Ph.D. THESIS INFORMATION

Thesis title: **RESEARCH ON THE APPLICATION OF LOW-POWER SEMICONDUCTOR LASER IN THE TREATMENT OF BEGIN PROSTATIC HYPERTROPHY IN THE ELDERLY**

Specialization: **Engineering Physics**

Specialization code: **62520401**

Ph.D. Student: **Tran Anh Tu**

Advisors: **1. Ph.D. Tran Thi Ngoc Dung**

2. M.D. Ton Chi Nhan

Ph.D. Academic institute: **University of Technology**

Vietnam National University - Ho Chi Minh City

The main contribution of the thesis

The objective of the thesis is to research the application of low-power semiconductor laser in the treatment of benign prostatic hypertrophy in the elderly by the method of Photo-acupuncture – Low power semiconductor laser phototherapy working at two wavelengths 780nm and 940nm when combined with intravascular laser at 650nm. The main contributions of the thesis are:

- The simulation of the compression of the benign enlarged prostate gland on the urethra, bladder, and the effect on urine flow was conducted using the finite element method, to explain the symptoms of obstruction and irritation of the patient.
- The simulation of the propagation of the low-power semiconductor laser beam from the skin surface to the prostate was conducted using the Monte Carlo method, have shown that wavelengths 780 nm, 850 nm, and 940 nm can penetrate deep into the prostate tissue. The simulation results show that the biostimulation effect can be achieved when the energy level of the laser beam projected from the skin surface to the prostate gland is 15 J (at the pubic bone) and 10 J (at the anus position), to design the treatment process and device.

- The results of treatment for 60 patients showed that: the patient's symptoms of obstruction and irritation were eliminated or reduced by 90%, the mean prostate volume of 60 patients after treatment decreased by 11.84% compared to that of 60 patients before treatment, and the average number of treatment days was (18.52 ± 3.84) days. The general recognition of the above study results is that there are no complications as well as harmful side effects for patients during low-power laser treatment.

The obtained results of the study aim to provide a new direction for the selection of treatment to preserve the physiological function of the prostate gland; symptoms of obstruction and irritation caused by prostate enlargement rapidly decrease and go to the end or decrease compared to before treatment; Prostate volume reduction therapy helps patients to quickly return to a near-normal life, as well as optimizes a new clinical modality that is easy to administer and has no side effects.

Advisors Ph.D. Student

Ph.D. Tran Thi Ngoc Dung M.D. Ton Chi Nhan Tran Anh Tu