RESEARCH ARTICLE

Can higher guy's scores predict increased complications? exploring the link with clavien-dindo classification

Laraib Gul, Shuah Ullah, Shariq Bin Yousuf, Bazgha Hassan, Tanzeel-Ur-Rahman Gazder, Rehan Mohsin

Abstract

Objective: To determine the role of guy's stone score in predicting the complications rate for percutaneous nephrolithotomy.

Method: The descriptive study was conducted at the Sindh Institute of Urology and Transplantation, Karachi, from August 2020 to February 2021, and comprised patients undergoing percutaneous nephrolithotomy. Data was collected regarding demographic, preoperative, intraoperative and postoperative variables, including Guy's stone score and complications classified by the Clavien-Dindo system. Data was analysed with SPSS 20.

Results: Of the 118 patients, 78(66%) were males, 40(34%) were females, 71(60%) were aged >30 years and 47(40%) were aged <30 years. There was a significant correlation between a higher Guy's stone score grade and increased postoperative mild complications (p<0.0001)

Conclusion: A higher Guy's stone score did not predict severe postoperative complications among percutaneous nephrolithotomy patients.

Key Words: Postoperative complications, Percutaneous nephrolithotomy, Clavien Dindo, Guys stone score, Scoring system, Stones.

(JPMA 75: 1533; 2025) **DOI: https://doi.org/10.47391/JPMA.20571**

Introduction

Depending on regional distribution, 1% to 20% of individuals will experience renal stone disease at some point in their lives.[1] In south and southeast Asia, including Pakistan (16%), urolithiasis is far more common due to high temperatures and prolonged sun exposure.[2] It makes for about 60% of all urological cases in Pakistan.[3] Treatment for kidney stones involves a variety of techniques, including open surgery, retrograde intra-renal surgery (RIRS), percutaneous nephrolithotomy (PCNL) and extracorporeal shockwave lithotripsy (ESWL).[4] For large and/or difficult kidney stones, PCNL remains the gold standard of care. For the diagnostic workup of renal stones, a variety of imaging modalities are available, such as non-contrast computed tomography (NCCT), ultrasonography (USG), intravenous pyelography (IVP) and kidney-ureter-bladder (KUB) radiography. Right now, the most popular imaging modality is NCCT. Better information about pelvicalyceal anatomy, stone density, obstruction indicators, tract length, and improved stone measures and distribution are all provided, all of which facilitate more effective surgical planning.[5-7]

Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, Pakistan.

Correspondence: Tanzeel-Ur-Rahman Gazder.

Email: tgazder11@gmail.com

ORCID ID: 0009-0001-9962-1303

Submission complete: 22-05-2024 **First Revision received:** 16-08-2024

Acceptance: 26-07-2025 **Last Revision received:** 25-07-2025

Guy's stone score (GSS) system comprises four grades, from 1 to 4. Research indicates that the rate of complications rises as the GSS increases; GS1 = 4.8%, GS2 = 9.1%, GS3 = 26.2% and GS4 = 44.4% (p<0.001).[8] GSS, a straightforward technique for classifying renal calculus difficulty that has good inter-observer agreement and a strong correlation with success and complication rates, was published in 2011.[9]

A standardised method for reporting and grading postoperative problems is the Clavien-Dindo Classification (CDC), which grades the complication as 1, 2, 3a and 3b.[10] There is a need to identify the best score that predicts the rates of complications for prone PCNL and grade them using CDC because the incidence of complex urological diseases, specifically renal and ureteric stones, has been increasing in Pakistan as a result of a confluence of genetic, environmental and lifestyle influences.

The current study was planned to determine if a higher GSS is correlated with higher complication rates.

Patients and Methods

The descriptive study was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation (SIUT), Karachi, from August 13, 2020, to February 12, 2021. After approval from the institutional ethics review committee, the sample size was calculated using a sample WHO sample size calculator.[11] The minimum required sample size was calculated to be 72 patients, based on a

population size of 180, a reported complication rate of 10.3%[12], a 5.5% margin of error, and a 95% confidence interval. However, to enhance the precision and reliability of the findings, a total of 118 patients were included in the final analysis. The sample was raised using non-probability, consecutive sampling technique.

