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Percutaneous nephrolithotripsy under assisted local anaesthesia for high risk patients: Is it effective?

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KEYWORDS

Percutaneous;
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Abstract

Objectives: The aim of the present study is to evaluate the feasibility and safety of performing PNL under local anesthesia in a selected group of patients who are at high risk for general anesthesia.

Patients and methods: Forty seven patients underwent PNL under local anesthesia. There were 38 males and 9 females with a mean age of 62 years. All patients were at medical high-risk for general anesthesia, with an American Society of Anesthesiologists (ASA) score of 3. The indications for local anesthesia in this study were obstructed single functioning kidney with azotemia in 29 patients, hepatic insufficiency in 8 patients, cardiac problems in 7 patients and 3 patients had hepatocellular carcinoma. The mean stone size was 2.7 cm (range 2–3.1 cm). Local infiltration with 10–20 cc of 2% lidocaine at the site of puncture was used in all cases. Narcotics were given 30 min prior to the procedure and medazolam was given intraoperatively upon demand. Ultrasound guided puncture was performed in all cases and tract dilatation was then done under fluoroscopy using high pressure balloon catheter in 35 and Alken's metal dilators in 12 cases. Stones were then retrieved after disintegration in the same session in 33 patients, while the other 14 patients underwent staged PNL, where a 12 Fr. nephrostomy tube was placed in the first stage, followed by tract dilatation and stone retrieval one week later.

Results: Out of 47 patients included, 44 had successful PNL either one stage (30 patients) or two stages (14 patients). Only 3 patients could not tolerate pain and the procedure was terminated after placement of nephrostomy tube and stone retrieval was completed later under general anesthesia.

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Conclusion: Our results demonstrated that PNL under local anesthesia with narcotics and sedatives seems to be a satisfying solution for the treatment of a selected group of patients with renal pelvic stones and who have high anesthetic risk. However, additional studies with different groups of patients are required to validate our results.

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Introduction and objectives

Decades had passed since Fernstrom and Johansson first removed a renal calculus through a nephrostomy tract in 1976 [1]. Since then, percutaneous nephrolithotomy (PNL) has dramatically changed and is continuing to evolve. Currently, PNL is an integral component of the management of large-volume renal calculus disease. It has the possible advantages of better stone clearance rates, cost-effectiveness, and early convalescence compared with other modalities such as SWL and open stone surgery [2]. In spite of the high-quality imaging, continuous technical improvements of lithotripsy devices, PNL is still a challenging [3]. Recently, there has been an increased interest in performing endourological procedures, including PNL, under local anesthesia. This is possibly because of physicians' increased experience with these techniques, the rising cost of health care and limited operative time required for these procedures [4].

The aim of our study is to evaluate the feasibility and safety of performing PNL under local anesthesia in a selected group of patients who are at high risk for general anesthesia.

Patients and methods

Forty seven patients were prospectively enrolled in the study. Meticulous preoperative assessment included complete blood picture, bleeding profile, renal and liver function tests, blood sugar level, complete cardiac and pulmonary assessment and blood pressure assessment was done. All patients were at high risk for general anesthesia with ASA score of 3, 29 patients had obstructed single functioning kidney with azotemia, eight patients with hepatic insufficiency, seven patients had cardiac problems and hepatocellular carcinoma in three patients.

Exclusion criteria were:

1. Patients with uncontrolled coagulopathy
2. Renal anatomic variations
3. Obesity (BMI more than 35 kg/m²)
4. Previous renal surgery
5. Patient's demographic and clinical data are presented in Table 1.

Technique

All patients given a written consent. Prophylactic antibiotics (3rd generation cephalosporins) and 100 mg pethidine HCl were given 30 min prior to the procedure, and midazolam 5 mg intravenously was given intraoperatively upon demand. After placement of the patient in the prone position, the appropriate site of puncture was selected under ultrasonic guidance. Infiltration of the skin and injection of 10–15 cc of 2% lidocaine along the direction of the

Table 1 Patient's demographic and clinical data.

No. of patients	47
Mean age (years)	54.3 ± 11.9 (range 31–72 years)
M/F ratio	38/9
Mean body mass index	24.45 ± 3.55
Hypertension	30 (63.8%)
Diabetes	14 (29.8%)
Mean serum creatinine (mg/dL)	1.7 ± 1.2 (range 0.5–4.7)
Mean stone bulk (cm ²)	2.7 (range 2.5–3.1)
Stone site	
Pelvic	22
UPJ	25

intended puncture was performed. An 18-gauge chiba needle was advanced and the access was monitored under ultrasonic and fluoroscopic guidance. A contrast material was then injected to assess the anatomy of the pelvicalyceal system and a 0.038 floppy tip J-shaped guide wire was inserted through the needle. Once the guide wire was secured into the kidney another 10–15 cc of lidocaine was injected along the tract adjacent to the guide wire under fluoroscopic guidance. Then dilatation of the tract was performed initially by fascial dilators up to dilator No. 12 Fr. to allow for introduction of the double lumen catheter with the insertion of safety guide wire. Dilatation was then completed using the high pressure balloon catheter (Nephro MAX™) in 35 cases and Alken's metal dilators in 12. Then a 30 Fr. Working Amplatz sheath was inserted and through it a 26 Fr. Rigid nephroscope was advanced into the renal pelvis. The stone was then disintegrated using wolf swiss lithoclast and the fragments extracted. A 16 Fr. Nephrostomy tube was left to drain the kidney at the end of the procedure.

