Nephrolithiasis is a condition where stones are formed within the kidneys [1]. Poor oral fluid intake, high intake of protein, high oxalate consumption, and high salt intake are all common risk factors for the development of stones [2]. The probability of a patient acquiring further kidney stones is significantly increased by a personal and family history of stones [3]. In the United States, urolithiasis is a common illness that affects roughly 1 in 11 persons. An estimated 1 million people attend emergency departments every year, costing the healthcare system $5 billion, according to estimates. It increasingly affects people of working age and is becoming more prevalent. Men appear more frequently than women [4,5]. The area known as the “stone belt” has a persistently high incidence of urolithiasis, and this includes Pakistan [2]. Based on the patient’s initial symptoms, urolithiasis is treated with a combination of conservative medicinal medicines and surgical procedures [6]. Surgical treatment was the only strategy to manage renal stones in 1900s, however, its activity was limited due to the major side effects including loss of blood, infection, high fever and damage to surrounding organs. After centuries, Fernstrom and Johansson [7] made a

Mini-Percutaneous Nephrolithotomy Versus Retrograde Intrarenal Surgery in Patients with Renal Stones

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MINI-PCNL and RIRS in Patients with Renal Stones

DOI: https://doi.org/10.54393/pbmj.v5i7.650

How to Cite:

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Received Date: 16th July, 2022  
Acceptance Date: 23rd July, 2022  
Published Date: 31st July, 2022

INTRODUCTION

Nephrolithiasis is a condition where stones are formed within the kidneys [1]. Poor oral fluid intake, high intake of protein, high oxalate consumption, and high salt intake are all common risk factors for the development of stones [2]. The probability of a patient acquiring further kidney stones is significantly increased by a personal and family history of stones [3]. In the United States, urolithiasis is a common illness that affects roughly 1 in 11 persons. An estimated 1 million people attend emergency departments every year, costing the healthcare system $5 billion, according to estimates. It increasingly affects people of working age and is becoming more prevalent. Men appear more frequently than women [4,5]. The area known as the “stone belt” has a persistently high incidence of urolithiasis, and this includes Pakistan [2]. Based on the patient’s initial symptoms, urolithiasis is treated with a combination of conservative medicinal medicines and surgical procedures [6]. Surgical treatment was the only strategy to manage renal stones in 1900s, however, its activity was limited due to the major side effects including loss of blood, infection, high fever and damage to surrounding organs. After centuries, Fernstrom and Johansson [7] made a

ARTICLE INFO

Key Words: Mini-PCNL, RIRS, Renal Stones, Adult patients

How to Cite:

ABSTRACT

Kidney stones, also known as renal calculi, are crystal concretions that primarily occur in the kidney and are referred to as nephrolithiasis. Ideally, calculi should form in the kidneys and pass out of the body through the urethra painlessly. Larger stones are uncomfortable and thus require surgery. Mini-percutaneous nephrolithotomy (mini-PCNL) and retrograde intrarenal surgery (RIRS) are the minimally invasive procedures employed these days to target renal stones. Objective: To compare the effectiveness of both mini-PCNL and RIRS in terms of targeting larger stones in adult patients along with other factors including hospital stay, operative time, stone passing rate and associated complications. Patients and Methods: In the year 2021, 101 patients undergoing mini-PCNL or RIRS in Doctors Hospital, Gujrat were observed in this study. Effectiveness of both the techniques, exposure time, transfusions required, stone free rates and hospital stay were compared in both groups of patients. Results: It was found that mini-PCNL has greater potential than RIRS in terms of stone clearing and operating time. However, RIRS has performed better in terms of reducing the hospital stay with mild complications in both the procedures. Conclusion: Both RIRS and mini-PCNL are extremely safe and highly efficient treatments for renal lithiasis with a diameter of 1.5 to 2.5 cm, and either one can be chosen to achieve outstanding stone-free rates.
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DOI: https://doi.org/10.54393/pbmj.v5i7.650

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MINI PCNL (n=50)
RIRS (n=51)
P-value

METHODS

complications, and outcomes were also evaluated. MINI PCNL and RIRS in Patients with Renal Stones

Mini-PCNL technique: Patient lies either in prone or supine position and general anesthesia is administered. Under the supervision of fluoroscopic and ultrasound imaging, a puncture is made into the appropriate lower pole calyx (via the flank) with a 22 gauge needle. A safety guidewire (model) is inserted into the bladder through the nephrostomy tract. A 14 Fr peel away sheath is introduced through another guide wire (model), which is then put into the bladder as a functioning guide wire. Additionally, a stiff ureteroscope is introduced to dilate the nephrostomy. Stone is extracted via suction after being broken with a HoYag laser. After the procedure is performed, a 14 Fr nephrostomy catheter is often left to assure outward urine flow and is withdrawn within 48 hours.

Statistical Analysis: Data was entered and analyze using SPSS 22.0. All the quantitative variables were presented in the form of mean + SD and qualitative variables with frequency and percentages. Chi square test was used to analyze the two groups of patients. Independent sample t test was applied to find out the significant difference between operative time, hospital stay and stone size among groups. P value < 0.05 was considered as significant.

