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A Study of Percutaneous Nephrolithotomy (PCNL) & Grading the Complexity of PCNL using Modified Guys Stone Score

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HIGHLIGHTS

- MGSS predicts PCNL outcomes
- Higher grades reduce clearance
- Complexity prolongs operative time
- MGSS predicts residual stones
- Fever and bleeding predominate

Key Words:

Percutaneous nephrolithotomy

Modified Guy's Stone Score

Renal calculi

Stone-free rate





ABSTRACT

Introduction: Renal stone disease is a common urological condition, and percutaneous nephrolithotomy (PCNL) is widely used for the management of large and complex renal calculi. **Aim & Objective:** The present study aimed to evaluate patients undergoing PCNL, assess procedural outcomes, and determine usefulness of the Modified Guy's Stone Score (MGSS) in grading stone complexity and predicting stone-free status and postoperative complications. **Material & Methods:** This prospective observational study included 50 patients with renal stones who underwent PCNL. Patients were evaluated clinically and radiologically, stone characteristics were assessed using the MGSS. Operative time, hospital stay, residual stones, stone-free rate (SFR), complications, ancillary procedures, postoperative complications according to the Modified Clavien classification were recorded. Statistical analysis was performed using SPSS version 25.0, with $p<0.05$ considered statistically significant. **Results:** The study included 25 males and 25 females, with a mean age of 42.48±12.51 years. Mean stone burden was 2.88±0.49 cm. Grade 1 was the most frequent MGSS category (58%). Overall, 40 (80%) patients achieved stone-free status, while 10 (20%) had residual stones. SFR progressively decreased with increasing MGSS, from 96.6% in Grade 1 to 0% in Grade 4b. MGSS was significantly associated with operative time (p=0.001), stone burden (p=0.001), hospital stay (p=0.006), residual stones (p=0.01), and ancillary procedures (p=0.007). Complications occurred in 48% of patients, predominantly fever and bleeding. The mean operative time was 88.40±19.42 minutes and mean hospital stay was 7.60±2.12 days. **Conclusion:** MGSS effectively stratified PCNL complexity and demonstrated a significant association with stone-free rate, operative time, hospital stay, residual stones, ancillary procedures, postoperative complications. Higher MGSS grades were associated with poorer stone clearance and greater procedural complexity. Therefore, MGSS is a useful preoperative tool for surgical planning, risk stratification, patient counseling, and prediction of PCNL outcomes.

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INTRODUCTION

Nephrolithiasis is a common urological disorder and an important public health concern worldwide, with its incidence increasing in both developed and developing countries. In India, urinary stone disease shows considerable geographical variation, with higher prevalence reported in northern regions. The recurrent nature of nephrolithiasis contributes substantially to healthcare utilization because patients may require repeated consultations, imaging, medical treatment, and surgical interventions. Changing dietary patterns, inadequate fluid intake, climatic conditions, metabolic abnormalities, and genetic predisposition are recognized contributors to the increasing burden of stone disease [1].

Management of renal calculi has evolved considerably with advances in endourology. Percutaneous nephrolithotomy (PCNL) has become the preferred treatment for large and complex renal stones, particularly stones greater than 2 cm, staghorn calculi, and stones unsuitable for or resistant to shock-wave lithotripsy or ureteroscopic treatment. PCNL provides a high stone-clearance rate while avoiding the morbidity associated with open surgery. Nevertheless, it remains an invasive procedure and may be associated with bleeding, infection, urinary leakage, adjacent-organ injury, and the need for additional procedures. The probability of achieving stone-free status and developing complications depends on several factors, including stone burden, number and location of stones, collecting-system anatomy, and the complexity of the renal stone. Therefore, accurate preoperative assessment is essential for appropriate surgical planning and patient counselling [2,3].

To overcome the variability in PCNL outcomes, several nephrolithometric scoring systems have been developed to standardize the description of stone complexity and predict surgical outcomes. The Guy's Stone Score (GSS), introduced by Thomas K, et. al; 2011, is a simple radiological classification that categorizes renal stones into four grades according to stone number, location, complexity, and renal anatomy. Its simplicity and reproducibility have contributed to its widespread clinical use. Evidence from comparative studies and meta-analyses indicates that increasing Guy's score is generally associated with lower stone-free rates after PCNL. Naeem Z, et. al; 2026, found that patients achieving stone-free status had significantly lower Guy scores and that the score was also associated with postoperative complications [4,5].

