

Enhancing Melanoma Diagnosis

Integrating new imaging technologies and RNA tape stripping with dermoscopy

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INTRODUCTION

Accurate melanoma diagnosis is crucial, but current methods often lack precision, leading to unnecessary excisions. This study explores photoacoustic imaging (PAI), which detects and quantifies skin chromophores like melanin, hemoglobin, lipids, and collagen. We assess whether combining PAI with reflectance confocal microscopy (RCM), RNA tape stripping, and dermoscopy can improve diagnostic accuracy.

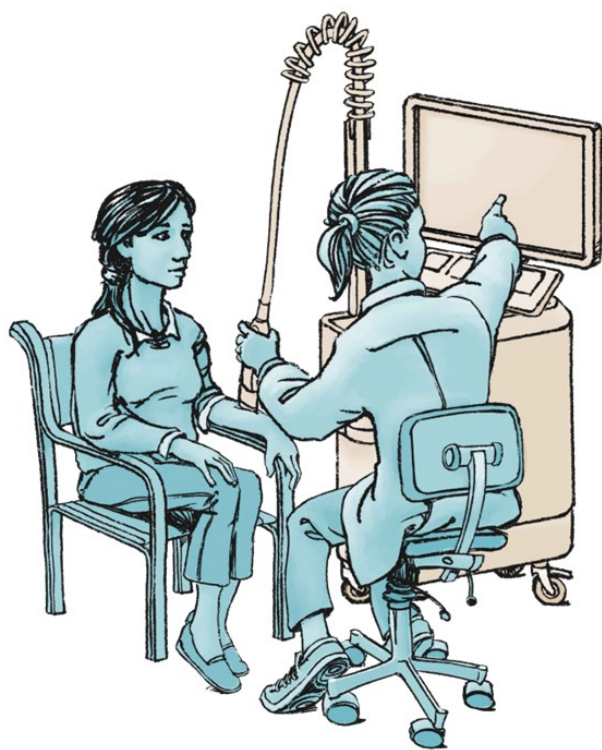


Figure 1. Imaging technologies

Patients with suspicious pigmented skin lesions were imaged with dermoscopy, RCM, and PAI before excision.

RESULTS

PAI revealed significantly higher melanin, hemoglobin, lipids, and collagen concentrations in malignant lesions, with an intermingled network of melanin and blood vessels being a key malignancy indicator. Adding PAI increased sensitivity by up to 20% over RCM and dermoscopy alone. The combined RNA and dermoscopy test achieved 100% sensitivity for malignancy, with 35% specificity.

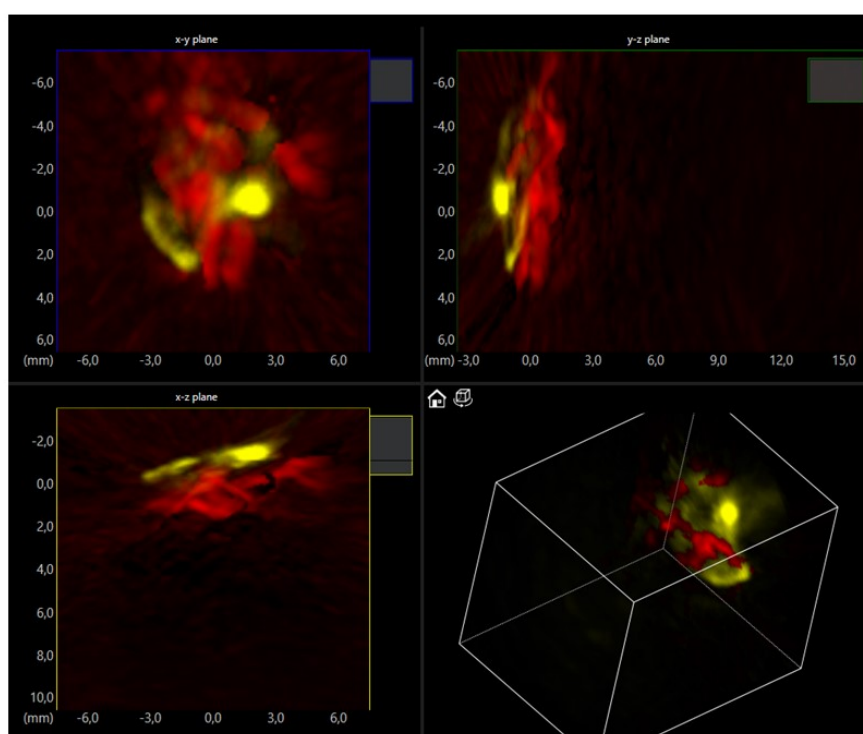


Figure 2. Malignant melanoma visualized by PAI

PAI showing a melanoma lesion on different imaging planes, with melanin (yellow) and arteries (red) in an intermingled network, a characteristic feature found in most malignant lesions.



Figure 2. Tape stripping

The lesion was marked, and adhesive tape applied to collect skin cells for RNA analysis of malignancy-related gene expression.

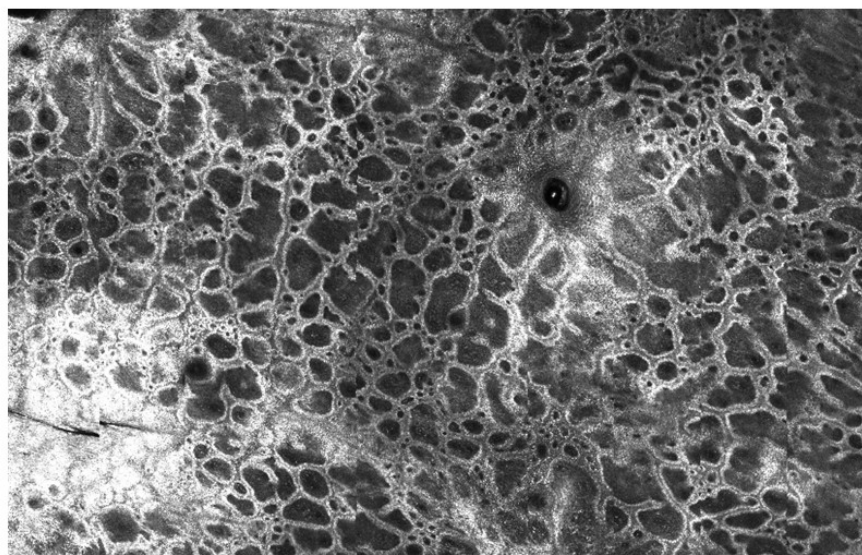


Figure 3. RCM image of malignant melanoma

RCM image showing atypical cells, dermal epidermal junction disarray, nucleated cells in dermal papillae and non-edged papillae, all strongly associated with malignancy.

MATERIALS AND METHODS

75 patients with a suspected diagnosis of melanoma were examined using dermoscopy, RCM, and PAI. RNA samples were collected by tape-stripping before excision. Diagnostic features from the imaging were analyzed, and new hypotheses combining RCM, PAI, and dermoscopy were tested. The expression of 11 RNA molecules was investigated.

CONCLUSIONS

PAI holds significant potential for improving melanoma diagnosis. Integrating PAI, RCM, RNA tape stripping, with dermoscopy enhances melanoma diagnosis with detailed chromophore data, real-time cellular imaging, and molecular insights.