SPECTROPHOTOMETRIC INTRACUTANEOUS ANALYSIS
A NEW TOOL FOR THE ASSESSMENT OF PIGMENTED SKIN LESIONS

M. Moncrieff, S. Cotton, E. Claridge & P. Hall

1. Abstract
A study of the use of in-vivo macro histological information returned by a SIA Scope in the diagnosis of malignant melanoma is presented.

2. SIA - a New, Rapid Analysis Technique
Spectroscopic Intracutaneous Analysis (SIA) is a non-invasive, rapid scanning technique where a SIA scope is used to analyse light reflected from the skin. Complex algorithms return “SIA graphs,” high-resolution maps of components of the skin. These include the:
- Location of melanin in the papillary dermis
- Concentration of blood and collagen in the papillary dermis
- Total concentration of melanin in the papillary dermis and epidermis
- Contours of the dermal-epidermal junction
- Concentration of keratin in the epidermis

3. Assessment of 138 lesions with SIA
138 lesions referred for biopsy excision were assessed using SIA scope for a range of features including:
- Presence of dermal melanin in the Dermal Melanin SIA graph
- Presence of blood displacement with a peripheral erythematous blush within the Blood SIA graph
- Presence of holes within the collagen of the papillary dermis within the Collagen SIA graph
- Clumping and aggregations of melanin within the Total Melanin SIA graph

Diameter greater than 6mm.

The lesions were then excised and sent for histological diagnosis. The diagnoses of these lesions included 19 invasive and 4 in situ melanomas, 73 common naevi, 2 lentigo malignas and 40 assorted lesions including congenital naevi, seborrheic keratoses, haemangiomata, Spitz naevi and other rarer pigmented lesions. The average Breslow thickness of the invasive melanomas was 1.81 mm (8 melanomas less than 0.76 mm).

4. Measuring the Diagnostic Accuracy of SIA
Logistic regression analysis was performed on the identified features where it was shown that a simple combination of the presence of dermal melanin concurrent with the presence of blood displacement and a peripheral erythematous blush and a diameter of 6mm or more produces the results shown in table 1.

Table 1
<table>
<thead>
<tr>
<th></th>
<th>Melanoma</th>
<th>Non-Melanoma</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test +ve</td>
<td>21</td>
<td>26</td>
<td>47</td>
</tr>
<tr>
<td>Test -ve</td>
<td>2</td>
<td>89</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>115</td>
<td>138</td>
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</tbody>
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The sensitivity of this approach was 91.3% with a specificity of 77.3%. The positive likelihood ratio was 4.02 and the negative likelihood ratio was 0.112. In other words, in the presence of these three signs the patient is four times more likely to have a melanoma. Conversely in the absence of these three signs the patient is nine times less likely to have a melanoma.

5. Conclusion
SIA Presents New Information Pertinent to the Diagnosis of Malignant Melanoma
The SIA scope presents new information regarding the in-vivo macro histology of the skin. In this study three easily identifiable and repeatable SIA scope features were shown to yield a high sensitivity in the diagnosis of malignant melanoma. Further research will produce a more definitive analysis of this technique with the aim of developing an atlas of SIA scope.

This information can be used to assist in the diagnosis and monitoring of naevi and early malignant melanoma. Further on, this two-year study will identify and assess features obtained using SIA technology and provide specificity and sensitivity to guide the physician in planning the management of their patient.

References:

Astron Clinica
United Kingdom: T. +44 (0) 1223 265 000 E. info@astronclinica.com
Australia: T. +61 (7) 3303 8472 E. info@astronclinica.com

Astron Clinica
THROWING LIGHT ON SKIN HEALTH
Originally presented at EADV 2000