Although the GSS is useful, limitations remain because renal stone complexity is influenced by multiple anatomical and stone-related factors that may not be completely represented by the original classification. Consequently, modified versions and other scoring systems have been developed. The S.T.O.N.E. nephrolithometry score incorporates stone size, tract length, obstruction, number of involved calyces, and stone density, whereas the CROES nomogram incorporates several clinical and radiological variables. Comparative studies have demonstrated that these systems can predict stone-free status following PCNL, although their relative performance varies between populations. Shahab S, et. al; 2022, reported that GSS, S.T.O.N.E., and CROES scores were all associated with stone-free rates, while differences existed in their practical application and prediction of complications [6,7].

The relationship between nephrolithometric scores and postoperative complications is clinically important because complications may range from minor events requiring conservative treatment to serious complications requiring intervention. The modified Clavien-Dindo classification provides a standardized method for grading these postoperative events. Evidence regarding the ability of individual scoring systems to predict complications remains inconsistent. Kumar U, et. al; 2018, of 18 studies involving 7,316 patients found that Guy's score showed an association with complications in several studies, although results across the available scoring systems were heterogeneous

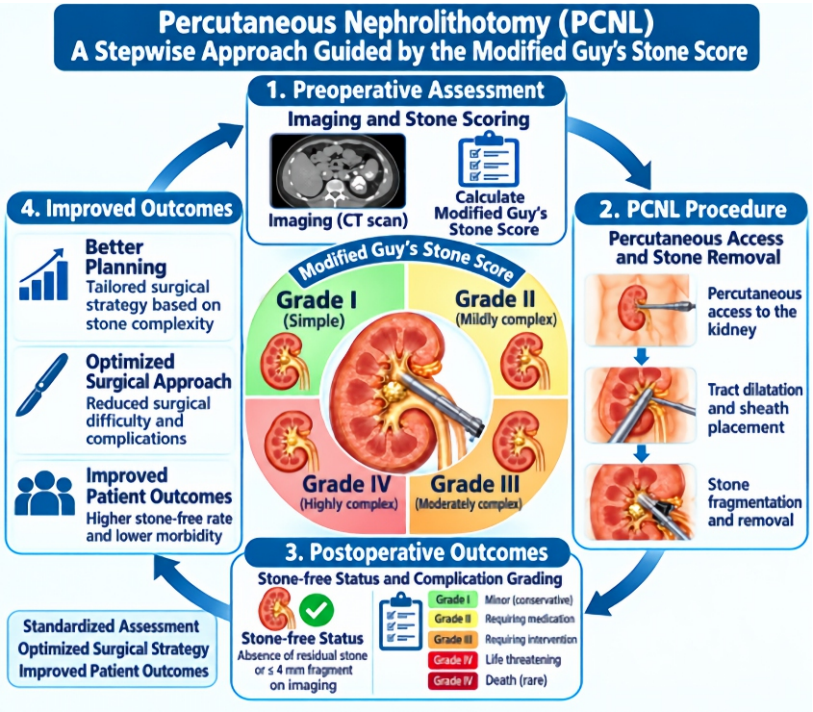


Figure 1: Stepwise Approach to Percutaneous Nephrolithotomy (PCNL) Guided by the Modified Guy's Stone Score.

and many studies were retrospective and single-center. Similarly, a meta-analysis found that the three commonly used systems-Guy's score, S.T.O.N.E., and CROES-were broadly comparable for predicting stone-free status, while Guy's score demonstrated an association with postoperative complications [8,9].

The present study at King George Hospital, Andhra Medical College, was undertaken to evaluate the usefulness of the Modified Guy's Stone Score in predicting outcomes following PCNL. Particular emphasis was placed on stone-free status and postoperative complications assessed using the modified Clavien classification. Such assessment is clinically relevant because reliable preoperative prediction can assist surgeons in selecting appropriate operative strategies, anticipating procedural difficulty, counseling patients regarding expected stone clearance and possible complications, & planning hospital resources. Previous studies involving complex or staghorn stones have shown that Guy's score can independently predict stone-free outcomes, although its ability to predict complications has not been consistent. Thus, validation in different patient populations remains important [9,10].

