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Technical and Therapeutic Results of the NLPC in the Treatment of Kidney Stones: Experience of the Urology Department of Military Instruction Hospital Mohammed V of Rabat: About 738 Cases

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Abstract **Original Research Article**

Introduction: Percutaneous nephrolithotomy (PNLT) is a minimally invasive surgical technique for the treatment of large kidney stones. The aim of this study was to determine the place of NLPC in the treatment of renal lithiasis. **Materials and Methods:** In this retrospective study, we present our experience 738 cas de néphrolithotomie percutanée réalisés chez 646 patients dans le service d'urologie de l'hôpital militaire d'instruction Mohammed V de Rabat entre Janvier 2004 et décembre 2022. **Results:** There were 387 males and 259 females, the mean age of our patients was 46.1 years (11 - 70) with a sex ratio of 1.58. The lithiasis was pyloric in 322 cases (49.6%), inferior calcific in 189 cases (29%) and coralliform in 73 cases (11%). The therapeutic efficacy of NLPC was assessed at one and three months. 67.7% of our patients were stone free. The main complications we encountered were haemorrhage (36 cases). **Conclusion:** NLPC has become the treatment of choice for pyelic, calcific and pyelocalcific calculi unresponsive to LEC. It has supplanted open surgery. Technological innovation and the ingenuity of urologists have improved efficacy and reduced morbidity.

Keywords: NLPC - indications - success rate – complications.

INTRODUCTION

Percutaneous nephrolithotomy is the post-destructive removal of renal or ureteral calculi via a percutaneous nephrostomy channel [1, 2] This technique represents a major advance, significantly reducing the number of lumbotomies performed in young patients with benign lithiasis, especially in view of technical advances and the miniaturization of instrumentation [1]. The aim of this work is to provide a detailed study of the contribution of percutaneous nephrolithotomy to the management of renal lithiasis: a comparative overview of the different aspects of this surgical technique, and its current place in the treatment of urinary calculi in the light of literature data in urology practice. We report on the experience of the Urology Department of the Mohammed V Military Training Hospital in Rabat, based on a retrospective study of 738 cases of NLPC performed on 646 patients between January 2004 and December 2022.

MATERIALS AND METHODS

This is a retrospective study of 738 cases of NLPC involving 646 patients collected in the urology department of the Mohammed V military training hospital in Rabat, carried out between January 2004 and December 2022. The following parameters were studied in all patients: Clinical study: 1. Identity 2. History 3. functional signs 4. physical signs. Paraclinical study: 1. radiology (AUSP, UIV, ultrasound, Uroscanner) 2. Biology (CBC, renal function, ECBU) Surgical technique and operative time Success or failure of procedure: Complications Postoperative follow-up: Length of hospital stay Postoperative radiological monitoring: follow-up. Study limitations: The main limitation of this study lies in the retrospective collection of data. We encountered difficulties in collecting information from the files, which led us to ask the attending physicians for additional information. The difficulties encountered were as follows: We were

unable to retrieve all the records of patients who had undergone NLPC in the department, which limited the number of NLPCs studied. A large amount of important information was not mentioned on the records. Spectrophotometric analysis is in progress.

RESULTS

The mean age in our series was 46.1 years, with extremes ranging from 11 to 70 years. The predominant age group was 40-49 years. This series included 387 men (59.9%) and 259 women (40.09%), giving a M/F sex ratio of 1.58. (Figure.31). Patient history: NLPC was performed on a single kidney in 23 patients (3.5%). NLPC was performed on ectopic kidneys in 13 patients (1.9%). NLPC was performed on a horseshoe kidney in 17 patients (2.6%). NLPC was performed on 49 patients (7.5%) with JJ probe calcification. 40 patients (6.3%) had already undergone surgery for homolateral calculi. Renal colic was the main symptom in our series, occurring in 362 patients (57%), while 259 of our patients (43%) consulted for intermittent low back pain. Other urinary signs were observed: Hematuria in 47 patients (11%). Stone emission in 97 patients (16%). Urinary irritative syndrome with positive ECBU in 130 patients (21%). 9 patients (1.5%) in our series were admitted to the emergency department for management of acute obstructive renal failure. The physical examination of our patients was normal in 93% of cases. Lumbar fossa tenderness was present in 8% of cases. Renal failure was found in 41 patients (6.9%), of whom 26 had a single kidney and 15 had bilateral renal lithiasis. ECBU was positive in 131 patients. The most frequent germ was Escherichia Coli: 98 patients. Other germs were Klebsiella pneumoniae (58 patients) and Proteus mirabilis (21 patients). Patients were treated with appropriate antibiotic therapy to sterilize urine prior to surgery. Patients underwent imaging (AUSP, ECHOGRAPHY, IVUS and UROSCANER): Lithiasis was bilateral in 28 patients (4.6%). Renal calculi were: (Table II) Simple pyloric in 322 cases (49.6%).

