Recent Trends in Percutaneous Nephrolithotomy in Pediatric Renal Stone Disease

Essay

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List of Abbreviations

AUA	American Urology Association
CT	Computerized Tomography.
EAU	European Association of Urology.
ECG	Electrocardiogram.
ESWL	Extracorporeal Shock Wave Lithotripsy
Fr	French.
GFR	Glomerular Filtration Rate.
HU	Hounsfield Unit.
INR	International Normalized Ratio.
IVU	Intra Venous Urography.
JJ	Double J.
KUB	Kidney, Ureter and Bladder radiograph.
NCCT	Non Contrast Computerized Tomography.
PCNL	Percutaneous Nephrolithotomy.
RIRS	Retrograde Intra Renal Surgery
Tc-DMSA	Technetium Dimercaptosuccinic Acid.
UPJO	Ureteropelvic Junction Obstruction.
US	Ultrasonography.
UTI	Urinary Tract Infection.
YAG	Yttrium Aluminum Garnet
MICRO PCNL	Micro percutaneous Nephrolithotomy
MINI PCNL	Mini Percutaneous Nephrolithotomy
UMP	Ultramini Percutaneous Nephrolithotomy

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INTRODUCTION

The prevalence of stone disease has been increasing because of changing dietary habits, obesity, and lifestyle factors. **(Oğuz U et al., 2014).**

The prevalence of stone disease was reported as 11.1% in the adult population. While the prevalence in children varies with age, it is approximately 2-3% **(Erbagci A et al., 2003).**

Malnutrition, racial factors, and anatomical and metabolic abnormalities are the most important risk factors responsible for the high incidence and recurrence rates in children. 40-50% of children with urolithiasis have a metabolic abnormality such as hypercalciuria, hyperoxaluria, hypocitraturia, cystinuria, or hyperuricosuria, with hypercalciuria and hypocitraturia being the most common **(Sarica K etal. 2006)**

Children with systemic disease need full metabolic and systemic evaluation. As, Paediatric patients have a high risk of recurrence because of long life epectancy, and so minimally invasive treatment options are preferred **(Muslumanoglu AY et al., 2011).**

Open surgery was the only surgical treatment option in the past; today stones can be managed with minimally invasive procedures, such as extracorporeal shock wave lithotripsy (ESWL), retrograde intrarenal surgery (RIRS), percutaneous nephrolithotomy (PCNL), or laparoscopy. The current treatment recommendations for kidney stones in children are similar to those in adults. For kidney stones <2 cm, ESWL has been recommended as the first-line treatment **(McAdams S et al., 2010).**

There are various factors affecting the stone-free rates of ESWL such as stone size, composition, and location. European Association of Urology (EAU) Guidelines recommend ESWL as a first-line treatment option in children with upper ureter or renal pelvis stones <2 cm **(Tekgül S et al., 2013)**

Increase of the stone size results in a decrease of the stone-free rates and an increase of retreatment rates. Stone-free rates for <1 cm, 1-2 cm, and >2 cm, were reported as nearly 90%, 80%, and 60%, respectively. The main disadvantage of the ESWL in children is the need for anaesthesia. But due to new advances in medication, anaesthesia does not seem to be a problem in infants **(Erbagci A et al., 2013).**

RIRS, which can be considered as a new approach for renal stones, has improved as a result of advances in the technology of flexible ureteroscopes **(Salerno et al., 2013).**

However, it is a new approach in children; it is not recommended under the EAU guidelines as a first-line treatment procedure for any of the kidney stones yet. It is mentioned as a secondary treatment option to ESWL in children with stones <1 cm **(Tekgül S et al., 2013)**

For the treatment of kidney stones >2 cm, it is recommended that PCNL be used as first-line treatment as it returns high success rates. PCNL is the primary treatment option in children with kidney stones >2 cm or with staghorn calculus, and EAU guidelines also recommend PCNL for lower pole calyx stones >1 cm in children , obstructed kidneys, hard stones such as cysteine and calcium oxalate monohydrate, and ESWL-failed kidney stones are other indications for PCNL**. (Tekgül S et al., 2013)**

There are many factors affecting the success rate of PCNL, such as the anatomy of the kidneys, stone burden, and localization. The stone-free rate of PCNL is between 73-96% **(Kapoor R et al., 2008)**

Although the success rate with PCNL is similar between children and adults, small kidneys and large instruments make this surgery difficult in children. All the complications that occur in adults can also be in children. Children have less

tolerance for bleeding, and this lack of tolerance can cause an anxiety for surgeons when performing PCNL. The effect of tract dilatation on growing kidneys and the side-effects of radiation are also important points that must be defined. But there are insufficient data and few articles regarding the effect of PCNL on growing kidneys in the international literature. **(Moskovitz B et al., 2006)**

Unsal and his colleagues evaluated 50 patients by dimercaptosuccinic acid (DMSA) before and 3-6 months after surgery. They found that six of the patients had new focal cortical defects corresponding to the access site for tract formation during PCNL. In contrast, they demonstrated that renal function was preserved after percutaneous stone removal. **(Unsal A et al. 2010)**

PCNL did not cause adverse renal morphologic or functional alteration in children. (**Wadhwa P et al. 2007)**

ESWL, ureteroscopy and PNL did not impair renal growth with a 6-year follow-up period. **(Reisiger k et al. 2007)**

AIM OF THE WORK

The aim of the work is to discuss the recent advances, safety and difficulties of percutaneous nephrolithotomy in pediatric age group.