Overall, the available evidence supports nephrolithometric scoring as a useful component of contemporary PCNL practice, while recognizing that no single scoring system has emerged as universally superior. The Modified Guy's Stone Score offers the advantages of simplicity, ease of interpretation, and clinically meaningful stratification of stone complexity. Evaluation in an Indian population is particularly valuable because variations in dietary habits, environmental exposure, stone composition, renal anatomy, and healthcare-seeking patterns may influence both nephrolithiasis and PCNL outcomes. The findings of the present study therefore contribute to the growing evidence supporting standardized preoperative assessment and may help optimize surgical planning, informed consent, and individualized management of patients undergoing PCNL [11,12]. **Figure 1** illustrates the four stages of PCNL management: (1) preoperative assessment using computed tomography (CT) imaging and stone complexity grading; (2) the surgical procedure, including percutaneous renal access, tract dilatation, sheath placement, and stone fragmentation and removal; (3) postoperative evaluation of stone-free status and complications; and (4) improved clinical outcomes through individualized surgical planning, optimized operative strategies, and reduced morbidity. The Modified Guy's Stone Score (Grades I–IV) supports risk stratification and procedural planning according to stone complexity.

The study aims to evaluate patients presenting with renal stones at our institution, determine the indications for percutaneous nephrolithotomy (PCNL), and assess the outcomes of the procedure in patients with renal stones. It further aims to grade and assess the complexity of PCNL procedures using the Modified Guy's Stone Score and to evaluate the stone-free rate and complications following PCNL in relation to the Modified Guy's Stone Score.

MATERIAL & METHODS

This observational prospective study was conducted at the Department of General Surgery, Andhra Medical College, Visakhapatnam from May 2023 to April 2025. Ethical approval has been obtained from the Ethical Approval Committee of Andhra Medical College, Visakhapatnam.

Study Population

The study population comprised patients aged 18–65 years with renal stones who underwent percutaneous nephrolithotomy (PCNL). Patients were included if they were suitable candidates for surgical intervention and provided informed consent. Patients deemed unfit for surgery due to bleeding diathesis, high cardiac risk, active infection, or sepsis were excluded. Individuals unwilling to provide informed consent for participation in the study were also excluded.

Data Analysis

Data were analyzed using SPSS version 25.0. Categorical variables were summarized as frequencies & percentages, whereas continuous variables were presented as mean ± standard deviation. Continuous variables were compared using the independent t-test, while categorical variables were analyzed using the chi-square test or Fisher's exact test, as appropriate. A two-sided p-value <0.05 was considered statistically significant for all analyses performed in the study.

RESULTS

The study included 50 patients undergoing PCNL, comprising 25 females (50%) and 25 males (50%), indicating an equal gender distribution. The mean age of the participants was 42.48 ± 12.51 years, with ages ranging from 18 to 70 years and an overall range of 52 years. On categorization, the highest proportion of patients belonged to the 51–60-year age group, followed by those aged 41–50 years. The mean stone burden was 2.88 ± 0.49 cm, ranging from 2.5 to 4.0 cm, with an overall range of 1.50 cm.

Among the 50 patients, calculus was located on the left side in 23 (46.00%) patients and on the right side in 27 (54.00%) patients, indicating a slightly higher prevalence of right-sided calculus **(Table 1)**. Among the 50 patients, calculus was most commonly located in the pelvic region (36.00%), followed by the lower region (16.00%), while upper and partial staghorn locations each accounted for 12.00%, multiple calculi for 10.00%, and middle and staghorn locations for 6.00% each; horseshoe/single pelvic calculus was least common (2.00%) **(Figure 2)**.

Among the 50 patients, Modified Guy's Grade 1 was most common, comprising 29 (58.00%) patients, followed by Grades 2a, 2b, and 3 with 6 (12.00%) patients each, while Grade 4a was seen in 2 (4.00%) and Grade 4b in 1 (2.00%) patient **(Table 2)**.

