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POSTOPERATIVE COMPLICATIONS IN LAPAROSCOPIC VS OPEN PYELOLITHOTOMY: A COMPARATIVE ANALYSIS

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ABSTRACT

Large renal pelvic stones are a common urological condition that can lead to pain, infection, and impaired kidney function. Surgical intervention is often required for effective management. Open pyelolithotomy has traditionally been used for the removal of large stones; however, laparoscopic pyelolithotomy has emerged as a minimally invasive alternative. The laparoscopic approach is associated with reduced postoperative pain, less blood loss, faster recovery, and shorter hospital stay.

Methodology: *This comparative cross-sectional study was conducted on adult patients diagnosed with large renal pelvic stones. A total of 126 patients were included and divided into two groups: those undergoing laparoscopic pyelolithotomy and those undergoing open pyelolithotomy. Postoperative outcomes such as pain, fever, infection, hematoma formation, urosepsis, blood loss, and length of hospital stay were recorded. Statistical analysis was performed to compare outcomes between the two surgical approaches.*

Results: *The results demonstrated that patients who underwent laparoscopic pyelolithotomy experienced significantly less postoperative pain and fewer complications compared to those who underwent open pyelolithotomy. Blood loss and hospital stay were also notably lower in the laparoscopic group. In contrast, the open surgery group showed higher rates of postoperative pain, complications, and longer recovery periods.*

Conclusion: *The study concludes that laparoscopic pyelolithotomy is a safer and more effective surgical technique for the management of large renal pelvic stones when compared to open pyelolithotomy. It is associated with reduced postoperative morbidity, shorter hospital stay, and improved patient recovery. Where surgical expertise and facilities are available, laparoscopic pyelolithotomy should be considered the preferred treatment option.*

INTRODUCTION

The treatment of kidney stones has undergone significant changes appreciations to modern endovascular techniques, which have greatly reduced the need for open surgery. Kidney stones are considered a common cause of urinary tract obstruction and kidney failure [1]. However, in recent years, less painful and less invasive methods of treatment have been preferred. Among these modern methods, laparoscopic pyelolithotomy has emerged as an effective option, which has been particularly effective in the treatment of large or complex stones such as staghorn calculi [2].

The introduction of modern techniques such as percutaneous nephrolithotomy (PCNL) and ureterorenoscopy has significantly changed the treatment of renal stones, with open surgery now being used as a secondary or even tertiary option [3]. Although these modern techniques have brought about major advances in treatment, surgical intervention is still unavoidable in certain

situations such as very large or complex stones, anatomical abnormalities, or failure of previous endo-urological efforts [4]. In such situations, both open and laparoscopic approaches retain their clinical value, making comparative analysis of their postoperative complications essential for clinical decision-making [5].

The risk of postoperative complications is inherent to every surgical procedure. These complications can range from minor to serious, affecting various body systems, prolonging hospital stay, increasing medical costs, and in rare cases, even causing death [6]. These complications may occur during surgery, immediately after surgery, or with some delay. Their nature and rate depend on several factors, including the patient's age, comorbidities, and the specific surgical procedure chosen [7]. Therefore, it is important to compare the safety and effectiveness of laparoscopic pyelolithotomy (LP) and open pyelolithotomy (OP) to determine which method provides better results and fewer complications in the treatment of pelvic kidney stones.Although laparoscopic pyelolithotomy (LP) offers advantages such as less tissue dissection, less blood loss, and faster recovery compared to open pyelolithotomy (OP), concerns remain regarding its technical complexity and the potential for specific complications. The main goal of modern surgical procedures has always been to minimize patient suffering and complications while maximizing therapeutic efficacy [8].

Studies comparing laparoscopic and open surgical approaches to treat various diseases, such as colon cancer, have shown that open surgery generally results in a more severe inflammatory response in the body. For example, levels of inflammatory markers such as C-reactive protein (CRP), tumor necrosis factor-alpha (TNF-α), and interleukin-6 (IL-6) have been found to be significantly higher in patients after open surgery than after laparoscopic surgery [9].

There is still need to establish the role of retroperitoneal pyelolithotomy (RPL) but each modality has its role in the treatment of large renal stones [10]. The articles have assessed that the likelihood of bleeding and hospitalization are reduced during the retroperitoneal laparoscopic approach to the treatment of complex renal stones [11]. A standard treatment modality should also be provided to patients who require pre-transplant or post-transplant native kidney nephectomy due to other reasons as retroperitoneoscopic nephectomy [12].

