19th EADO CONGRESS
April 20th–22nd, 2023

Advanced 2D and 3D total body scanning for detection of melanoma

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DISCLOSURE OF CONFLICTS OF INTEREST

SPEAKER: Almirall, BMS, ISDIN, La Roche Posay, Leo, Novartis, Pierre Fabre, Roche, Sanofi

HONORARIA OR CONSULTATIONS FEES : Almirall, BMS, Biofrontera, GSK, ISDIN, La Roche Posay, Leo, Novartis, Polychem, Dermavision, Pierre Fabre.

GRANTS & RESEARCH SUPPORT: Almirall, Amgen, BMS, Biofrontera, Canfield, Cantabria, Fotofinder, GSK, ISDIN, La Roche Posay, Leo, Mavig, Nevisense, Novartis, Polychem, Roche, Dermavision

Spouse/partner: Almirall, Amgen, BMS, Biofrontera, Canfield, Cantabria, Fotofinder, GSK, ISDIN, La Roche Posay, Leo, Mavig, Nevisense, Novartis, Pierre Fabre, Polychem, Roche

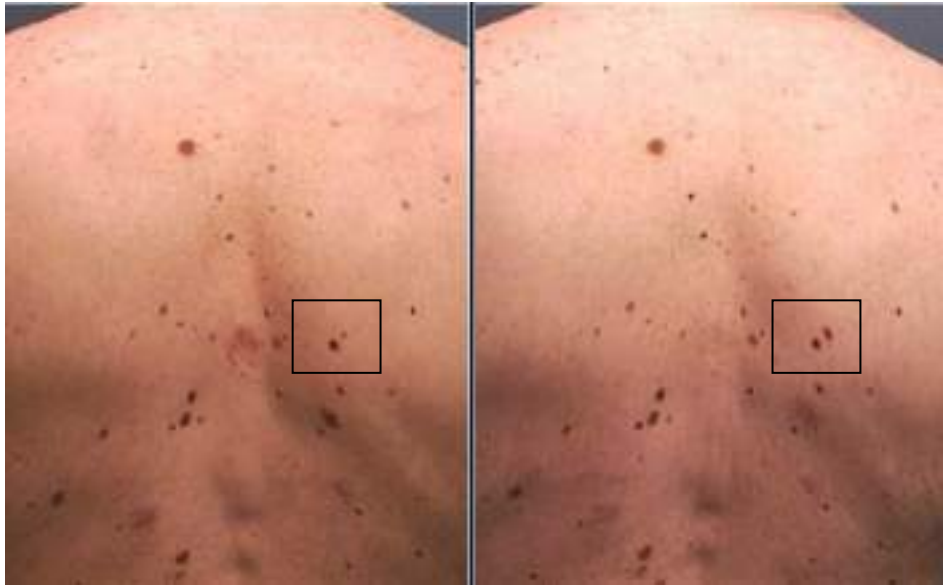
Other support (please specify): Abbie (educational activities), Lilly (educational activities), Novartis Co-Founder of Athena Tech.

RESEARCH AND INNOVATION GRANTS

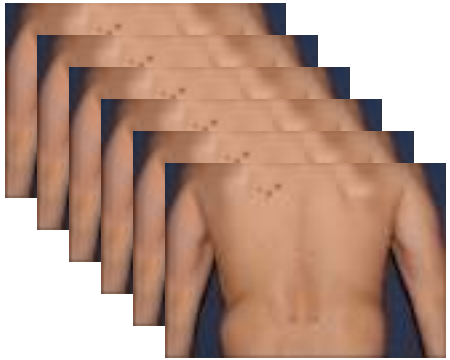
M-Skip

Definition of TBP

TBP can help identify new or changing naevi through comparison of base- line TBP images with subsequent skin examinations or comparison of sequential TBP images over time, either by clinicians or computer-assisted algorithms.