Among the 50 patients undergoing PCNL, residual stones were present in 10 (20%) patients, while 40 (80%) patients achieved complete stone clearance. Postoperative complications were observed in 24 (48%) patients, with fever being the most common complication in 12 (24%), followed by bleeding in 8

(16%). Pleural injury requiring ICU care, increased renal function tests, sepsis, and death occurred in 1 (2%) patient each. Ancillary procedures were required in 10 (20%) patients, including ESWL in 6 (12%) and redo PCNL in 4 (8%). The mean hospital stay was 7.60 ± 2.12 days, ranging from 6 to 14 days, while the mean operative time was 88.40 ± 19.42 minutes, ranging from 70 to 140 minutes. According to the Modified Clavien classification, 26 (52%) patients had Grade 0 complications, 13 (26%) had Grade 1, 4 (8%) had Grade 2, 2 (4%) had Grade 3a, 2 (4%) had Grade 3b, 2 (4%) had Grade 4, and 1 (2%) had Grade 5 complication. Modified Guy's grading showed a statistically significant correlation with Modified Clavien grading, with higher Guy's grades generally associated with increasing Clavien grades (p=0.001), indicating a significant relationship between stone complexity and postoperative comp-lications **(Table 3)**. Baseline characteristics showed no significant association with gender or stone side (p=0.34 and p=0.84), while residual stones and ancillary procedures increased significantly with higher Modified Guy's grades (p=0.01 and p=0.007); stone-free rates progressively declined from 96.6% in Grade I to 0% in Grade IVB **(Table 4)**. Operative time increased significantly with higher Modified Guy's grades (p=0.001), rising from a mean of 81.03 minutes in Grade 1 to 111.7 minutes in Grade 3 and 120 minutes in Grade 4a, indicating greater stone complexity required longer operative time **(Table 5)**. Stone burden increased significantly with higher Modified Guy's grades (p=0.001), with the mean burden rising from 2.72 in Grade 1 to 3.33 in Grade 3 and 4.00 in Grades 4a and 4b, indicating greater stone burden with increasing stone complexity **(Figure 3)**.

Hospital stay increased significantly with higher Modified Guy's grades (p=0.006), with the mean stay rising from 6.76 days in Grade 1 to 9.83 days in Grade 3 and 10.00 days in Grade 4a, indicating longer hospitalization with increasing stone complexity **(Table 6)**.

Table 1: Side of the Calculus

Variable	Unit	N=50 n (%)
Side	LT	23 (46.00)
	RT	27 (54.00)

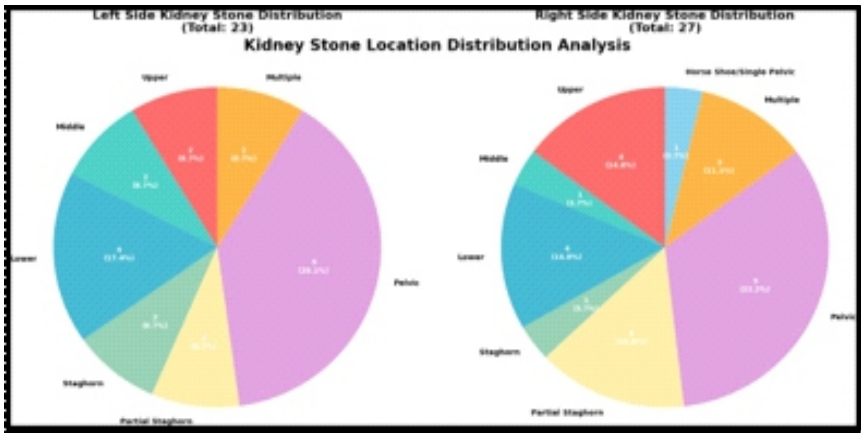


Figure 2: Pie chart shows the location of the calculus

Table 2: Modified Guy's Grade

Variable	Unit	N=50 n (%)
Modified Guy's Grade	1	29 (58.00)
	2a	6 (12.00)
	2b	6 (12.00)
	3	6 (12.00)
	4a	2 (4.00)
	4b	1 (2.00)

