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UTILITY OF THE GUY'S STONE SCORE IN PREDICTING DIFFERENT ASPECTS OF PERCUTANEOUS NEPHROLITHOTOMY.

Urology

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ABSTRACT

Introduction: The incidence of kidney stone disease has markedly increased during past 2 decades worldwide. With this dramatic increase in stone disease incidence and prevalence, use of Percutaneous Nephrolithotomy (PCNL) to treat large stone burden has continued to increase. Despite continuous refinements in surgical techniques and technology, overall complication rate of PCNL remains higher. This study was undertaken to understand role of Guy's stone scoring system, their feasibility, reproducibility, reliability and superiority for assessing their relative predictive value for Stone Free Rates (SFR) and surgical outcomes of PCNL, based upon our observations and overall results. **Materials And Methods:** A prospective observational study was conducted in the department of Urology at a tertiary care centre over a period of 18 months in which all patients with renal stones who fulfilled all inclusion and exclusion criteria and underwent Percutaneous Lithotripsy surgery were enrolled into the study. Guy's stone score was calculated for all the patients preoperatively and its role was assessed to determine the relative predictive value for stone free rates and surgical outcomes of PCNL. **Results:** The stone free rates as per Guy's stone scoring system were: The complications observed as per Clavien Grade 1 were in 11(16.67%) cases, Grade 2 in 21(31.82%), cases, Grade 3a in 3(4.54%) cases. No death was noted. The stone free rates according to Guy's stone score were 16/16 cases (100 %) in Grade 1, 28/30 cases (93.33 %) in grade 2, 3/11 cases (27.27 %) in Grade 3 and 1/9 cases (11.11 %) in Grade 4. **Conclusion:** Guy's scoring system is simple, easy to perform, and reliable system to grade stone complexity before PCNL. Guy's scoring system divides the renal stone into 4 different grades as per the complexity. Based on the complexity and grading of stone, Guy's scoring system has a strong positive correlation in predicting peri-operative outcomes like no. of puncture, total operative time, and length of hospital stay. Guy's scoring system has also good positive correlation with both stone free rate and rate of postoperative complications.

KEYWORDS

INTRODUCTION:

The incidence of kidney stone disease has markedly increased during past 2 decades worldwide. With this dramatic increase in stone disease incidence and prevalence, use of Percutaneous Nephrolithotomy (PCNL) to treat large stone burden has continued to increase. Despite continuous refinements in surgical techniques and technology, overall complication rate of PCNL remains higher.[1,2]

The stone burden and density, positional distribution, calyceal and anatomical complexity, degree of hydronephrosis and secondary changes demonstrates to play an important role in outcome of PCNL.[3] The Stone Free Rate (SFR) after PCNL has been variously reported to be from 56% to 76%.[4]However; comparison between multiple studies is difficult for two reasons –

1) There is no uniform grading system to categorize stone complexity.
2) Definition and way of assessment of stone clearance is not standardized.[5]

Although PCNL is considered as minimal invasive procedure, yet it has risk of significant complications and does not always render the patient stone free. Guidelines are available for the indications for PCNL and the Clavien system has been modified for grading of complications.[6]

Furthermore, there is no universally accepted grading system of stone complexity to ensure an appropriate comparison among studies. The existence of validated user-friendly stone score would assist in comparing outcomes and potentially aid in advising patients regarding the likelihood of a "Stone Free" outcome postoperatively.

In 2007 UK National PCNL audit by British Association of Urological Surgeons (BAUS) identified 'inability to stratify stone complexity' as a significant barrier towards derivation of meaningful audit conclusions.[7]

Two broad categories of scoring systems have been described aiming to be associated with SFR after PCNL.[8-10]

Firstly, Ordinal Scoring Systems which were derived from single institution analysis and categorised calculi into 'Ordered' grades of increasing complexity based predominantly on what experts thought were factors determining SFR (aided by historical data), and then further tested statistically.