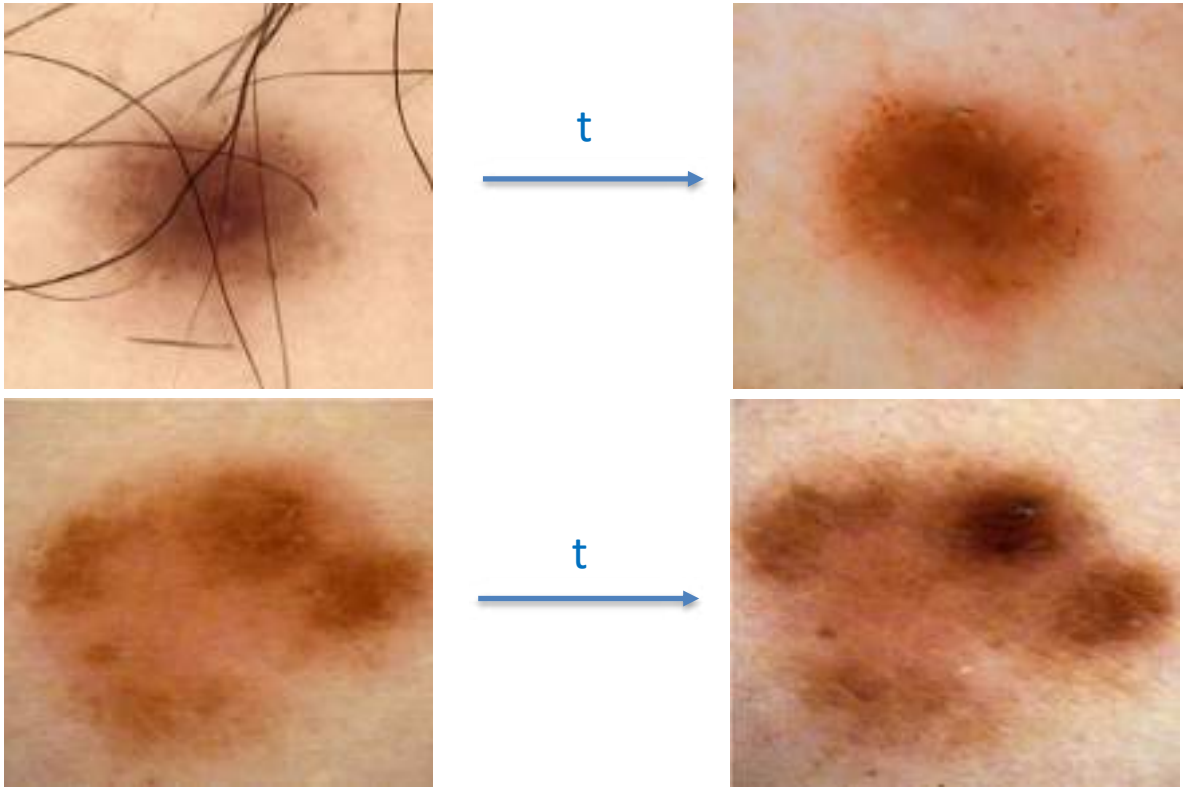


- 2D TBP /3D TBP / Standard photography vs polarised light TBP
- TBP vs digital Dermoscopy follow-up

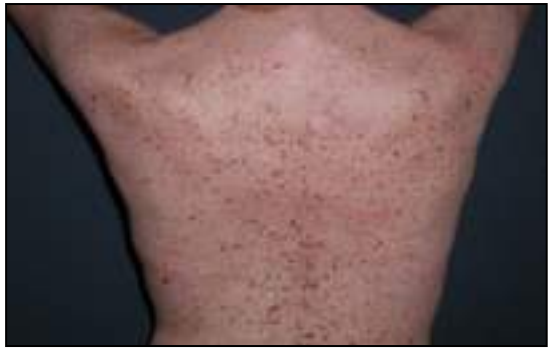


Digital follow-up (Dermoscopy)

Digital follow-up (Dermoscopy)

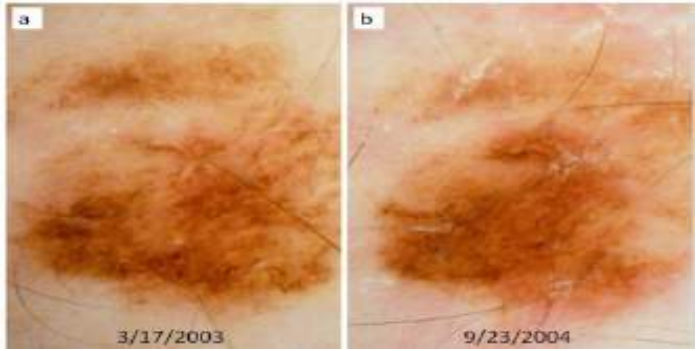


Total Body Photography



24 Photos per patient (15-56)

Digital Dermoscopy



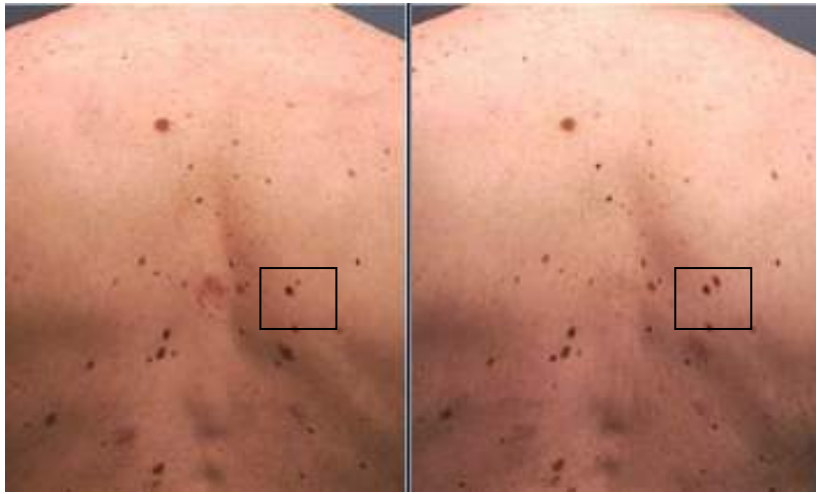
18.44 lesions /patient (15-25)

“Two steps method of digital follow-up”

