

## PREOPERATIVE URINARY STAINING CONTRIBUTES TO THE OCCURRENCE OF INGUINAL HERNIA AFTER ROBOT-ASSISTED RADICAL PROSTATECTOMY.

### Hypothesis / aims of study

Previous studies reported that about 10% of patients who underwent robot-assisted radical prostatectomy (RARP) developed inguinal hernia (IH) after surgery [1] [2]. It is known that increased abdominal pressure is a causative factor for IH in general population [3]. Therefore, we hypothesized that preoperative urinary straining contributes to the occurrence of IH after RARP.

### Study design, materials and methods

Subjects included patients who underwent RARP for prostate cancer in our institution from February 2012 to January 2015. Those with previous/concomitant IH history, concurrent IH-prophylaxis surgery, and follow-up < 1 year were excluded. Demographic and clinical profiles were collected from medical records. Every RARP video record was reviewed by a blinded urologist to verify the existence of a patent processus vaginalis (PPV). Univariate and multivariate Cox proportional hazards models were used to determine relationships between post-RARP IH and age, body mass index (BMI), previous lower abdominal surgery, total International Prostate Symptom Score (IPSS), IPSS voiding score, IPSS storage score, IPSS question 5 (weak stream) and 6 (straining) score, maximum urethral closing pressure (MUCP) and functional profile length (FPL) on urethral pressure profile, prostate weight, and PPV. Pre- and postoperative IPSS, MUCP, and FPL were included.

### Results

Patients' characteristics are shown in Table 1. Of 284 patients in the study, 42 (14.7%) developed IH at a median duration of 8 months (interquartile range, 6-16) after RARP. On univariate Cox proportional hazards models, BMI  $\geq$  23, preoperative IPSS question 5 score > 2, preoperative IPSS question 6 score > 2, and the existence of PPV were significantly correlated with the occurrence of post-RARP IH (HR 0.51, 95% CI 0.27 – 0.95,  $p = 0.03$ ; HR 2.29, 95% CI 1.19 – 4.40,  $p = 0.01$ ; HR 3.78, 95% CI 1.89 – 7.53,  $p < 0.001$ ; HR 3.48, 95% CI 2.35 – 5.17,  $p < 0.001$ , respectively)(Table 2). On multivariate Cox proportional hazards models, preoperative IPSS question 6 score > 2 and the existence of PPV were significantly correlated with the occurrence of post-RARP IH (HR 4.17, 95% CI 2.07 – 8.37,  $p < 0.001$ ; HR 3.67, 95% CI 2.36 – 5.69,  $p < 0.001$ )(Table 3). There were no significant associations between post-RARP IH and the following factors: past history of pelvic surgery, prostate volume, pre- and postoperative total IPSS score, IPSS voiding score, IPSS storage score, MUCP and FPL, and postoperative IPSS question 5 and 6 score.

### Interpretation of results

Our study indicates that (1) post-RARP IH developed in 14.7% patients, (2) preoperative IPSS question 6 score > 2 and the existence of PPV were significantly correlated with the occurrence of post-RARP IH. It is possible that patients with high IPSS 6 score tend to strain for urination. Chronic strain during urination, and overstretching of musculoaponeurotic structures around the internal inguinal ring via PPV during RARP could disrupt anti-hernia mechanism around the internal ring, resulting in the occurrence of inguinal hernia after RARP.

### Concluding message

Preoperative urinary straining and PPV were predictive of de novo IH after RARP. Prophylactic surgery should be considered to perform during surgery in patients with high-risk for de novo IH.

Table 1 Patients' characteristics † SD: standard deviation, ‡ PSA: prostatic specific antigen

Age, years, SD†		66 ± 6
Body mass index, SD†		23.5 ± 3.5
PSA‡, ng/mL, SD†		11.7 ± 12.2
Operative time, minutes, SD†		170 ± 45
Gleason grade group	1	99
	2	82
	3	38
	4	49
	5	16
pT stage	pT0	9
	pT2a	39
	pT2b	14
	pT2c	126
	pT3a	57
	pT3b	13
pN stage	pNx	85
	pN0	199

Table 2 Univariate analysis of clinical factors for de novo inguinal hernia

† IPSS: international prostate symptom score, ‡ PPV: patent processus vaginalis

	p-value	95% Confidence Intervals	Hazard Ratio
Age ( $\geq 70$ years: $<70$ years)	0.16	0.79-3.76	1.73
Body mass index ( $\geq 23$ : $<23$ )	0.03	0.27-0.95	0.51
Previous pelvic surgery (present: absent)	0.35	0.21-1.72	0.61
IPSS† total score ( $>10$ : $\leq 10$ )	0.44	0.66-2.52	1.29
IPSS† voiding score ( $>5$ : $\leq 5$ )	0.49	0.64-2.48	1.26
IPSS† question 5 score ( $>2$ : $\leq 2$ )	0.01	1.19-4.40	2.29
IPSS† question 6 score ( $>2$ : $\leq 2$ )	$<0.001$	1.89-7.53	3.78
Max Urethral Closing Pressure ( $\geq 80$ cm H <sub>2</sub> O: $<80$ cm H <sub>2</sub> O)	0.84	0.48-1.80	0.93
Functional Profile Length ( $\geq 4$ cm: $<4$ cm)	0.32	0.71-2.69	1.39
Prostate volume ( $\geq 35$ g: $<35$ g)	0.67	0.60-2.10	1.14
PPV‡ (present: absent)	$<0.001$	2.35-5.17	3.48

Table 3 Multivariate analysis of clinical factors for de novo inguinal hernia.

† IPSS: international prostate symptom score, ‡ PPV: patent processus vaginalis

	p-value	95% Confidence Intervals	Hazard Ratio
Body mass index ( $\geq 23$ : $<23$ )	0.12	0.30-1.15	0.59
IPSS† question 5 score ( $>2$ : $\leq 2$ )	0.15	0.81-3.83	1.76
IPSS† question 6 score ( $>2$ : $\leq 2$ )	$<0.001$	2.07-8.37	4.17
PPV‡ (present: absent)	$<0.001$	2.36-5.69	3.67

## References

1. Patent processus vaginalis in adults who underwent robot-assisted laparoscopic radical prostatectomy: Predictive signs of postoperative inguinal hernia in the internal inguinal floor. Dong Hoon Lee, et al. *Int.J.Urol.* (2013), 20: 177-182
2. Incidence, Risk Factors and a Novel Prevention Technique for Inguinal Hernia after Robot-Assisted Radical Prostatectomy. Masaki Shimbo, et al. *Urol Int* (2017), 98(1): 54-60.
3. The epidemiology of inguinal hernia. A survey in western Jerusalem. Abramson JH, et al. *J Epidemiol Community Health* 1978, 32(1):59-67.

## Disclosures

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