Characteristics of percutaneous nephrolithotomy in elderly patients

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Abstract

Introduction: This study aims to highlight the characteristic of percutaneous nephrolithotomy as treatment for reno-ureteral lithiasis in elderly patients from our clinic.

Materials and methods: A descriptive and retrospective study was performed. It included elderly patients admitted from 01.01.2012 to 31.12.2012, diagnosed with reno-ureteral lithiasis and treated by percutaneous nephrolithotomy. Elderly patients were considered those 70 years old and above. We studied population characteristics, stone type and location, intervention and postoperative outcomes.

Results: A number of 61 percutaneous nephrolithotomies were performed on elderly patients, representing 9,91% of the total of 615 performed during the 12 months included in the study. Average age of the lot was 74,26±3,04 years. Mean postoperative admission time was 7,10 days, close to the 6,84 days in younger patients that had surgery during this period. Staghorn calculi represented a quarter of all lithiasis found in this group. Stone-free status was achieved for 78,21% of the patients on the 30 days postoperative follow-up. Clavien-Dindo grade four complications were encountered in 8,19% of patients. There were no deaths.

Conclusions: Percutaneous nephrolithotomy in elderly patients has indications, complications and outcomes similar to those in younger ones but postoperative recovery may be slightly slower.

Key words: PCNL, age, stone-free, complications, Clavien-Dindo grading system
**Introduction and objectives**

Large kidney stones (more than 2 cm) are a common pathology affecting all population groups and may result in important complications if left untreated. Percutaneous nephrolithotomy (PCNL) in the modern era has been the culmination of nearly seventy years of development. [1] Rupel and Brown were the first to report that renal stones could be removed through an operatively established nephrostomy tract. [2]

PCNL was initially reserved only for patients who were poor candidates for open surgery but with rapid developments of purpose built equipment and ancillary tools, PCNL has now become the treatment of choice for large kidney stones. [3]

Although it is a more aggressive intervention than extracorporeal shock wave lithotripsy (ESWL) in elderly patients, percutaneous nephrolithotomy is still required for complex or bulky renal lithiasis. [4]

This study aimed to highlight the characteristics of percutaneous nephrolithotomy (PCNL) and assess the safety of the procedure as treatment for reno-ureteral lithiasis in elderly patients.

**Material and methods**

This is a descriptive and retrospective study with the following inclusion/exclusion criteria:

**Inclusion criteria:**
- Age 70 or older at the time of surgery;
- Diagnosis of reno-ureteral lithiasis;
- Percutaneous nephrolithotomy performed during admission;

**Exclusion criteria:**
- Multi-stage PCNL surgery with at least one stage outside studied period;
- Lack of follow up;

We have gathered information regarding the following aspects: age, hospital stay, stone characteristics, technical aspects of the surgery, postoperative evolution, complications (Classified according to the Dindo-modified Clavien scale), and outcomes (stone free rates).

**Results**

There were 615 PCNL procedures performed during this one year period, 61 of them (9.91%) for elderly patients. Average age in our elderly lot was 74.26 ± 3.04 years (Fig. 1).

Most of our patients were admitted to the clinic the day prior to the surgery, so we consider only postoperative hospitalization as being relevant to our study. The average postoperative hospital stay was 7.10 ± 3.82 days in elderly patients, very close to that in younger patients 6.84 ± 4.33 days, but not statistically significant (p=0.44). (Fig.2) CROES Global PCNL study found a medium hospital stay of five days in elderly patients vs. 4.1 days in younger patients (p<0.001).[5] All patients to whom PCNL is performed are postoperatively hosted in the urology-dedicated Intensive Care Unit(ICU) of our clinic for a minimum of 24 hours, longer for complicated cases. Average stay in the intensive care unit was 1.42 ± 1.43 days for elderly patients while for the rest was 1.38 ± 1.32 days.

We used PCNL in the treatment of large renal stones >2cm or >1.5cm for lower calyceal stones, staghorn stones, failure of ESWL or ureteroscopy, reduced probability of fragment passage after ESWL or obesity.

Ureteroscopy with push-up followed by PCNL was the treatment of choice for stones located in the lumbar ureter.

Percutaneous nephrolithotomy is usually performed with the patient in prone position through a posterior calyx. This technique is well established, with high rates of success and accepted morbidity. [6] Since 1998 when Valdivia-Uria described the lateral access...
with the patient in supine position, few groups have used this approach for PNL. The potential advantages of the supine position over the prone position include ease of patient positioning, ability to perform simultaneous PNL and ureteroscopic procedures, better control of the airways, dependent Amplatz sheath drainage facilitating the evacuation of stone fragments. Despite the potential advantages of the supine position, it is not widespread through the urologic community, perhaps due to the lack of experience and afraid of colonic injuries. [7] Prone position was used in all our patients regardless of age.