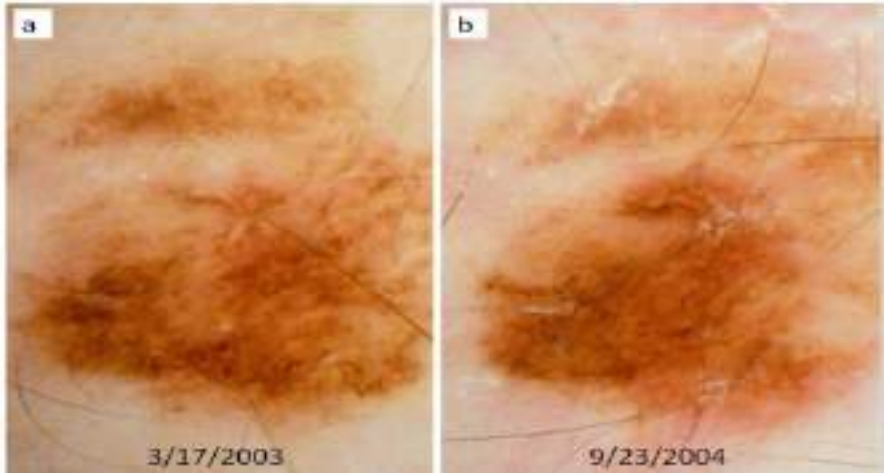
J Malvehy, S Puig, R Martí, et al. Follow-up of melanocytic skin lesions with digital total-body photography and digital dermoscopy: a two steps method. Clinics in Dermatol 2002

30% of lesions were excised because changes in Total Body Photography

40% of the new MMs



70% excised because changes in digital dermoscopy /60% of the new MMs



Salerni G, et al. Benefits of total body photography and digital dermatoscopy ("two-step method of digital follow-up") in the early diagnosis of melanoma in patients at high risk for melanoma. JAAD 2012

Nelson KC, Swetter SM, Saboda K et al. Evaluation of the number- needed-to-biopsy metric for the diagnosis of cutaneous melanoma: a systematic review and meta-analysis. JAMA Dermatol 2019; 155:1167–74.

Study (year)	Patients receiving TBP	Total number of biopsies	Mean biopsies per patient	True positives	False positives	Number needed to biopsy	Naevus : melanoma ratio	MIS : MM ratio
Drugge (2020)[12]	218	225	2·0	67	158	3·36	2·36	1·91
Feit (2004)[5]	567	77	6·4	27	50	2·85	1·85	3·50
Goodson (2010)[7]	1076	548	0·6	28	520	19·57	18·57	1·15
Greenwald (2020)[20]	36832	1571	1·1	260	1311	6·04	5·04	2·81
Lallas (2020)[13]	977	121	NS	52	69	2·33	1·33	2·06
Mintsoulis (2016)[21]	114	267	2·3	14	253	19·10	18·07	NA
Moloney (2014)[22]	311	770	NS	82	688	9·39	8·39	NA
Risser (2007)[11]	64	53	1·9	0	53	NE	NA	NA
Salerni (2012)[19]	618	1152	1·9	98	1054	11·76	10·76	1·18
Truong (2016)[8]	926	1419	1·6	93	1326	15·26	14·26	0·98
Total	41703	6203	NA	721	5482	NA	NA	NA
Range			0·6–6·4			2·33–19·6	1·33–18·57	0·98–3·50
Weighted mean			1·6			8·6	7·6	1·68

MIS, melanoma *in situ*; MM, malignant melanoma; NA, not applicable; NE, not estimable. Values were calculated from source study data when not directly provided in the manuscript. Mean biopsies per patient = number of lesions biopsied/number of patients biopsied. True positives (MIS or MM on histopathology), false positives (neither MIS nor MM on histopathology), and number needed to biopsy (lesions biopsied for one MIS or MM) are shown for combined MIS and MM.

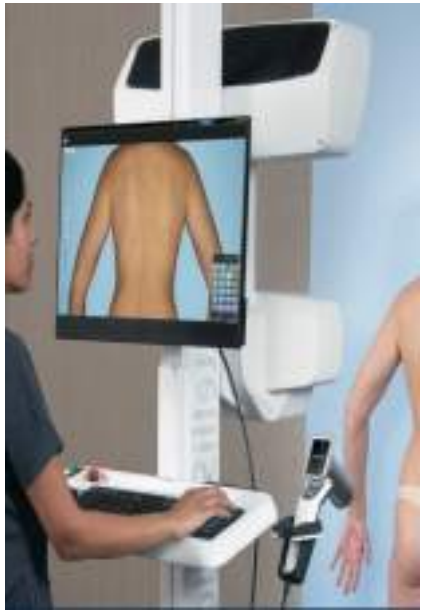
455 496 biopsies and 29 257 melanomas from 46 studies, assessed the accuracy of clinicians diagnosing melanoma. Mean 4–12% of lesions biopsied demonstrated melanoma; NNB of 14,8

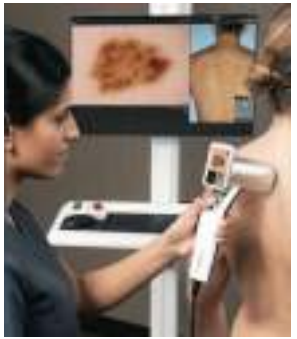
Diagnostic accuracy

1. Based on previous studies, **the sensitivity of TBP+SDD** is very low in the first visit (<25%) and increase to 100% in subsequent visits (1,2,3...) since we can assume that every MM can be detected when the tumor grows and exhibits a significant change.
2. However **benign lesions can change** as well, and this fact determines a **specificity** in this population that is very low (i.e. NNT= 1:12-14).

