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PERCUTANEOUS NEPHROLITHOTOMY (PCNL) MADE EASIER: A CASE REPORT AND PRACTICAL GUIDE

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ABSTRACT

Management of nephrolithiasis witnessed a revolution in the 1980's by the advent of shock-wave lithotripsy (Chaussey, 1980) and percutaneous nephrolithotomy (Fernstrom and Johannson, 1976; Smith, Alken, Marberger, Wickham, 1980-84).

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INTRODUCTION

The success of these new revolutionary techniques can be gauged by the fact that, in most well-equipped Urology centers in the world now, open surgery for kidney stones has been practically relegated to a thing ofthe past.Today, forinterventional removal of renal calculi, there are several treatment options available, including Extracorporeal Shock Wave Lithotripsy (ESWL), the Retrograde Intrarenal Surgery (RIRS) and the PercutaneousNephroLithotripsy (PCNL) PCNL can be in short for nephro-lithotomy or nephrolithotripsy: 'lithotomy' meaning removal of stone, and 'lithotripsy' meaning shearing or fragmentation of stone (B THWONG, 2009 and Mahesh, 2012). Percutaneous extraction of renal stone - properly termed percutaneous nephrolithotomy (PCNL) - had been invented over three decades ago (*Fernstrom and Johansson* 1976). first reported the formation of a percutaneous track for the specific purpose of subsequently removing an intrarenal stone. This technique was rapidly taken up by other centers, with *Alken et al* (1981) and *Wickham et al* (1981) further demonstrating the effectiveness and safety of the procedure in disintegrating and clearing not just small stones in renal pelvis. It has since evolved and been refined with the development of purposely designed instruments, endoscopes and accessories, and has remained a standard treatment for different varieties of renalstonessincetheeighties.

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What is Percutaneous Nephrolithotomy?

This is a procedure that is performed for the removal of large kidney stones that will not be adequately treated by other less invasive techniques. The procedure involves placing a small needle through the back into the kidney.

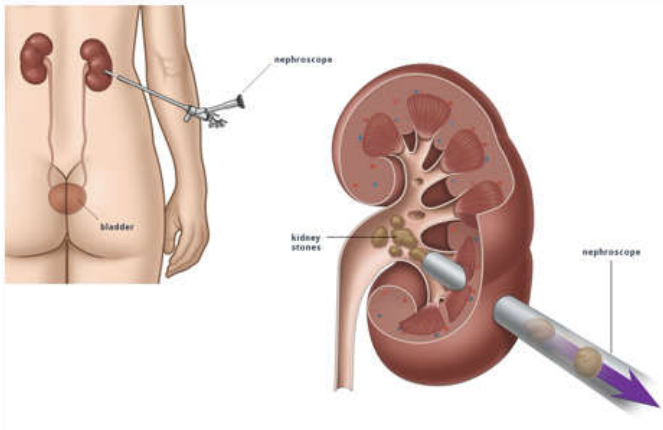

Fig. 1. From European Association of Urology (EAU)

This hole is then enlarged to about the size of a dime.

A telescope is then placed through this hole into the kidney and avariety of instruments can be used to remove kidney stones.

The techniques needed to manage kidney stones over the past 30 years are rapidly improving.

*Percutaneous Nephro lithotriyps(PCNL) is*a preferred method for treating large kidney stones (Mahesh, 2012). Percutaneous Nephro lithotripsy is a common method for treating stones in the upper portion of the urinary tract.

The benefits of this method to traditional surgery include:

- A lower incidence of morbidity and mortality, faster healing, and lower costs (Mahesh, 2012).
- PCNL is a minimal invasive technique with the potential risk of complications such as Infection, bleeding, Urinary fistula and the risk of perforation of adjacent organs (Service d'urologie du, 2006).
- However, complications such as hydrothorax, hemothorax or pneumothorax are not uncommon afterwards (Albala, 2001).

The purpose of *(PCNL)*?

Occasionally stones are too large to be treated with other less invasive techniques. This type of surgery allows for a more complete removal of larger kidney stone. The hope is to minimize the number of surgeries required to completely treat the stones.

Clinical Applications

In a prospective randomized trial of *extracorporeal shock wave lithotripsy* ESWL versus PCNL for lower pole nephrolithiasis, *Albala et al* (2001) suggested that lower pole calyceal stones larger than 1 cm are better treated by primary percutaneous removal, as this offers the best chance of rendering patient stone-free after one single procedure**.** PCNL can practically be applied to most, if not all, renal stones. It is the preferred treatment for obstructive stones that have long been impacted or stones that are deemed too big (>1.5 cm) to be optimal for *extracorporeal shock wave lithotripsy* (ESWL), because percutaneous removal has less infective and obstructive complications and more effective stone clearance. PCNL can also be applied to stones in calyceal diverticulum, horseshoe kidney, transplanted kidney and in children, though these are challenging situations where substantial technical difficulty would beexpected.

