VIDEOUROLOGY

# Suctioning Flexible Ureteroscopy with Automatic Control of Renal Pelvic Pressure

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Mary Ann Liebert, Inc. DOI: 10.1089/vid.2015.0036


## Abstract

***Introduction:*** Flexible ureteroscopy (URS) is becoming a first-line therapy for many patients with renal and ureteral calculi rapidly.[1] Current commonly used medical infusion devices can only monitor the infusion flow and infusion pressure, but not the renal pelvic pressure (RPP).[2,3] We sought to invent a novel technique of suctioning flexible URS with an intelligent control of RPP.

***Materials and Methods:*** We performed flexible URSs for patients with the help of a self-designed intelligent system, including an irrigation and suctioning platform and a transparent ureteral access sheath (UAS) with a pressure-sensitive tip, which can precisely regulate the infusion flow and control the vacuum suctioning by computerized real-time recording and monitoring of RPP through pressure feedback, ensuring a stable RPP. The outer body diameter of the UAS was 15F; the diameter of the working channel was 11.55F; and the length of the UAS was 20 to 45 cm. On the platform, RPP control value was set at $-2$ mm Hg, RPP warning value was set at 20 mm Hg, and RPP limit value was set at 30 mm Hg. Intraoperatively, Holmium laser was used to powderize the stone at 0.8 J/pulse with a frequency of 20 pulses/second (Lumenis, fiber diameter 200 $\mu$m). In the process of powderizing lithotripsy using the laser, the scope body was moved back and forth slightly in an uninterrupted manner in the sheath, with a distance of about 2 to 3 mm, to facilitate small gravel particles inside the sheath gap to be sucked out automatically. Gravel particles, larger than sheath gap but less than UAS in diameter, were sucked out by withdrawing the scope intermittently without a need of stone basketing. We retrospectively reviewed 51 patients with renal or ureteral calculus (55 renal units, 9 ureteral calculi), who received the flexible URS from November 2014 to March 2015.

***Results:*** We were able to perform all the procedures with clear operative visualization. The mean stone size was $16.1 \pm 3.9$ mm. The mean operative time was $22.3 \pm 16.4$ minutes. The stone-free rate on postoperative day 30 was 93.8% (60/64) by the kidney, ureter, and bladder radiograph. No patient had a sepsis.

***Conclusions:*** Flexible URS with the help of our intelligent system is technically feasible, safe, and efficacious for treating upper urinary tract calculi with the advantages of breaking stones at high efficacy and low complication rates because of its automatic control of RPP.

*Acknowledgment:* The research project was funded by the Science and Technology Department of Jiangxi Province and was listed as a major project of the Science and Technology Department of Jiangxi Province with a number of 20152ACG70009.

*No competing financial interests exist.*

Runtime of video: 9 mins 52 secs



## Cite this video

Xiaolin Deng, Leming Song, Donghua Xie, Lunfeng Zhu, Lei Yao, Jianrong Huang, Shulin Guo, Zuofeng Peng, Suctioning Flexible Ureteroscopy with Automatic Control of Renal Pelvic Pressure, J Endourol Part B Videourology. 2015, DOI: 10.1089/vid.2015.0036.

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**Original Publication Date:** 2015