Metanalyses of TBP-SDD (Salerni G, Terán T, Puig S, Malvehy J, Zalaudek I, Argenziano G, Kittler H. Meta-analysis of digital dermoscopy follow-up of melanocytic skin lesions: a study on behalf of the International Dermoscopy Society. J Eur Acad Dermatol Venereol. 2013 Jul;27(7):805-14)

MELANOMA RISK SCORE: DEEP IMAGING



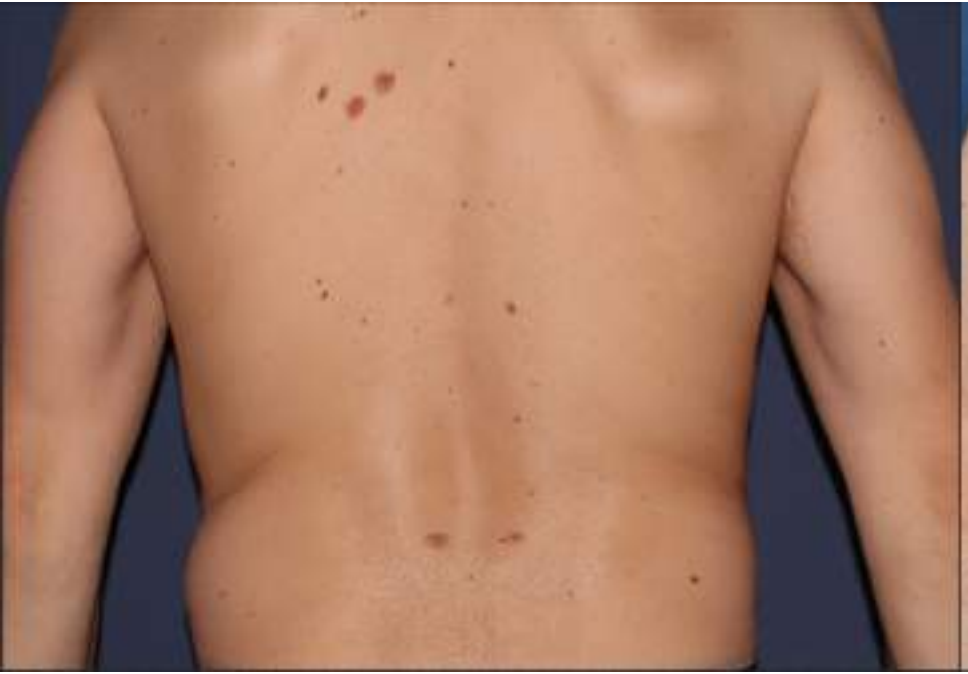


Automatic identification of lesions; detection of changes; lesion risk assessment; faster examination

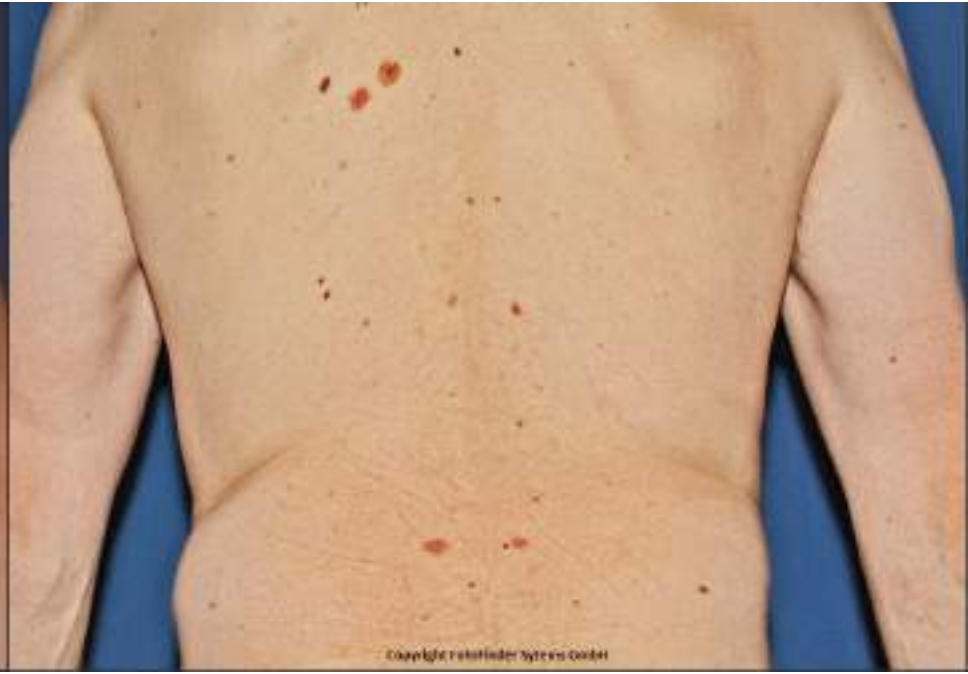
HIGH-RESOLUTION TBP COMPARED WITH DIGITAL DERMOSCOPY

- New TBM photographic devices improved the quality and reduced the acquisition time
- Detection of changes in patients with atypical mole syndrome based on TBP is more accurate but there are no results from prospective studies with these new devices
- It is presumed that fewer dermoscopic images are needed to detect melanoma using new TBM devices. However there is no evidence of this assumption
- There is a lack of clinical standards for TBP + digital Dermoscopy

