



## MINIPERC VS ESWL IN PEDIATRIC AGE GROUP WITH BORDERLINE STONES (10-19mm) : AN INSTITUTIONAL STUDY

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**ABSTRACT** The extracorporeal shockwave lithotripsy (ESWL) is first line treatment for renal stones in the pediatric population. The purpose of this study is to evaluate outcomes of the ESWL and miniperc in treatment of stones size 10-19mm. Study done at Madras medical college Chennai. 62 patients  $\leq 6$  years of age with 1-2 cm single renal pelvis stone, were randomized into two groups. Group 1 containing 32 patients and group 2 containing 30 patients. Patients in group 1 were subjected to SWL while those in group 2 underwent miniperc using 18 Fr percutaneous sheath. The stone-free rate after first session was 53.6% (17 cases) and 86.6% (26 cases), Retreatment rates were 6.6% versus 46.8% for groups 1 and 2 (significant  $P < 0.005$ ), respectively. No significant difference was found in the complications of the both groups. Miniperc gives better stone clearance in single sitting in most of pediatric cases but comparable to ESWL after three sessions, however, the miniperc has more radiation exposure, complications and requires a longer hospital stay.

### KEYWORDS :

#### INTRODUCTION

Extracorporeal Shock wave lithotripsy (SWL) is the most common and first-line treatment for pediatric renal stones. Although it is the least invasive treatment, it has a high retreatment rate and auxiliary procedures.<sup>(1)</sup> In contrast, the percutaneous nephrolithotomy (PNL) achieves a high stone free rate (SFR). The drawback is its higher complications rate which might be related to the use of larger instruments.<sup>(2)</sup> The Miniperc achieve success rates similar to standard PNL, but with lower complications.<sup>(3)</sup>

The aim of the study was to compare the outcomes of Miniperc versus SWL for the treatment of renal stones (10–19 mm) in preschool children. This comparison is important to help in the selection of the most appropriate treatment modality for these stones.

#### METHODS

It is an prospective study, done at Institute of urology Madras medical college Chennai from October 2017 to Jan 2020. Children aged  $\leq 6$  years with single renal pelvic calculi sizing 10–19 mm were included. Exclusion criteria were coagulation disorders, obstruction distal to calculi, impaired renal function (according to age) or non-functioning kidney. In brief, preoperative evaluation included serum creatinine, KUB and US. Stone size was determined by its longest diameter using non-contrast computed tomography scan. UTIs were treated according to culture and sensitivity.

The study was approved by the ethical committee. Written informed consent was provided by all patients. Patients were randomized by computer software in two groups for treatment group 1 and group 2. Patients in group 1 were subjected to SWL while those in group 2 underwent miniperc. JJ stent were inserted in all patients before Miniperc and SWL, respectively, to relieve anuria and acute renal failure before definitive management.

#### Miniperc procedure

After retrograde placing of a 4–6-Fr ureteric catheter in the pelvicalyceal system under fluoroscopy. In prone position One lower calyx puncture was done in all children. the nephrostomy tract was dilated to accommodate an 18- Fr renal sheath. <sup>(4)</sup> Stones were completely fragmented (to  $< 2$  mm fragments) using holmium: YAG laser with a 365-micron fiber through a 16 Fr nephroscope. Finally, a 3 Fr stent was inserted. If residual fragments ( $> 3$  mm) were detected in the radiological evaluation (KUB and US) on the first postoperative day, a second-look Miniperc was carried out. Removal of the stent done on 14th day.

#### SWL procedure

SWL was carried out using a Dornier electromagnetic Lithotripter. <sup>(5)</sup> All procedures were carried out with the patients under general anesthesia with fluoroscopic localization. The maximum number of shockwaves was 2500/session in a delivery rate of 60–90 pulses/min. Success was defined as complete clearance of stones (KUB and US) 3 weeks postoperatively. If there was inadequate stone disintegration (residuals  $> 3$  mm), a repeated SWL was carried out at that time.

#### Follow up

The patients were followed-up to assess the stone recurrence or the progress of any CIRFs (clinically insignificant residual fragments) ( $< 4$  mm). CIRFs were included within the failed cases in the SWL and Miniperc groups. SFR, retreatment rate and complications were compared using the  $\chi^2$ -test or Fisher's exact test as appropriate.

#### RESULTS

SWL and Miniperc were carried out in 32 and 30 preschool children, respectively. Age, sex and different parameters of stones were comparable in both groups (Table 1). Stone size was comparable in the both ( $P = 0.453$ ) groups (Table 1). SFR were significantly higher with Miniperc when compared with SWL in all patients ( $P < 0.001$ ; Table 2). Furthermore, retreatment rates were less in with Miniperc in all patients ( $P < 0.001$ ). No significant difference ( $P = 0.467$ ) was found in complications in SWL (15.6%) versus Miniperc (20%) groups (Table 2). The patients in the Miniperc group had a mean hospital stay of  $4.5 \pm 1.5$  days (range 1–7 days) (the longer stay was reported in cases with complications, whereas SWL was carried out as an outpatient procedure.

