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**ORIGINAL ARTICLE**

# Efficacy of Seoul National University Renal Stone Complexity Score for Predicting Stone Free Rate after Percutaneous Nephrolithotomy

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## ABSTRACT

**Aim**: To determine the frequency of stone clearance following single tract percutaneous nephrolithotomy and evaluate the reliability of the renal stone.
**Study Design:** Descriptive study
**Place and duration of study:** Department of Urology, SIUT, Karachi from 1st January 2020 to 31st October 2021.
**Methodology:** One hundred and forty four patients were enrolled. Patients were classified into three groups, low, medium and high score group based on Seoul Renal Stone Complexity Scoring System. To determine the SFR, all patients were followed with ultrasound and X-ray KUB for 30th day after the surgery.
**Results:** The patients' mean age was 34.51±12.57 years. The mean SReSC score was 4.00±1.96. There were 106(73.61%) males and 38(26.39%) patients were females. SReSC score was low in 71 patients (49.31%), medium in 45 patients (31.25%), and high in 28 patients (19.44%). 114(79.17%) patients were found to be stone-free. The SFR was greater among patients with a low S-ReSC score 98.6%.
**Conclusion:** The S-ReCSC scoring system is valuable in predicting of the post PCNL stone free rate.
**Keywords:** Seoul National University Renal Stone Complexity Score, Stone free rate, Percutaneous Nephrolithotomy.

## INTRODUCTION

According to the regional distribution, 1% to 20% of people will experience renal stone disease at some stage of their lives. The risk of developing stone disease over a person's lifetime varies depending on intrinsic (patient-specific: sex, age, family history, and other illnesses) and extrinsic (fluid intake, diet, lifestyle, climate, and country of evidence) factors[1]. Compared to the eastern zone (1–5%), the prevalence of renal stones is higher in the western zone (5–9% in Europe and 13%–15% in the United States)[2]. It makes up about 60% of all urological cases in Pakistan[3]. For the diagnosis of renal stones, a number of imaging modalities are available, including intravenous pyelography (IVP), non-contrast enhanced computed tomography (NCCT), and X-ray kidney, ureter, and bladder (KUB). Before percutaneous nephrolithotomy, enhanced noncontrast computed tomography (NCCT) was the most common imaging modality. It offers greater pelvicalyceal anatomical data and stone dimensions and distribution that are more accurate. Additionally, it provides details on stone density, obstructive symptoms, and tract length, all of which aid in better surgical planning[4-6]. Oddly enough, surgical stone removal is not the end of the illness process; at least 50% of people will develop another stone within 10 years of the first one, according to research[7].

For the treatment of kidney stones, a variety of non-invasive to minimally invasive treatments are now available. PCNL is the gold standard treatment option for large, complicated kidney stones; it has totally superseded open surgery as it is a minimally invasive procedure with good safety characteristics, a lower cost, and a higher stone-free rate. Although it was first introduced three decades ago, there is still no single standardised system to precisely estimate the stone-free rates (SFR) before surgery[8,9]. According to estimates, the overall stone clearance following PCNL ranges from 56 to 75%[10,11].

One important factor to consider when assessing the success of a stone surgery is the stone-free rate. It is difficult to objectively measure SFR because of various factors, which include stone types under treatment, fragment migration into the inaccessible calyx, post-operative imaging, and the ideal period of imaging. The fact that the type of stone treated has a direct impact on the stone-free rate is no coincidence. Some researchers have employed just non-contrast CT imaging for stone clearance; however, the majority of studies have used both x-rays and ultrasounds. In numerous investigations, postoperative imaging was performed from postoperative day 1 through 90. Some studies on conventional percutaneous nephrolithotomy (PCNL) have used 4 mm as the cutoff for inconsequential fragments, while others have ignored the determination of fragment size; stone-free rates (SFR) decrease with more severe definitions for stone removal. [12] The Seoul-National University for Renal Stone Complexity (S-ReSC) score method was recently published. [13] It is user-friendly and accurate in predicting the stone-free rates following percutaneous nephrolithotomy. The score is determined by the number of involved sites, irrespective of the size and quantity of stones.

Pakistan is situated in an area known as the "stone belt," where stone disease is very common. [3] Although percutaneous nephrolithotomy (PCNL) is a widely used operation to treat renal stones, there is currently no preoperative approach or instrument that can be used to predict stone clearance before PCNL[14]. Our study can assist us in counseling patients regarding the possible need for any auxiliary procedures and stone clearance prior to surgery. Urologists can also utilise it to compare the actual and anticipated stone-free rates.

## MATERIALS AND METHODS

This descriptive Study was conducted at Department of Urology, Sindh Institute of Urology & Transplantation (SIUT) Karachi after approval from Ethics Review Committee (ERC). Patients who underwent single tract percutaneous nephrolithomy between January 2020 and October 2021 were included by non-probability consecutive technique until a sample size of 144 patients was achieved. Informed written consent was obtained from all the participants. Patients were scored according to the Seoul Renal stone complexity scoring system and divided into three Groups, low group (1-2), Medium group (3-4) and High group (5-9). All the study patient Underwent Ultrasound and Non-contrast Computed Tomography (NCCT) for Kidney-Ureter-Bladder (KUB) before the procedure, and follow up after one month with Ultrasound KUB to assess the stone free rate. The Data analysis was carried out using SPSS-23. Effect modifiers like age, gender, stone Site and grade were compared to determine the difference using Chi-square test. A p-value <0.05 was considered as significant.