Retroperitoneal pyelolithotomy has not become very popular even after the introduction of the methods of balloon dissection . We have compared the RPL and the open procedure in regard to fractured large pelvic stones and also compared the merits and demerits of the two procedures. The procedure of open treatment of kidneys stones has been subjected to a lot of change in the last 3 decades. Previously, the conventional surgeries including open pyelolithotomy dominated the treatment. But using the minimally invasive technologies of today like SWL Extracorporeal Shock Wave Lithotripsy (SWL), Flexible Ureteroscopy (URS), Percutaneous Nephrolithotomy (PCNL), and Laparoscopic Surgery. the necessity of open operation has been diminished greatly. SWL has been demonstrated to be especially effective on stones less than 1.5 cm in size because it applies external shock waves to fracture the stone into small particles, which are naturally expelled via the urinary tract [13]. On the same note, ureteroscopy is also applicable in visually examining the stone and obstructing it into fragments to eliminate it. These two approaches have greatly minimized complications after surgery, hospitalization and pain among patients. Consequently, open pyelolithotomy is currently only carried out in complex and large stones or when the current minimally invasive procedures have failed or cannot be applied [14].

With the ongoing development of minimally invasive surgery, laparoscopy is more and more used as a first choice for the treatment of large renal stones. Laparoscopy is less traumatic in comparison with open surgery, has fewer postoperative complications, and is followed by quicker recovery. Three basic laparoscopic techniques are utilized in urological practice: transperitoneal, retroperitoneal, and extraperitoneal. Each method has its particular strengths and weaknesses, which are determined by patient characteristics and the skill level of the surgeon [15]. The transperitoneal route is the most popular method used, since it offers an extensive working area and good visualization of anatomical structures, with which it is simpler to learn and do especially for those with previous experience in the abdomen. It does, however, have the risk of damage to intra-abdominal organs [16].

The retroperitoneal approach, on the other hand, does not involve penetration of the peritoneal cavity, thus lowering the risk of visceral and vascular damage, as well as complications like ileus or postoperative adhesions. The route also allows for faster recovery because intra-abdominal organs are less perturbed. The extraperitoneal method, albeit less commonly used, can also prove useful in certain circumstances [17]. With the growing importance of laparoscopic procedures in stone surgery, the current study was conducted to assess open pyelolithotomy versus laparoscopic pyelolithotomy with respect to intraoperative and postoperative variables [18]. Transperitoneal, retroperitoneal, and extraperitoneal laparoscopic access can be used for urological interventions. Because of more familiar anatomical landmarks and a larger working space, the transperitoneal approach has a shorter learning curve [19]. The retroperitoneal laparoscopic approach has the potential benefit of reducing visceral and vascular injuries while also improving postoperative comfort by avoiding the opening of the peritoneal cavity [20].

MATERIAL AND METHODS:

This was a cross-sectional study, in which data were collected from patients who came to the hospital at a specific time. The study was conducted at different private and govt hospitals, where patients who are about to undergo surgery for the removal of renal stones will be recruited. Data were analyzed using SPSS. The dependent variables in the study included: Postoperative complications (such as fever, infection, urinary retention, bleeding, and length of hospital stay), Duration of the operation, Blood loss, Rate of complete stone passage. The independent variable was the type of surgery, i.e. open pyelolithotomy and laparoscopic pyelolithotomy. The study included adult patients aged 18 to 65 years who were diagnosed with large stones in the renal pelvis and required surgical treatment.

Results:

Gender				
	Frequency	Percent	Valid Percent	Cumulative Percent
Male	72	57.1	57.1	57.1
Female	54	42.9	42.9	100.0
Total	126	100.0	100.0	

The majority of the participants were middle-aged adults: 263160 (42.1) and 4160 (41.3) respectively. A minor fraction of the participants represented by the 1825 years (9.5) and above 60 years (7.1) brackets. Most of the respondents (75.4 percent) were married and 24.6 percent were single thus providing diversity on the dataset. Fifty percent (50) of the respondents underwent laparoscopic surgery and 48.4% underwent open surgery.

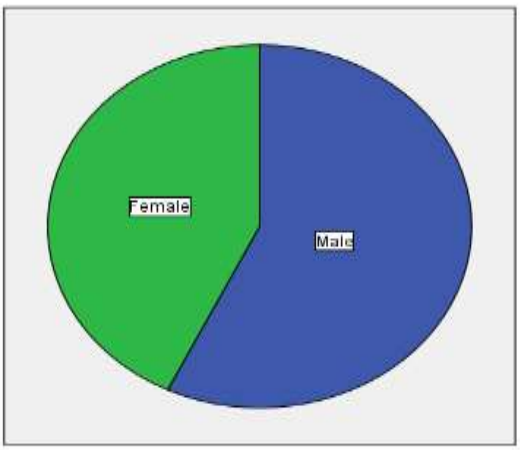

Table: Frequency Of age of respondents

Age				
	Frequency	Percent	Valid Percent	Cumulative Percent
18-25years	12	9.5	9.5	9.5
26-40years	53	42.1	42.1	51.6
41-60years	52	41.3	41.3	92.9
More than 60	9	7.1	7.1	100.0
Total	126	100.0	100.0	