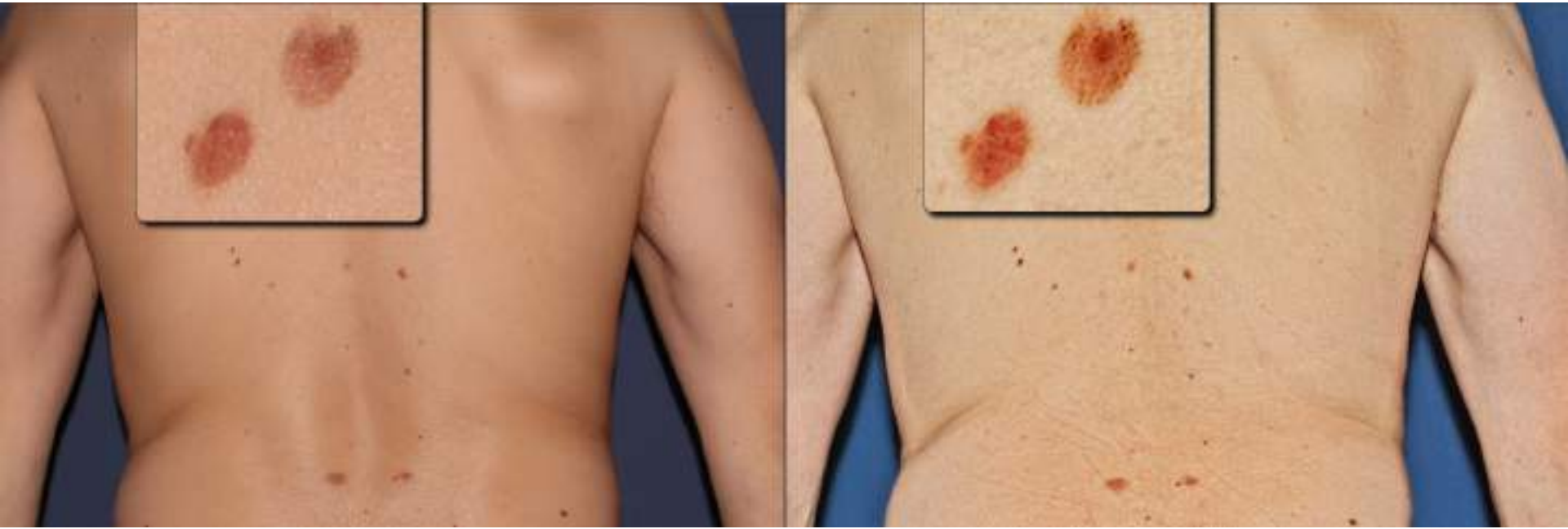
Next Gen TBM: cross-polarised light and higher resolution



Non polarized image (EOS 700D)



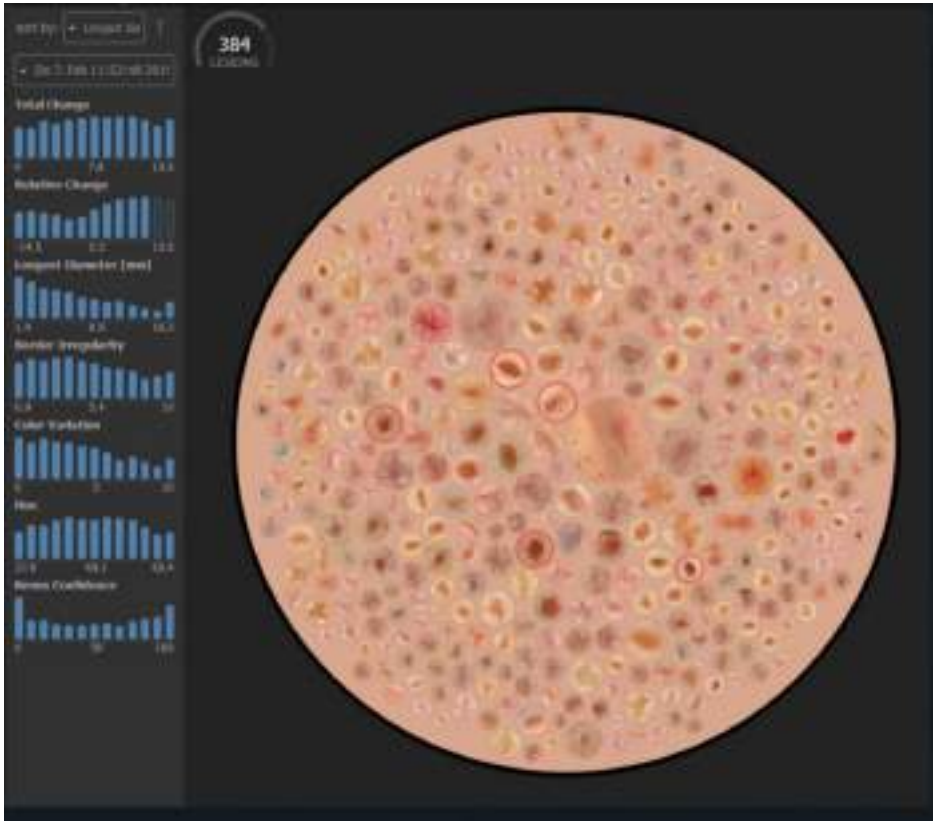
RAW processed image (full frame DSLR)

