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Original Research

Efficacy of surgical techniques and factors affecting residual stone rate in the treatment of kidney stones

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ABSTRACT:

Background: The present study was conducted to assess efficacy of surgical techniques and factors affecting residual stone rate in the treatment of kidney stones. **Materials & Methods:** 102 patients of kidney stones of both genders were divided into 3 groups. Group I patients underwent open stone surgery, group II patients underwent percutaneous nephrolithotomy (PNL) and group III underwent retrograde intrarenal surgery (RIRS). Surgical techniques complications were evaluated. **Results:** In group I mean stone burden was 3.2 cm^2, in group II was 2.5 cm^2 and in group III was 1.9 cm^2. The mean operative time in group I was 84.2 minutes, in group II was 118.4 minutes and in group III was 78.6 minutes. There were 9 cases in group I, 7 in group II and group III was 5 cases. There were 7 cases of fever in group I, 4 in group II and 2 in group III, infection 2 in group I and 3 in group III, urine leakage 5 in group III and persistent pain 6 in group I and 1 in group II. The difference was significant (P< 0.05). **Conclusion:** PNL and RIRS have been seen as safe and effective methods as compared to open method in case of kidney stones.

Key words: Percutaneous nephrolithotomy, Retrograde intrarenal surgery, Kidney stone.

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INTRODUCTION

Urinary system stone disease is one of most frequently encountered diseases in the urology practice. The stones are frequently observed in the renal localization, and most of them require intervention.[1] Kidney stone disease, also known as urolithiasis or renal calculi contributes to one of the most common health problems in the daily lives of men and women. It occurs when a solid piece of material (stone) forms in the urinary tract.[2] Approximately 12% of men and 6% of women in the USA and 10 to 15% of people in Europe and North America are affected by it. Calcium oxalate (CaOx) is found to one component of the most common kidney stones. It has been proposed that the most likely stone formation mechanism for people with idiopathic CaOx stones is caused by CaOx overgrowth in renal papillary Randall's plaque.[3] Preventive measures such as dietary therapy and therapeutic treatments such as drugs and surgical techniques have been verified to be effective in the treatment of renal calculi. Dietary modification is a safe and economical preventive measure for dietary therapy, and in some cases, drugs are important to reduce the risk of stone formation. Unfortunately, since the 1980s, there have been no new drugs developed for the prevention of renal calculi after the introduction of potassium citrate.[4]

Some of these methods include percutaneous nephrolithotomy (PCNL), extracorporeal shockwave lithotripsy (SWL), retrograde intrarenal surgery (RIRS), etc. Extracorporeal shock wave lithotripsy (ESWL) into clinical practice after 1980s, a new era had begun in the treatment of urinary system stone disease. In recent years, percutaneous nephrolithotomy (PNL) has taken increasingly greater part in the treatment of stone disease with success rates nearing to 80 percent.[5] The present study was conducted to assess efficacy of surgical techniques and factors affecting residual stone rate in the treatment of kidney stones.

MATERIALS & METHODS

The present study was conducted among 102 patients who underwent surgical treatment of kidney stones of both genders in the department of general surgery in a medical college hospital. All were informed regarding about the study and their consent was obtained.

Data such as name, age, gender etc. was recorded. Patients were divided into 3 groups. Group I patients underwent open stone surgery, group II patients underwent percutaneous nephrolithotomy (PNL) and group III underwent retrograde intrarenal surgery (RIRS).

Endoscopic stone surgery was performed for stone fragmentation in all patients using pneumatic lithotriptor or Holmium: YAG laser. Surgical techniques complications were evaluated. Stones equal or larger than 4 mm were considered as residual stones. The dimensions of the stones were calculated and measured in cm^2. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III
Methods	Open stone surgery	PNL	RIRS
M:F	34	34	34

Table I shows that group I patients underwent open stone surgery, group II patients underwent PNL, and group III underwent RIRS. Each group had 34 patients.

Table II Assessment of parameters

Parameters	Group I	Group II	Group III	P value
Stone burden (cm^2)	3.2	2.5	1.9	0.01
Operative time (mins)	84.2	118.4	78.6	0.001
Length of hospital stay	3.2	3.0	1.4	0.05
Cases with residual stone	9	7	5	0.02

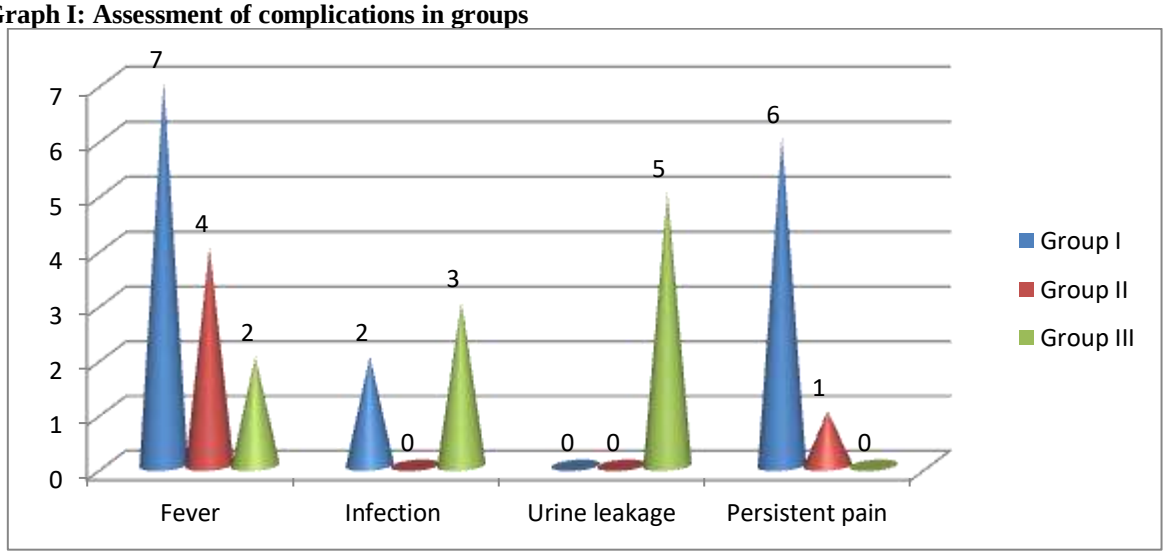
Table II shows that in group I mean stone burden was 3.2 cm^2, in group II was 2.5 cm^2 and in group III was 1.9 cm^2. The mean operative timein group I was 84.2 minutes, in group II was 118.4 minutes and in group III was 78.6 minutes. There were 9 cases in group I, 7 in group II and group III was 5 cases. The difference was significant (P< 0.05).

