

Bilateral Percutaneous Nephrolithotomy in Single Session in Children Under General Anaesthesia: Our Experience

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ABSTRACT

Objective: To evaluate the efficacy of removing bilateral kidney stones simultaneously from children, in one session.

Patients and Methods: Thirteen patients (three girls and 10 boys, 26 kidneys; mean age 8 years, range 3–14) underwent simultaneous bilateral percutaneous nephrolithotomy (PCNL) in the same session, under general anaesthesia, starting with ureteric catheter insertion into both kidneys and using a 26 F adult nephroscope. The mean (range) stone diameter was 2 (1–3.5) cm. Three patients had staghorn stones in one of their kidneys. Ultrasonic disintegration was used; two patients had bilateral and two others unilateral endopyelotomy, and one patient had percutaneous suprapubic cystolithotomy in the same session. The mean (range) operative duration was 65 (55–90) min.

Results: All patients were rendered stone free; there was no severe bleeding or any other complication. On one side in one of the patients, a second session was needed because of residual stone. The nephrostomy tubes were removed 3 and 4 days after PCNL and the hospital stay were 6 (1–11) days.

Conclusion: The advantages of simultaneous bilateral PCNL are reduced psychological stress, one cystoscopy and

anaesthesia, less medication and a shorter hospital stay and convalescence, with considerable savings in cost. In experienced hands this method can be used not only in adults but also in children. To our knowledge this is the only report of this technique in children.

Keywords: Percutaneous Nephrolithotomy, Kidney Stones, General Anaesthesia.

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INTRODUCTION

Since the early 1980s when percutaneous nephrolithotomy (PCNL) was introduced, open surgical procedures have virtually been replaced in adults. This technological advance was slowly applied in children, primarily because of the technical limitations associated with smaller patients and secondly because of the rarity of paediatric urolithiasis. Simultaneous bilateral PCNL (SBPCNL) was reported in adults.¹⁻³ SBPCNL in children is a challenge for the endourologist; to our knowledge, we report the first series in children.

PATIENTS AND METHODS

Between January 2015 and December 2016, 13 children (three girls and 10 boys, 26 kidney units; mean age 8 years, range 3–14) with bilateral kidney stones were treated by SBPCNL. The mean (range) stone diameter was 2 (1–3.5) cm; three patients had staghorn stones in one of their kidneys. SBPCNL was conducted with the patients under general anaesthesia; in the lithotomy position a paediatric cystoscope was inserted into the urinary

bladder and 4–5 F ureteric catheters inserted into both kidneys, and fixed to an 8–10 F Foley bladder catheter. The patient was then turned prone, and both kidney areas disinfected and isolated. The operation began with the side containing the larger stone. Contrast material, was given through the ureteric catheter to make the collecting system visible under fluoroscopy. An 18 G needle was used to puncture the collecting system. The lower or middle calyx was punctured, depending on the location of the stone. When the needle was safely positioned in the collecting system (from the appearance of contrast material through the needle), a 0.9 mm guidewire was inserted through the needle into the collecting system. After making a small skin incision, the needle was removed. The nephrostomy tract was dilated with metal dilators up to 23 F, then a 26 F adult nephroscopic sheath inserted above the last dilator, the dilators removed and the nephroscope inserted. The dilatation procedure was controlled under fluoroscopy. Isotonic saline was used for irrigation and visualization. The large and staghorn stones were crushed with an

ultrasonic disintegrator, small stone fragments removed by suction, and larger fragments with stone forceps. At the end of the procedure an 18 F nephrostomy tube was left through the nephroscope sheath. The nephrostomy tube provided compression to avoid bleeding after the procedure, and helped the drainage of bloodstained urine and clots soon after surgery. There was no severe bleeding alongside the 18 F nephrostomy tube. After finishing one side the surgeon changed position, and the mobile fluoroscope and all instrumentation were moved to the contralateral side, and the procedure repeated. In one patient, when a second session was necessary, no ureteric catheter was inserted, as the patient had a nephrostomy tube and thus contrast material was delivered through the tube the tract re-dilated as usual. Two patients had bilateral and two others unilateral PUJ stenosis, and had an endopyelotomy in the same session. The ureter was stented with a paediatric JJ catheter for 6 weeks. One patient had a percutaneous suprapubic cystolithotomy in the same session for a urinary bladder stone.