Inferior calculi in 189 cases (29%). Medium calculi in 44 cases (6.9%). Superior callus in 39 cases (5.8%). Coralliform in 73 cases (11%). Table 1: Location of stones. The mean stone size in our series was 38.45mm. The patient is placed in a modified lateral position after general anaesthesia. The procedure begins with placement of a ureteral probe to opacify and dilate the renal cavities, facilitating calyceal puncture under image intensifier. Puncture at the bottom of the chosen calyx, usually posterior and inferior, remains the safest option to reduce the risk of complications. After insertion of the guide wire and dilatation to create the cutaneous-caliceal tunnel, an amplatz sheath is inserted to pass the nephroscope and extract the lithiasis fragments. The simplest stones (less than 15mm) were extracted using 1 endoscopic forceps, while larger stones were fragmented. A nephrostomy tube should be inserted at the end of the procedure, and clamped and removed, usually on the second postoperative day, after performing an unprepared abdomen. We succeeded in fragmenting the entire stone in 438 patients, for a success rate of 67.5%. Residual calculi required further treatment in 168 cases (27%). (Table 2) ReNLPC in 92 cases. Lombotomy after failure of NLPC in 25 cases. Complementary LEC in 121 cases. NLPC failed in 41 cases, a rate of 6.4%. Complications were encountered in 61 cases, a rate of 9.4%, and are shown in Table 3. They were mainly haemorrhagic: 23 cases. 9 cases of lumbar fistula.18 cases of infection. 11 cases of hydronephrosis due to stone migration. Operating time ranged from 62 minutes to 137 minutes. Average hospital stay was 4.8 days, with extremes of 3 and 12 days. The characteristics of the two patient groups are presented in Table 4.

Table 1: location of stones

Stone	Rate (%)
Renal pelvis	49.6
Calyceal inferior	29
Calyceal Medium	6.8
Calyceal Superior	5.8
Coralliform	11

Table 2: Complementary treatment of residual stones

Traitement	Number	Rate (%)
ReNLPC	92	14
Lumbotomy	25	3.8
NLPC	121	18.6

Table 3: Complications of NLPC

Complication	Number	the rate (%)
hemorrhage	23	3.5
lumbar fistula	9	1.3
infection	18	2.7
hydronephrosis due to stone migration	11	1.6

Table 4: Characteristics of the two groups of patients

		Group A	Group B	P
Age		53.2	57.6	0.25
Gender	Woman	46.7%	46.7%	1.00
	Man	53.3%	53.3%	
Circumstances	Symptomatic	86.7%	86.7%	0.467
	Accidental	13.3%	13.3%	
Intraoperative results	Average aspirated volume (ml)	313 (100-1000)	273 (60-500)	0.75
	intraoperative incidents.	0	1 (6.6%)	1.00
	Average intervention time	15 (10-30 min)	Conversion 45 (40-75)	<0.001
Post operative course	Need for analgesics	1 (6.6%)	7 (46.7%)	<0.001
	Postoperative complications	2 (13.3%)	0	0.356
	Average hospital stay duration (days)	3.2 (1-6)	2.8 (2-4)	<0.001
Clinical results	No symptoms	7 (53.8%)	9 (69.2%)	<0.001
	Decrease ≥50%	4 (30.8%)	2 (15.4%)	0.020
	Decrease <50%	2 (15.4%)	2 (15.4%)	0.035

DISCUSSION

The surgical treatment of urinary calculi has changed considerably in recent years. NLPC was introduced in France by Le Duc and Vallancien in 1983. The advent of LEC abruptly curbed the initial enthusiasm for NLPC, and by the late 1980s, NLPC was only indicated for large stones, and in cases where LEC failed or was contraindicated. Technological advances have also improved its efficacy and reduced its morbidity [3]. Our complete success rate (stone free) is 67.5%. Our success rate is slightly lower than that reported in the literature. This may be explained by the nature, chemical composition and dimensions of the stones treated in Morocco, and the learning curve for young surgeons. The occasional occurrence of intraoperative incidents and the availability of fragmentation equipment. Operating time ranged from 62 minutes to 137 minutes. The literature reports average operating times of 48 to 150 minutes, depending on the type of stone to be treated: volume of stones (greater than 4cm) location and topography of stones. The overall complication rate in our series was 9.4%, which is comparable to the figures reported in the literature. It depends essentially on the operator's experience, the technical set-up, anatomical variations in the rien and excretory tracts, and the presence of co-morbidity. Hemorrhage is the most frequent complication of percutaneous kidney surgery. In the literature, rates vary from 0.8% to 17%, due to patient selection criteria; in our series, the bleeding rate was 3.5% [4]. Twenty of our patients (3.1%) presented urinary complications. These included nine lumbar fistulas and eleven hydronephrosis due to stone migration. In a series of 198 patients, A.Benchakroun et al [5] reported 02 cases of urinary fistula. Sepsis complicated the NLPCs in our series in 2.7% of cases. This is comparable to the results found in the literature, and would be related to an error in the indication for antibiotic prophylaxis, or to an infectious calculus that cannot be sterilized by antibiotics.

