A Discrepancy of Penile Hemodynamics during Visual Sexual Stimulation Observed by Near-Infrared Spectroscopy

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Abstract— **In this paper, we observed discrepancy of penile hemodynamics dependent on probe location by using near infrared spectroscopy (NIRS). The results demonstrate NIRS as a potentially enhanced diagnosis tool of male erectile dysfunction over the current standards.**

Keywords— **NIRS, hemodynamic, erectile dysfunction, penile erection**

I. INTRODUCTION

Male erectile dysfunction (ED) affects 5-20% of the world's male population and can have a severe negative effect on the subject's life. The inability to maintain a penile erection is biologically marked by the lack of blood flow to the penis [1]. Therefore accurate measurements of penile hemodynamics are crucial in the diagnosis of erectile dysfunction.

II. METHODS

A. Instrumentation

Our in house-built continuous wave NIRS sensor consisted of one LED and one monolithic photodiodes. The LED and photodiode were fixed onto the sensor by means of a PDMS probe holder and sequenced between two wavelengths of 735 and 850nm in order to obtain relative concentration changes of oxy- (HbO) and deoxy- (RHb) hemoglobin. The sampling rate of the system was 2 Hz.

B. Sensor Location

Our study consisted of three different placements of the probe: a single probe placed on top of the genital organ, a single probe placed on the side, and two identical probes placed on the top and side for simultaneous monitoring. The subject determined the exact location of the probe, but received training on proper placement. The probe was affixed to the genital organ using commercial medical tape. The distance between the LED and the photo detector was 1 cm, to give a penetration depth of approximately .25 - .3 cm.

C. Procedure

The first two experiments were run for 6 healthy male subjects and the third experiment was run with one male, all with no previous history of ED. The subject sat down and was shown two types of videos: a still image of a cross for one minute (baseline), and adult video (sexual stimulation) for two minutes.

III. RESULTS

Figure 1 displays the relative concentration changes at the end of visual sexual stimulation. When the sensor is placed on the top of the genital organ, RHb decreases, whereas on the side of the genital organ, it increases. In addition, a Wilcoxon rank-sum test shows a statistical significant difference (p<0.05) between RHb and total hemoglobin changes (HbT) from top and side of genital organ.

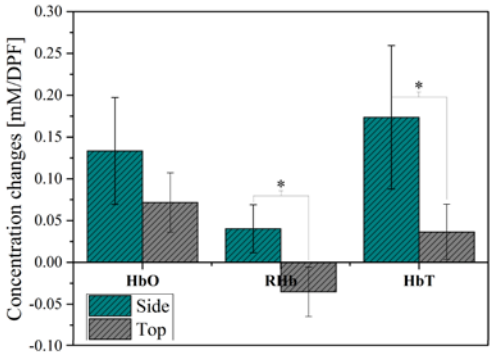

Fig.1 Comparison of penile hemodynamics based on NIRS probe location on the genital organ (* represents p<0.05).

IV. CONCLUSION

Our preliminary results imply that NIRS can detect critical hemodynamic changes in a healthy male penile erection. The multi-location measurement of penile hemodynamics may provide enhanced diagnosis of male erectile dysfunction.

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REFERENCE

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