Arab Journal of Urology (2017) **15**, 7–16

Arab Journal of Urology
(Official Journal of the Arab Association of Urology)

www.sciencedirect.com

STONES/ENDOUROLOGY
ORIGINAL ARTICLE

How practical is the application of percutaneous nephrolithotomy scoring systems? Prospective study comparing Guy's Stone Score, S.T.O.N.E. score and the Clinical Research Office of the Endourological Society (CROES) nomogram

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Received 5 September 2016, Received in revised form 13 November 2016, Accepted 27 November 2016
Available online 12 January 2017

KEYWORDS

Clinical Research Office of the Endourological Society (CROES);
Percutaneous nephrolithotomy (PCNL);
Renal stone;
Guy's Stone Score;
S.T.O.N.E. score

Abstract ***Objective:*** To prospectively compare the Guy's Stone Score (GSS), S.T.O.N.E. [stone size (S), tract length (T), obstruction (O), number of involved calices (N), and essence or stone density (E)] score and the Clinical Research Office of the Endourological Society (CROES) nephrolithometric nomogram to predict percutaneous nephrolithotomy (PCNL) success rate and assess the correlation with perioperative complications.

Patients and methods: We prospectively evaluated all consecutive PCNL patients at our institute between 1 November 2013 and 31 May 2015. The above scoring systems were applied to preoperative non-contrast computed tomography and the practical difficulties in such applications were noted. Perioperative complications and the stone-free rate (SFR) were also recorded. Receiver operating characteristic curves were drawn and the areas under curves were compared and appropriate statistical analysis done.

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Peer review under responsibility of Arab Association of Urology.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.aju.2016.11.005

Results: In all, 48 renal units were included in the study. The overall SFR was 62.2%. The presence of staghorn stones (β = 27.285, 95% confidence interval 1.19–625.35; P = 0.039) was the only significant variable associated with the residual stones on multivariate analysis. Stone-free patients had significantly lower median GSS (2 vs 4) and S.T.O.N.E. scores (6 vs 10) and higher median CROES scores (83% vs 63%) (all $P < 0.001$) compared to residual-stone patients. All scoring systems were significantly associated with SFR (all $P < 0.001$). There was no significant difference in the areas under curves of the scoring systems (0.858, 0.923, and 0.931, respectively). Furthermore, all scoring systems had weak correlations with Clavien–Dindo classified complications (r = 0.29, P = 0.045; r = 0.40, P = 0.005 and r = −0.295, P = 0.04, respectively). We found no standardisation for the measurement of stone dimensions, tract length, Hounsfield units, and staghorn definition.

Conclusions: All scoring systems equally predicted SFR and had a weak correlation with Clavien–Dindo complications. Standardisation is needed for the variables in which they have been found deficient.

ABBREVIATIONS

ACS, acute angle, complicated calyx and stone size;
AUC, area under curve;
BMI, body mass index;
CCI, Charlson Comorbidity Index;
CROES, Clinical Research Office of the Endourological Society;
3D, three-dimensional;
GSS, Guy's Stone Score;
HU, Hounsfield unit;
IQR, interquartile range;
KUB, plain abdominal radiograph of the kidneys, ureters and bladder;
NCCT, non-contrast CT;
PCNL, percutaneous nephrolithotomy;
ROC, receiver operating characteristic;
SFR, stone-free rate;
SFS, stone-free status;
S.O.N., stone size, obstruction and number of involved calyces;
SPSS, Statistical Package for the Social Sciences;
SSD, skin-to-stone distance;
S.T.O.N.E., stone size (S), tract length (T), obstruction (O), number of involved calices (N), and essence or stone density (E);
SWL, shockwave lithotripsy;
US, ultrasonography

Introduction

Urinary stone disease is a prevalent problem throughout the world, with an incidence of 5–10% in the general population [1] and of which 15–20% of patients with renal stones require invasive intervention [2]. The goal of any such intervention is to achieve maximum stone clearance with minimum morbidity. Among the several treatment options, percutaneous nephrolithotomy (PCNL) has the highest stone clearance rates [3]. It is now the treatment of choice for large and complex renal stones, including staghorn stones [3]. But as with any