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Boundary Detection Method in Skin Diseases by Using Confocal Raman Micro-Spectroscopy

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Recently, there has been much interest in research to detect cancer boundary for accurate treatments. In this study, we report the disease boundary detection method using confocal Raman micro-spectroscopy. The boundary positions estimated by Raman signal analysis were almost similar to the actual boundary positions of the two-layer skin model. These results show the possibility of detection of the disease boundary in actual diagnosis.

Introduction

Conventional biopsy

Advantages	Disadvantages
• Accurate diagnosis • Find out the histological structure	• Time consuming to find boundary of lesion • Repetition

To overcome limitation of biopsy

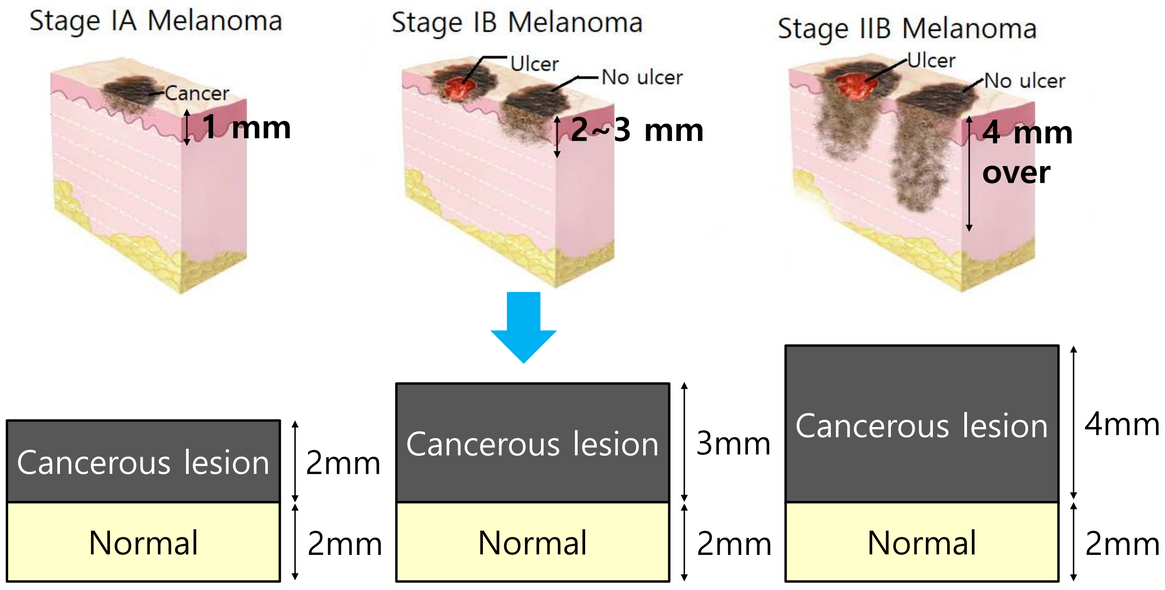
- **Combination with confocal Raman micro-spectroscope opens the way for user to make decision based on chemical analysis.**

Objective

- **In this study, we made the boundary detection method of a two-layer skin model using confocal Raman microscope.**
- **Boundary detection with Confocal Raman microscope can be help to decide biopsy region for minimal invasive biopsy .**