Thomas K et al (2011)[8] described Stone Scoring System, "Guy's Stone Score" (GSS), which comprises 4 grades based upon renal anatomy, number of stone and patient factors. Okhunov Z et al[9](2013) proposed S.T.O.N.E. [stone size (S), tract length (T), obstruction (O), number of involved calices (N), and essence or stone density (E)] which integrates five components measured from preoperative CT images and quantitatively characterizes stone status to provide overall picture of complexity of surgical procedure.[9]

The second type, Smith A et al (2013)[10] proposed CROES (Clinical Research Office of the Endourological Society) nomogram for PCNL success. CROES is statistically derived data-driven risk estimator model based on regression modelling derived from multiple institutions. It gives continuous score that can 'predict' dependent outcome of SFR with explanatory variables of stone burden, case volume, prior stone treatment, staghorn stone, stone location, and stone count. Stone burden was best predictor of stone-free rate (Chi-square =30.27, p =0.001)[10]

CT provides high resolution spatial imaging for accurate characterization of stone size and distribution, pelvicalyceal anatomy, anomalies and anatomical relationships that may dictate feasibility and risks of different treatment modalities. With these measurable values of stone and patient features the GSS,[8] S.T.O.N.E. nephrolithometry[9] and the CROES nephrolithometry nomogram [10] were introduced for systematic and quantitative assessment of kidney stones. In addition to imaging characteristics, these models also take co-morbidities into account that contribute to disease outcome.[8-10] The scoring systems serve as disease stratification tools that allow the surgeon to more accurately predict PCNL outcomes to improve patient counselling and surgical planning.[8-10]

Another potential advantage of scoring systems is uniform and standardized reporting across different series. To date comparative evaluation of treatment for urolithiasis has been limited by lack of widely accepted and user-friendly stone scoring standardization system.[5]

This study was undertaken to understand role of Guy's stone scoring system, their feasibility, reproducibility, reliability and superiority for assessing their relative predictive value for Stone Free Rates (SFR) and surgical outcomes of PCNL, based upon our observations and overall results.

AIMS AND OBJECTIVES:

AIMS

To evaluate Guy's scoring system (GSS) as grading system for complexity of kidney stone before percutaneous nephrolithotomy (PCNL) as a predictor for different items of outcome.

OBJECTIVES

With the use of Guy's score
To predict number of punctures required for PCNL
To predict operative time during PCNL
To predict complications
To predict stone free rate (SFR)

MATERIALS AND METHODS:

A prospective observational study was conducted in the department of Urology at a tertiary care centre over a period of 18 months in which all patients with renal stones who fulfilled all inclusion and exclusion criteria and underwent Percutaneous Lithotripsy surgery were enrolled into the study. The inclusion and exclusion criteria were as follows:

Inclusion Criteria:

All patients with renal stone who got admitted and underwent PCNL surgery at hospital during study period.

Exclusion Criteria:

Patients with uncorrected bleeding disorders
Active urinary tract infection (UTI)
Patient with concomitant ureteric stone on same side

After obtaining ethical committee approval and informed consent, patients with renal calculi were enrolled into study.

Preoperative parameters included demographic like age and sex, detailed clinical history on basis of symptoms and its duration, associated co-morbidities, past calculus history, previous surgical intervention (especially urological) and family history of calculus disease, diabetes, hypertension, malignancy and were noted followed by thorough clinical examination.

Radiological assessment included details of stone location, site, size, number, stone density, calyceal involvement, dilated system and associated congenital & anatomical abnormalities by utilising Xray KUB, USG KUB and NCCT KUB.

After assessment Stone Scoring calculation was done in all study cases using Guy's stone scoring system on basis of imaging and pre-operative variables as follows:

Table 1: Guy's Stone Score

Grade	Description
Grade I	A solitary stone in the mid/lower pole with simple anatomy OR A solitary stone in the pelvis with simple anatomy
Grade II	A solitary stone in the upper pole with simple anatomy OR Multiple stones in a patient with simple anatomy OR Any solitary stone in a patient with abnormal anatomy
Grade III	Multiple stones in a patient with abnormal anatomy OR Stones in a calyceal diverticulum OR Partial Staghorn Calculus
Grade IV	Staghorn Calculus OR Any stone in a patient with spina bifida or spinal injury

Surgical Intervention in form of PCNL was performed.

Peri-operative variables included Operative side (Laterality of stones), Stone location, Stone size, Number of calyces involved, Anatomy of kidney (normal or abnormal) operative time, analgesic and blood requirement, length of hospital stay were noted and surgical complications (intraoperative and postoperative) according to modified Clavien system were observed. Post operatively Stone Free Status was assessed by X-Ray KUB /Non-Contrast CT /USG KUB within 30 days during follow up.

Outcome:

Outcomes were Stone Free Rate (SFR) and complications. SFR was evaluated by X-Ray KUB /Non-Contrast CT /USG KUB. Complications were recorded following latest guidelines according to modified Clavien Dindo Score specific for PCNL.

