

## THE EFFECT OF THE VESICAL ADAPTATION RESPONSE TO DIURESIS ON LOWER URINARY TRACT SYMPTOMS AFTER ROBOT-ASSISTED LAPAROSCOPIC RADICAL PROSTATECTOMY

### Hypothesis / aims of study

When urine output increases, voided volume at each voiding also increases in normal subjects. This is generally understood as a vesical adaptation response to diuresis (VARD). Because lower urinary tract symptoms (LUTS) are supposed to be improved by the change in bladder function after robot-assisted laparoscopic radical prostatectomy (RARP), the aim of the present study was to investigate whether VARD is involved in the improvement of LUTS after RARP.

### Study design, materials and methods

100 consecutive patients who underwent RARP and had International Prostate Symptom Score (IPSS), quality of life (QOL) index, a frequency-volume chart (FVC), uroflowmetry, and post-voided residual urine (PVR) available were evaluated before and after RARP. This cohort was divided into patients with and without preoperative LUTS according to the preoperative IPSS total score. VARD was defined as the presence of a significant correlation between the urine output rate and voided volume at each voiding ( $R^2 > 0.2$ ).

### Results

In FVC analyses, a preliminary analysis of VARD before RARP was conducted. The group without preoperative LUTS had VARD, but the group with preoperative LUTS did not have it (Fig.1). In patients with preoperative LUTS, although VARD was not seen before RARP ( $R^2 = 0.05$ , Fig.2A), it was seen after RARP (3 months  $R^2 = 0.22$ , 12 months  $R^2 = 0.23$ , Fig.2A). The maximum flow rate improved, and PVR was significantly reduced after RARP ( $P = 0.004$ ). IPSS total, storage, and voiding symptom scores were significantly improved after RARP (all  $P < 0.001$ ). The QOL index was also significantly improved after RARP ( $P < 0.05$ ). On the other hand, in patients without preoperative LUTS, VARD was seen before RARP and was maintained during the observation period (before RARP  $R^2 = 0.24$ , 3 months after RARP  $R^2 = 0.25$ , 12 months after RARP  $R^2 = 0.33$ ; Fig. 2B). The IPSS total score ( $P < 0.001$ ), voiding symptom score ( $P < 0.05$ ), and storage symptom score ( $P < 0.001$ ) were significantly aggravated at 3 months after RARP, and these eventually returned to baseline values at 12 months after RARP. The QOL index was not changed between before and after RARP.