Indications

PCNL is contraindicated if patient has uncorrectable coagulopathy. Antiplatelet medications like aspirin shouldbediscontinued7daysbeforeoperation. We report a case of pneumo-mediastinum, pneumothorax, pneumoperitoneum and subcutaneous emphysema from the neck region to the top of the thighbilaterally (Figure 2, 3). Fifty-one-year-old man was brought into the operating room for 3 days after PCNL was taken to discharge the clot.

Case

Fifty one - years oldman, with Diabetes mellitus for the discharge of the clot, following a PCNL operation performed on the left kidney three days ago. The stone was 2 cm in diameter localized in the lower of the left kidney, this kidney stone was broken by a pneumatic stone crusher, The pieces of stone were removed by Pens. The patient had no problems at the end of the surgery. The patient was stable, without any problem at the end of procedure and extubate. The patient also noted a history of right kidney PCNL about 3 months ago. The patient's Chest X-Ray image, was normal three days earlier, before surgery. The patient was awake and alert when he came to the operating room, and he patient had no complaints of dyspnea. Patient's vital signs BP= 118/75 ml/hg, Pulse =85 / min and SPO2 at room temperature was 94%. His hemoglobin was Hb=8. He received 500cc normal saline then, 2cc Marcaine, 5% of the L5-L4 (ISA) with needle number 25. Evacuation of colt was started for the patient. But 10 minutes after spinal anesthesia (ISA), he complained of nausea. His blood pressure dropped to 89/65.

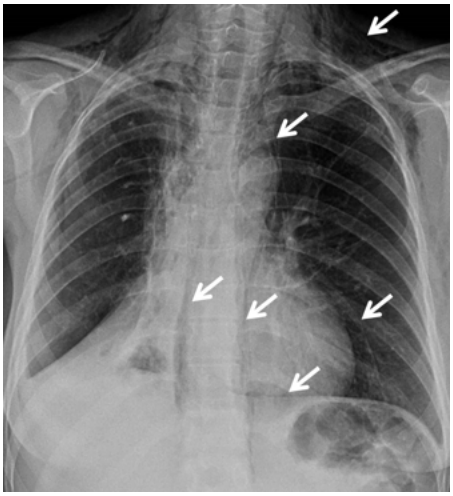

Fig. 2. OR- Chest X-ray shows Pneumomediastinum

The patient was given 0.6 mg of atropine and 10 mg ephedrine IV, and 500cc saline was free. The patient's nausea was

resolved after 2 minutes and blood pressure reached to109/60.Again, 10 minutes later, he complaints of dyspnea with shortness of breathing, Agitation and BP dropped to 75 / 60 and SPO2 began to fall. The patient was given IV ephedrine mg10, P. Cell and a voluven unit IV also began.Patient BP increased, saturation was still falling. Oxygen mask was placed on the patient. Considering continued to drop saturation, patient received *100µg fentanyl* and*60 mg porfol* and *20 mg atracurium* and then he was intubated with a tube number 7/5. Tracheal tube was fixed on number 22. After intubation the patients had still low saturation. Auscultation sounds over the left lung was much reduced (Figure 2). The patient was manually ventilated. Following these events, sub-cutaneous emphysema was apparent in the chest wall bilaterallywith, extensive emphysema in the abdomen and perineum and the possible diagnosis of tension pneumothorax. Emergency chest tube was inserted in the left chest of the patient and his saturation had gradually improved, So that 96%= SPO2, BP=130/85, PR=94. Chest X-Ray was taken in the operating room where a subcutaneous emphysema was seen on the left and right side of the chest (Figure 3).

Fig. 3. Subcutaneous emphysema left and right side of the chest and left Pneumothorax

The abdominal sonography was performed (Fig-3), with no evidence of bladder perforation.Due to extensive abdominal emphysema, except for previous retroperitoneal bleeding nothing was reportable (Cheng‑Hsi Chang, 2017). Eventually, the patient was sent to the ICU under the appropriate sedation with BP =140/ 85, PR =80 and SPO2=96%. Under suspicion of right side pneumothorax, the patient got a chest tube in the ICU.

