

## ANALYSIS OF BLADDER BLOOD FLOW BEFORE AND AFTER PROSTATIC SURGERY IN PATIENTS WITH BPH

### Hypothesis / aims of study

Previous studies have suggested that bladder ischemia is involved in the pathophysiology of overactive bladder associated with bladder outlet obstruction (BOO) caused by BPH. There have been a few reports about BOO and bladder blood flow that used ultrasonography or laser tissue blood flowmeter. However much is still unknown about BPH and bladder blood flow in a clinical setting. In this study, we investigated bladder blood flow using contrast-enhanced ultrasonography before and after transurethral resection of the prostate (TURP) in patients with BPH.

### Study design, materials and methods

Thirty-two patients (mean age 71 years) who underwent TURP for lower urinary tract symptoms (LUTS) associated with BPH were prospectively studied. Severity of LUTS and the quality of life were assessed by using International Prostate Symptom Score (IPSS) and QOL index. Preoperative prostatic volume (PV) was measured by transabdominal ultrasonography. Before TURP, all patients underwent uroflowmetry (UFM), pressure-flow study (PFS) and contrast-enhanced color Doppler transabdominal ultrasonography (CDUS) with Levovist® (Bayer, Japan) for measuring bladder blood flow. Three months after TURP the patients were reassessed with IPSS, QOL index, UFM and CDUS. Using CDUS, arterial blood flow of lateral bladder wall was examined and resistive index (RI =  $V_{max} - V_{min} / V_{max}$ ) was calculated as a variable of bladder blood flow.

### Results

Compared with healthy young male controls (n=10, mean age 25 years), the patients with BPH had a higher RI (0.564 vs. 0.403,  $p<0.001$ ). Preoperative RI did not correlate with age, body mass index and IPSS. Mean preoperative PV was 54 ml (14 – 100 ml). Mean preoperative RI was significantly higher in patients with PV 60 ml or greater than in those with PV less than 60 ml (0.604 vs. 0.529,  $p=0.01$ ). In 11 patients with severe BOO (obstruction grade 5 and 6 by the Schäfer nomogram), preoperative RI was significantly higher than in other 21 patients with obstruction grade 4 or less (0.615 vs. 0.538,  $p=0.02$ ). IPSS (from 21.2 to 5.6,  $p<0.001$ ), QOL index (from 5.0 to 1.6,  $p<0.001$ ) and maximum flow rate (from 8.0 to 19.7 ml/sec,  $p<0.001$ ) were improved significantly after TURP. RI significantly decreased after TURP (from 0.564 to 0.450,  $p<0.001$ ) and postoperative RI was in similar range of controls. Mean weight of resected prostatic specimen was 25.5 g (6 – 60 g). Weight of resected prostatic specimen correlated with the change of RI (before TURP minus after TURP) ( $r=0.515$ ,  $p<0.01$ ) (Figure 1). In 12 patients with persisting urgency after TURP, RI was less improved than in other 20 patients without urgency after TURP (n=20) (change of RI 0.068 vs. 0.142,  $p<0.05$ ).

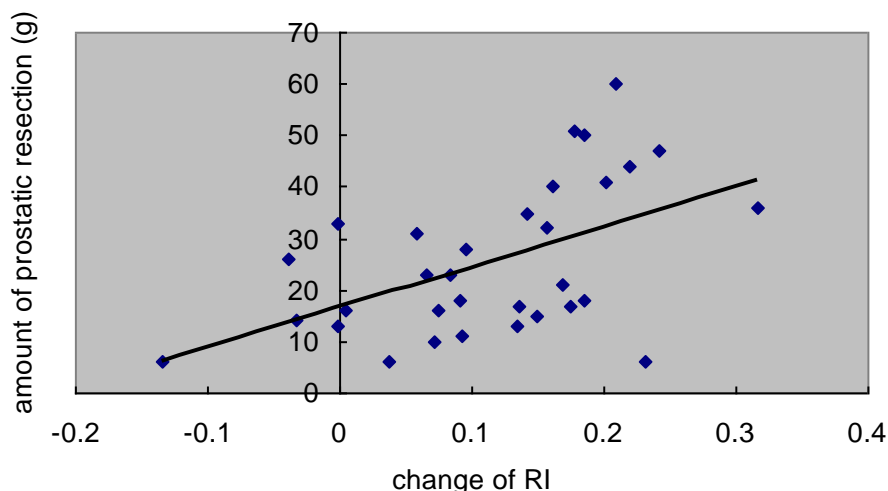
### Interpretation of results

Bladder blood flow in patients with BPH is impaired. The impairment of bladder blood flow is remarkable in patients with larger PV and severe BOO. Bladder blood flow is improved after TURP in proportion to the amount of resected prostate. However in patients with persisting urgency after TURP, bladder blood flow is less improved. Resolution or persistence of overactive bladder after TURP seems to be related to the degree of improvement of bladder blood flow after TURP.

### Concluding message

Bladder blood flow in patients with BPH is impaired in relation to PV and severity of BOO. Bladder blood flow is improved after TURP in parallel with the amount of prostatic resection. Less improvement of blood flow is related to persisting urgency after TURP. Thus impaired bladder blood flow is one of the important factors of persisting overactive bladder after TURP.

Figure 1. The relationship between change of RI and the amount of prostatic resection. RI was decreased in parallel with the amount of prostatic resection. ( $y=78.061x+16.62$ ,  $r=0.515$ )



<i>Specify source of funding or grant</i>	none
<i>Is this a clinical trial?</i>	No
<i>What were the subjects in the study?</i>	HUMAN
<i>Was this study approved by an ethics committee?</i>	Yes
<i>Specify Name of Ethics Committee</i>	The ethical committee of Asahikawa Medical College
<i>Was the Declaration of Helsinki followed?</i>	Yes
<i>Was informed consent obtained from the patients?</i>	Yes