ORIGINAL RESEARCH PAPER

Surgery

KEY WORDS: Guy's Stone Score, GSS, PCNL, Stone free rate.

GUY'S STONE SCORE (GSS) RELATIONSHIP WITH STONES FREE RATE ON PERCUTANEOUS NEPHROLITHOTOMY (PCNL) PROCEDURE AT ADAM MALIK HOSPITAL MEDAN

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ABSTRACT

INTRODUCTION: Percutaneous Nephrolithotomy (PCNL) is one of the minimally invasive actions in the field of urology aimed at removing kidney stones using percutaneous access to reach the pelviocalises system. One of the simplest and applicative scoring systems as a predictor of the free number of stones in the PCNL procedure is Guy's Stone Score. The purpose of this research is to know the relationship of Guy's Stone Score and stone free number after PCNL procedure at Adam Malik Hospital Medan.

METHODS: This research is an analytical study with prospective design. During the period of October 2016 to April 2017, 34 patients with kidney stones were found in the PCNL procedure aged> 18 years, with stone size> 20 mm were included in this study but patients who had already done ESWL or endourology were excluded from this study.

RESULTS: Mean age of patient was 51.02 ± 10.4 years with number of men and women were 18 and 16 respectively (52.9% and 47.1%), mean BMI 23.3 ± 2.9 with overweight body mass index of 17 (50%) patients. Total stones was dominated by the radiopaque rock group in 32 patients (94.1%) and treatment success with stone free rate parameters in 27 (79.4%) patients. Of the 34 patients, Guy Stone Score 4 was the largest proportion in 13 (38.2%) patients and Guy Stone Score 1 was the lowest in 6 patients (17.6%). Average patient age from Guys Stone Score 1,2,3,4 were 50.5 ± 10.2, 48.1 ± 9.7, 47 ± 8.8, 55.2 ± 11.3. The radiopaque stone description dominates Guy Stone's Score population of 1 to 4 in 100%, 75%, 100%, and 100%. The result of stone free rate on Guys Stone Score 1-4 is 100%, 87.5%, 71.4%, and 69.2% respectively, with p-Value 0.102 in which there was no statistically significant relationship between GSS grading and stone free rate.

CONCLUSION: There is a relationship between GSS with stone free number (r=1.0 and p = 0,000).

INTRODUCTION:

Percutaneous Nephrolithotomy (PCNL) is one of the minimally invasive actions in the field of urology aimed at removing kidney stones using percutaneous access to reach the pelviocalise system (Nugroho D, et al, 2011, Purnomo B, Urology Basics 2011; Wein A. J et al , Campbell-Walsh Urology, 2016). The advantage of the PCNL procedure is that the rock-free number larger than ESWL, can be used for large-scale kidney stones (> 20 mm) therapy, can be used on inferior calix stone that hard to treat with ESWL, and lower morbidity compared to open surgery in both systemic and preservation responses to postoperative renal function. (Nugroho D, et al, 2011).

The weakness of PCNL requires special skills and experience to perform its procedures. Currently open kidney stone surgery has been largely replaced by PCNL and ESWL procedures in both monotherapy and combination forms, due to greater open-operative morbidity than PCNL and ESWL (Kyriazis et al 2015, Nugroho D, et al., 2011).

The PCNL indications are 1. stone in the pelvicalises system that is not suited to ESWL 2. fails with ESWL management 3. stones with ureteric obstruction pelvic junction 4. Stones on Calix diverticicles 5. Anatomical abnormalities (eg, horse horseshoe) (Hohenfellner et al., Manual Endourology 2005; Nugroho D, et al., 2011). Contra absolute indications are the presence of active urinary tract infection and coagulopathy. The relative indication is that transabdominal renal surgery performed previously may result in retinal rectal projection. (Hohenfellner et al, 2005 and Nugroho D, et al., 2011).

The success of PCNL in the management of large kidney stones began to shift open surgical procedures. Although minimally invasive, PCNL is a major surgery that has a risk of complications (Thomas et al 2002). After completion of PCNL, the use of nephrostomy drainage is usually recommended. Postoperative nephrostomy post-PCNL hoses have several objectives, among others, as bleeding tamponade arising from the pathway of nephrostomy lesions, providing an opportunity for renal puncture to recover, urinary drainage, and providing access to the pelvicalises system when further PCNL (Hohenfellner et al, Manual Endourology 2005, Nugroho et al. 2011; Wein A. J et al., Campbell-Walsh Urology, 2016).

Tubeless PCNL is indicated in cases with low stone burden and in simple, fast and uncomplicated procedures. This latter action may be combined with the use of DJ stents or catheter ureters to make adequate urinary drainage and accelerate the healing of pelviocalise system injuries (Hohenfellner et al, Manual Endourology 2005, Nugroho et al., 2011; Wein A. Jal al, Campbell-Walsh Urology, 2016).