SFR was defined as absence of residual stones (no calculi) including presence of asymptomatic fragments ≤4 mm on X-Ray KUB /Non-Contrast CT /USG KUB [Clinically Insignificant Residual Fragments (CIRF)].

RESULTS:

This study was undertaken to understand and analyse role of Guy's stone scoring system.

In 66 cases of present study, Guy's Stone Scoring System was evaluated to establish feasibility, reproducibility, reliability for assessing predictive value for Stone Free Rates (SFR) and overall surgical outcomes. Cases were categorised as per Guy's Stone Score (GSS) into four Grades (Grade 1,2,3,4). The Demographic (Age, Sex) and Clinical characteristic (Laterality, S. Creatinine), Peri-operative parameters (Operative Time (OT), Length of Hospital Stay (LOS) were analysed and complications were Graded according to modified Clavien classification.

Outcome:

The outcome of our analysis was Stone Free Rate (SFR) as assessed by Non-Contrast CT/ X-Ray KUB /Renal Ultrasound. We used a cut off size of 4mm for Clinical Insignificant Residual Fragment (CIRF).

Other outcome analysis was aimed to identify the predictive value of the scoring system to assess feasibility, reliability and accuracy further based upon linear regression predictability for Operative Time (OT), Length of Hospital Stay (LOS) and complications according to modified Clavien classification.

Demographic Characteristics:

As regards age distribution majority of cases were in their productive years of life with mean age of 46.68± 11.81years. 45 males (68.18%) and 21 females (31.81%) fulfilled the study inclusion criteria.

Clinical Characteristics:

Out of total 66 cases of Renal Stones, left sided stones noted in 39 cases (59.10%) while 27 cases (40.90%) had right sided stone pathology. The mean S. Creatinine was 1.10mg±0.18 (SD) mg/dl. Mean stone burden was 1330.69 mm2±941.33mm2(SD).

Stone Scoring System:

It is evident from table 3 analysis that **Guy's Scoring System (GSS)** cases were divided into four Grades: - Grade 1: 16(24.24%) cases, Grade 2: 30(45.46%), Grade 3: 11(16.67%) and Grade 4: 9(13.63%) cases. Majority of cases were in Grade 2(45.46%) and least no. of cases 9(13.63%) noted in Grade 4.

Table 2: Distribution Of Cases As Per Guy's Stone Score

Guy Score Grade	N	%
Grade I	16	24.24
Grade II	30	45.46
Grade III	11	16.67
Grade IV	9	13.63

Perioperative Parameter:

Perioperative parameters calculated as No. of Puncture, Operative Time (OT in minutes), Length of Hospital Stay (LOS in days). Mean no. of Puncture was 1.53 ± 0.61, Mean operative time was 81.25 ± 22.58 min, while Length of hospital stay was 3.8±0.78 days.

Table 3: Peri-operative Parameters

Variable	Outcome
Number of Puncture	1.53 (Mean) ± 0.61 (SD)
Operative Time (OT in mins)	81.25 (Mean) ± 22.58 (SD)

Length of Hospital Stay (LOS in days)	3.8 (Mean) ± 0.78 (SD)

Perioperative Outcomes As Per GUY's STONE SCORE Scoring System:

It is evident from above table that the number of punctures required for pcnl, Mean Number of Puncture, mean operative time (OT) and mean hospital stay (LOS) were calculated according to scoring system as per grading.

Table 4: Distribution Of Peri-operative Parameters As Per Guy's Stone Score

Guy Score Grade	No. of Puncture	Operative Time (OT) mins	Length of Hospital Stay (LOS) days
Grade I	1.31 ± 0.48	50.75 ± 6.8	3
Grade II	1.40 ± 0.49	79.5 ± 6.93	3.73 ± 0.52
Grade III	1.63 ± 0.67	94 ± 17.08	4.27 ± 0.64
Grade IV	2.22 ± 0.67	114.1 ± 5.97	5
p Value	<0.01*	<0.01*	<0.01*

*: statistically significant

As the complexity of stone increased according to stone scoring No. Of PUNCTURE, OT, LOS were also found to be increased significantly (p <0.01) in Stone Scoring System.

Complications:

Operative complications were classified according to modified Clavien classification. Overall, 31(46.97%) cases had No complications while 35 (53.03%) cases experienced complications: The complication observed as per Clavien Grade 1 were in 11(16.67%) cases, Grade 2 in 21(31.82%), cases, Grade 3a in 3(4.54%) cases. No death was noted.

