Editorial

What are the predictors of residual stone after ureteroscopy for urolithiasis?

Go Anan[1]^, Daisuke Kudo[2], Toshimitsu Matsuoka[2]

[1]Department of Urology, Yotsuya Medical Cube, Tokyo, Japan; [2]Department of Urology, Hachinohe Heiwa Hospital, Hachinohe, Japan

Correspondence to: Go Anan, MD, PhD. Department of Urology, Yotsuya Medical Cube, 7-7 Nibancho, Chiyoda-ku, Tokyo, 102-0084, Japan. Email: g-anan@mcube.jp.

Comment on: Wu W, Zhang J, Yi R, *et al.* A simple predictive model with internal validation for assessment of stone-left after ureteroscopic lithotripsy in upper ureteral stones. Transl Androl Urol 2022;11:786-93.

Submitted Jun 29, 2022. Accepted for publication Aug 11, 2022.
doi: 10.21037/tau-22-438
View this article at: https://dx.doi.org/10.21037/tau-22-438

The management of urolithiasis has evolved over time to minimally invasive endoscopic laser lithotripsy. Technological advancements such as the use of holmium laser and flexible ureteroscope have led to the establishment of ureteroscopy (URS) for intrarenal stones (1-4). Moreover, the use of equipment such as basket catheter and anti-retropulsive device has improved the outcomes of URS (5-7). Recently, along with improvements in laser and surgical instruments, the number of URS procedures for urolithiasis has increased significantly. There are available nomograms and scoring systems for predicting surgical outcomes. Furthermore, urologists have recently used nomograms and scoring systems to predict the success of treatment and the outcomes of different urological conditions (8,9).

The stone-free rate (SFR) of patients with upper ureteral stone is lower than that of patients with middle or distal ureteral stone (10). Wu *et al.* identified easily accessible risk factors associated with residual stones after URS for upper ureteral stones, and established a simple and reliable predictive model (11). They showed that stone length and shape, type of treatment modality, and distance of stones to the ureteropelvic junction (UPJ) were used in a simple and reliable predictive model. The stone was classified based on shape (quasi-circular and oval). The types of treatment modality were semirigid URS alone, semirigid URS with an anti-retropulsion device, and flexible URS. Moreover, the stones were also divided based on their distances from the UPJ, which were as follows: ≤30, 31–90, and >90 mm. Quasi-circular stone was defined as a stone with a difference of ≤2 mm between the stone length and width. The oval stone was defined as any other stones. The evaluation of stone shape is also a novel point. Stone shape may be correlated with stone retropulsion. In relation to this, it may have an impact on achieving stone-free status. Compared with other predictive models, the novel model is advantageous as it is simple to use. Further, it focuses on four parameters only, which can be observed via kidney, ureter, and bladder (KUB). Hence, further measurement or transformation is not required.

As shown in previous studies, some nomograms and scoring systems have been used to predict the success rate of URS (12-16). Moreover, it is important to note the targeted stones (renal, ureteral, or both) and the treatment method (rigid or flexible URS). Imamura *et al.* developed a nomogram for predicting the outcomes of rigid URS for ureteral stones (12). Stone length and location, number of stones, and the presence of pyuria were significant independent factors correlated with SFR. Meanwhile, single stone, stone size, distal position, and absence of hydronephrosis, which are significant predictive factors of stone-free status, were used in another nomogram for predicting the outcome of rigid URS for ureteral stones (13). Resold *et al.* developed a scoring system for assessing the outcome of flexible URS for renal stones, ureteral stones, and the results showed that stone size, stone

^ ORCID: 0000-0001-8325-2606.

location, stone number, renal malformation, and lower pole infundibulopelvic angle significantly affected SFR (14). Ito *et al.* developed a nomogram for investigating the outcome of flexible URS for renal stones (15). This study revealed that stone volume, presence of lower pole stone, operator with an experience of >50 flexible URS, stone number, and presence of hydronephrosis were stone-free status. Hori *et al.* developed a nomogram for evaluating the outcomes of flexible URS for ureteral and renal stones (16). This study showed that stone length, stone occupied lesion, and Hounsfield unit were significant predictive factors of stone-free status.

Flexible URS is important for the treatment of upper ureteral stones in some cases. A flexible ureteroscope is useful for upper ureteral stones if the ureter is tortuous due to hydronephrosis or if the rigid ureteroscope does not provide a clear view of the upper ureteral stones. In such cases, the upper ureteral stone must be pushed back from the narrow ureter to the renal pelvis, where there is more space. Furthermore, the stone should be fragmented in the renal pelvis and then extracted to improve SFR (5,6).

The outcomes of URS are challenging to compare due to various reasons. First, there is no uniform definition for stone-free status, stone size (no fragmentation, <2 mm, or <4 mm), timing of post-surgical evaluation (2 weeks or 1 month), and assessment instrument (computed tomography or KUB study). Second, there are differences in terms of surgical methods (rigid or flexible URS) and surgical equipment (laser device or basket catheters). In addition, the presence of a preoperative ureteral stent and impacted stone has a significant impact on surgical outcomes (17). As patient background, a relatively large number of patients in some nomograms had a ureteral stent inserted before the URS procedure (18). Also, there is no uniform definition for impacted stone. All nomograms have their own characteristics. However, there is no such thing as a perfect nomogram. Nomograms are created at different times of the year, and the periods of the cases used to create the nomograms differ as well. The outcomes will vary based on the time period considered because endoscopes and lasers are evolving every year.