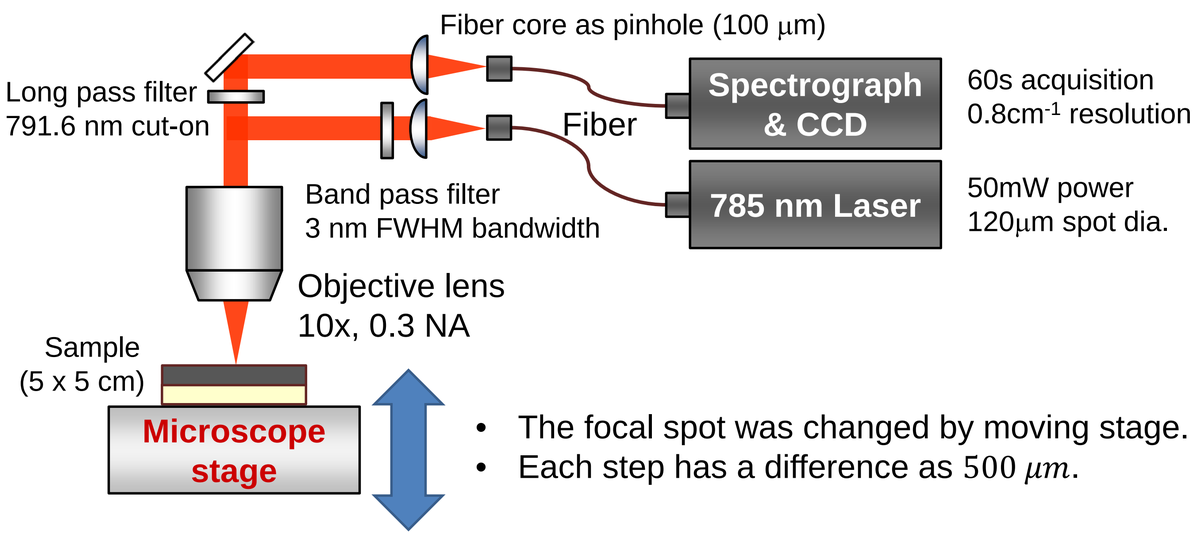
Method

Sample preparation



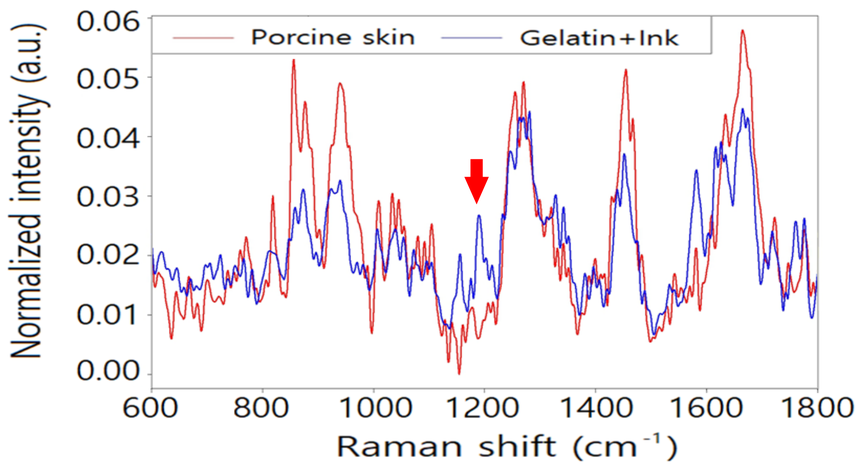
- **Cancerous lesion : gelatin + black water-based ink**
- **Normal : porcine skin**

Data acquisition

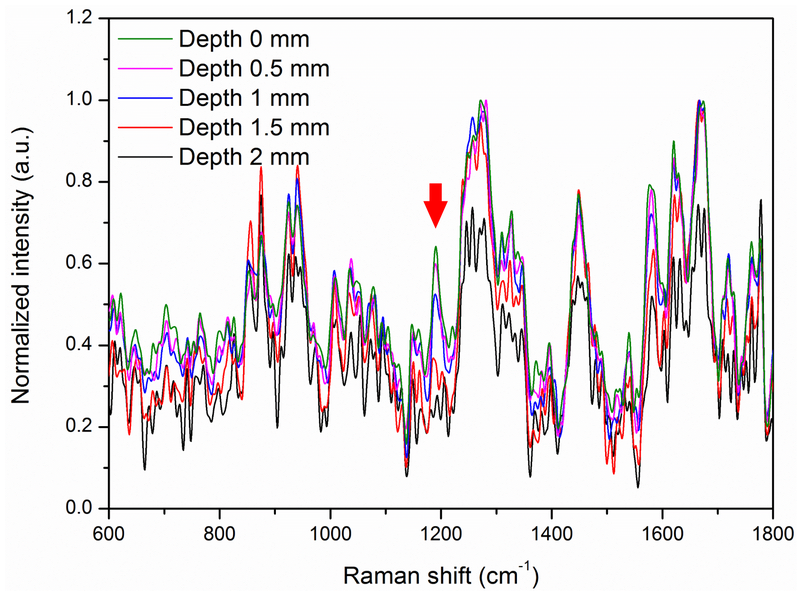


- The focal spot was changed by moving stage.
- Each step has a difference as $500\ \mu m$.

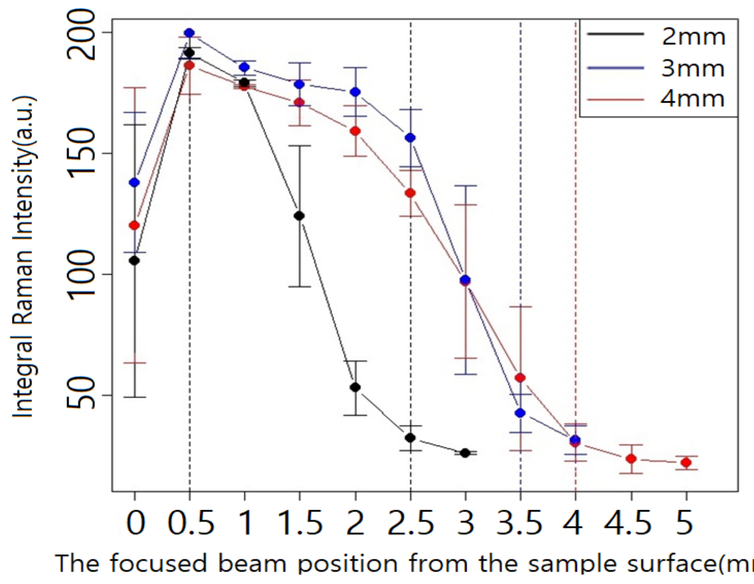
Results



[Figure 1] The normalized intensity of porcine skin and gelatin-ink samples



[Figure 2] The spectra in a 2mm two-layer skin model as the depth increases



[Figure 3] The mean and standard deviation of integral Raman signal intensity

Conclusion

- **We confirmed the possibility that if this method is used for diagnosis of skin disease, it can find the boundary of the disease.**

Reference

[1] Narendran Sudheendran, et al., "Line-scan Raman microscopy complements optical coherence tomography for tumor boundary detection," *Laser Phys. Lett.*, vol. 11, 105602, 2014.

[2] C. A. Lieber, S. K. Majumder, D. L. Ellis, D. D. Billheimer, and A. Mahadevan-Jansen, "In-vivo nonmelanoma skin cancer diagnosis using Raman microscpectroscopy," *Lasers Surg. Med.*, vol. 40, pp. 461-467, 2008.

Acknowledgment

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