

1     **Management of Pediatric Renal Stones (10-20mm) by Flexible**  
2     **Ureteroscopy (F-URS), Miniaturized Percutaneous Nephrolithotomy**  
3     **(Mini-Perc) or Extracorporeal Shock Wave Lithotripsy (ESWL):**  
4     **Comparative Study**

7     **Abstract**

8     **Objective:** To compare safety, efficacy, and stone free rate of retrograde intrarenal surgery (RIRS),  
9     mini PCNL and extracorporeal shock wave lithotripsy (ESWL) in the treatment of pediatric renal stones.

10    **Patients and methods:** Ninety pediatric patients (9-18 years old) with single renal stone (pelvis or  
11    lower calyx) 10-20 mm in size, were prospectively collected and randomly divided into three groups, A  
12    (RIRS), B (Mini-PCNL) and C (ESWL). RIRS was performed using flexible ureteroscope (Boston  
13    Scientific LithoVue™ 7.7/9.5Fr). Mini-PCNL was performed using rigid pediatric nephroscope (Storz  
14    miniperc 16.5 Fr) and the stones were fragmented or dusted in groups A and B using holmium:YAG  
15    laser (Luminis Pulse 30H). ESWL was performed using a piezoelectric lithotripter (Piezolith 3000 plus)  
16    device under fluoroscopy guidance.

17    **Results:** Operative time significantly differed between the studied groups ( $P < 0.001$ ), it was  
18    significantly higher in group B ( $101 \pm 11$  min) than in groups A ( $82 \pm 9$  min) and C ( $75 \pm 28$  min).  
19    Fluoroscopy time significantly differed between the studied groups ( $P < 0.001$ ), it was significantly  
20    higher in group B ( $103 \pm 14$  sec) than in groups A ( $44 \pm 7$  sec) and C ( $90 \pm 12$  sec).

21        The median hospital stay showed an overall significant difference between the studied groups ( $P <$   
22     $0.001$ ). No significant differences were observed regarding stone free rate ( $P = 0.667$ ), pain score ( $P =$   
23     $0.125$ ), complications ( $P = 0.516$ ), and complication type ( $P = 0.867$ ).

24 **Conclusion:** ESWL, RIRS and mini-PCNL are safe and effective methods in treatment of renal  
25 pediatric stones (10-20 mm).