

Original Research

Intricate Evaluation of Surgical Methodologies and Factors Influencing Residual Stone Rate in the Clinical Management of Kidney Stones: An Original Research Study

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ABSTRACT:

Background & Aim: Renal stone is one of the greatest dilemmas which affect the overall performance and health of kidneys. Most of the life threatening conditions of kidneys can be raised from renal stone if left untreated. This study was undertaken to evaluate the correlations of surgical methodologies and factors affecting residual stone rate in the clinical management of kidney stones. **Materials and Methods:** This study included total 50 patients in which surgeries have been conducted for renal stone and related symptoms or complications. Three regular surgical methodologies were utilized for the surgery namely Open Stone Surgery, Percutaneous Nephrolithotomy, Retrograde Intrarenal Surgery. All study participants were grouped as per their type of surgeries into group 1, 2 and 3. Both male and female patients were included in the study (30 male and 20 female). Parameters and factors related to type of surgery and related complication were studied specifically. All data was sent for statistical analysis for further analysis and interpretations. P value less than 0.05 was taken as significant. **Statistical Analysis & Results:** Statistical analysis was performed by using statistical package for the Social Sciences software. In the first age range of 35-40 years, total 17 patients were identified. P value was highly significant for this group (0.02). For Group 1, the mean operation theater time was 91.41 minutes while mean Post Operative Staying time was 3.26 days. For Group 2, the mean operation theater time was 98.73 minutes while mean Post Operative Staying time was 2.60 days. Here, the means of fever, pain and infection were 7.64, 3.40 and 2.18 respectively. For Group 3, the mean Stone size was 1.84 cm² while mean cases with residual stone was 7.83. Here, the means of fever, pain and infection were 5.52, 1.39 and 1.09 respectively. **Conclusion:** Authors concluded that patients treated with Retrograde Intrarenal Surgery showed better clinical parameters (when compared with other studied techniques) like OT timings, pain, fever, infection, and residual stone rate. Authors also anticipate other long term studies with larger sample size to establish other related guidelines.

Keywords: Retrograde Intrarenal Surgery, Open Stone Surgery, Percutaneous Nephrolithotomy, Renal Stone, Fever, Pain, Infection

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INTRODUCTION

Renal stone or urolithiasis or renal calculi is one of the most common problems faced by patients of almost all age. This clinical dilemma is mostly asymptomatic and does not produce any potent clinical symptom until bigger in size.^{1,2} Presence of hematological fragments, pain and infection could be

early deleterious symptoms of the kidney stone. Biochemically, these renal stones are mostly Calcium Oxalate crystals which accumulate at certain renal areas due to various reasons.^{3,4} For its clinical management, many of the clinicians have suggested different Preventive measures like dietary therapies. Also, several therapeutic approaches and surgical

techniques have been explained in the literature. Many of the clinical practitioners and researchers have started practicing different surgical techniques to overcome these interrelated patient problems.^{5,6,7} Some of the popular surgical approaches were percutaneous nephrolithotomy, extracorporeal shockwave lithotripsy, retrograde intrarenal surgery, extracorporeal shock wave lithotripsy.^{8,9} Each technique had certain advantages and complications. Hence, this study was primarily conducted to evaluate the correlations of surgical methodologies and factors affecting residual stone rate in the clinical management of kidney stones.

MATERIALS AND METHODS

The study was planned, abstracted and performed in the territory hospital in which surgical methodologies and factors affecting residual stone rate in the clinical management of kidney stones were evaluated comprehensively. The study included total 50 patients in which surgeries have been performed for the clinical management of renal stone and associated symptoms or complications. Three common surgical methodologies were utilized for the surgery namely Open Stone Surgery, Percutaneous Nephrolithotomy, Retrograde Intrarenal Surgery. Patients those underwent Open Stone Surgery were categorized in group 1. Patients those underwent Percutaneous Nephrolithotomy were categorized in group 2. Patients those underwent Retrograde Intrarenal Surgery were categorized in group 3. Renal stones equal or larger than 4 mm were taken as residual stones. For stone fragmentation, endoscopic stone surgery was performed in all participants. After explaining the study aim, written and signed consents were obtained from all 50 willing participants. Systematic sampling procedure was utilized logically to select all participating subjects. Both male and female patients were included in the study. 30 male and 20 female patients were studied in detail (Table 1 and Graph 1). Parameters and factors related to type of surgery and related complication were studied in detail (Table 2-4). All data was sent for statistical

analysis for further analysis and interpretations. P value less than 0.05 was taken as significant.

