concerns the small number of patients (n = 11) and availability of the optical measurements over the entire course of treatment (see Table 1). A large pool of patients and optical data would increase the statistical power of measurement results. Lastly, the treatment outcomes from the patients need to be correlated with tumor hemodynamic responses to determine the prognostic value of optical measurements. However, all eleven patients involved in this study demonstrate consistent treatment outcomes (i.e., a complete response to radiation treatment) in the measured cervical lymph nodes (see Table 1), making it impossible to investigate the correlations between tumor hemodynamic responses and clinical outcomes. To overcome these limitations of the present study, we have recently combined the DCS device with a commercial frequency-domain tissue-oximeter (Imagent, ISS Inc. USA) that can measure the absolute values of tumor optical properties and tumor oxygenation [53]. We will use this hybrid instrument to quantify the absolute values of tumor hemodynamics during radiation treatment. More patients are being recruited and clinical outcomes continue to be collected.

Although there is much work to be done, our pilot study results suggest that tumor hemodynamic changes during radiation delivery can be optically detected using the DCS flow-oximeter without being overly burdensome on patients. The unique remotely operated optical system developed in this study has potential to be used in other therapeutic/diagnostic rooms (e.g., CT) where operators are not allowed to stay. It is our hope that real-time monitoring of tumor hemodynamic changes during radiation delivery integrated with the pretreatment absolute measurements of tumor blood flow and oxygenation will provide best information for the early prediction of cancer treatment outcomes.

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