Table 5: Distribution Of Complications As Per Modified Clavien Classification

Complications	Frequency	Percentage
Clavien Grade 0	31	46.97 %
Clavien Grade 1	11	16.67 %
Clavien Grade 2	21	31.82 %
Clavien Grade 3a	3	4.54 %
Clavien Grade 3b	0	0 %

Complications As Per GUY's STONE SCORE Scoring System:

Complications as per modified Clavien grading6 were estimated as per scoring system Grades. When Clavien grading rate </= 2 it was considered as No or minor complications while Clavien grading >2 rating were considered under major complication.

Amongst GSS grading 1 & 2 No major complications were noted. In GSS Grade 3, out of 11 cases 1(9.09%) had manageable major complications and in 10(90.91%) cases had none /minor complication while amongst GSS Grade 4, out of 9 cases 2(22.22%) had manageable major complications and in 7 (77.78%) cases had none /minor complication. p value was <0.01.

On the basis of this stone scoring Grade system the rate of major complication was high as the stone complexity increased.

Table 6: Distribution Of Complications As Per Guy's Stone Score Scoring System

Scoring system	No/Minor complications		Major complications	
	N	%	N	%
Guy's score Grade 1: (16)	16	100	0	0
Grade 2: (30)	30	100	0	0
Grade 3: (11)	10	90.91 77.78	1	9.09
Grade 4: (9)	7		2	22.22
p value	<0.01*			

*: statistically significant

Stone Free Rate (SFR):

The Stone Free Rate (SFR) amongst PCNL cases in this study were calculated finally on the basis of NCCT/KUB/USG imaging. Out of total 66 cases overall stone-free was observed in 48(72%) cases while 18(28%) cases were not stone free.

Stone Free v/s Non-Stone Free as per Guy's Stone Scoring System:

Guy's SS the SFR success v/s SFR failure results estimated were observed mean 1.76 ± 0.61 and 3.33 ± 0.68 respectively. The p value ($p < 0.01$) is statistically significant.

Table 7: Stone Free v/s Non Stone Free As Per Guy's Stone Scoring System

Stone Scoring System(SSS)	Stone Free	Non-Stone Free	t- test	p value
Guy's Score (GSS) (Mean±SD)	1.76 ± 0.61	3.33 ± 0.68	8.47	<0.01*

*: statistically significant

Stone Free v/s Non-Stone Free as per Guy's SS grading:

In Guy's Scoring System (GSS), cases were divided into four Grades. Grade 1: comprised of total 16 cases, all cases were stone free (100% success). Grade 2: comprised of total 30 cases, out of these 28(93.33%) cases were stone free while 2(6.67%) were non stone free. Grade 3: comprised of total 11 cases, out of them 3(27.27%) cases were stone free while8(72.73%) were non stone free. Grade 4: comprised of 9 cases out of these 8(88.89%) were non stone free and only 1(11.11%) cases were stone free.

Table 8: Stone Free v/s Non Stone Free As Per GSS Grading

GSS	Total cases	Stone Free	Non Stone Free	Chi Test	p value
GSS Grade 1	16	16(100%)	0(0%)	38.06	<0.01*
Grade 2	30	28(93.33%)	2(6.67%)		
Grade 3	11	3(27.27%)	8(72.73%)		
Grade 4	9	1(11.11%)	8(88.89%)		
Total	66	48(72.72%)	18(27.28%)	--	--

*: statistically significant

DISCUSSION:

For large and complex renal stone, Per Cutaneous Nephrolithotomy (PCNL) has emerged as a well-established standard treatment of choice. It is a minimal invasive procedure providing high success rate and safety profile. PCNL is also associated with variable outcomes based upon renal anatomy, number of stones, involvement of calices, stone burden, complexity and other predictors. Various Stone Scoring Systems have come into practice to validate and assess predictive nomograms which can significantly add to preoperative treatment planning and patient counselling.

The Guy's Stone Score (GSS) per grading was developed by Thomas K et al (2011)[8] to predict SFR based on stone complexity; Ingimarson et al (2014)[11] validated the GSS, higher the grade will be associated with decrease SFR.

