

## Abstract

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### **Near infrared spectroscopy to assess penile blood flow: a novel technique**

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**Introduction and Objective:** Near Infrared Spectroscopy (NIRS) uses photons of light in the near-infrared spectrum to assess concentration changes of oxygenated hemoglobin (O<sub>2</sub>Hb) and deoxygenated hemoglobin (HHb) in tissues. NIRS has been used to assess muscle blood flow. We examined the use of NIRS to detect penile blood flow to see if changes in O<sub>2</sub>Hb and HHb concentrations correlate with erections.

**Methods:** Two groups of men were examined. Group 1, 10 men with no erectile difficulties mean age 19 years (range 18-22), were used to determine the technical aspects of penile NIRS monitoring (i.e. position and securing the probe) and the feasibility of assessing penile blood flow with visual sexual stimulation (VSS). Group 2 consisted of 12 men with prostate cancer undergoing a bilateral nerve sparing radical prostatectomy. Mean age of the patients was 55 years (range 44-66). These men underwent NIRS with VSS preoperatively and at 3 months postoperatively with and without 20 mg of vardenafil. Each completed an IIEF questionnaire pre and postoperatively. During NIRS testing each man was asked to assess if an erection occurred during the VSS.

**Results:** With Group 1 we created a re-usable NIRS probe which was taped to the penis. In 7/10 of the men an erection occurred with VSS and with NIRS testing O<sub>2</sub>Hb concentration increased in all 7 men. In Group 2 the mean IIEF preoperative score was 25 (range 5-30) and the postoperative score was 11.1 (range 1-26). With NIRS testing preoperatively without vardenafil, 8/12 men felt they had some erection with VSS and in 7/8 of these men there was an increase in O<sub>2</sub>Hb concentration. In this same group, 9/12 men with NIRS showed increases in O<sub>2</sub>Hb concentration with VSS, 2 of which felt they had no erection. When vardenafil was given preoperatively with NIRS testing, 12/12 men felt they had some erection and 10/12 of these men had an increase in O<sub>2</sub>Hb concentration. Postoperatively without vardenafil on NIRS, 2/12 men felt they had some erection and 7/12 men were found to have increases in O<sub>2</sub>Hb concentration including the 2 men that had some erection. When vardenafil was added postoperatively 7/12 men felt they had some erection and 7/12 men had increases in O<sub>2</sub>Hb concentrations on NIRS.

**Conclusions:** These preliminary studies show that NIRS can be used to assess penile blood flow with sexual stimulation. A rise in O<sub>2</sub>Hb concentration on NIRS testing can assess penile blood flow and correlates well to patient perceived erections. NIRS is easy to use, safe and requires no special training to interpret the results. More studies are needed to correlate NIRS with Doppler studies.