RESULTS

The mean (range) operative duration was 65 (55–90) min; all patients were eventually rendered stone free (Fig. 1b), with one patient having a residual stone on one side, requiring a second session 6 days after the first. There was no severe bleeding or any other complication, and no blood transfusion was required; the mean decrease in haemoglobin was 1.73 g/L. The ureteric catheters and bladder catheter were removed on the first day and patients assessed by a plain abdominal film and ultrasonography on the second day. If there was no residual stone and the urine from the nephrostomy tubes was clear, the nephrostomy tubes were clamped and removed at 3 and 4 days, respectively. The plain film was repeated after removing the nephrostomy tubes. Patients were discharged 4 or 5 days after PCNL; in one patient the ureteric catheters and bladder catheter were removed on the day of PCNL, as the urine was clear in both nephrostomy tubes and the plain film was negative, and the patient was discharged on the same day. The mean (range) hospital stay was 6 (1–11) days. The JJ ureteric stents were removed after 6 weeks. Stone analysis showed cystine and calcium oxalate mono- and dihydrate in one patient each, ammonium urate in two and mixed calcium oxalate and uric acid in nine. One patient with a cystine stone had a recurrence on one side after 2 years, treated by PCNL. All of the six endopyelotomies appeared to be successful, as assessed by IVU at 1 year, but could not be validated statistically because there were too few patients.

DISCUSSION

Bilateral stones in children are challenging for the endourologist; although ESWL is the first choice for most the upper urinary tract stones, for those >1.5 cm or dense stones the success rate of ESWL decreases. The clearance rate is also less in children than in the adults, reported as 45–82%, but as low as 28% in some reports.^{9–11} To attain a high stone-free rate requires more sessions for larger and/or dense stones, but the need for auxiliary procedures¹² and the chance of complications also increases. The late biological effects of ESWL in children remain controversial, e.g. changes in predicted renal growth rates were reported recently.¹³ As experience is gained in percutaneous stone surgery there is continuous improvement in the success rate and a

decrease in operating time, complication rate and hospital stay after treatment. We have used PCNL in > 1000 adults and > 100 bilateral PCNL. In our experience we have had no complications related to the relatively large instruments (26 F nephroscope).¹⁴ We felt able to use SBPCNL in children after > 150 successful interventions in adults; the previous study in adults showed no significant difference in laboratory values and complications between SBPCNL and unilateral PCNL.^{7,8} The planned bilateral procedure should not be continued if there is any complication on the initial side; the contralateral side is better postponed for a separate session. After endopyelotomy there was no recurrent PUJ obstruction after 1 year in the three patients treated. Because of the few patients and the short follow-up the results cannot be assessed statistically, but in our previous report the success rate was 86–89% in adults and children.^{15–17} Two patients had ammonium urate stones, probably of a nutritional origin; to reduce the occurrence of such acid urate crystals, mother's milk should be supplemented with additional food from infancy, possible by mass education and eradication of poverty in the developing world. Almost all of the present interventions were in Rajasthan; thus social customs were respected, as most of these patients came from remote villages, where there were no healthcare services within a reasonable distance, and thus there were no facilities for a rigorous follow-up. Another important reason for using endoscopic stone removal as the primary management was financial, as there is no health insurance, and the parents were able to pay only for one definitive procedure.

CONCLUSION

The advantages of SBPCNL are evident; one preparation, minimized psychological stress, one cystoscopy and anaesthesia, one (shorter) hospital stay and convalescence, less medication and considerable cost saving. In experienced hands and with selected cases, this method can be used not only in adults but also in children.

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