Those included were PCNL patients of either gender aged 15-65 years who had radiopaque renal stones on the preoperative NCCT scan, with stones measuring at least 2cm (1.5cm in case of the lower calyx), having several stones with partial or total staghorn calculus. The following conditions were excluded: coagulopathy, pregnancy, skeletal malformation of the spinal cord, and active urinary tract infection. Informed consent was obtained from all those enrolled in the study.

Demographic data, including age and gender, as well as preoperative variables, including stone side, size, GSS, diabetes, hypertension, body mass index (BMI) and complications that can affect the outcome, were noted using a proforma. The GSS was calculated on the basis of NCCT by two researchers as per operational definitions. Intraoperative variables included operating time (from the first prick till wound closure recorded using a stopwatch), number of tracts, and punctured calyx were noted by surgeon on the proforma. A 28Fr size of sheath was used in all cases, and 2 urologists performed PCNL having at least two years' experience. Postoperative variables included complication graded using CDC.[11] Patients were discharged on 2nd or 3rd postoperative day, and the follow-up was done on 8th and 15th day as per the institutional protocol. All complications with possible interventions made for them were recorded and graded as per the CDC on the 15th day.

Data was analysed using SPSS 20. Data was categorised based on GSS and postoperative CDC grades. Postoperative complications were further classified into specific complications, including haematuria, urinary leak, residual stones and infection. The association between GSS and postoperative complications was assessed using chi-square tests or Fisher's exact test. Age, gender, diabetes mellitus, hypertension and BMI were analysed for their relationship with postoperative complications. Chi-square test was used for categorical comparisons. $P<0.05$ was considered significant.

Results

All the 118(100%) patients enrolled completed the study. Among them, 78(66%) were males, 40(34%) were females, 71(60%) were aged >30 years and 47(40%) were aged <30 years.

Table-1: Comparison of postoperative complications graded according to Clevian Dindo classification and Guy's Stone Score.

Complications	Grade 1	Grade 2	Grade 3	Grade 4	p-value
Haematuria (%)	8 (6.8%)	12 (10.2%)	15 (12.7%)	8 (6.8%)	0.34
Urinary Leak (%)	5 (4.2%)	7 (5.9%)	9 (7.6%)	6 (5.1%)	0.15
Residual Stone (%)	8 (6.8%)	11 (9.3%)	14 (11.9%)	10 (8.5%)	0.45
Infection (%)	6 (5.1%)	9 (7.6%)	12 (10.2%)	7 (5.9%)	0.21

Table-2: Guy's Stone Score and specific postoperative complications.

Guys Stone Score	Postoperative Complications				
	Grade 1	Grade 2	Grade 3	Grade 4	p-value
Grade 1	27 (22.9%)	3 (2.5%)	4 (3.4%)	2 (1.7%)	
Grade 2	17 (14.4%)	7 (5.9%)	19 (16.1%)	7 (5.9%)	0.0001
Grade 3	5 (4.2%)	1(0.8%)	18 (15.3%)	6 (5.1%)	
Grade 4	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (1.7%)	

Table-3: Association of demographic and clinical factors with postoperative complications.

Age Group In Years	Postoperative Complications				
	Grade 1	Grade 2	Grade 3a	Grade 3b	p-value
12 – 30	23 (19.5%)	4 (3.4%)	14 (11.9%)	6 (5.1%)	0.618
>30	26 (22.0%)	7 (5.9%)	27 (22.9%)	11 (9.3%)	
Gender	**Postoperative Complications**				
	Grade 1	Grade 2	Grade 3a	Grade 3b	p-value
Male	31 (26.3%)	7 (5.9%)	31 (26.3%)	9 (7.6%)	0.366
Female	18 (15.3%)	4 (3.4%)	10 (8.5%)	8 (6.8%)	
Diabetes Mellitus	**Postoperative complication**				
	Grade 1	Grade 2	Grade3a	Grade 3b	p-value
Diabetic	10 (8.5%)	0 (0.0%)	6 (5.1%)	1 (0.8%)	0.232
Non-Diabetic	39 (33.1%)	11 (9.3%)	35 (29.7%)	16 (13.6%)	
Hypertension	**Postoperative Complications**				
	Grade 1	Grade 2	Grade 3a	Grade 3b	p-value
Hypertensive	7 (5.9%)	3 (2.5%)	13 (11.0%)	5 (4.2%)	0.237
Non- Hypertensive	42 (35.6%)	8 (6.8%)	28 (23.7%)	12 (10.2%)	
Body Mass Index In kg/m2	**Postoperative Complications**				
	Grade 1	Grade 2	Grade 3a	Grade 3b	p-value
11 – 24	21 17.8%)	5 (4.2%)	19 (16.1%)	8 (6.8%)	0.985
>24	28 (23.7%)	6 (5.1%)	22 (18.6%)	9 (7.6%)	

Of the total, 147 specific complications noted, haematuria 43(29.3%) and residual stone 43(29.3%) were the most common, followed by infection 34(23%) and urinary leak 27(18.4%). They were not significantly associated with GSS grade (Table 1).