Twenty three percent of all lithiasis was represented by staghorn calculi. (Fig. 3) CROES Global PCNL study found a prevalence of staghorn calculi of 27.5% in general population. [7, 8]

Although CT (computed tomography) is now the gold standard for identifying urinary stones the most of the patients were assessed by IVU (intravenous urography) due to the technical means and vast clinical experience in interpreting IVUs. Moores O’Boyle classification was used for staghorn calculi. Half the staghorn calculi were type C followed by type A calculi (35.7%) - (Fig. 4). There were no type D or F stones in our lot.

Non-staghorn calculi were most commonly located in the renal pelvis, lumbar ureter, inferior calyx and ureteropelvic junction (Fig. 5).

The kidney puncture for gaining access to the collecting system was always performed under fluoroscopic guidance, after placement of a simple ureteral catheter through cystoscopy or ureteroscopy for push-up procedures, allowing dilation of the collecting system with saline and contrast media. The patient initially rests in a lithotomy position for placement of the simple ureteral catheter, requiring repositioning to a prone position to perform the puncture and access to the collecting system.

Tract dilation and access sheath insertion are important and integral aspects of PCNL. [1] Tract dilation was commonly achieved with Alken’s telescoping metal dilators and, in isolated cases, with Amplatz fascial dilators.

All procedures were standard PCNL. There weren’t mini PCNL instruments available at the time of the study. Fragmentation was performed with different available pneumatic systems.

Internal urinary drainage was used exclusively in single stage PCNL procedures (Fig. 6);

There was an average leukocyte count (WBC) rise of $1.92 \pm 2.95 \times 10^3/cm^3$. (Fig. 7)
29.5% of the patients had positive urinary cultures at admission time (Table).

<table>
<thead>
<tr>
<th>Germ</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli</td>
<td>5</td>
<td>27.77%</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>4</td>
<td>22.22%</td>
</tr>
<tr>
<td>Klebsiella</td>
<td>3</td>
<td>16.66%</td>
</tr>
<tr>
<td>Proteus</td>
<td>3</td>
<td>16.67%</td>
</tr>
<tr>
<td>Pseudomonas</td>
<td>1</td>
<td>5.56%</td>
</tr>
<tr>
<td>Mixt</td>
<td>2</td>
<td>11.12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
<td>100</td>
</tr>
</tbody>
</table>

There were no nosocomial infections.

Renal access is the most critical factor for blood loss. [9] Average hemoglobin drop was 1,70±1,45g/dl during admission. (Fig. 8) Six patients representing 9.83% of the elderly patients included in our study required blood transfusions – Transfusion rate in CROES Global PCNL study was 4.9% in general population. [7] Serum creatinine average drop was 0.3±1.037/dl.

General conservative measures including adequate hydration, prevention of hypothermia, clamping the nephrostomy tube if present, diuretics, and hemostatic drugs are adequate to treat mild bleeding. Moderate hemorrhage demands blood transfusion in addition to conservative measures. If hemodynamic instability is noted, superselective renal angiography to identify the site and type of vascular injury leading to severe bleeding is the treatment of choice. [9, 10] Superselective embolization was needed for five patients, but it only controlled the bleeding in three cases, the other two requiring open exploration followed by nephrectomy.

The success of PCNL was defined as the patient being stone 30 days post PCNL. Significant remnant stones and obstructing residual fragments were considered indications for secondary procedures.

Stone-free rate of 78,21% similar to the 75.5% found by the CROES Global PCNL study– 75.5%.

Five patients had major complications (Clavien-Dindo grade ≥ 4) - (8.19%). Two hemostasis nephrec-

tomies (Clavien grade 4a) were required, there were two cases of sepsis (Clavien grade 4b) and one stroke (Clavien grade 4b)

There were no deaths in our lot.

**Conclusion**

Hospital stay and stone characteristics are similar to those in general population. Septic and hemorrhagic risk along with stone-free rates are alike those found in large studies.

Percutaneous nephrolithotomy in elderly patients is a safe procedure with manageable complications.

Percutaneous nephrolithotomy in elderly patients has indications, complications and outcomes similar to those in younger ones but postoperative recovery may be slightly slower.

**Bibliography**