

## EXTRACORPOREAL SHOCKWAVE LITHOTRIPSY(ESWL) IN CHILDREN

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### ABSTRACT

**OBJECTIVE:** *To assess the efficacy and safety of extracorporeal shock wave lithotripsy (ESWL) in children.*

**STUDY DESIGN:** *Prospective Study.*

**MATERIALS AND METHODS:** *Sixty five children having reno ureteral stones were under went ESWL. Among them 41(63.07%) were males and 24(36.92%) were females. Their age ranged between 11 months to 14 years (mean age 7years). Most of the children presented with pain, fever and hematuria. All the children were under went Ultrasound KUB, IVP, Blood CP, Renal Function Tests, and Urine DR & Urine Culture for Sensitivity & Coagulation profile. MPL 9000 (Dornier) and Compact sigma (Dornier) Lithotripters were used, and 50 (76.92%) children were treated under General Anaesthesia while 15(23.07%) required only Analgesia.*

**RESULTS:** *950 patients treated on ESWL from January 2005 to December 2008 at Department of Urology, CMCH Larkana. Among them 63(96.92%) children had renal stones (32 right & 31 left) two(3.07) children had left upper ureteral stones. 43(66.15%) children become stone free with 1<sup>st</sup> session, 15 required two sessions to clear their stones while 1 child required 3 sessions. At the end of study 63(96.29%) children were stone free while two (3.07%) lost to follow up. Minor complications like, colic was encountered in 15 (23.07%) patients, and five (7.69%) developed fever. These patients were treated conservatively. Seven (10.76%) children developed stein strasse among them 4 patients cleared the fragments on expectant therapy while 2 patients required URS and 1 patient needed PCN.*

**CONCLUSION:** *Extracorporeal Shock wave lithotripsy is an effective treatment for upper urinary tract calculi in children and infants.*

**KEY WORDS:** ESWL, Renal Stones, Ureteric Stones.

### INTRODUCTION

The surgical management of urolithiasis has under gone dramatic shift in last 30 to 40 years. Therapy historically consisted of open surgical procedures and lengthy hospital stay. This approach has now largely been replaced by minimal invasive procedures that are performed on outpatient basis, with similar efficacy and less morbidity.

Extracorporeal shock wave lithotripsy (ESWL), the procedure resulting in urinary stones destruction allowing spontaneous expulsion of stone particles in urine was first introduced in 1980.

The advent of extracorporeal shock wave lithotripsy (ESWL) as a non-invasive technique has revolutionised the management of urinary tract calculi. It is considered a safe and effective treatment for urinary lithiasis in adults. However, the application of this modality of treatment in children followed rather slowly. Although evidence has accumulated on the efficacy of ESWL in treating calculi in children<sup>1, 2&3</sup>, the effects of shock wave on the pediatric urinary tract still need to be clarified. Indeed, ESWL was considered by some to be contra-indicated in children.<sup>4</sup>

The aim and objective of this study was to evaluate prospectively the safety and efficacy of extracorporeal shock wave lithotripsy (ESWL) in children

### MATERIALS AND METHODS

Between January 2006 and December 2008, 65 children with stones in the upper urinary tract were treated by ESWL using MPL 9000 (Dornier) and the compact sigma (Dornier) Lithotripters at department of urology Chandka Medical College Hospital Larkana.

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There were 41(63.07%) boys and 24(36.92%) girls male female ratio was 1.64:1 and their ages ranged from 11 months-14 years (mean 7y). Prior to shock wave treatment, all patients underwent ultrasound of kidneys, ureter and bladder(KUB), intravenous urography (IVU), blood tests for complete picture, renal function tests, coagulation profile, urine analysis and urine culture. Fifty-three (81.53%) children presented with pain, nine (13.83%) with micro-hematuria, one (1.53%) with gross hematuria and two (3.07%) with incidental finding during investigation for other ailment. Urine culture was positive in eight children, E.coli was present in five children, two having proteus, in one it was kliebeclla. and they received appropriate antibiotic therapy before stone treatment, while in all other children inj: gentamycin 2mg per kg body weight was given prophylactically one hour before therapy and post therapy oral 3<sup>rd</sup> generation cephalosporin was continued for five days. There were 63(96.92%) renal stones and two (3.07%) children had ureteric stones. Only three (4.61%) children had radiolucent calculi. The stone size ranged from 0.8cm to 2 cm (mean 1.6cm) in the largest diameter. ESWL was done as an outpatient procedure in 50 (76.92%) children. Fifteen children (23.07%) were hospitalized for 24 hours who were less than or up to two years of age. General anesthesia was used in 60 (92.30%) patients, usually those below the age of twelve years. The rest received inj: pentazocin for sedation and analgesia. The mean number of shocks delivered per session was 3000, and the generator voltage ranged from 14 to 16 kV. Most of the patients required only one ESWL session.

Plain abdominal x-ray was done usually two weeks after treatment and repeated monthly in the outpatient department for three months. Patients with radiolucent stones and those with bulky stones were followed with ultrasound scans. A patient was regarded as stone free if no stone fragment was discernible and the time to this status was noted. A "successful outcome" was defined to include stone free patients and those patients with stone fragments less than 4 mm which were deemed passable.