There were 36(30.5%) patients with GSS grade 1. Of them, CDC grade 1 complications were noted in 27(22.9%) cases. GSS grade 2 was found in 50(42.4%) patients, with 26(22%) having either CDC grade 3a or 3b. GSS grade 3 cohort had 30(25.4%), and 24(20.3%) of these cases had either CDC grade 3a or 3b complications. There were 2(1.7%) cases with GSS grade 4, and both of them had CDC grade 3b complications. There was a significant correlation between a higher GSS grade and increased postoperative mild complications ($p<0.0001$) (Table 2).

Age, gender, diabetes, hypertension and BMI had no significant correlation with complications (Table 3).

Discussion

The GSS is a reliable and straightforward tool for evaluating the stone-free rate following PCNL and for assessing the complexity of the procedure, as evaluated by a study of 100 patients which concluded that the only characteristic that could reliably and significantly predict the stone-free percentage was GSS.[9] A study comprising 166 patients[6] demonstrated a correlation between a higher GSS grade and a worse rate of stone clearance, but it did not address postoperative complications. There are several studies[8,13-16] that did not examine the correlation between GSS and complications.

Based on the burden, configuration and existence of kidney or skeletal defects, patients can be categorised into four GSS grades, making it a straightforward, subjective and repeatable scoring system.[17] Preoperative nomograms are a great tool for informing patients about the likelihood of being free of stones and the potential problems associated with PCNL. Both GSS and Size-Topography-Obstruction-Number of calyces-Essence (STONE) scores have an identical level of effectiveness in predicting the success rate of the surgery, as noted by a study which, however, lacked evidence regarding whether GSS predicts the complication rate or not.[18] Aminsharifi et al.[19] identified a significant association that aligns with the current findings. The current study noted that a higher GSS grade did not exhibit a positive correlation with more complications. In fact, there was an inverse relationship between GSS and complications, indicating that there were additional factors contributing to the complications beyond just the complexity of the stone.

The current study has limitations of a single-centre design with a small sample size. Besides, without multivariate analysis, the ability to extrapolate and generalise the results is further constrained. Large-scale multi-centre studies are essential to validate the current findings.

Conclusion

A higher GSS grade did not predict severe postoperative complications among patients undergoing PCNL.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