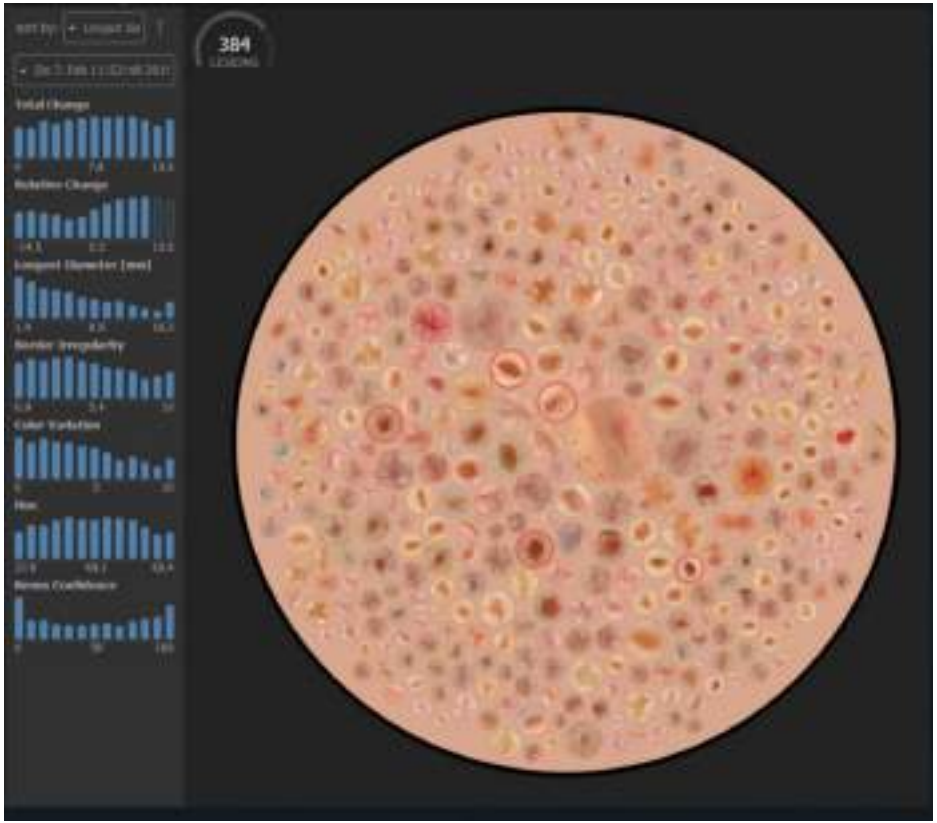


Non polarized image (EOS 700D)

RAW processed image (full frame DSLR)

MELANOMA RISK SCORE: DEEP IMAGING

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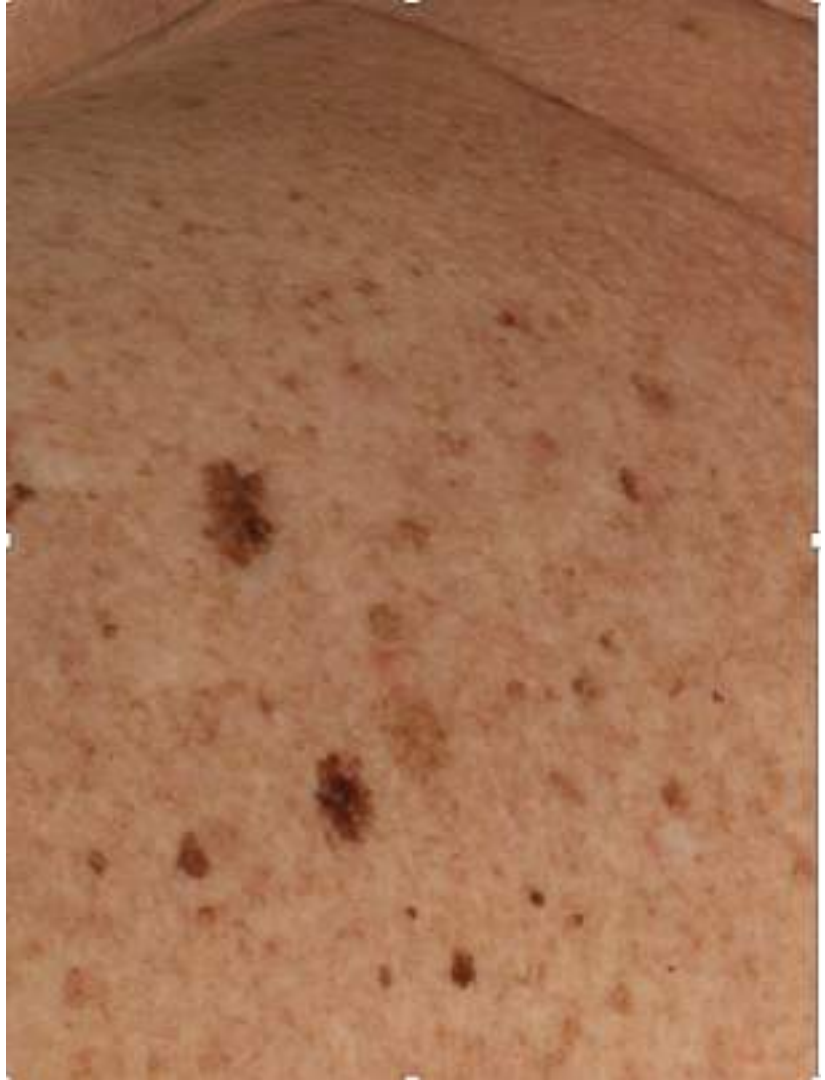