## RESULTS

Of the 950 patients treated on ESWL during January 2005 to December 2008 65 (6.84%) were children. Among them, 41 (63.07%) were male and 24(36.92%) were female (M.F: 1.7: 1) with mean age of seven years (range 11 months to 14 years). Among the 65 Reno ureteral units 63 (96.93%) had renal stones while two (3.07%) had ureteral

**Table I**  
**Sessions of ESWL (n=65)**

Sessions	Number	No: Of shocks	% Of successful patients.
One	43	3000	66.15%
Two	15	6000	23.07%
Three	05	8500	7.70%
one	02	3000	Lost to follow up.
Total	65		96.92%

**Table II**  
**COMPLICATIONS**

NO	Complication	Number	%	Management of complication
01	Pain	15	23.07%	Conservative
02	Fever	05	7.70%	Conservative
03	Stone Strasse	07	10.76%	4 expectant therapy 2 URS 1 PCN

stones. In 32(49%) children stones were on right side and 31(47.70%) at the left side, both the ureteral stones were on the left side. All the renal stones were treated under ultrasound guidance while both ureteral stones were treated under fluoroscopic guidance. In this study 43 (66.15%) children cleared their stones with 1 session, 15(23.07) children required 2 sessions and five (7.70%) child required 3 sessions, while 2(3.06%) patients lost to follow up after first session (Table -1). In this study 60(92.30%) children required general anesthesia and 5(7.70%) children were treated with analgesia and sedation with pentazocin. At the end of study 63(96.92%) children were stone free and two lost to follow up. Complications encountered after ESWL were abdominal pain in 15(23.07%) patients, five (7.70%) children developed fever and they were treated conservatively with analgesics and antibiotics, seven (10.76%) children developed stone strasse, out of them four have cleared their fragments conservatively, two children required URS and in one child PCN was placed for relieving the obstruction, later all these children passed their fragments spontaneously (Table 11). Mild hematuria was seen in all children for 24 to 48 hours which was subsided with conservative management. None of our patients had developed renal hematoma or bruises on the treatment side.

## DISCUSSIONS

Technological advances in ESWL, ureterorenoscopy and percutaneous

nephrolithotomy (PCNL) have had a significant effect on the management of urolithiasis in children, in contrast to the management of urinary stones by open surgery in the early days.

Concern about the potential long term renal damage, damage to lungs and possible skeletal deformities associated with ESWL in children had delayed its acceptance into pediatric practice.

But due to endemicity of stone diseases in children and its recurrent nature leading to renal damage and end stage renal failure makes a strong case for application of minimal invasive and non-invasive methods of treatment rather than repeated open surgery. Trax et al (1999)<sup>5</sup> have conducted a study to evaluate the potential long term renal parenchymal damage by 99mTc DMSA scan before and six months after treatment, and have found no incidence of high blood pressure nor parenchymal lesions due to ESWL therefore they recommend ESWL even in infants. We also endorse the view of the above authors in terms of any renal parenchymal damage. There were also concerns that thin pediatric ureter is capable to transport stone fragments after ESWL as efficiently as the adult ureter does. Gofrit, muslumanghu, are of opinion that pediatric ureter is more capable of transporting the stone fragments after ESWL than adults, because children are more mobile than adults and mobility is known to favour stone passage.<sup>6, 7</sup>

During the initial period investigators were using the lung shields to protect the lungs

from possible damage (Karamlosky EV et al 1987)<sup>8</sup>. Van Harn et al (1995)<sup>9</sup> have not used lung shields in their patients and none of them have developed hemoptysis. In conclusive remarks he was of opinion that new generation lithotripters have virtually no effect on lungs as they have very small focal areas. We also favour the opinion of above author as none of our patients also had developed hemoptysis and we are also not using lung shield in our patients.

In this series 43(66.15%) have cleared their stones in first session which is slightly higher than reported by Nazli et al (1998)<sup>10</sup> who have reported 59.6% in their series and M.lal et al (2001)<sup>11</sup> reported 56.9% in their series while the report of Ram Prakash Narayan et al (2007)<sup>12</sup> have reported 88% success rate with one session which was higher success rate than our series. Overall stone clearance at three months follow up was about 96.92% in our patients which is almost parallel to the studies performed by various authors. G.schwerd et al(1996)<sup>13</sup> reported overall stone free rate of about 92% and SAH Rizvi et al(2002)<sup>14</sup> reported 84.2% stone free rate at three months follow up. We have encountered minor complications during this study, seven (10.76%) developed steinstrasse out of these four have passed the gravels conservatively only three children required intervention. This data is parallel to the international literature. Kishore et al (2001)<sup>15</sup> have reported 5.9% and Landau EH et al (2001)<sup>16</sup> reported 3% steinstrasse. Soyger et al (2006)<sup>17</sup> have reported 11.6% steinstrasse in their patients and all of them completely cleared without any intervention, therefore they stressed on expectant management even in patients who develop steinstrasse after ESWL. No case of renal hematoma or bruises on the therapy side was encountered in our series. Brinkman et al(2001)<sup>18</sup> and Elsokby et al(2000)<sup>19</sup> also shared the same experience.

## CONCLUSION

ESWL is an effective treatment for upper

urinary tract calculi in children and infants. A child's ureter is capable of transporting the fragments after lithotripsy and expectant management is usually adequate even in patients who develop steinstrasse after ESWL. With negligible complications ESWL can be considered as the first line treatment for renal and upper urinary tract stone in pediatric age group.

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