The Guy's Score includes number of stones, abnormal renal anatomy and calyceal diverticulum All the scoring systems include a measure of stone complexity. Staghorn or partial staghorn stone formation is mostly used to indicate the complexity of a stone and is included as a variable in the GSS. [8,10]These scoring systems are susceptible to score variations caused by subjective interpretation to stone burden and location.[8,11]

When considering the optimal scoring system, it is essential that it must be reproducible, easily implementable and adequately comprehensive for thorough reporting and comparison. GSS score determination requires only assessing renal imaging which can be done at centres where CT is available. GSS is associated with predicting complications. It is comparatively less cumbersome.

The GSS has been validated in many reported studies as good inter-rater concordance.[11]

The present prospective clinical comparative study was carried out on 66 cases of renal stones in the department of urology at a tertiary care centre during a period of Jan 2020 to July 2021 to evaluate basic demographic, clinical and imaging parameters to assess Guy's scoring systems in each and every case for grading and scoring per Guy's SS and to identify independent predictors for post operative SFR and complications after PCNL in Guy's scoring system.

Demographic Variables:

As regards demographic variable, overall mean Age± SD was 46.68± 11.81 years. The Sex ratio (M: F) was = 2:1, 45(68.18%): 21 (31.81%).

In multicentric study done by Tailly T et al (2015) [12] mean Age± SD was 55.8± 15.1 years. Amongst our study male gender predominance was observed similar findings have been reported by other authors.

CLINICAL CHARACTERISTICS:

As regards laterality amongst our cases left sided stones noted in 39(59.10%) cases while on right side 27(40.90%) cases. Mean stone burden was 1330.69 mm2±941.3mm2(SD). Evidently mean Stone burden was higher in this study. The mean S. Creatinine was 1.10 mg±0.18(SD) mg/dl. (Range was being to 0.50-2.2 mg/dl) Tailly T et al (2015)[12] reported left sided stones in 53.6% cases while 47.4% cases had right sided stone pathology. Mean stone burden was 714 mm2±817 (SD). Yarimoglu S et al (2017)28 observed left sided stones in 55.6% cases while 44.4% cases had right sided stone pathology. Mean stone burden was 959 mm2±647 (SD).

STONE SCORING SYSTEM:

The mean Guy's SS, was 2.19 ± 0.96, in present study of 66 cases while in multicentric large study of 586 cases reported by Tailey et al (2016)[12] in the literature mean Guy's SS, was 2± 1. Yarimoglu et al (2017)[13] observed mean Guy's SS as: 3.5 ± 0.5. Our mean scores of Guy's findings are corroborative with these studies.

PERI OPERATIVE OUTCOME AND COMPLICATIONS:

In our study, overall mean **No. of Puncture** was 1.53 ± 0.61. Minimum was 1 and maximum was 3. Mean No. of puncture in GS1, GS2, GS3, GS4 grades was1.31 ± 0.48, 1.40 ± 0.49, 1.63 ± 0.67, 2.22 ± 0.67 respectively. In study conducted by Khalil et al (2018)36, mean number of punctures in GS1, GS2, GS3, GS4 was 1.16 ± 0.37, 1.39 ± 0.49, 1.41 ± 0.5, 1.46 ± 0.52. respectively which was similar for GS1 and GS2 grade and slightly lower than our study in GS3 and GS4 grade.

In our study, mean **total operative time** was 81.25 ± 22.58 min. Minimum 43 was and maximum was 120 min. Mean Operative time in GS1, GS2, GS3, GS4 grades was 50.76 ± 6.8, 79.5 ± 6.93, 94 ± 17.08, 114.1 ± 5.97 min respectively. In the study conducted by Khalil et all (2018)36, mean operative time in GS1, GS2, GS3, GS4 was 69.5 ± 13.4, 111.4 ± 14.5, 128.2 ± 22.2, 153.9 ± 43.5 minute respectively which was slightly higher than our study. In study conducted by Taily T et al. (2016)[12], mean total operative time was 100±54 min which was slightly higher than our study. In study conducted by Yarimoglu S et al (2017)[13], mean total operative time was 124.5±44.1 min which was slightly higher than our study.

In our study, overall mean **Length of Hospital Stay** was 3.8 ± 0.75 days. Minimum was 3 and maximum was 6 days. Mean Length of Hospital Stay in GS1, GS2, GS3, GS4 grades was 3, 3.73 ± 0.52, 4.27 ± 0.64, 5 days respectively. In study conducted by Taily T et al. (2016)[12], mean Length of Hospital Stay was 3.2±2.4 days which was slightly lower than our study. In the study conducted by Yarimoglu S et al (2017)[13], mean Length of Hospital Stay was 4.3±2.8 days which was slightly higher than our study.

