Semi-automated non-invasive diagnostics method for melanoma differentiation from nevi and pigmented basal cell carcinomas

I. Lihacova, K. Bolocko, A. Lihachev
The incidence of melanoma in industrialized countries with predominantly light-skinned people\(^1\) is still rising;

Late detection causes high mortality;

High cost of dermatology services, long queues on state funded oncologist examinations and inaccessibility of oncologists in the countryside regions causes late tumor diagnostics and high mortality risks;

Lack of inexpensive, easy to use skin malformation diagnostic equipment available for primary care physicians.

Multispectral camera with integrated liquid crystal filter and equipped with ring of halogen lamps, diffuser and polarizer.

Spectral range: 450- 950 nm; step 10 nm

$I_0(\lambda)$- intensity from white paper reference placed on skin surface

$I(\lambda)$- intensity from interested region of skin

$$OD(\lambda) = -\log\left(\frac{I(\lambda)}{I_0(\lambda)}\right)$$


$p = OD_{650} + OD_{950} - OD_{540}$

$p' = p - p_0$

$p$- in pathology;

$p_0$- in healthy skin

At 2012: melanomas have areas, where mean value of this area $p' > 0$

for other pigmented malformations (nevi, pigmented basal cell carcinomas) $p' \leq 0$

Sensitivity 94%, specificity 89%.


Results

$p'$ values for:

- **nevī** are in range $[-0.3; +0.25]$;
- **pigmented basal cell carcinomas** do not reach the boundary $p' = +0.25$ and have values under boundary $p' = -0.3$;
- **melanomas** are above boundary $p' = +0.25$, which is possible in combination with values under boundary $p' = -0.3$. 
47 dermatologically confirmed nevi, 6 histologically confirmed pigmented basal cell carcinomas and 30 histologically confirmed melanomas.
Established method distinguishes melanoma from pigmented basal cell carcinomas and nevi with **sensitivity 97%** and **specificity 96%**. Test distinguishes pigmented basal cell carcinomas from melanomas and nevi with sensitivity 100% and specificity 95%.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Sensitivity</th>
<th>Specificity</th>
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</thead>
<tbody>
<tr>
<td>MelaFind</td>
<td>78% (in practice)</td>
<td>46% (in practice)</td>
</tr>
<tr>
<td>SIAscope</td>
<td>83-96%</td>
<td>80-87%</td>
</tr>
<tr>
<td>SolarScan</td>
<td>91%</td>
<td>68%</td>
</tr>
<tr>
<td>p’ maps + classification scheme</td>
<td>97%</td>
<td>96%</td>
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</tbody>
</table>
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Thank you for your attention!

For more questions, please, contact me:

ilze.lihacova@gmail.com