Percutaneous stone removal

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Abstract

Aim. The aim was to evaluate the safety and efficacy of percutaneous nephrolithotomy (PCNL) at our academic hospital. The primary objective was to determine the percentage successful PCNL procedures performed.

Methods. The study included 169 patients (116 males, 53 females; mean age 45 years, range 6 - 75 years) treated with PCNL in our Department of Radiology between 1997 and 2004. The data of all the PCNLs done at the vascular suite from 1997 to 2004 were retrieved from the Department of Radiology records and a retrospective data analysis was performed.

Results. A total of 169 patients underwent PCNL treatment from 1997 until 2004. Of these, 121 (72%) had one procedure and 38 (21%) had a second PCNL procedure, while 9 (6%) of the patients had three or more attempts. The average number of PCNLs performed was 21 (5 – 35) per year. The average theatre time was 121 minutes (30 - 250). The two complications documented were blood loss in 13 (7%) and postoperative fever in 3 (1.75%) patients. Most of the stones were located in the lower pole of the kidney (43%) with 36% located in the renal pelvis, 14% in the midpole and 6% in the upper pole. One hundred and twenty (71%) patients were stone-free after PCNL treatment. Incomplete removal of stones was noted in 30 (18%) patients and the procedure was a complete failure in 19 (11%) of the patients.

Conclusion. PCNL has proved to be a safe and effective method of stone treatment in our academic setting. Our complication rate was within acceptable limits. We may improve our success rate if we make the nephrostomy tract above the 12th rib in the treatment of midpole stones.

Introduction

Percutaneous nephrolithotomy (PCNL) is an effective procedure to treat patients with complex renal stones, e.g. staghorn calculi and stones greater than 20 mm in diameter. The treatment of choice for small, less complex renal stones is extracorporeal shock-wave lithotripsy (ESWL).[1] We have treated renal stones mainly with PCNL at our academic hospital, as ESWL was not available until 2004. A retrospective data analysis was performed to evaluate the percentage of successful PCNLs and to see whether success rates and operating times improved as experience was gained at our centre.

Aim

The aim was to evaluate the safety and efficacy of percutaneous nephrolithotomy at the Department of Diagnostic Radiology, Universitas Hospital, Bloemfontein, an academic institution.

The primary objective was to determine the percentage of successful percutaneous nephrolithotomies performed.

The second objective was to compare the theatre time on a yearly basis to see if a reduction in duration of procedures occurred with time as experience was gained.

The third objective was to determine the success in treatment of stones located in the upper calyx through a lower calyx nephrostomy tract.

Patients and methods

The study included 169 patients (116 males, 53 females; mean age 45 years, range 6 - 75 years) treated with PCNL in the radiology department between 1997 and 2004 (an average of 21 patients per year). Routine preoperative evaluation showed renal and/or impacted proximal ureteric stones in all of these patients. The data were collected retrospectively and evaluated. All procedures are carried out under general anaesthesia with the patient prone.

The percutaneous tract was made by the interventional radiologist under ultrasound combined with

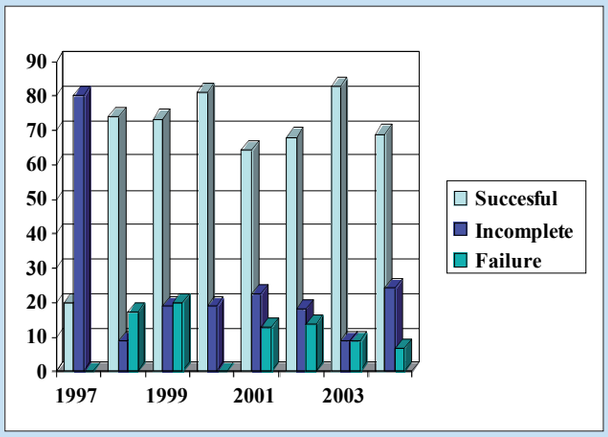

Fig 1. Outcome/year as a percentage of total PCNL performed.

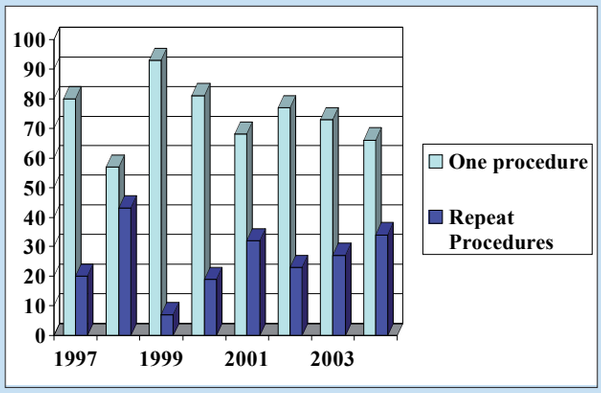

Fig. 2. Number of repeat procedures as a percentage of totals.

fluoroscopy guidance. Two guide wires were placed down the ureter. One of these wires was used as a safety wire. A balloon dilator was placed over the guide wire and a sheath was placed in the tract. Renal stones were removed through the tract and sheath with a nephroscope by the urologist. After the procedure a double-J stent was placed down the ureter and a 24 Fr catheter was placed in the nephrostomy tract to control bleeding. To minimise the risk of hyponatraemia we limited the irrigation time and we used mannitol or saline as irrigation fluid.