Overall, 31(46.97%) cases had No complications while 35(53.03%) cases experienced complications: The **complication observed as per Clavien** Grade 1 were in 11(16.67%) cases, Grade 2 in 21(31.82%), cases, Grade 3a in 3(4.54%) cases, no death was noted. In multicentre external validation of stone scoring Study by Taily T et al. (2016)[12] Overall, 70.8% cases had No complications while 29.2% cases experienced complications: Clavien Grade 1 in 21.5% cases, Clavien Grade 2 in 4.3% cases, Clavien Grade 3a in 1.7% cases, Clavien Grade 3b in 1.2% cases while Clavien Grade 4 complications were in 0.5% cases. In Yarimoglu S et al (2017)[13] study, overall 63.8.8% cases had No complications while 36.2% cases experienced complications: Clavien Grade 1 in 12.5% cases, Clavien Grade 2 in 9.4% cases, Clavien Grade 3a in 12.5% cases, Clavien Grade 3b in 1.9% cases while none in Clavien Grade 4.

PERI-OPERATIVE COMPLICATIONS AS PER GUY'S STONE SCORING SYSTEMS (GSS):

The complications were evaluated in this study based upon modified Clavien grading system.[6,14] The Clavien grading of below or equal to 2 were considered as: none or minor complication while complication above Clavien grade 2 were labelled as: major complication.

Complication In GSS Group:

Amongst GSS grade 1 and 2 cases no major complications were noted, In GSS grade 3, out of 11 ,1 (9.09%) had complication more than Clavien grade 2 (considered under major complication). In GSS grade 4 cases, out of 9, 2(22.22%) had major complication (Clavien grade > 2). Poudyal S et al (2017)[15] recently published the study showing complications related to scoring system. 2.3 % cases in GSS grade 1; no cases in grade 2, 26% in grade 3, and 20 % in grade 4 had major complications (clavien grade>2).

Major complication is noted in higher the GSS grade cases.

On the basis of this scoring system the rate of major complications was high with increase in stone complexity.

Stone Free Rate (SFR):

In present study overall Stone Free Rate (SFR) observed 72% confirmed by NCCT/KUB/USG imaging. Various authors like Labadie K et al (2014)[16], Tailly T et al (2016)[12] and Yarimoglu S et al (2017)[13] have reported stone free rate of 56%, 67.4% and 59% respectively. Our SFR results are marginally higher, yet are in close proximity to other reported studies.

Stone Free Status As Per Guy's Stone Scoring System (GSS):

On present prospective study analysis Guy's SS amongst SFR success group v/s SFR failure cases results observed were 1.76 ± 0.61 and 3.33 ± 0.68 respectively ($p < 0.001$). GSS reported by Labadie K et al (2014)[16] scores were: SFR success group as 2.2 and in SFR failure group it was 2.7 while Yarimoglu et al (2017)[13] amongst study of stag horn calculi found Guys score 3.4 in SFR success group and 3.6 amongst failure cases. Higher the Guys score higher the failure rate.

STONE FREE STATUS PER STONE SCORING GRADE GROUP:

Guy's Scoring System (GSS):

Study performed by Labadie K et al (2014)23 showed 70.2% cases in GSS grade 1, 65.4% in grade 2, 48.1% in grade 3 and 35.9% in grade 4 were stone free. Tailly T et al (2016)[12] demonstrated 80.3% cases in GSS grade 1, 73.8 % in grade 2, 60.5 % in grade 3 and 52.3% in grade 4 were stone free. In our study all cases of Guy's Scoring System (GSS) grade 1 (100% success), 93.33% cases of Grade 2, 27.27% cases of Grade 3 and only 11.11% cases of Grade 4 were stone free.

Our study as well as different studies demonstrated that as complexity of stone increased, stone free rate decreased accordingly.

CONCLUSION:

Guy's scoring system is simple, easy to perform, and reliable system to grade stone complexity before PCNL. Guy's scoring system divides renal stones into 4 different grades as per complexity. Based on complexity and grading of stone, Guy's scoring system has strong positive correlation in predicting peri-operative outcomes like number of punctures, total operative time and length of hospital stay. Guy's scoring system has also good positive correlation with both stone free rate and rate of postoperative complications.

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