Table 3: Modified Guy's Grading and Modified Clavien Grading Correlation

		Modified Guy Grade							
	Grade	1 n (%)	2a n (%)	2b n (%)	3 n (%)	4a n (%)	4b n (%)	Total	p-value
Cavien grade	0	21 (72.41)	2 (33.33)	2 (33.33)	1(16.67)	0(0.00)	0(0.00)	26 (52.00)	0.001
	1	7 (24.14)	3 (50.0)	2 (33.33)	0(0.00)	0 (0.00)	1(100.0)	13 (26.00)	
	2	1 (3.45)	0 (0.00)	1 (16.67)	2 (33.33)	0 (0.00)	0 (0.00)	4 (8.00)	
	3a	0 (0.00)	0 (0.00)	0 (0.00)	1 (16.67)	1 (50.00)	0 (0.00)	2 (4.00)	
	3b	0 (0.00)	1 (16.67)	0 (0.00)	0 (0.00)	1 (50.00)	0 (0.00)	2 (4.00)	
	4	0 (0.00)	0 (0.00)	1 (16.67)	1 (16.67)	0 (0.00)	0 (0.00)	2(4.00)	
	5	0 (0.00)	0 (0.00)	0 (0.00)	1 (16.67)	0 (0.00)	0 (0.00)	1(2.00)	
	Total	29 (100.00)	6 (100.00)	6 (100.00)	6 (100.00)	2 (100.00)	1 (100.00)	50 (100.00)	

Table 5: Op Time versus Modified Guy Grading

Modi Guys Grade	N	Mean	Std Dev	p-value
1	29	81.03	13.19	
2a	6	90.0	26.1	
2b	6	88.33	7.53	0.001
3	6	111.7	24.8	
4a	2	120.0	0.0	
4b	1	90.00	*	

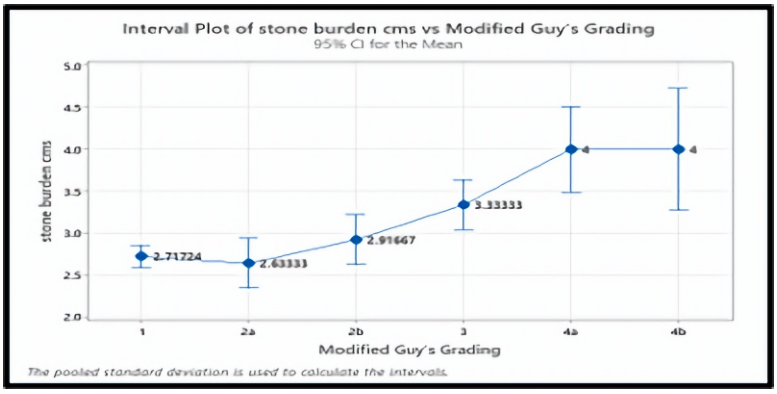


Figure 3: Interval plot of stone burden vs modified Guy Grading

Table 6: Stay versus Modified Guy Grade

Modi Guy Grade	N	Mean	Std Dev	p-value
1	29	6.759	1.300	
2a	6	8.333	2.251	
2b	6	8.000	2.098	**0.006**
3	6	9.83	3.25	
4a	2	10.00	2.83	
4b	1	7.000	*	

DISCUSSION

The present study, titled "A Study of Percutaneous Nephrolithotomy (PCNL) and Grading the Complexity of PCNL Using Modified Guy's Stone Score," evaluated 50 patients undergoing PCNL for renal calculi, with particular emphasis on stone characteristics, procedural complexity, stone-free rate (SFR), operative time, hospital stay, complications, and the requirement for ancillary procedures. The study demonstrated that the Modified Guy's Stone Score (MGSS) was significantly associated with important perioperative outcomes, supporting its usefulness as a simple preoperative tool for stratifying PCNL complexity and predicting treatment outcomes. The original Guy's Stone Score was developed by Thomas K, et. al; 2011, to classify PCNL complexity into four grades according to stone number, location, renal anatomy, and stone configuration, and was shown to predict stone-free status independently [13,4]. In the present cohort, males and females were equally represented, with 25 patients (50%) of each sex. Although renal stone disease has historically been reported more frequently among men, the equal sex distribution observed here may reflect regional epidemiological variation, referral patterns, dietary factors, or the relatively small sample size. Therefore, sex alone should not be considered a determinant of PCNL complexity. The mean age was 42.48 years, with the largest proportion of patients belonging to the 51–60-year age group, followed by those aged 41–50 years. This distribution is consistent with the recognized predominance of nephrolithiasis during adult and middle age. Importantly, the absence of a significant relationship between demographic characteristics and MGSS indicates that stone complexity is determined predominantly by anatomical and stone-related factors rather than age or sex [14].