**Table 1- comparison of preoperative data**

	SWL (n=32)	Miniperc (n=30)	P-value
Mean Age (Months)	50+-12.5	48+-14.7	0.24
Sex (male/female)	21/11 (65.6%/34.3%)	21/9 (70%/30%)	0.67
Side of stone			
Right	17 (53%)	20 (66.6%)	
Left	15 (47%)	10 (33.3%)	
Stone size	15.6+-3.1	14.3+-4.1	0.453

**Table 2- Comparison of outcome of miniperc and SWL groups**

	SWL (n=32)	Miniperc (n=30)	P-value
<b>Complications (modified clavien)</b>	5(15.6%)	6(20%)	0.467
<b>Grade 1</b>			
Steinstrasse (conservative)	1(3.12%)	NA	
Bleeding	0	1(3.3%)	
Urine leakage	NA	0	
<b>Grade 2</b>			
Fever	2(6.25%)	3(10%)	
UTI	1(3.12%)	1(3.3%)	
<b>Grade 3</b>			
RP perforation	NA	1(3.3%)	
Steinstrasse (URS)	1(3.12%)	NA	
<b>Auxiliary procedures</b>			0.134
URS for steinstrasse	5(15.6%)	2(6.6%)	
Auxiliary miniperc (post SWL) or SWL(post miniperc)	2(6.25%)	NA	
	3(9.37%)	2(6.6%)	

<b>Retreatment rate</b>			
Second session	15(46.8%)	2(6.6%)	<0.001
Third session	2(6.25%)	0	
<b>SFR</b>			
After single session	17(53.12%)	26(86.6%)	<0.001
After two session	25(78.12%)	29(96.6%)	0.044
After three session	30(93.75%)	29(96.6%)	

All patients were followed up without stone recurrence, without passage or increase in size of CIRFs and without any other complication to the end of the study. Serum creatinine was preserved in all patients. No hypertension was developed in any patient.

## DISCUSSION

The recurrent nature of pediatric stones and small size of the kidneys necessitate need for minimally invasive procedures to achieve a high success without an increase in complications<sup>(1)</sup> Furthermore, this crucial high success rate should be achieved in a single sitting to avoid exposing the child to repeated anesthesia.<sup>(6)</sup> SWL is least invasive treatment but SFR after the first session might be as low as 44%. The reported retreatment rates (14–54%) and auxiliary procedures (10–20%) were high.<sup>(1)</sup> As PNL is more invasive, it is recommended for large stone burden (>2 cm), lower pole calculi >1 cm, known cystine or struvite composition or concurrent anatomic abnormality. The reported SFR was between 86.9% and 98.5% after a single session.<sup>(1)</sup> The introduction of Miniperc with smaller sheath sizes and fewer complications added more indications for Miniperc, especially for smaller stones. In the present study, SFR in the Miniperc and SWL groups were 86.6% versus 53.12%, and 96.6% versus 93.7% after the first and last retreatment sessions, respectively. 3 patients in the SWL group required auxiliary Miniperc, whereas 2 patients in the Miniperc group required auxiliary SWL. This is close to that reported by Zeng et al., who reported the same results for renal stones 15–25 mm in size.<sup>(7)</sup> Of the 3 renal units with residual stones in the Miniperc group, 2 were successfully treated with a second-look Miniperc procedure; one with no symptoms was managed conservatively. Of the 15 infants with residual stones in the SWL group, all were treated with a repeated SWL session; 2 failed to respond to SWL and were converted to undergo Miniperc. The re-treatment rate was significantly higher in the SWL group (46.8%) than in the Miniperc cohort (6.6%).<sup>(7)</sup> Kumar et al., compared Miniperc and SWL for single radio-opaque 1–2 cm lower calyceal calculi in children (aged <15 years).<sup>(8)</sup> The retreatment and auxiliary procedure rates were significantly greater in the SWL group compared with the Miniperc group (41.5% vs. 2.8% and 14.2% vs. 5.6%, respectively). In the present study, no significant difference was found in the total complications of the SWL (15.6%) and Miniperc (20%) groups. Miniperc complications were bleeding (3.3%), renal pelvis perforation (3.3%), UTI (3.3%) and fever (10%). The SWL complications were two steinstrasse cases, one case with UTI and two cases with fever. One steinstrasse case was treated by ureteroscopy. Other complications were self-limited. Although complications were relatively more in the Miniperc group, they were treated conservatively in almost all cases. Auxiliary interventions including auxiliary SWL and auxiliary Miniperc were required in 9.37% and 6.6% in the SWL and Miniperc groups, respectively. In contrast, Zeng et al. reported significantly more complications in the SWL group than in the Miniperc group (45.5% vs. 16%).<sup>(7)</sup> In the present study and the other two studies comparing SWL versus Miniperc in children, the number of sessions required to clear stone was higher in the SWL group.<sup>(7,8)</sup> In pediatric patients, general anesthesia is required during SWL sessions, because the stones will be off target as a result of the movement of the child, with loss in the efficacy of stone fragmentation.<sup>(9)</sup> Increase in the number of sessions will increase the financial and the psychological stress on the family in addition to the need for a close follow up for a longer period. This is more prolonged in patients with CIRFs after SWL. In contrast, hospital stay and exposure to radiation are clearly longer in the Miniperc group.

The present study was limited by its lack of data including the postoperative glomerular filtration rate, stone composition and metabolic work-up for these children. Despite these limitations, the present study is important for narrowing the gap in the literature in preschool children. We recommend using Miniperc in the treatment of renal pelvis stones (10–19 mm) in preschool children because of its higher SFR in a single sitting without compromising safety. Further prospective randomized studies are required to help in making a decision about the ideal treatment modality.

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