Table: Response of Surgery Type

Surgery Type				
	Frequency	Percent	Valid Percent	Cumulative Percent
Laparoscopic	63	50.0	50.0	50.0
Open Surgery	61	48.4	48.4	98.4
Surgery convert from Lap. to open	2	1.6	1.6	100.0
Total	126	100.0	100.0	

Only a minimal percentage (1.6) had to be converted to open surgery because of laparoscopy. This demonstrates that the least invasive procedures were widespread but not exclusive. The pie chart below shows the gender representation of the participants. **Open surgery** also accounted for a notable share, indicating that it remains a commonly adopted approach in certain situations. Only a **very small fraction** of procedures required conversion from laparoscopy to open surgery, suggesting that complications or technical difficulties during laparoscopic procedures were uncommon.

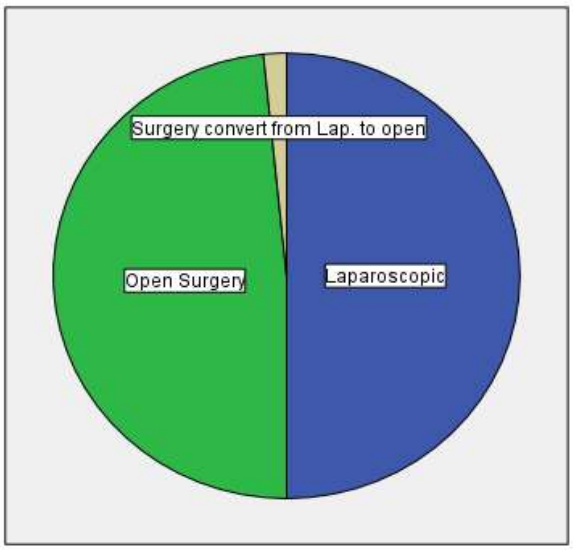

Table. Statistics for the variables Post Op. Complications

Hematoma formation				
	Frequency	Percent	Valid Percent	Cumulative Percent
Hematoma	17	12.7	12.7	12.7
No-Hematoma	109	86.5	86.5	99.2
Total	126	100.0	100.0	

Urosepsis				
	Frequency	Percent	Valid Percent	Cumulative Percent
Urosepsis	21	16.7	16.7	16.7
NoUrosepsis	105	83.3	83.3	100.0
Total	126	100.0	100.0	

Duration of Hospital Stay				
	Frequency	Percent	Valid Percent	Cumulative Percent
24hours	44	34.9	34.9	34.9
48hours	17	13.5	13.5	48.4
Morethan 48hours	65	51.6	51.6	100.0
Total	126	100.0	100.0	

This pattern shows that hematoma was an infrequent complication overall. Most individuals recovered without showing signs of localized bleeding. urosepsis was relatively less. Overall, most participants did not face severe urinary tract–related infection. More than half of the respondents (51.6%) remained hospitalized for over 48 hours. This suggests that extended hospital stay was needed for many individuals, possibly due to their clinical condition.

Table. Statistics for the variables Pain Scores, Immediately, 24 hours post-op and 48 hours post op

Pain-Score (VAS)	VAS1 Frequency	VAS1 %	VAS2 Frequency	VAS2 %	VAS3 Frequency	VAS3 %
1	1	0.8%	0	0%	2	1.6%
2	6	4.8%	0	0%	16	12.7%
3	25	19.8%	7	5.6%	32	25.4%
4	14	11.1%	32	25.4%	18	14.3%
5	16	12.7%	29	23.0%	3	2.4%
6	27	21.4%	11	8.7%	0	0%
7	26	20.6%	1	0.8%	0	0%
8	10	7.9%	1	0.8%	0	0%
9	1	0.8%	45	35.7%	55	43.7%
Total	**126**	**100%**	**126**	**100%**	**126**	**100%**

The immediate pain scores (VAS1) show that most patients started with moderate to high pain levels, as the majority selected scores between 3 and 7. The distribution changed significantly after 24 hours (VAS2) and fewer patients stated a lower level of pain, and the number of higher scores increased significantly, including VAS 9, which is associated with discomfort. At 48 hours (VAS3) the patterns of pain shifted to be more polarized, but a significant proportion still reported severe

pain (score 9) with some moving to lower levels (2 and 3).