The mean stone burden in this study was 2.88 cm, ranging from 2.5 to 4.0 cm. This finding is appropriate for a PCNL cohort because contemporary guidelines recommend PCNL as the primary treatment for renal stones larger than 2 cm. The European Association of Urology similarly recommends PCNL as first-line treatment for stones >2 cm because SWL frequently requires multiple sessions and may result in obstruction from stone fragments. The predominance of stones of this size therefore supports the appropriateness of PCNL in the present population. Right-sided stones were slightly more common than left-sided stones (54% versus 46%), but laterality did not significantly differ across MGSS categories, suggesting that the side of involvement has little influence on overall stone complexity [15,16].

Regarding stone location, renal pelvic calculi were most common (36%), followed by lower-caliceal stones (16%), upper-caliceal stones (12%), multiple-site stones (10%), staghorn calculi (6%), and partial staghorn calculi (12%). The predominance of pelvic and lower-caliceal stones is clinically relevant because these locations influence access selection and the ability to achieve complete clearance. Upper-pole stones may require more technically demanding access and, particularly with supracostal puncture, carry a risk of pleural complications.

Complex or multiple stones may require flexible nephroscopy, multiple tracts, or staged procedures. Thus, stone location contributes substantially to the technical difficulty captured by MGSS [17,18]. The distribution of MGSS demonstrated that 58% of patients were Grade 1, while 12% each were Grades 2a, 2b, and 3; 4% were Grade 4a and 2% were Grade 4b. This predominance of lower-grade disease indicates that most procedures involved relatively less complex stones with favorable anatomy. The original Guy's classification similarly defines Grade 1 as solitary stones in the mid/lower pole or pelvis with simple anatomy, whereas Grades 3 and 4 represent increasingly complex situations such as multiple stones with abnormal anatomy, caliceal diverticular stones, partial or complete staghorn calculi, and severe anatomical abnormalities. The present findings therefore demonstrate that MGSS provides clinically meaningful stratification of procedural complexity [18,19].

The overall SFR in this study was 80%, with residual stones in 20% of patients. Importantly, SFR declined progressively with increasing MGSS, from 96.6% in Grade 1 to 66% in Grades 2a and 2b, 50% in Grades 3 and 4a, and 0% in Grade 4b. This marked gradient strongly supports the predictive value of MGSS. Thomas et al. demonstrated that Guy's Stone Score independently predicted stone-free status after PCNL, while subsequent studies have confirmed that higher scores are associated with lower SFR and increased need for retreatment. In a contemporary study, SFR decreased from 96.43% for Guy Grade I to 50% for Grade IV, with progressively greater odds of requiring additional treatment as the score increased. The present findings are therefore consistent with the established relationship between stone complexity and incomplete clearance [19,4,20].

The association between MGSS and residual stones also has important practical implications. Grade 1 stones were associated with excellent clearance, whereas highly complex Grade 4b stones were difficult to clear completely in a single session. Complex stones may involve multiple calyces, abnormal anatomy, large stone burden, or staghorn configuration, making complete extraction technically challenging. In such circumstances, flexible nephroscopy, multiple access tracts, staged PCNL, or adjunctive SWL may be required. The significant association between MGSS and ancillary procedures in the present study further emphasizes the importance of preoperative counseling regarding the possibility of staged or additional treatment [20,21].

Operative time also increased significantly with MGSS ($p = 0.001$). The mean operative duration was 88.40 ± 19.42 minutes, ranging from 70 to 140 minutes, while the mean duration increased from approximately 80 minutes in Grade 1 to 120 minutes in Grade 4b. This progressive increase reflects the greater technical demands of complex stone treatment, including difficult access, increased fragmentation and extraction time, multiple calyceal involvement, and the potential requirement for additional access. Yuhico MP & Ko R. 2008, demonstrated associations between higher nephrolithometric scores, prolonged operative duration, & less favorable postoperative outcomes. This relationship has practical implications for operating-room scheduling, anesthesia planning, and allocation of surgical resources [21].