Heart rate, blood pressure and peripheral oxygen saturation were monitored continuously throughout the procedure. Also, patients were strictly observed for the degree of pain experienced during the procedure.

The operative time was counted as the time from the puncture until the final placement of a nephrostomy tube.

Results

Thirty three patients (70.2%) were scheduled for one stage PNL, while the other fourteen patients scheduled for staged PNL (had single functioning obstructed kidneys and azotemia). In the later group a 12 F nephrostomy tube was placed in the first stage and the second stage was performed one week later after improvement of azotemic status. Out of 29 patients with azotemia due to obstructed single functioning kidney, 15 underwent haemodialysis twice prior to PNL (all of them underwent single stage PNL). The percutaneous procedure was performed using a single nephrostomy tract in 43

patients and 2 tracts in the other 4 (8.5%), all of them had staged PNL.

Forty-four patients tolerated the procedure well with only mild pain mainly during tract dilatation. Three out of the thirty three patients who were scheduled for single stage PNL, experienced severe intolerable pain and could not complete the procedure, which was terminated by placement of nephrostomy tube and the maneuver was completed later under general anesthesia.

The mean operative time for the 30 patients who had single session was 47 min (range 29–75 min), while it was 79 min (range 55–100 min) in the other 14 patients who had staged procedure (including both sessions). The access was easily gained in all cases.

Patients who had single session were discharged on the second day, while those who had staged procedure were discharged on the same day after the first session and on the second day after the second session. No major complications were encountered. Five patients had mild bleeding but none of them required blood transfusion and 4 had postoperative fever that was controlled by I.V. antibiotics.

Discussion

Continuous progresses in development of new instrumentation, and the development of novel technologies as SWL, have considerably changed the modern management of urolithiasis. At present, the surgical selection of an urologist contains a variety of minimally invasive treatment options for urinary calculi, including SWL, ureteroscopy and PNL. Each modality offers potential advantages and disadvantages that must be considered when selecting the surgical approach. These treatment related qualities include considerations such as success rates as monotherapy, the need for anesthesia, the need for postoperative hospitalization and the likelihood of postoperative morbidity.

There are many reasons to develop PNL under local anesthesia such as unfit patients for general anesthesia caused by severe comorbidity as well as the need for cost suppression [5].

Clayman et al. in 1983 reported his early experience with four cases with complex renal stones treated by combined chemolysis and electrohydraulic lithotripsy under local anesthesia [6]. Preminger et al. in 1986 published one of the earlier series describing an outpatient PNL in 5 patients with small renal stones using assisted local anesthesia [7]. About twenty years later a novel technique for performing PNL under local anesthesia was introduced by Dalela et al. when they infiltrate Lignocaine at the site of renal entry for renal capsular block in 11 patients with a well tolerated procedure and satisfied results [5].

Many theories explaining the cause of pain during PNL. One of the most accepted is that attributing pain mainly to the renal capsular and parenchymal dilatation rather than stone disintegration, so, the renal capsule must be targeted for local anesthesia [8].

As pain is a subjective symptom, many factors had been identified that may affect pain intensity, Lang et al. reported that procedure duration is one of the important factors in pain experience [9]. In our study, the operative time was ranging from 29 to 75 min in 33 patients who had one stage procedure with mean operative time of 47 min,

while it was 79 min (range 55–100 min) in the other 14 patients who had staged procedure. These results are in agreement with Aravantinos et al., who reported the mean operative time, including both stages was 127 min (range: 85–155 min). The mean operative time of first stage was 26 min (19–37 min), and that of the second stage was 101 min (66–125 min) [10].

Pain and sensation of discomfort may be also belonged to prolonged prone position, in their study on high risk patients, El-Husseiny et al., described the lateral position for performing percutaneous endourologic procedures under regional anesthesia. They performed PNL for 22 patients with an ASA score of 3. Although this is a promising technique we believe that this technique requires high experience to do a renal puncture from an unusual angle [11].

In 2007, Aravantinos et al., [10] evaluated the safety and efficacy of PNL under local anesthesia. Their study included 24 patients with unilateral renal obstruction due to pelvic stones ≥ 2.0 cm.

In our study, we evaluated a larger cohort of patients, with a relatively larger mean stone size (2.7 cm²).

Regarding the complications of PNL, it may be classified into either access related or stone retrieval related. Of these, hemorrhagic complication that requires blood transfusion is the most important (range from 0% to 23%) [12–14]. In the present study, only five patients had minimal bleeding (11.4%) that was managed conservatively without need for blood transfusion.

Patel and associates [15] in their study of 25 high risk patients, found that two patients (8%) developed sepsis requiring parenteral antibiotics and this is matching our results as we had sepsis complication rate of (9%).

Our findings propose that the use of local anesthesia does not affect the safety and efficacy of the procedure with an overall success rate of 93%, which is consistent with the reported success rates in other series [10,16].

No major complications occurred with the procedure and its safety was found to be comparable to that performed in high risk patients under general anesthesia [16].

Furthermore, none of our patients experienced anesthesia-related complication as lignocaine toxicity is mainly associated with its intravenous administration [17].

Conclusion

Our results demonstrated that PCNL under local anesthesia with narcotics and sedatives seems to be satisfying solution for the treatment of a selected group of patients with renal pelvic stones and who have high anesthetic risk, with comparable efficacy and safety with that done under general anesthesia. However, additional studies with different groups of patients are required to validate our results.

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