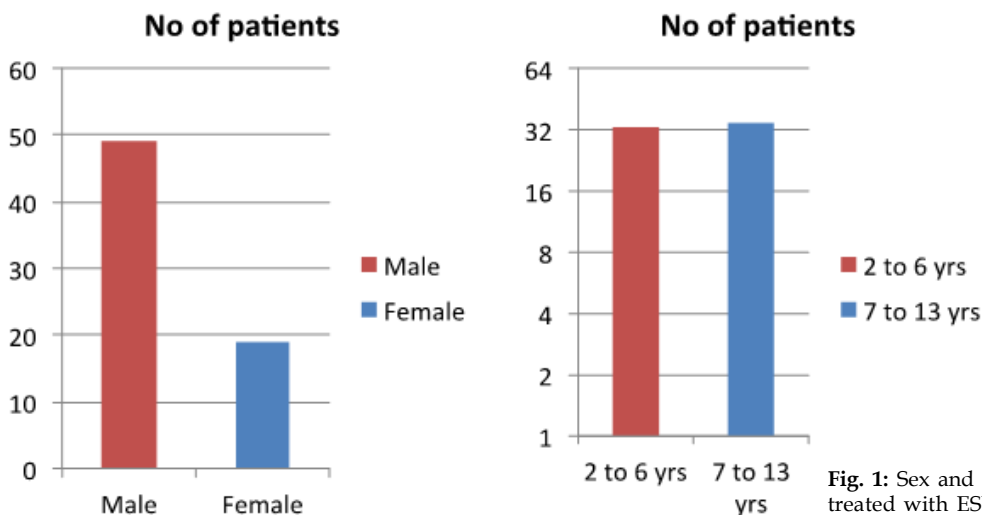


Fig. 1: Sex and age group of the children treated with ESWL

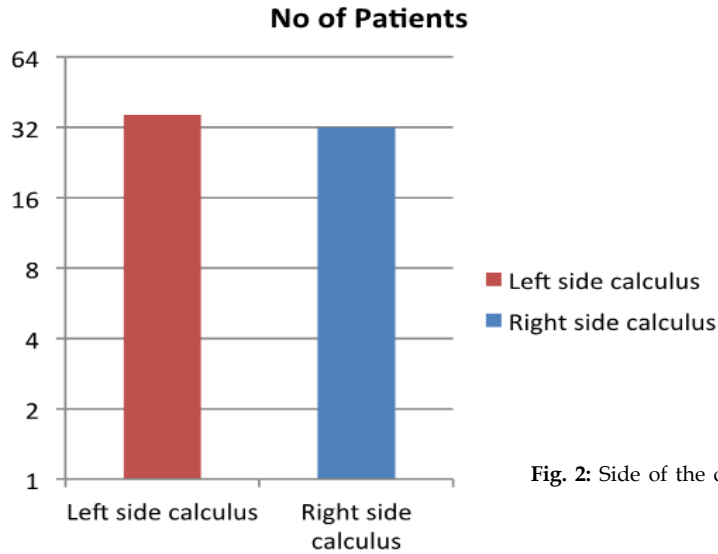


Fig. 2: Side of the calculus

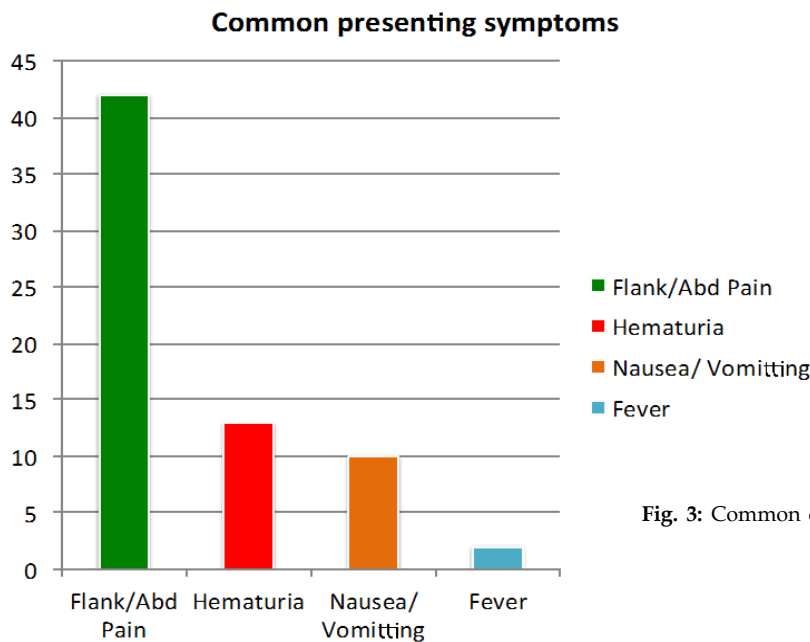


Fig. 3: Common clinical presentations

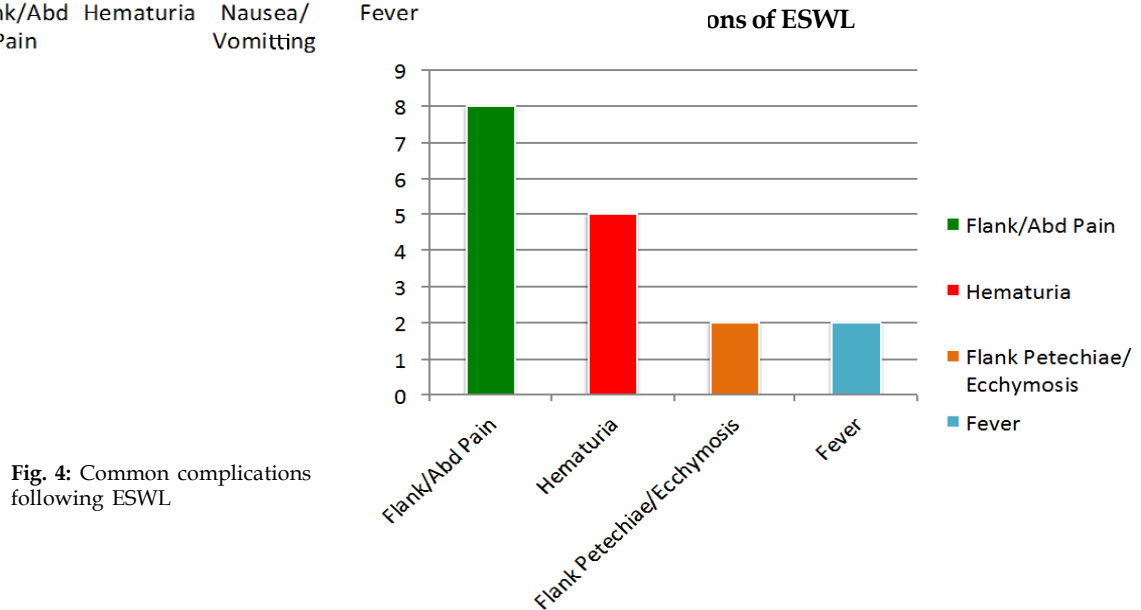


Fig. 4: Common complications following ESWL

Discussion

Most common gender treated is male children (72%) and ages of the children treated are 2-13 years with the mean age of 7.22, which is comparable to Badawy et al and Goel et al [5,6].

Stone clearance rate after first and second sitting of ESWL is high, 95.59% and 98.52% compared to the study done by Caione P et al. which is 74% and 88% [7]. This high clearance rate may be due to low-density stones, which was not assessed routinely by CT scan. Children who required 2nd sitting ESWL are having the stone size of more than 15mm, even though ESWL can be done up to 4cm stones in some studies its safe to do for the stone size less than 2 cm to increase the success rate, reduce the renal damage and morbidity [4,8].

All the complications observed post ESWL were managed conservatively. There is no life threatening complications noted with ESWL treatment.

Conclusion

ESWL is a safe and effective method for pediatric urolithiasis. It is also cost effective, safe with acceptable retreatment rate, less morbid procedure and avoids the open surgery related morbidity.

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