**Article type:** Research Letter

**Title:** Patterns of Use of Reflectance Confocal Microscopy at a Tertiary Referral Dermatology Clinic

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**Funding sources:** Funding: Research was funded in part by the P30 Cancer Center Support Grant (P30 CA008748) for Memorial Sloan Kettering Cancer Center and by the National Institutes of Health Research Project Grant (RO1) Program (RO1EB020029 and RO1EB012466).

**Conflicts of Interests:** A.M declares research support from Incyte and Amryt Pharma and serves on the advisory board of Alira Health. VR is an expert advisor for Inhabit Brands, Inc. MR owns equity in CaliberID (formerly, Lucid Inc). The VivaScope is the commercial version of an original laboratory prototype that was developed by Dr. Rajadhyaksha when he was at Massachusetts General Hospital, Harvard Medical School.

IRB approval status: Reviewed and approved by Memorial Sloan Kettering Cancer Canter IRB, protocol #17-078

**Reprint requests:** Veronica Rotemberg

**Manuscript word count:** 499

**References:** 5

**Figures:** 1

**Supplementary figures:** 0

**Tables:** 1

**Supplementary tables:** 0

**Attachments:** 0

Keywords: Reflectance confocal microscopy, imaging, diagnosis, clinical, real-world, RCM, confocal, optical, non-invasive
Reflectance Confocal Microscopy (RCM) imaging allows noninvasive examination of skin in real-time at the bedside with cellular level resolution. At Memorial Sloan Kettering Cancer Center (MSKCC), we have been using RCM, both the arm-mounted, wide-probe microscope (Vivascope 1500, CaliberID) and the handheld, portable microscope (Vivascope 3000, Caliber ID), in our dermatology and dermatologic surgery clinics since 2011. The handheld microscope is not currently reimbursable and we do not bill for it. RCM has been shown to improve malignancy detection, reduce unnecessary biopsies, and guide interventions/surgical procedures. However, these applications have not been described in a practice setting. To describe the use of RCM in a tertiary referral center, we queried the imaging performed at MSKCC between January 2017 and December 2020 from clinical documentation and an internal database. We extracted lesion site, microscope used, initial clinical concern, and when available, the RCM impression and pathology report.

Of the 1905 lesions with a recorded initial clinical concern, melanocytic lesions comprised 46% (n=874), basal cell carcinomas (BCCs) 30% (n=571), extramammary Paget’s diseases (EMPDs) 4% (n=68), squamous cell carcinomas (SCCs) 3% (n=50), and rare or unspecified lesions 18% (n=342). Amongst these most commonly imaged lesions, 30% (n=465) of imaging was performed for margin mapping to guide surgical excision and 70% (n=1098) to guide diagnosis.

Figure 1 shows the specific RCM device used at each anatomic site. The handheld microscope was used for 51% (n=971) of lesions, mostly on the ear, head/neck, oral/genital, and nose...
regions. The arm-mounted microscope was used in 49% of lesions (n=934), mostly on the upper/lower extremity and torso.

Of the 486 lesions for which RCM impressions were available, 431 were one of the three most common lesions: melanoma, BCC, or SCC. Table 1 shows the clinical decision-making of these lesions. The positive predictive value/negative predictive value was 47%/97% for melanoma, 50-79%/80-88% for BCC, and 31-69%/83% for SCC (ranges due to empirically treated lesions obscuring pathology-confirmed diagnoses). All lesions with the RCM diagnosis of malignancy were biopsied or empirically treated, whereas 95%, 78%, and 73% of lesions suspicious for melanoma, BCC, and SCC, respectively, which showed benign RCM features were spared biopsy. Some of these cases were still biopsied, likely because of dermoscopic suspicion and because RCM could not conclusively rule out malignancy.

This study of RCM’s uses shows that the imaging is used not only for diagnosis but also for surgical margin mapping of tumors. Our frequent handheld microscope use, especially on uneven anatomic surfaces, suggests the need to establish new CPT codes to improve the feasibility of this technology for dermatology clinics. The 73-95% of lesions spared biopsy despite initial clinical suspicion confirms findings from prior studies showing RCM minimizes biopsies and decreases morbidity. Limitations of this study include incomplete recording of data, which calls for standardization, and the evolving skill of confocalists. The understanding of RCM use in a specialized setting will help clinicians understand the value of integrating RCM
into practice as the technology becomes more accessible due to reduced costs and improved billing opportunities.

References:


<table>
<thead>
<tr>
<th>Clinical Concern</th>
<th>RCM Impression</th>
<th>Management Decision</th>
<th>Pathology</th>
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<tbody>
<tr>
<td><strong>Melanoma/Lentigo Maligna (n=271)</strong></td>
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<tr>
<td>Malignant: 24% (n=66)</td>
<td>Biopsy: 100% (n=66)</td>
<td>Melanoma/LM: 47% (n=31) Benign: 44% (n=29) BCC: 3% (n=2) Declined Biopsy: 6% (n=4)</td>
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<tr>
<td>Indeterminate: 19.2% (n=52)</td>
<td>Biopsy: 63% (n=33)</td>
<td>Malignant: 30% (n=10) Benign: 67% (n=22) Declined Biopsy: 3% (n=1)</td>
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<tr>
<td>Follow up: 37% (n=19)</td>
<td>Later Biopsied: 26% (n=5)</td>
<td>Melanoma: 20% (n=1) Benign: 80% (n=4)</td>
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<td></td>
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<td>Continued Follow-up: 74% (n=14)</td>
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<tr>
<td>Benign: 56.4% (n=153)</td>
<td>Biopsy: 5% (n=7)</td>
<td>Benign: 100% (n=7)</td>
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<tr>
<td>Follow-up: 95% (n=146)</td>
<td>Later Biopsied: 16% (n=24)</td>
<td>Melanoma: 20% (n=3: in-situ) Benign: 80% (n=19)</td>
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<td></td>
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<td>Continued follow-up: 83.6% (n=122)</td>
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<td><strong>Basal Cell Carcinoma (n=138)</strong></td>
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<td>Malignant: 51% (n=70)</td>
<td>Recommended Biopsy: 71% (n=50)</td>
<td>BCC: 70% (n=35) SCC: 4% (n=2) Benign: 18% (n=9) FU: 4% (n=2) Outside Biopsy: 2% (n=1)</td>
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<tr>
<td>Intermediate: 14% (n=19)</td>
<td>Biopsied: 63% (n=12)</td>
<td>Malignant: 25% (n=3) Benign: 58% (n=7)</td>
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<td></td>
<td>Follow up: 26% (n=5)</td>
<td>Declined Biopsy/Treatment: 17% (n=2)</td>
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<td>Treated Empirically: 11% (n=2)</td>
<td>Continued Follow-up: 100% (n=5)</td>
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Table 1: “Clinical decision-making of diagnostic lesions imaged with RCM.” The lesions included in the primary three clinical concern categories (suspected diseases) for which RCM imaging was performed. We show the clinical concern of the lesion, the RCM impression, management decision, and the pathology result of the lesion if and when it is biopsied. Lesions were considered benign if biopsy-proven or clinically followed without biopsy, and malignant if biopsy-proven. Indeterminate lesions did not have any RCM features diagnostic of a benign or malignant process and therefore were classified as intermediate. The positive predictive
value/negative predictive value for melanoma was 47%/97%, 50-79%/80-88% for BCC and 31-69%/83% for SCC (ranges due to empirically treated lesions). The negative predictive value is 97% for melanoma, 80-88% for BCC (due to empirically treated lesions), and 83% for SCC.