Table III Assessment of complications in groups

Complications	Group I	Group II	Group III	P value
Fever	7	4	2	0.02
Infection	2	0	3	0.05
Urine leakage	0	0	5	0.05
Persistent pain	6	1	0	0.001

Table III, graph I shows that there were 7 cases of fever in group I, 4 in group II and 2 in group III, infection 2 in group I and 3 in group III, urine leakage 5 in group III and persistent pain 6 in group I and 1 in group II. The difference was significant (P< 0.05).

Graph I: Assessment of complications in groups



DISCUSSION

Currently, a diverse range of non-invasive, minimally invasive and invasive methods have been reported as treatment approaches for renal calculi. Recent studies have reported that flexible ureterorenoscopy (URS)/holmium laser lithotripsy can be an alternative treatment for patients with renal calculi. The micro-percutaneous nephrolithotomy (microperc) is a recently described technique in which percutaneous renal access and lithotripsy are performed in a single step. Microperc has been found to be safe and effective in removing small renal calculi in the adult and pediatric populations with a high stone-free rate and lower complication rate.[6] Despite all the new approaches, shock wave lithotripsy (SWL) remains the first line treatment modality that is widely used for renal, ureteral and intermediate-size renal calculi. Its success rates from contemporary series vary from 60 to 90%. However, during an SWL procedure, physicians should consider the association between SWL-related pain and patients' positioning, which may negatively affect the SWL success rate as well as its potential complications. PCNL can be divided into two types: minimally invasive percutaneous nephrolithotomy (mini-PCNL) and standard percutaneous nephrolithotomy (standard PCNL).[7] Mini-PCNL has a higher efficacy and better safety in the management of small renal calculi, while standard PCNL is still regarded as the conventional technique for the treatment of large renal stones in the upper urinary tract. However, in the recent years, there has been a shift in trend to favor a mini-PCNL approach in order to reduce the morbidities.[8]The present study was conducted to assess efficacy of surgical techniques and factors affecting residual stone rate in the treatment of kidney stones.

In present study, group I patients underwent open stone surgery, group II patients underwent PNL, and group III underwent RIRS. Each group had 34 patients. Ayedemir et al[9] included records of 109 cases of kidney stones. Patients were divided into three groups in terms of surgical treatment; open stone surgery, percutaneous nephrolithotomy (PNL) and retrograde intrarenal surgery (RIRS). Patients' history, physical examination, biochemical and radiological images and operative and postoperative data were recorded.The patients had undergone PNL (n=74; 67.9%), RIRS (n=22;20.2%), and open renal surgery (n=13; 11.9%). The mean and median ages of the patients were 46±9, 41 (21–75) and, 42 (23–67) years, respectively. The mean stone burden was 2.6±0.7 cm2 in the PNL, 1.4±0.1 cm2 in the RIRS, and 3.1±0.9 cm2 in the open surgery groups. The mean operative times were 126±24 min in the PNL group, 72±12 min in the RIRS group and 82±22 min in the open surgery group. The duration of hospitalisation was 3.1±0.2 days, 1.2±0.3 days and 3.4±1.1 days respectively. While the RIRS group did not need blood transfusion, in the PNL group blood transfusions were given in the PNL (n=18), and open surgery (n=2) groups. Residual stones were detected in the PNL (n=22), open surgery (n=2), and RIRS (n=5) groups.

We found that in group I mean stone burden was 3.2 cm^2, in group II was 2.5 cm^2 and in group III was 1.9 cm^2. The mean operative time in group I was 84.2 minutes, in group II was 118.4 minutes and in group III was 78.6 minutes. There were 9 cases in group I, 7 in group II and group III was 5 cases. Stone-free rate in percutaneous nephrolithotomy can vary dependent on the stone location, and size, as reported in the literature, it increases up to 90 percent. In the AUA guideline, this rate has been given as 78 percent. In our study, in 74 patients, a 70.3% stone-free rate has been detected. Size, location, composition of the stone, anatomy of the affected kidney, and experience of the surgeon are effective on success, and complications of PNL.[10]

We found that there were 7 cases of fever in group I, 4 in group II and 2 in group III, infection 2 in group I and 3 in group III, urine leakage 5 in group III and persistent pain 6 in group I and 1 in group II. Lingeman et al[11]reported 88–91% success rates for stones with a diameter of 1–3 cm, mean success rate decreased to 75% in stones larger than 3 cm in diameter. Still Clayman et al[12]reported success rates as 89.2, and 97–100% for stone with a stone burden of >2, and <2 cm^2, respectively.

CONCLUSION

Authors found that PNL and RIRS have been seen as safe and effective methods as compared to open method in case of kidney stones.

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