DESCRIPTION OF IMAGES OF TBP AND D-DERMOSCOPY

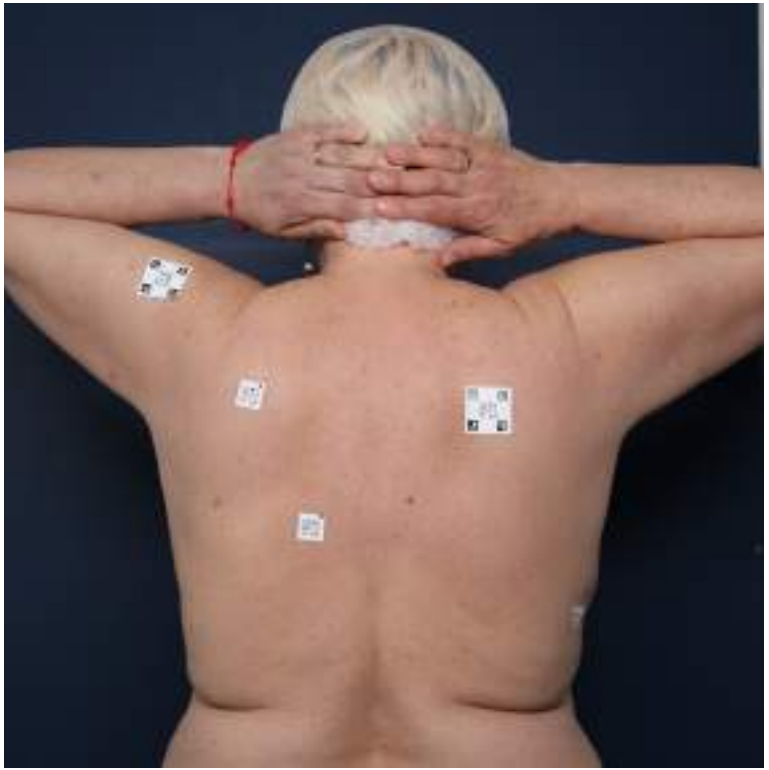
Number of Line Pairs / mm in USAF Resolving Power Test Target 1951

	Group Number											
Element	-2	-1	0	1	2	3	4	5	6	7	8	9
1	0.250	0.500	1.00	2.00	4.00	8.00	16.00	32.0	64.0	128.0	256.0	512.0
2	0.281	0.561	1.12	2.24	4.49	8.98	17.96	35.9	71.8	143.7	287.4	574.7
3	0.315	0.630	1.26	2.52	5.04	10.08	20.16	40.3	80.6	161.3	322.5	645.1
4	0.354	0.707	1.41	2.83	5.66	11.31	22.63	45.3	90.5	181.0	362.0	724.1
5	0.397	0.794	1.59	3.17	6.35	12.70	25.40	50.8	101.6	203.2	406.4	812.7
6	0.445	0.891	1.78	3.56	7.13	14.25	28.51	57.0	114.0	228.1	456.1	912.3

1951 USAF resolution test chart widely used in optical engineering laboratory work to analyze and validate imaging systems.

- Koren 2003: Norman Koren's updated resolution chart better suited for computer analysis

DESCRIPTION OF IMAGES OF TBP AND D-DERMOSCOPY



1951 USAF resolution test chart widely used in optical engineering laboratory work to analyze and validate imaging systems.

