Hypothesis / aims of study
To explore the possibility of applying near-infrared spectroscopy (NIRS) for the evaluation of low urinary tract symptoms (LUTs) in benign prostate hyperplasia (BPH) model. By using transurethral microwave thermotherapy (TUMT) to verify the modeling foundation.

Study design, materials and methods
Prostates 18 ~ 42 g in 13 male Beagle dog (3 ~ 8 years old, weighting 15 ~ 20 Kg) were monitored with Urodynamix NIRS Transducers placed transrectally during transurethral microwave treatment using a Prolieve Thermodilatation System at 15 ~ 50 W. Laser diodes at three wavelengths sequentially emitted energy into the prostate through fiber optics. Receivers placed at distances from the emitter allowed monitoring of various depths and volumes of tissue. Custom computer algorithms evaluated laser reflections for changes in oxygenation. A real time graphical display was used to indicate changes in blood volume/flow and tissue coagulation at various depths in the prostate.

Results
An initial rise in both Hb and HbO2 reflective of vasodilation was seen followed by a drop in HbO2 within 3 ~ 7 minutes as microwave power was ramped up. Continued increases in Hb were then recorded, likely indicating metabolic demand during tissue heating. A precipitous drop in one or both signals were seen within 12 ~ 32 minutes as thermal coagulation progressed, reflecting a rapid reduction of blood volume/flow and/or thermal degradation of the hemoglobin protein in the monitored volume. Histological evaluation correlated thermal coagulation necrosis with the location of NIRS monitored tissue volumes.

Interpretation of results
In this study, there were significant correlation between regional tissue hemodynamics and histological condition with dynamic changes. These results indicate that the NIRS may reflect the morphological and functional condition of the LUTs by monitoring prostate blood volume/flow changes. Our model can verify those correlation changes.

Concluding message
Non-invasive NIRS appears applicable in the evaluation of prostate tissue condition on BPH model by expressing the alterations in the regional tissue hemodynamics during thermal therapies. NIRS could provide urologists with new methods of physiologic diagnostic evaluation on LUTs.

Specify source of funding or grant
National Technology R&G Program

Is this a clinical trial?
No

What were the subjects in the study?
ANIMAL

Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?
Yes

Name of ethics committee
ethics committee of Capital Medical University