The procedure was considered a success if all the stone/s were removed. When the stone/s were only partially removed, the procedure was considered incomplete. These patients received a second procedure. The procedure was considered a failure when no stone/s could be removed after multiple attempts.

Operation time was recorded from time of induction of general anaesthesia to termination of the procedure.

Results

Renal stones were located as follows: 43% located in the lower pole, 36% in the renal pelvis, 14% in the middle pole and 6% located in upper pole. Some of the patients had multiple stones.

The treatment was successful in 120 (71%) of the patients who were stone-free. Incomplete removal of stones occurred in 30 (18%) patients and the procedure was a complete failure in 19 (11%) of the patients, as no stones could be removed (Fig. 1).

Of the 169 patients, 121 (72%) had only 1 procedure, 38 (22%) had 2 procedures, 6 (4%) had 3 procedures and 3 (2%) had more than 3 procedures (Fig. 2).

The two main complications were blood loss and fever (Fig. 3). Blood loss occurred in 13 patients (7%) which was considered a major complication when it was severe enough to require termination of the procedure and/or blood transfusion. Transient fever was documented in 3 patients (1.75%). No mortalities occurred as a result of PCNL. The total complication rate during this period is estimated at 8.75%

No significant reduction in operation time occurred during the 8-year period. The mean (range) operative duration was 121 (30 - 250) minutes which equals an average cost of R 4 235 per session (Fig. 4).

Discussion

PCNL is an effective method of treatment of urolithiasis with the overall stone-free rate ranging from 66% to 93.7%,[1,2] which correlates with our current results of 71%. Note that results in the literature refer to treatment of large or multiple stones, and stones in the inferior calyx which are better suited for PCNL treatment. ESWL is the treatment of choice for small renal stones.[1] We did not have the option to use ESWL so treated all renal stones with PCNL.

PCNL is safe to perform for all age groups, including children and the elderly.[3,4] The published complication rates range from 21% to 44%.[5,6] Our complication rate of 8.7 % is within acceptable limits. Most of the complications encountered at our department were clinically insignificant and could be managed conservatively. No blood transfusions or open surgery were required. No reports of sepsis were documented. The low rate of transient fever (1.75%) may however be attributed to suboptimal documentation.

PCNL has no long-term adverse effects on kidney

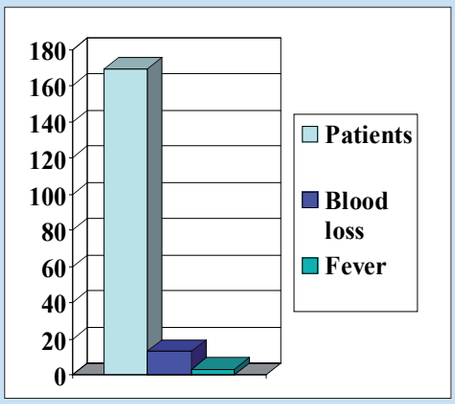

Fig 3. Morbidity as a result of PCNL in comparison with the number of patients.

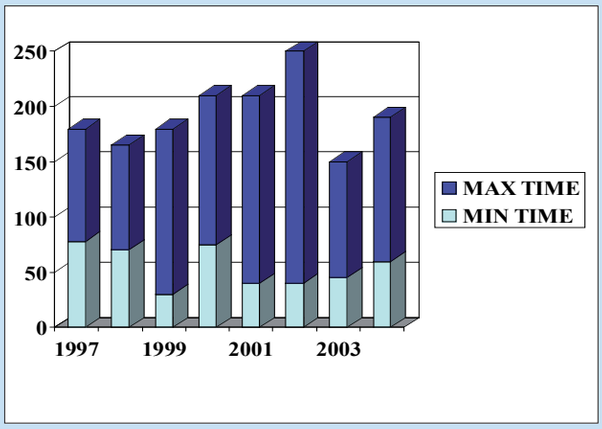

Fig 4. Average theatre time in minutes during period 1997 to 2004.

function.[7] Severe complications such as acute hyponatraemia and renal failure are very rare and we had no cases reported.[8] No intrathoracic complications, e.g hydrothorax or pneumothorax, were encountered as all the procedures used a subcostal approach. No injuries to surrounding organs occurred. This can be attributed to the appropriate choice and positioning of the puncture into the desired calyx under ultrasound and fluoroscopic guidance.[9]

The operative theatre time usually varies between 60 and 210 minutes according to the literature, which correlates with our theatre time of an average of 121 (30 – 250) minutes.[10] The operative theatre time was recorded from induction of general anaesthesia until conclusion of the procedure. No decrease in theatre time was observed during the time span of the study. The rotation of registrars with different levels of experience may have contributed to this.

Conclusion

PCNL, used as the principal method in treating renal stones at our institution, has proved itself to be a safe and effective method when compared with reports in the literature. Our complication rate is within acceptable limits. We may improve our success rate in treating midpole stones by making the nephrostomy tract above the 12th rib, should this be indicated.

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