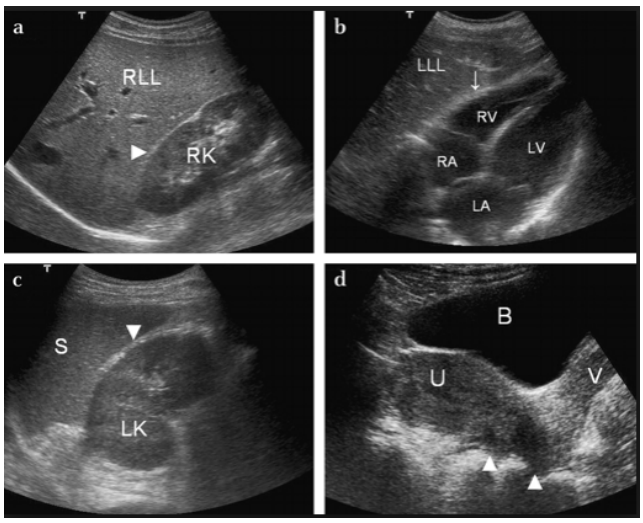

Fig. 3. Emergency focused assessment with sonography in trauma (FAST) and hemodynamic stability

PCNL is a convenient method for treating renal stones larger than 2 cm, or stones in the upper portions of the urinary tract. PCNL can be performed under general or regional anesthesia.With this approach, a few millimeters of access through the skin of the stones are crushed and extruded, in addition to reducing morbidity, a better result can be obtained. (Tangpaitoon, 2012). Pneumomediastinum is not uncommon after Urologic surgeryand it is common under general anesthesia, due to better control of breathing and more comfort for patients. Pneumomediastinum prevalence in retroperitoneal laparoscopic methods Compared to transperineally laparoscopic surgery, 30% vs. 6.4. (Abreu, 2004). Pneumomediastinum usually resolves spontaneously, howeverin rare cases, pneumomediastinum may progress to tension pneumothorax, followed by collapse of cardiovascular system, which may be life-threatening (Lee, 2001). Although PCNL is a minimal invasive technique (Service d'urologie du CHU de Poitiers, 2006). However, pulmonary complications may occur in the post-operative period, and could be the major cause of mortality in patients under anesthesia and Surgery. Complications depend on different methods and types of anesthesia.

Palnizky. G et al, in a prospective study 2013 on 100 patient who were undergoing PCNL, to find out the factors associated with postoperative complications. The study noted that 8 patients (8%) had postoperative pulmonary complications. Seven patients had pneumothorax, and onepatients was suffering from pleural effusion and atelectasis. Patients who goes under right renal PCNL surgery, have also lower risk of postoperative pulmonary complications and these complications are most common in younger patients (Palnizky, 2013).

Another study, from 2000 to 2006 by *Mousavi et al* a total of 671 patients after PCNL were studied (Mousavi-Bahar, 2011).

Table 1. Indicates the low level of complications during PCNL. (8)

Complications	Patients
Renal parenchyma in	42
Delayed bleeding in	6
Fever	7
Colon perforation	2
Damage to large vessels	3
Hemothorax	2
Pneumothorax	3

Complications were observed in 203patients (Mousavi et al)

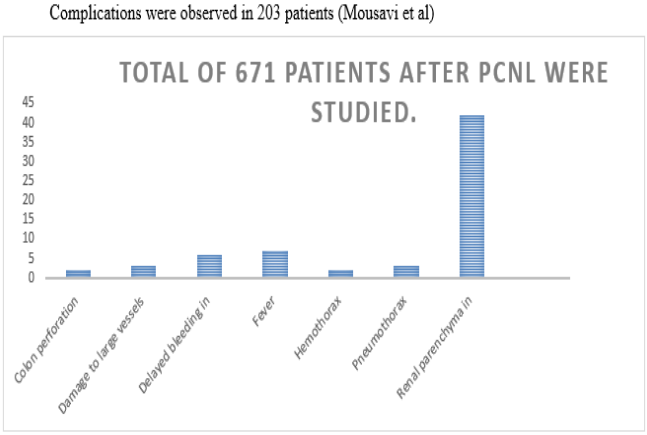

Fig. 1. Indicates the low level of complications during PCNL. (8)

This patient was no taken achest X-ray post PCNL, and perhaps he suffered from pleural damages and pneumothorax after the PCNL. In reoperation for his post PCNL complication, which is followed by positive pressure ventilation, a simple pneumothorax converted to a tension pneumothorax, and after clinical diagnosis of tension pneumothorax, he got a chest tube. We recommended that, a chest X-ray control, in patients who need reoperation in the early days post PCNL to ensure that there are no damages in the thoracic cavity. The tension pneumothorax is a rare but is a dangerous complication after PCNL, and the surgeons should be alert about it.

Conclusion

Percutaneous nephrolithotomy has long been proven to be safe and efficacious. It is minimally invasive surgery and is an indispensable tool in the armamentarium of urologists for the treatment of renal stones. We recommended that, a chest X-ray control, in patients who need reoperation in the early days post PCNL to ensure that there are no damages in the thoracic cavity. The tension pneumothorax is a rare but is a dangerous complication after PCNL, and the surgeons should be alert about it.

Disclosure

The authors declare no conflicts of interest.

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