Guy's Stone Score is an easy-to-understand, valid and reliable method to explain the state of stone and predict stone-free numbers. . (Mandal et al., 2012; Noureldin A, et al 2014, Thomas K, 2011). Surgeons can use Guy's stone score to compare between the results of his work and the prediction of a stone-free number according to Guy's stone score. It can also be useful for preoperative and durante operative preparations. . (Mandal et al., 2012; Noureldin A, et al 2014, Thomas K, 2011).

The increase size of the stone, the location of the stone in the Calix, the printed stone and the moderate to severe hydronephrosis associated with the low number of free stones after PCNL (Zhu et al., 2011). Primary stone free numbers differ significantly on small stones (<2 cm) compared to large stones (> 2 cm) (90.8% vs 76.3%, p = 0.007). At PCNL it will be done in prone position. After 1998, Valdivia Uria described a series of patients undergoing a supine-positioned procedure. Some position changes are attempted to optimize results and prevent complications. The PCNL procedure becomes more difficult in patients with printed stones than patients who are not stones. According to the research of Astroza et al, the free number of rocks of stone patients with PCNL procedure in prone position was higher than supine position (59.2% vs 48.4%, p <0.001) (abdelhafez et al, 2012). The surface area of the pelvicalises system is an anatomical factor that affects the success of PCNL. And patients with an area of pelvicalises <20.5 cm2 have a higher success rate (Binbay et al, 2011). PCNL remains safe for patients aged over 65 years with 85% free stone rates for all types of stones (Karami et al, 2010).

METHODS

This research is an analytical study with prospective design. During the period of October 2016 to April 2017, 34 patients with kidney stones were found in the PCNL procedure with aged > 18 years, rock size > 20 mm were included in this study but patients who had already done ESWL or endourology were excluded from this study. Sampling is done by consecutive sampling. The minimum number of samples calculated based on the formula is 28 people.

RESULTS

The mean age of patient was 51.02 ± 10.4 years with number of men and women were 18 and 16 patients respectively (52.9% and 47.1%), mean BMI was 23.3 ± 2.9 with overweight body mass index was found of 17 (50%) patients. Total stones was dominated by the radiopaque stone group in 32 patients (94.1%) and treatment success with stone free rate parameters in 27 (79.4%) patients. Of the 34 patients we analyzed, Guy Stone Score 4 was the largest proportion in 13 (38.2%) patients and Guy Stone Score 1 was the lowest in 6 patients (17.6%). Average patient age from Guys Stone Score 1,2,3,4 were 50.5 ± 10.2, 48.1 ± 9.7, 47 ± 8.8, 55.2 ± 11.3. The radiopaque stone description dominates by Guy Stone's Score of 1 to 4 are 100%, 75%, 100%, 100%. The result of Stone free rate on Guys Stone Score 1-4 is 100%, 87.5%, 71.4%, and 69.2% respectively, with p-Value 0.102 where there is no statistically significant relationship between GSS grading and Stone free rate.

Tablel 1. Sample Characteristics

Variable	Descriptive N (%)
Age	51.02 ± 10.4
Gender	
Male	18 (52.9%)
Female	16 (47.1%)
BMI	
Mean	23.3 ± 2.9
Underweight	2 (5.9%)
Normal	15 (44.1%)
Overweight	17 (50%)
Radiography	
Radiolucent	2 (5.9%)
Radioopaque	32 (94.1%)
Position	
Prone	17 (50%)
Supine	17 (50%)
Stone Free	
No	7 (20.6%)
Yes	27 (79.4%)

Tabel 2. Distribution of Guy's Stone Score.

Variable	Descriptive
GSS (Guy Stone Score):	
Ÿ 1	6 (17.6%)
Ÿ 2	8 (23.5%)
Ÿ 3	7 (20.6%)
Ÿ 4	13 (38.2%)
Total	34 (100%)

Of the 34 patients, Guy Stone Score 4 was the highest with 13 patients (38.2%) and Guy Stone Score 1 was the lowest, held by 6 patients (17.6%). We also analyze patient characteristics based on Guy Stone Score, with distribution distribution like the table below.

Table 3 Patients Characteristics based on GSS

Variable N: 34	GSS 1 N: 6 (%)	GSS 2 N: 8 (%)	GSS 3 N: 7 (%)	GSS 4 N: 13 (%)
Age	50.5 ± 10.2	48.1 ± 9.7	47 ± 8.8	55.2 ± 11.3
BMI	24.3 ± 2.3	22.8 ± 2.5	23.2 ± 3.8	23.3 ± 3.04
Stone Burden	27.6 ± 7.9	32.1 ± 14.4	33.5 ± 7.4	41.8 ± 8.4
Male : Female Ratio	4:2	3:5	2:5	9:4
Radiography				0 (0%)
Ÿ Radiolucent	0 (0%)	2 (25%)	0 (0%)	13
Ÿ Radioopaque	6 (100%)	6 (75%)	7 (100%)	(100%)
Posisi:				
Ÿ Prone	4 (66.7%)	3 (37.5%)	5 (71.4%)	5 (38.5%)
Ÿ Supine	2 (33.3%)	5 (62.5%)	2 (28.6%)	8 (61.5%)
BMI:				
Ÿ Underweight	0 (0%)	0 (0%)	1 (14.3%)	1 (7,7%)
Ÿ Normal	2 (33,3%)	6 (75%)	3 (42.9%)	4 (30.8%)
Ÿ Overweight	4 (66.7%)	2 (25%)	3 (42.9%)	8 (61.5%)