RESULTS

Total 101 patients were enrolled in current study. The patients were divided into two groups (MINI PCNL = 50 Vs RIRS = 51). The mean age in groups were not significantly different (MINI PCNL = 42.23±13.06 Vs RIRS = 38.73±13.08). Male patients were more frequent as compared to females. The stone size was significantly different among both groups (MINI PCNL = 1.80±0.51 Vs RIRS = 1.26±0.35). The most affected kidney site was left (n=58). 45 patient have stone in renal pelvis, 29 in lower calyx, 19 in upper calyx and 8 in inter polar calyx. (Table 1)

Table 1: Demographic and stone characteristics of patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>MINI PCNL (n=50)</th>
<th>RIRS (n=51)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Mean+SD)</td>
<td>42.28±13.06</td>
<td>38.73±13.08</td>
<td>0.075</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>26(52.0%)</td>
<td>27(52.9%)</td>
<td>0.53</td>
</tr>
<tr>
<td>Female</td>
<td>24(48.0%)</td>
<td>24(47.1%)</td>
<td>48</td>
</tr>
<tr>
<td>Stone Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone Size (Mean+SD)</td>
<td>1.80±0.51</td>
<td>1.26±0.35</td>
<td>0.000</td>
</tr>
<tr>
<td>Site of Kidney</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>30(60.0%)</td>
<td>28(54.9%)</td>
<td>0.58</td>
</tr>
<tr>
<td>Right</td>
<td>20(40.0%)</td>
<td>23(45.1%)</td>
<td>43</td>
</tr>
<tr>
<td>Site of Kidney stone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Calyx</td>
<td>21(42.0%)</td>
<td>8(15.7%)</td>
<td>0.029</td>
</tr>
<tr>
<td>Renal Pelvis</td>
<td>24(48.0%)</td>
<td>21(42.1%)</td>
<td>46</td>
</tr>
<tr>
<td>Upper Calyx</td>
<td>5(10.0%)</td>
<td>14(27.5%)</td>
<td>19</td>
</tr>
<tr>
<td>Inter Polar calyx</td>
<td>0(0.0%)</td>
<td>8(15.7%)</td>
<td>8</td>
</tr>
</tbody>
</table>

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**Table 2**: Comparison of perioperative and postoperative outcomes

**Independent sample t test**  
**Chi square test**

**| Procedure | MINI PCNL | RIRS | P-value |**
---|---|---|---|---|
**Operation time in minutes** | | | | |
MINI PCNL | 65.00 | 15.74 | 0.006** | |
RIRS | 74.12 | 16.73 | | |
**Hospital stay in days** | | | | |
MINI PCNL | 2.74 | 0.94 | 0.000** | |
RIRS | 1.90 | 0.67 | | |

**Complications**

| | MINI PCNL | RIRS | **|**
---|---|---|---|---|
Fever | 5(10.0) | 10(19.6) | | |
Hematuria | 8(16.0) | 8(15.7) | | |
Obstructive | 4(8.0) | 0(0.0) | | |
Pyelonephritis | 4(8.0) | 4(8.6) | 0.345a | |

**DISCUSSION**

Renal lithiasis affects between 1 and 15% of persons worldwide at some time in their lives [12,13]. There were 22.1 million cases in 2015, and there were around 16,100 fatalities [14, 15]. With the advancements in technology, science has introduced newer procedures which are efficient, result oriented, minimally invasive with faster healing time and lesser complications. Two such methods are mini-percutaneous nephrolithotomy (mini-PCNL) and retrograde intrarenal surgery (RIRS). Mini PCNL complemented the original method and reduced the morbidity rate by use of smaller tracts [16]. In this study, we compared the effectiveness of both the mini-PCNL and RIRS. Few studies have been done before to compare the results of the two procedures. Retrograde intrarenal surgery is mentioned in European Association of Urology guidelines for treatment of renal lithiasis[17]. However, the gold standard is still shock wave lithotripsy and percutaneous nephrolithotomy [18]. Mini-PCNL and RIRS have gained popularity as it is an innocuous and effective method. Many urologists have documented the efficiency of both the procedures. Ho et al. [19] reported that the stone free rates were 82 % for patients with stones having sizes between 0.1-1 cm, 71% for patients with stone size of 1.1-2cm and 65% for stones greater than 2 cm using RIRS. Likewise, Mhaske et al. [20] presented 100% and 95.4% stone clearance rates on employing mini-PCNL and RIRS procedures with longer operative time in case of RIRS and lower hemoglobin levels in case of mini-PCNL. In another study, Pelit et al. [21] also compared the efficiency of mini-PCNL and RIRS in pre-school-aged children and found out that RIRS is superior over mini-PCNL in terms of shorter hospital stay, shorter exposure time in case of fluoroscopy and reduced operative time in terms of treating renal stones, whereas PCNL was found to have higher stone free rate on comparison with RIRS in a single session. In this study we found the efficiency of the two procedures, 1-2 days post-operation with a follow-up for 1 month. We found mini-PCNL group has an efficiency of 93.2% with 90.2% efficiency in RIRS group. Even though both procedures are highly effective but mini-PCNL has a significantly shorter operative time and higher stone clearance rats, whereas in case of RIRS group, shorter hospital stay was observed in adult patients Also, both techniques can be employed as a good choice for stones of larger diameters i.e., 2-3 cm. It is documentable that the management protocols for the two procedures are different.

**CONCLUSION**

Both RIRS and mini-PCNL are extremely safe and successful treatments for renal lithiasis and either one can be used to obtain outstanding stone-free rates.

**REFERENCES**