Rather than comparing the superiority or inferiority of nomograms, it is more important to use them as a reference when selecting the appropriate surgical procedure (flexible URS or shock wave lithotripsy or percutaneous nephrolithotomy) (19,20). In addition, the use of nomograms and scoring systems could allow surgeons to select a staged procedure rather than a single URS procedure. Additionally, predicting not only the SFR but also the complications of URS using nomograms and scoring systems is important. In the future, the effect of using nomograms and surgical prediction models on treatment selection should be considered.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Translational Andrology and Urology*. The article did not undergo external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://tau.amegroups.com/article/view/10.21037/tau-22-438/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Fried NM, Irby PB. Advances in laser technology and fibre-optic delivery systems in lithotripsy. Nat Rev Urol 2018;15:563-73.
2. Inoue T, Okada S, Hamamoto S, et al. Current trends and pitfalls in endoscopic treatment of urolithiasis. Int J Urol 2018;25:121-33.
3. Li JK, Teoh JY, Ng CF. Updates in endourological management of urolithiasis. Int J Urol 2019;26:172-83.
4. Geraghty RM, Jones P, Somani BK. Worldwide Trends of Urinary Stone Disease Treatment Over the Last Two

Decades: A Systematic Review. J Endourol 2017;31:547-56.
5. Anan G, Komatsu K, Hatakeyama S, et al. One-surgeon basketing technique for stone extraction during flexible ureteroscopy for urolithiasis: A comparison between novice and expert surgeons. Int J Urol 2020;27:1072-7.
6. Anan G, Hattori K, Hatakeyama S, et al. Efficacy of one-surgeon basketing technique for stone extraction during flexible ureteroscopy for urolithiasis. Arab J Urol 2021;19:447-53.
7. Saussine C, Andonian S, Pacík D, et al. Worldwide use of antiretropulsive techniques: observations from the clinical research of the endourological society ureteroscopy global study. J Endourol 2018;32:297-303.
8. Xuan Z, Yu Z, Tan G, et al. Development and validation of a novel nomogram for predicting systemic inflammatory response syndrome's occurrence in patients undertaking flexible ureteroscopy. Transl Androl Urol 2022;11:228-37.
9. Liu Y, Jian Z, Ma Y, et al. Changes of renal function after retrograde intrarenal surgery using flexible ureteroscope in renal stone patients. Transl Androl Urol 2021;10:2320-31.
10. Perez Castro E, Osther PJ, Jinga V, et al. Differences in ureteroscopic stone treatment and outcomes for distal, mid-, proximal, or multiple ureteral locations: the Clinical Research Office of the Endourological Society ureteroscopy global study. Eur Urol 2014;66:102-9.
11. Wu W, Zhang J, Yi R, et al. A simple predictive model with internal validation for assessment of stone-left after ureteroscopic lithotripsy in upper ureteral stones. Transl Androl Urol 2022;11:786-93.
12. Imamura Y, Kawamura K, Sazuka T, et al. Development of a nomogram for predicting the stone-free rate after transurethral ureterolithotripsy using semi-rigid ureteroscope. Int J Urol 2013;20:616-21.
13. De Nunzio C, Ghahhari J, Lombardo R, et al. Development of a nomogram predicting the probability of stone free rate in patients with ureteral stones eligible for semi-rigid primary laser uretero-litothripsy. World J Urol 2021;39:4267-74.
14. Resorlu B, Unsal A, Gulec H, et al. A new scoring system for predicting stone-free rate after retrograde intrarenal surgery: The “resorlu-unsal stone score.” Urology 2012;80:512-8.
15. Ito H, Sakamaki K, Kawahara T, et al. Development and internal validation of a nomogram for predicting stone-free status after flexible ureteroscopy for renal stones. BJU Int 2015;115:446-51.
16. Hori S, Otsuki H, Fujio K, et al. Novel prediction scoring system for simple assessment of stone-free status after flexible ureteroscopy lithotripsy: T.O.HO. score. Int J Urol 2020;27:742-7.
17. Anan G, Kudo D, Matsuoka T, et al. The impact of preoperative percutaneous nephrostomy as a treatment strategy before flexible ureteroscopy for impacted upper ureteral stones with hydronephrosis. Transl Androl Urol 2021;10:3756-65.
18. Anan G. Editorial Comment to Novel prediction scoring system for simple assessment of stone-free status after flexible ureteroscopy lithotripsy: T.O.HO. score. Int J Urol 2020;27:748.
19. Wiesenthal JD, Ghiculete D, Ray AA, et al. A clinical nomogram to predict the successful shock wave lithotripsy of renal and ureteral calculi. J Urol 2011;186:556-62.
20. Okhunov Z, Friedlander JI, George AK, et al. S.T.O.N.E. nephrolithometry: novel surgical classification system for kidney calculi. Urology 2013;81:1154-9.

Cite this article as: Anan G, Kudo D, Matsuoka T. What are the predictors of residual stone after ureteroscopy for urolithiasis? Transl Androl Urol 2022;11(8):1071-1073. doi: 10.21037/tau-22-438