Average patient age from Guys Stone Score 1,2,3,4 were 50.5 ± 10.2, 48.1 ± 9.7, 47 ± 8.8, 55.2 ± 11.3. The male sex ratio compared to female was 2: 1. Guy Stone Scores 1 and 4 were male-dominated, while Guy Stone Scores 2 and 3 are female-dominated. On radiological examination, radiographic stone stones predominate polpulations of Guy Stone Scores 1 to 4 in 100%, 75%, 100%, 100% respectively.

Table. 4. Relation between Guy's Stone Score with Stone Free Rate

GSS	Stone free	Residual Stone	% free	
1	6	0	100%	r = -1,0
2	7	1	87.5%	p = 0,000
3	5	2	71.4%	
4	9	4	69.2%	
Total	27	7		

DISCUSION:

Previously, there was no precise scoring system to predict PCNL outcomes and complication rates, which is very important for doctors and patients. The ideal scoring system should be easy to perform and should have good determinants, be able to manage patients in risk groups according to their prognosis and predict results and complications including SFR (Stone Free Rate) after PCNL. This is very important for patient counseling, surgeon training, and action planning. Several studies have attempted to classify PCNL to predict outcomes and complications. Currently, the urolithiasis assessment system for PCNL results has been developed including Guy Stone Score (GSS), STONE nephrometry and CROES nephrolithometric nomogram. Guy Stone Score, STONE nephrometry and CROES nomogram are used as stratification systems for surgical planning and patient counseling in the aspect of surgical outcome, but only GSS and STONE nephrometry scores are associated with possible complications.

Guy Stone Score (GSS) is the first reported and simplest scale to be reliable for predicting success rates. Research Thomas et al. Using the GSS scale to evaluate SFR in 100 patients undergoing PCNL, and reporting GSS prediction values for SFR as follows: 1-81% Class, Class 2-72.4%, 3-35% grade and grade 4-29%. Then Vicentini et al used Guy's Stone Score (GSS) to predict PCNL results in supine position based on CT scan and reported SFR as follows: 95%, 79.5%, 59.5% and 40.7% for Class 1-4. Vincentini and the team confirmed the utility of the GSS system based on CT scans with accurate evaluation of kidney stones in relation to surgical outcomes and complications.

Several studies have reported the use of CT (computed tomographic) scans in GSS estimates to be more accurate. CT scans were used as preoperative investigations in stone patients, which improved the accuracy of stone and kidney information as well as the urinary system. We agree that preoperative CT scans may provide more accurate anatomy-related details such as the stone characteristics and anatomy of the pelviocalices system, which is a factor in the assessment of this system. However, GSS is based on BNO photos and intravenous urography is reasonably priced and is a common routine investigation in stone patients especially in developing countries with high prevalence of stone disease. This investigation has the added benefit of a lower radiation dose than CT scan.

In our study we used GSS to predict PCNL results in either supine or prone positions and obtain SFR as follows: 100%, 87.5%, 71.4% and 69.2% for grade 1-4. This result is in line with research

conducted by Vincentini et al who use CT scans. This study confirms that GSS based on BNO photographs and intravenous urography is a valuable modality in predicting outcomes and rates of post-PCNL complications. Success rates, operating times, surgical rates (tubeless rates), and complications were significantly different in each GSS group. Fewer numbers of all positive result parameters and more complications were found in patients with higher GSS scores.

Based on our study, we found no significant differences in patient age. This is shown from the range of patients whose variations are quite close and do not affect post-PCNL outcomes. In the literature it is clear that the increase in age and BMI affect the poor prognosis post PCNL. The obese group (n = 8) alone in our study fell into the category of GSS 4 with lower SFR.

Limitations. The number of patients in this study was small and did not recruit patients with other factors such as renal anomalies that could affect the outcome. Only Guy's Stone Score (GSS) used in this study was based on BNO and intravenous pyelogram (IVP) to predict the results, so it can not be compared with other scores, requiring CT scans. In addition, in this study PCNL procedures performed more than one operator, so that in the future there is expected to research with one operator. A prospective or prospective meta-analysis is needed in the future.

CONCLUSION

Based on the results of data analysis obtained, then the conclusion that can be taken in this research is there is relationship between GSS with stone free number (r = 1.0 p = 0.000).

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