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## RESULTS

The mean age of patients was 34.51±12.57 years range 15-60 years. Mean SReSC score was 4.00±1.96 range between 1-9.There were more male 106(73.61%) as compared to female 38(26.39%) patients. Left side PCNL was performed in 73(50.69%), right in 70(48.61) and bilateral in just 01(0.69%) patient. S-ReSC score was low in 71(49.31%) patients, medium in 45(31.25%) patients and high in 28(19.44%) patients .Stone free rate (SFR) was observed in 114(79.17%) patients (Table 1).

On stratification no statistically significant correlation was found between Stone free rate and age or gender of the patient. There was no association of side of PCNL and SReSC category with stone free rate (Table 2).

Table 1: Demographic information of the patients (n=144)

| Variable | No. | % |
|---|---|---|
| **Gender** | | |
| Male | 106 | 73.61 |
| Female | 38 | 26.39 |
| **Site of Percutaneous Nephrolithotomy** | | |
| Left | 73 | 50.69 |
| Home | 70 | 48.61 |
| Bilateral | 1 | 0.69 |
| **SReSC score category** | | |
| Low | 71 | 49.31 |
| Suicide | 45 | 31.25 |
| High | 28 | 19.44 |
| **Frequency of stone free rate** | | |
| Yes | 114 | 79.17 |
| No | 30 | 20.38 |

Table 2: Different variables association of SReSC with stone free rate (n=144)

| Variable | Stone Free Rate | | P value |
|---|---|---|---|
| | Yes | No | |
| **Age (years)** | | | |
| 15-33 | 61 | 13 | 0.321 |
| 34-60 | 53 | 17 | |
| **Association of gender with stone free rate** | | | |
| Male | 82 | 24 | 0.372 |
| Female | 32 | 06 | |
| **Association of side of PCNL with stone free rate** | | | |
| Left | 61 | 12 | 0.345 |
| Right | 52 | 18 | |
| Bilateral | 01 | 0 | |
| **Association of SReSC with stone free rate** | | | |
| Low | 70 | 01 | <0.001 |
| Medium | 34 | 11 | |
| High | 10 | 18 | |

## DISCUSSION

To accurately retrieve renal stones, it is necessary to comprehend the architecture of the complex pelvicalyceal system. Sampaio and colleagues[15] introduced the anatomical classification in research and described two primary divisions of calyxes. Previous researchers[16-18] has created various scoring systems for predicting surgical outcomes. "Guy's stone score" included stone number, placement, Staghorn shape, and anomalous anatomy in the establishment of grades, and SFR reduced with rising grade[19]. The distinction between upper pole and other pole stone placements in Grades I and II reflected surgical challenges in earlier studies[11] However, it appears that this scoring system is not commonly employed because it does not permit prompt grade determination. Staghorn morphometry is a new prediction model based on the precise assessment of stone volume, but this paradigm necessitates the software that is not openly accessible. In addition, surgical difficulties in context to renal stone removal have previously been connected with a complicative architectural procedure. This historical procedure was attributed with a renal-collecting system independent of the stone size.

The essential concept of the S-ReSC score system is that the locational diversity of calculi is the most reliable indicator of SFR after PCNL[13]. This way of scoring might have some flaws. It can't show if there are disparities in SFR between different-sized stones in an identical calyx. Despite these drawbacks, the S-ReSC scoring method is extremely user-friendly, quantitative, precise, and reproducible. In addition, all evaluators were able to accurately assess the S-ReSC results. An AUC of 0.86 was obtained in the initial study reporting S-ReSC for predicting SFR post-PCNL [13].

In the present study, the overall stone-free rate was 79.17%, higher in patients with a low S-ReSC score (98.6%).

Choo et al.20 did a validation study on the S-ReSC score and came to the conclusion that it is a good way to predict the SFR in PCNL.They reported an overall SFR of 65.4% regarding categories of S-ReSC score, the SFR was 83.9% in patients with a low S-ReSC score, 47.6% with medium, and 21.4% with a high S-ReSC score.

Jeong et al.13 reported an SFR of 96% in patients with a low S-ReSC score, 69% in those with a medium score, and 29% in those with a high S-ReSC score in a comparable trial.

This study has various limitations. This was a study with a single center. In addition, this is a descriptive method for showing the intricacy of renal stones. Consequently, a multicenter study is required to validate our findings. Overall, the S-ReSC grading system is user-friendly and reliable. This score predicts the SFR with precision. Moreover, it highlights the difficulty of surgical procedures. The S-ReSC scoring system can therefore be used as a prediction approach to estimate the SFR after PCNL.

## CONCLUSION

S-ReSC score method is advantageous for expecting the post PCNL SFR as well as unfolding the complexity of renal calculi. Patients with a low S-ReSC score have the highest stone free rate.

**Conflict of interest:** Nil

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