Table. Analysis Results for Post op Complications * Type of Surgery Crosstabulation

Ranks			
Cateogries	Surgery Type	N	Mean Rank
Gender	Laparoscopic	63	56.50
	Open Surgery	61	71.61
	Surgery convert from Lap. to open	2	36.50
	Total	126	
Age	Laparoscopic	63	67.33
	Open Surgery	61	57.63
	Surgery convert from Lap. to open	2	122.00
	Total	126	
Maritalstatus	Laparoscopic	63	60.00
	Open Surgery	61	66.61
	Surgery convert from Lap. to open	2	79.00
	Total	126	
Hospital	Laparoscopic	63	74.00
	Open Surgery	61	53.39
	Surgery convert from Lap. to open	2	41.00
	Total	126	
PainScore	Laparoscopic	63	36.78
	Open Surgery	61	90.31
	Surgery convert from Lap. to open	2	87.50
	Total	126	

Table. Analysis Results for Kruskal-Wallis H

	Gender	Age	Maritalstatus	Hospital	PainScore
Kruskal-Wallis H	8.739	8.664	2.481	15.447	69.342
df	2	2	2	2	2
Asymp. Sig.	.013	.013	.289	.000	.000

The Kruskal–Wallis H test was applied to compare laparoscopic surgery, open surgery, and surgeries converted from laparoscopic to open across different variables.

The analysis showed a **statistically significant difference in gender distribution** among the three surgical groups (H = 8.739, p = 0.013), indicating that gender varied significantly with the type of surgery performed. Similarly, **age differed significantly** across the surgical groups (H = 8.664, p = 0.013), suggesting that patient age influenced the selection or outcome of surgical technique.

In contrast, **marital status did not show a significant difference** among the groups (H = 2.481, p = 0.289), indicating no association between marital status and type of surgery.

A **highly significant difference was observed for hospital variable** (H = 15.447, p < 0.001), reflecting variation in surgical approach across hospitals. Most notably, **postoperative pain scores showed a very strong significant difference** among the groups (H = 69.342, p < 0.001). Patients who underwent laparoscopic surgery had markedly lower mean pain ranks compared to those who underwent open surgery or conversion procedures.

Discussion:

In the majority of recent clinical reports, patients who receive the laparoscopy procedure are less likely to complain of post-operative pain, have small incisions, and recover faster than patients who receive the open method [21].

These variations are majorly described by the less tissue disturbance and no massive flank incision. The injury in laparoscopic surgery is less extensive, and, therefore, there is less blood loss, and other complications that may arise later, such as pain or infection, are not common. In certain cases e.g. where the stone is large, branched or where the anatomy is such that access to the scope is not possible, an open pyelolithotomy may still be required. Under these circumstances, the surgeon can have a better view and greater control with the open approach, although the outcome is greater pain and prolonged healing period [22].

Most studies show that patients have a shorter hospital stay and less pain after laparoscopic procedures, as wounds are smaller and mobility is easier. However, the results are not the same at every center [23]. Postoperative care and surgeon experience in some hospitals may increase or decrease this benefit. Some trials have also shown that the difference in hospital stay between the two procedures is not significant, suggesting that the patient's condition, their case, and hospital care policies can significantly influence the outcome[24]. The degree to which the kidney is cleared after stone removal, or the stone-free rate, is an important factor in the success of treatment. Both types of surgeries laparoscopic and open allow direct removal of the stone, so their results are quite similar in most studies [25].

If the stone is completely removed with a single, small incision, the laparoscopic approach is as effective as open surgery and may spare the patient the need for a larger incision. But when the stone is very large, staghorn-shaped, or has spread to the calyces, more frequent procedures such as endoscopic or percutaneous techniques must be used along with both surgical approaches [26].

Conclusion:

The crosstabulation analysis shows that which disinfection technique medical staff use The Kruskal-Wallis H test was applied to examine the differences in surgery types across various demographic and clinical variables. The rest of the share is made up of females who constitute a bit less than half of the group. All in all, the chart indicates moderate imbalance with males being somewhat higher than females but the two distinct genders are well represented in the study. The findings indicate that the gender was found to have a statistically significant influence on the type of surgery (H = 8.739, df = 2, p = 0.013) meaning that there was a difference between the type of surgery males and females had. On the same note, the age also exhibited an important correlation to the type of surgery (H = 8.664, df = 2, p = 0.013), implying that there was a difference between the surgical distribution of the older and middle-aged participants. Marital status on the other hand did not differ significantly (H = 2.481, df = 2, p = 0.289) meaning that the decision to get an abortion and the type of abortion were not determined by whether a person was single or married. The variable hospital was also very significant (H = 15.447, df = 2, p = 0.000) which shows that the preference or ability of various hospitals to use laparoscopic, open, or converted surgeries was different.

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