No cases of gastrointestinal perforation were reported in our series. Perforation of the digestive tract is a very rare complication of NLPC, with punctures that are too far anterior being the main cause, and congenital anomalies in the position of the colon (retrorenal colon). There were no cases of pleural perforation in our series. According to the literature, pleural perforation accounts for 0.3% of complications in Lang [6]. The average hospital stay reported in the literature is 5 days. In our series, this was 4.7 days, with extremes ranging from 3 to 11 days, due to the number of patients who had developed complications. NLPC versus surgical lithotomy [7,8,9] Brannen reviewed 350 consecutive patients, the first 100 of whom were treated by surgical lithotomy and the next 250 by NLPC. Thanks to a device whereby the success rate was defined by the removal of a previously targeted stone, success rates were comparable and excellent, approaching 100%. The advantages of NLPC were shorter operative time, a three-day shorter hospital stay, less postoperative pain, a convalescence time of around two weeks, and one week shorter than in the surgical lithotomy group. The complication rate was lower with NLPC, 7% versus 40% for open surgery, and these were less severe, while some complications disappeared altogether. NLPC versus LEC: The results of LEC alone show success rates of 30% to 50% in the case of complete coralliform calculi, and up to 90% in the case of a single kidney stone equal to or less than 10 mm. Overall, success rates are in the region of 65% to 70%. Mays [10] compared LEC and NLPC from a public health point of view: for comparable populations, LEC has a success rate of 58%, NLPC 86°/°. In 1996, Carr et al published the results of a study evaluating the stone recurrence rate in patients treated with either NLPC or LEC, with a difference in lithiasis size of no more than 20 mm in the case of LEC treatment.

This study found a difference in recurrence in favor of NLPC. In contrast, Lingeman [11] concludes that NLPC is clearly superior in this indication; on the one hand, the declivity of the inferior calyces makes

evacuation of fragments difficult, and on the other, they allow easy, direct percutaneous access. The authors conclude that NLPC is indicated as first-line treatment, especially for lower pole lithiasis larger than 10 mm. 6-4 Diverticular calculi: If the neck of the diverticulum is narrow and posteroinferior, NLPC is the most suitable technique [12]. It allows both the stone and the anatomical anomaly to be treated. If the diverticulum is located anteriorly or superiorly, LEC is initially proposed. Ureterorenoscopy with Holmium:YAG laser is an alternative [13]. In the event of failure, and depending on the operator's skills, NLPC or open surgery may be proposed. Laparoscopic surgery is indicated in cases of large anterior calcific diverticulum with thinning of the parenchyma opposite [14]. NLPC versus laparoscopic lithotomy: Laparoscopic treatment of renal lithiasis supports the current trend among leading urology schools to abandon open surgery for good in the treatment of renal lithiasis. Advantages and disadvantages: Advantages of NLPC: - Minimal trauma to the kidney: Mayo [15], Ekleund [16], Eshgui [17], and Urivetsky [18] studied renal function before and after NLPC treatment, using DMSA renal scintigraphy or separate creatinuria measurements.

All these authors concluded that the renal parenchyma was well tolerated to NLPC. Lower complications: NLPC has been reported to have a postoperative morbidity rate of 2% to 5%, which is lower than that of other techniques. No parietal problems thanks to the minimal size of the access tunnel to the kidney, eliminating any problem of remote lumbar ventration, and also enabling a low parietal scar, which is an aesthetic advantage. Short hospital stay: 5 days in the literature. Post-operative comfort: Thanks to the low level of muscle damage, post-operative pain is minimal. Convalescence time: This averages two weeks, enabling patients to return to normal activity as soon as possible, and thus to save money (Wickham [19], Munch [20], Darabi [21]. Lithiasis recurrence: In 1996, Carr et al published a comparative study between NLPC and LEC, and found a difference in recurrence rate in favour of NLPC. However, the technical difficulty encountered after open surgery is not the same as with NLPC, because the latter is less traumatic for the wall and generates less inflammation and therefore less fibrosis, making revision easier. Disadvantages of NLPC : Exposure to X-rays remains the major disadvantage of this technique. The duration of NLPC is difficult to predict, and sometimes NLPC requires a longer operating time, which increases anesthetic risks.

CONCLUSIONS

Since 1980, the treatment of urinary lithiasis and endourology have continued to evolve, especially with the advent of modern, minimally invasive techniques. Percutaneous nephrolithotomy has become the standard treatment for pyelic, calcific and pyelocalcific calculi that do not respond to LEC. It has supplanted open surgery. Technological innovation and the ingenuity of urologists have improved its efficacy and reduced its morbidity.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

The authors participated equally. All authors read and approved the final version of the manuscript.manuscrit.

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