STATISTICAL ANALYSIS AND RESULTS

All the applicable data were set systematically and subjected to basic statistical analysis using SPSS statistical package for the Social Sciences version 21 for Windows. Table 1 & Graph 1 demonstrates about age & gender wise allocation of patients. Total 50 patients were included in the study including 30 male and 20 females in the age range of 35 to 55 years. In the first age range of 35-40 years, total 17 patients were identified. P value was highly significant for this group (0.02). In the age range of 51-55 years, total 4 participants were seen. P value was highly significant for this group (0.01). Table 2 shows about basic statistical analysis and related interpretations for correlation of approach method and clinical factors for Group 1: Open Stone Surgery. The mean operation theater time was 91.41 minutes [P value was highly significant for this group (0.01)] while mean Post Operative Staying time was 3.26 days. The mean Stone size was 3.64 cm² while mean cases with residual stone was 11.83. Means of fever, pain and infection were 8.52, 5.39 and 2.90 respectively. Table 3 shows about basic statistical analysis and related interpretations for correlation of approach method and clinical factors for Group 2: Percutaneous Nephrolithotomy. The mean operation theater time was 98.73 minutes [P value was highly significant for this group (0.02)] while mean Post Operative Staying time was 2.60 days. The mean Stone size was 2.44 cm² while mean cases with residual stone was 9.74. Means of fever, pain and infection were 7.64, 3.40 and 2.18 respectively. Table 4 shows about basic statistical analysis and related interpretations for correlation of approach method and clinical factors for Group 3: Retrograde Intrarenal Surgery. The mean operation theater time was 64.41 minutes [P value was highly significant for this group (0.01)] while mean Post Operative Staying time was 1.76 days. The mean Stone size was 1.84 cm² while mean cases with residual stone was 7.83. Means of fever, pain and infection were 5.52, 1.39 and 1.09 respectively.

Table 1: Age & gender wise allocation of patients

Age Group (Yrs)	Male	Female	Total	P value
35-40	8	9	17	0.02*
41-45	12	6	18	0.07
46-50	7	4	11	0.08
51-55	3	1	4	0.01*
Total	30	20	50	*Significant
*p<0.05 significant				

Table 2: Basic statistical analysis and related interpretations for correlation of approach method and clinical factors (Group 1: Open Stone Surgery)

Parameters	Statistical Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
OT Time (Minutes)	91.41	0.486	0.945	1.96	1.983	1.0	0.01*
Post Op Staying (Days)	3.26	0.622	0.609	1.89	1.546	2.0	0.09

Stone (cm ²)	3.64	0.499	0.832	1.98	1.690	1.0	0.06
Pt. reported with residual stone	11.83	0.847	0.839	1.43	1.983	1.0	0.30
Fever	8.52	0.693	0.602	1.34	1.433	2.0	0.08
Pain	5.39	0.435	0.854	1.23	1.563	1.0	0.06
Infection	2.90	0.536	0.923	1.53	1.132	1.0	0.92

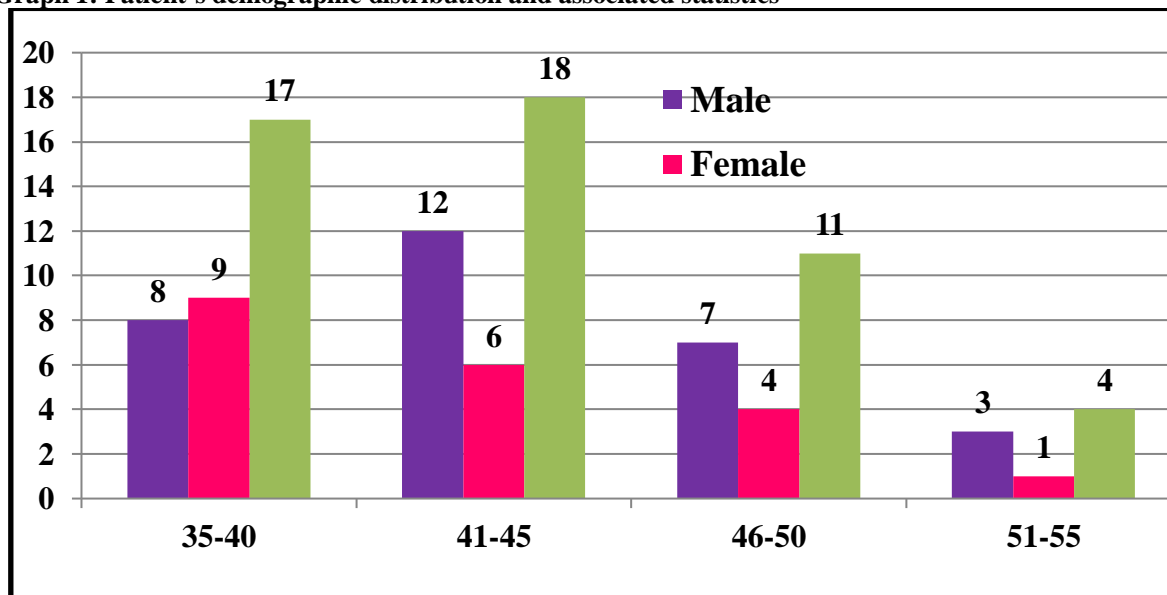
Table 3: Basic statistical analysis and related interpretations for correlation of approach method and clinical factors (Group 2: Percutaneous Nephrolithotomy)