References

1. Scales CD Jr, Smith AC, Hanley JM, Saigal CS. Prevalence of kidney stones in the United States. Eur Urol 2012;62:160-5. doi: 10.1016/j.eururo.2012.03.052.
2. Memon A, Anwar K, Orakzai N, Ather MH, Biyabani SR, Nasir AR, et al. Epidemiology of stone disease in Pakistan. In: Talati J, Tiselius HG, Albala DM, YE Z, eds. Urolithiasis: basic science and clinical practice, 1st ed. London, UK: Springer, 2012; pp 21–38. Doi: 10.1007/978-1-4471-4387-1_3.
3. In: Talati J, Tiselius HG, Albala DM, YE Z, eds. Urolithiasis: basic science and clinical practice, 1st ed. London, UK: Springer, 2012. doi: 10.1007/978-1-4471-4387-1.
4. Türk C, Petřík A, Sarica K, Seitz C, Skolarikos A, Straub M, et al. EAU Guidelines on interventional treatment for urolithiasis. Eur Urol 2016;69:475-82. doi: 10.1016/j.eururo.2015.07.041.
5. Ahmed F, Zafar AM, Khan N, Haider Z, Ather MH. A paradigm shift in imaging for renal colic – is it time to say goodbye to an old trusted friend? Int J Surg 2010;8:252-6. doi: 10.1016/j.ijsu.2010.02.009.
6. Ingimarsson JP, Dagrosa LM, Hyams ES, Pais VM Jr. External validation of a preoperative renal stone grading system: reproducibility and inter-rater concordance of the Guy's stone score using preoperative computed tomography and rigorous postoperative stone-free criteria. Urology 2014;83:45-9. doi: 10.1016/j.urology.2013.07.065.
7. Nadeem M, Ather MH, Jamshaid A, Zaigham S, Mirza R, Salam B. Rationale use of unenhanced multi-detector CT (CT KUB) in evaluation of suspected renal colic. Int J Surg 2012;10:634-7. doi: 10.1016/j.ijsu.2012.08.010.
8. Vicentini FC, Marchini GS, Mazzucchi E, Claro JF, Srougi M. Utility of the Guy's stone score based on computed tomographic scan findings for predicting percutaneous nephrolithotomy outcomes. Urology 2014;83:1248-53. doi: 10.1016/j.urology.2014.01.020.
9. Thomas K, Smith NC, Hegarty N, Glass JM. The Guy's stone score – grading the complexity of percutaneous nephrolithotomy procedures. Urology 2011;78:277-81. doi: 10.1016/j.urology.2010.12.026.
10. Mitropoulos D, Jensen JB, Artibani W, Biyani CS, Rouprêt M, Truss M, et al. Validation of the Clavien-Dindo grading system in urology by the EAU guidelines ad hoc panel. Eur Urol Focus 2018;4:608-13. doi: 10.1016/j.euf.2016.10.009.
11. Lwanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. Geneva, Switzerland: World Health Organization; 1991 . [Online] 1991 [Cited 2022 July 20]. Available from URL: https://apps.who.int/iris/handle/10665/40062.
12. Rizvi SA, Hussain M, Askari SH, Hashmi A, Lal M, Zafar MN. Surgical outcomes of percutaneous nephrolithotomy in 3402 patients and results of stone analysis in 1559 patients. BJU Int 2017;120:702-9. doi: 10.1111/bju.13900.
13. Chen YH, Li WM, Juan YS, Huang TY, Wang YC, Lee HY, et al. A comparison of STONE nephrolithometry scoring system, Guy's stone score, and Seoul National University Renal Stone Complexity (S-ReSC) in predicting mini-PCNL stone-free rate.

Urolithiasis 2024;52:19. doi: 10.1007/s00240-023-01477-0.
14. Peter J, Bhat S, Paul F. STONE score versus Guy's Stone Score in the prediction of stone clearance in percutaneous nephrolithotomy: a cross-sectional study. J Clin Diagn Res 2024;18:PC01-4. doi: 10.7860/JCDR/2024/65355.18019.
15. Lee HY, Chen YH. MP04-15 A comparison of STONE nephrolithometry scoring system, Guy's stone score and Seoul National University Renal Stone Complexity (S-ReSC) in predicting mini-PCNL stone free rate. J Urol 2024;211:e40. doi: 10.1097/JU.0000000000003927.04.
16. Zou XC, Huang J, Yuan RM, Jin MN, Zeng T, Chao HC, et al. Prediction of preoperative stone-free rate in percutaneous nephrolithotomy based on CT clinical-radiomics nomogram: a comparative study with Guy's stone score and STONE score. Urolithiasis 2024;52:95-105. doi: 10.1007/s00240-023-01484-1.
17. Vernez SL, Okhunov Z, Motamedinia P, Bird VG, Okeke Z, Smith AD. Nephrolithometric scoring systems to predict outcomes of percutaneous nephrolithotomy. Rev Urol 2016;18:15-27. doi: 10.3909/riu0670.
18. Kumar U, Tomar V, Yadav SS, Priyadarshi S, Vyas N, Agarwal N, et al. STONE score versus Guy's Stone Score – prospective comparative evaluation for success rate and complications in percutaneous nephrolithotomy. Urol Ann 2018;10:76-81. doi: 10.4103/UA.UA_33_17.
19. Aminsharifi A, Irani D, Tayebi S, Jafari Kafash T, Shabanian T, Parsaei H, et al. Predicting the postoperative outcome of percutaneous nephrolithotomy with machine learning system: software validation and comparative analysis with Guy's Stone Score and the CROES Nomogram. J Endourol 2020;34:692-9. doi: 10.1089/end.2019.0734.

AUTHOR'S CONTRIBUTION:
LG: Concept and design.
SU: Data acquisition and collection.
SBY: Data analysis.
BH: Critical review.
TURG: Final approval.
RM: Agreement to be accountable for all aspects of the work.