The mean hospital stay was 7.60 days, ranging from 6 to 14 days, and increased significantly with MGSS ($p=0.006$), from 6.93 days in Grade 1 to approximately 10 days in Grade 4b. Longer hospitalization in complex cases is likely related to prolonged procedures, increased bleeding risk, infectious complications, need for drainage, and slower postoperative recovery. Mazzon G, et. al; 2023, evaluated PCNL outcomes have likewise reported associations between increasing stone complexity, prolonged operative time, hospital stay, and complications. The present findings suggest that MGSS may therefore assist not only in predicting stone clearance but also in anticipating postoperative resource requirements [22].

Complications occurred in 24 of 50 patients (48%), with fever (24%) and bleeding (16%) being the most frequent events. Less common complications included pleural injury, intensive-care admission, deterioration in renal function, sepsis, and mortality, each occurring in 2% of patients. Although the overall complication rate was higher than that reported in large international series, most complications were minor and managed conservatively. In the CROES global PCNL study involving 5,803 patients, 85.5% of procedures were uneventful; significant bleeding occurred in 7.8%, fever in 10.5%, hydrothorax in 1.8%, and blood transfusion was required in 5.7%. Differences may reflect variation in patient selection, stone complexity, surgical expertise, reporting methodology, and institutional practices [20].

The use of the Modified Clavien classification provided a standardized method for evaluating these complications. In the present study, 52% of patients had no complications, 26% had Grade 1 complications, 8% Grade 2, 6% Grade 3, 6% Grade 4, and 2% Grade 5 complications. The Clavien system has been specifically validated for PCNL and facilitates objective comparison of postoperative morbidity between studies. Importantly, the significant association between MGSS and Modified Clavien grade ($p=0.001$) indicates that increasing stone complexity was accompanied by increasing complication severity. De La Rosette JJ, et. al; 2012, demonstrated significantly higher complication rates among patients with higher Guy's Stone Scores [23].

The requirement for ancillary procedures in 20% of patients, including ESWL in 12% and redo PCNL in 8%, further reflected the difficulty of achieving complete clearance in complex stones. The need for additional treatment increased with MGSS, whereas most Grade 1 patients achieved adequate clearance after a single procedure. This finding is clinically relevant because patients with higher scores can be counseled before surgery regarding the possibility of staged PCNL or adjunctive procedures. Contemporary evidence also supported the association between higher Guy's scores, lower SFR, and increased retreatment requirements [23,24].

Overall, the significant correlations observed between MGSS and stone burden, operative time, hospital stay, residual stones, ancillary procedures, SFR, and Modified Clavien grade demonstrate that MGSS is a useful multidimensional indicator of PCNL complexity. The relationship between stone burden and MGSS confirms that larger stones generally represent more challenging procedures, although MGSS has an advantage over

stone size alone because it incorporates stone distribution and renal anatomical complexity. Recent systematic evidence indicates that Guy's Stone Score is associated with postoperative complications in several studies, although the predictive performance of nephrolithometric systems varies between populations. Therefore, MGSS should be regarded as an important component of preoperative assessment rather than a substitute for comprehensive clinical and radiological evaluation [24,25].

CONCLUSION

The analysis demonstrated that Modified Guy's Stone Score (MGSS) effectively predicted PCNL complexity, operative time, complications, hospital stay, and stone-free rates, supporting its role in preoperative planning and patient counseling. The predominance of Grade 1 cases (58%) with a 96.6% stone-free rate indicated excellent outcomes in less complex stones, whereas increasing MGSS grades were associated with declining clearance and greater morbidity. Higher scores also correlated with longer procedures and hospitalization. The overall complication rate of 48%, mainly minor complications, emphasizes meticulous technique, appropriate patient selection, and careful postoperative monitoring.

LIMITATIONS & FUTURE PERSPECTIVES

The study's limitations include a single-centre setting, a relatively small sample size, and a short study duration, which may limit the broader applicability of the results. Future studies should incorporate multicentre designs with larger populations to enhance validity, assess long-term outcomes, and investigate advanced diagnostic & management approaches. Such efforts will improve overall patient care & help minimize complications.

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical health-care, diagnosis, and treatment outcomes. By highlighting real-care applications. It emphasizes the importance of translating scientific observations into meaningful improvements in patient world relevance, the study contributes to evidence based medical practice and supports informed clinical decision making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

PCNL: Percutaneous Nephrolithotomy
MGSS: Modified Guy's Stone Score
SFR: Stone-Free Rate

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AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in the writing or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

AUTHOR'S NOTE

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