Parameters	Statistical Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
OT Time (Minutes)	98.73	0.827	0.403	1.96	1.838	1.0	0.02*
Post Op Staying (Days)	2.60	0.603	0.601	1.39	1.503	2.0	0.10
Stone (cm ²)	2.44	0.423	0.854	1.28	1.623	1.0	0.76
Pt. reported with residual stone	9.74	0.403	0.423	1.96	1.838	1.0	0.20
Fever	7.64	0.622	0.601	1.39	1.503	2.0	0.10
Pain	3.40	0.442	0.033	1.23	1.532	1.0	0.12
Infection	2.18	0.837	0.133	1.53	1.022	1.0	0.10

Table 4: Basic statistical analysis and related interpretations for correlation of approach method and clinical factors (Group 3: Retrograde Intrarenal Surgery)

Parameters	Statistical Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
OT Time (Minutes)	64.41	0.486	0.945	1.96	1.983	1.0	0.01*
Post Op Staying (Days)	1.76	0.622	0.609	1.89	1.546	2.0	0.09
Stone (cm ²)	1.84	0.499	0.832	1.98	1.690	1.0	0.06
Pt. reported with residual stone	7.83	0.847	0.839	1.43	1.983	1.0	0.30
Fever	5.52	0.693	0.602	1.34	1.433	2.0	0.08
Pain	1.39	0.435	0.854	1.23	1.563	1.0	0.06
Infection	1.09	0.441	0.002	1.27	1.029	1.0	0.32

Graph 1: Patient's demographic distribution and associated statistics



DISCUSSION

Roughly 13% of male and 7% of females in the United States and 11 to 16% of population in Europe and South America are suffering with this clinical dilemma. Calcium oxalate is considered as the chief constituent of renal stone or urolithiasis or renal

calculi. The formation of Calcium oxalate is a natural process however it's rate of production can be affected/enhanced by certain dietary components and ongoing medications.^{10,11} Literature have well evidenced about different clinical and preventive measures for renal stone. Most of the preventive

measures are revolving around the dietary modifications only. However, severe or chronic situations require immediate surgical attention and intensive post operative care.^{12,13,14} Commonly used surgical techniques are percutaneous nephrolithotomy, extracorporeal shockwave lithotripsy, retrograde intrarenal surgery, extracorporeal shock wave lithotripsy. The micropercutaneous nephrolithotomy method is a newly introduced technique in which percutaneous renal access and lithotripsy are conducted in a single step. Micropercutaneous nephrolithotomy technique has been shown to be secure and efficient in removing small renal calculi in the adult and children with considerably lower complication rate. However, many of the pioneer researchers believe shock wave lithotripsy as the best modality and first surgical choice for managing stone patients.^{15,16} Its overall success rate have been shown up-to 90 percent by several long term studies published in reputed journals. However, these correlations and recommendations must not be directly utilized in Indian scenario.

CONCLUSION

Within the limitations of the study, authors concluded that patients treated with Retrograde Intrarenal Surgery showed improved clinical parameters like OT timings, pain, fever, infection, and residual stone rate. Additionally, patients treated with Open Stone Surgery showed diminished clinical parameters (OT timings, pain, fever, infection, and residual stone rate etc). All these factors and parameters are applicable to the studied patients only hence we must be very careful while applying these inferences on other populaces. Elucidations and findings of the present study should be correlated systematically. Authors also expect other long term studies with larger sample size in these regards.

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