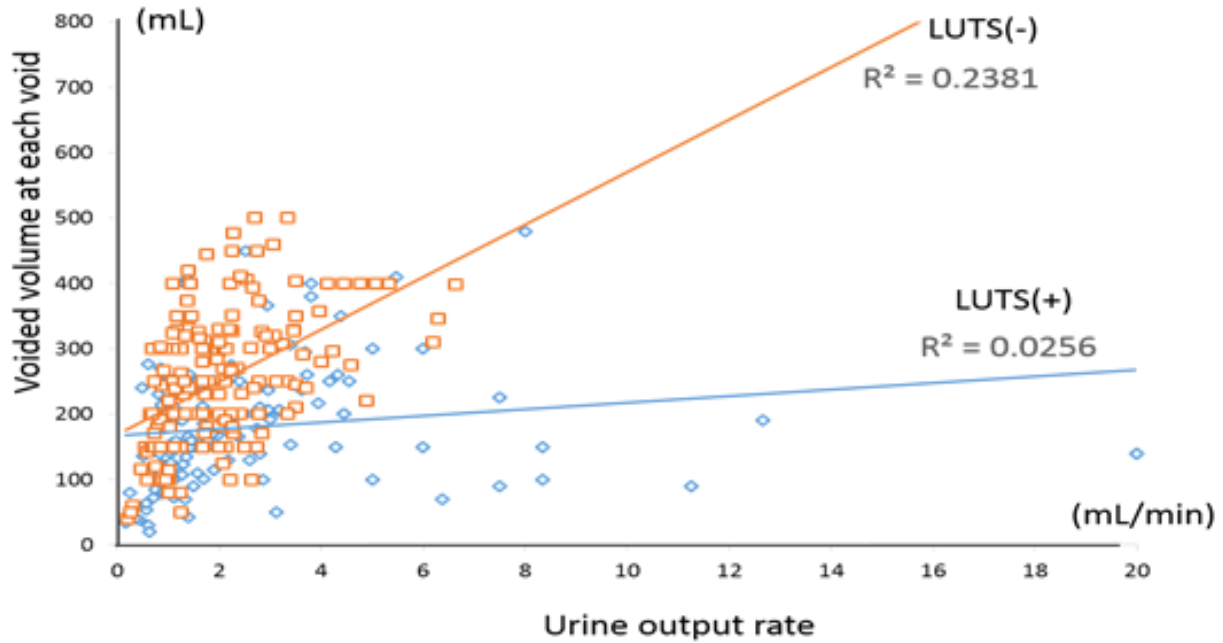
### Interpretation of results

In the present study, the preoperative preliminary analysis demonstrated that the patients without preoperative LUTS had VARD, but the patients with preoperative LUTS did not have it. In our previous study, we demonstrated that OAB patients lack VARD(1). These data suggest that the pathogenesis of LUTS is associated with lack of VARD. In addition, although VARD was not observed in patients with preoperative LUTS, VARD was seen after RARP, following the improvement of LUTS. Therefore, this phenomenon might support the association between VARD and LUTS. In other words, acquisition of VARD may improve LUTS. In patients without LUTS, VARD was seen before RARP. Although VARD was not changed after RARP, VARD was maintained during the observational period. Although LUTS was temporarily aggravated in patients without LUTS at 3 months after RARP, LUTS eventually returned to baseline values at 12 months after RARP. Namely, maintenance of VARD may prevent the permanent aggravation of LUTS.

### Concluding message

Improvements of LUTS and lower urinary tract dysfunction were seen with acquisition of VARD after RARP in patients with preoperative LUTS. As a result, urinary QOL was significantly improved in patients with preoperative LUTS. VARD could be considered a physiological reaction of a living organism that occurs with normalization of lower urinary tract function. RARP might be an effective procedure for amelioration of LUTS through acquisition of VARD.

**Fig 1. Micturition plots of patients with and without lower urinary tract symptoms before RARP**

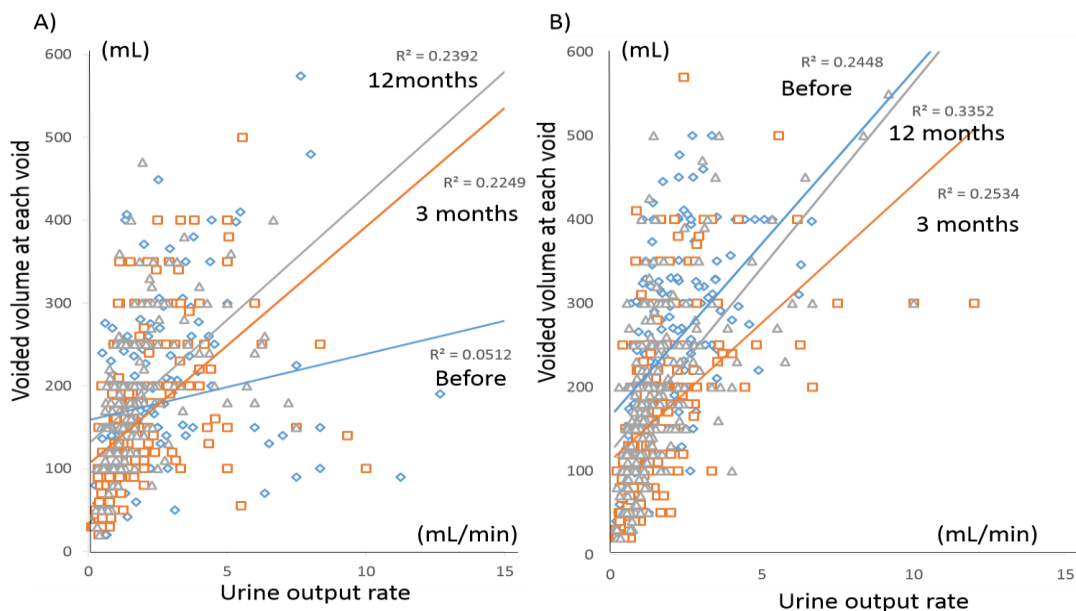


Blue diamond plots and the blue regression line indicate the micturitions of the patients with preoperative LUTS. Red square plots and the red regression line indicate the micturitions of the patients without preoperative LUTS. The vesical adaptation response to diuresis is seen in patients without preoperative LUTS.

**Fig 2. The scatter plots of the urine output rate versus the voided volume at each voiding**

**A) Micturition plots of the patients with preoperative LUTS and stratified according to evaluation time period**

**B) Micturition plots of the patients without preoperative LUTS stratified according to evaluation time period**



Blue diamond plots and the blue regression line indicate the micturitions before RARP. Orange square plots and the orange regression line indicate the micturitions 3 months after RARP. Gray triangle plots and the gray regression line indicate the micturitions 12 months after RARP.

**References**

1. Shishido, K., Uchida, H., Matsuoka, H. et al.: Bladder behavior in response to diuresis. *Neurourol Urodyn*, 24: 533, 2005

**Disclosures**

**Funding:** We have no conflict of Interest. **Clinical Trial:** Yes **Registration Number:** 2334 **RCT:** No **Subjects:** HUMAN **Ethics Committee:** Ethics Committee of Fukushima Medical University **Helsinki:** Yes **Informed Consent:** Yes