DESCRIPTION OF IMAGES OF TBP AND D-DERMOSCOPY

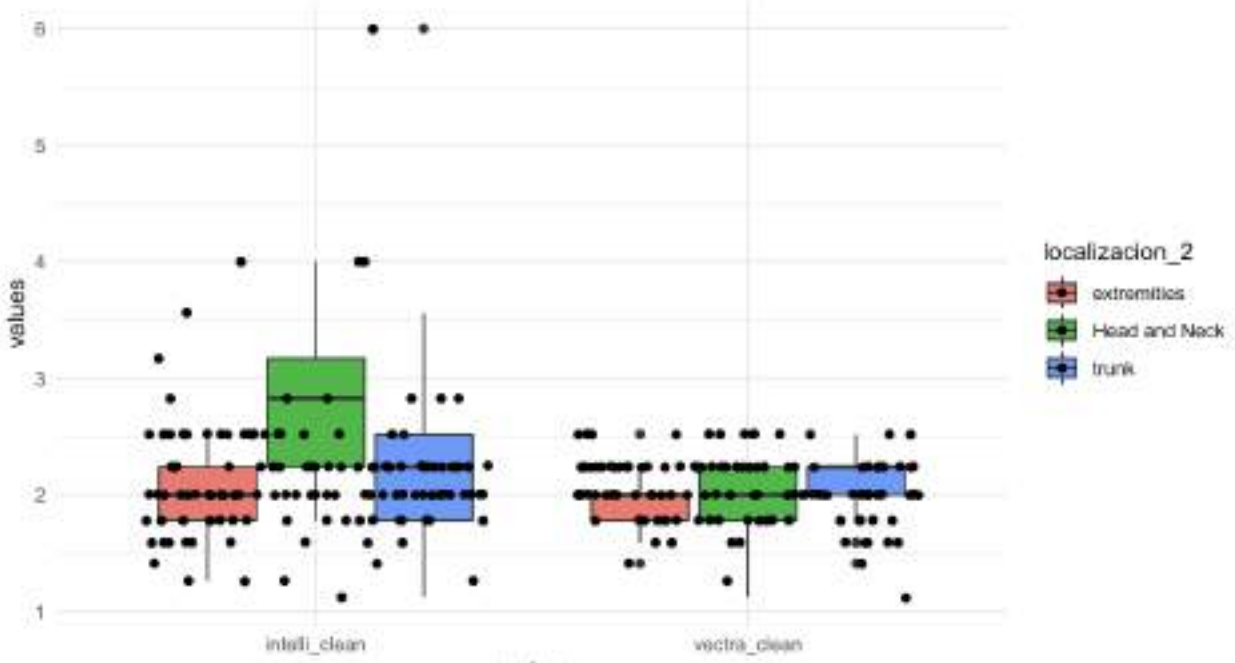


Figure 7 Graphic of 1951 USAF test mediums comparison according to body site

TBP
1951 USAF (25 cm) = 3.56 lp/mm.
1951 USAF (150 cm)= 1 lp/mm.

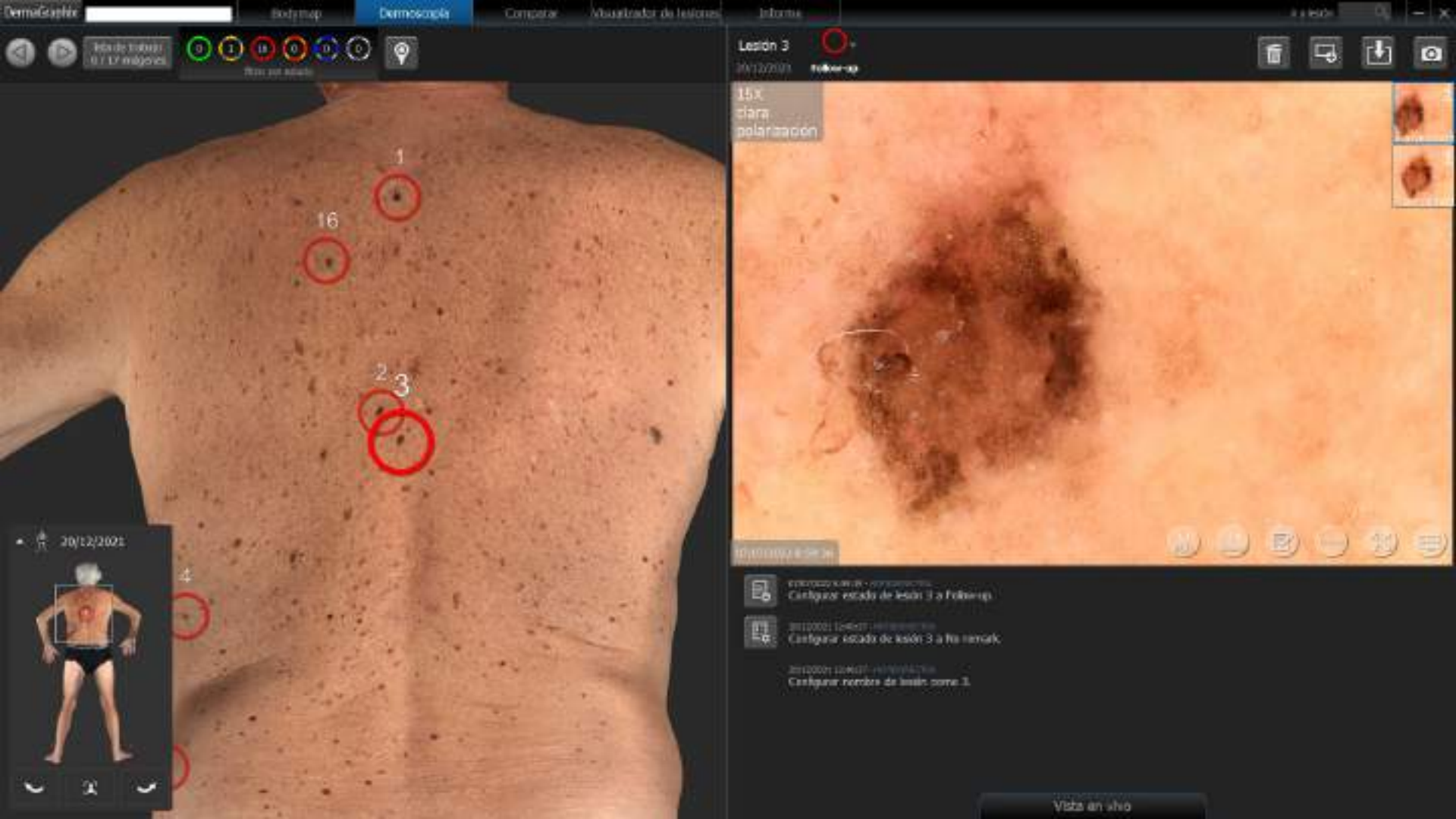
Cross-polarized manual dermatoscope
USAF 1951 >14.3 lp/mm.

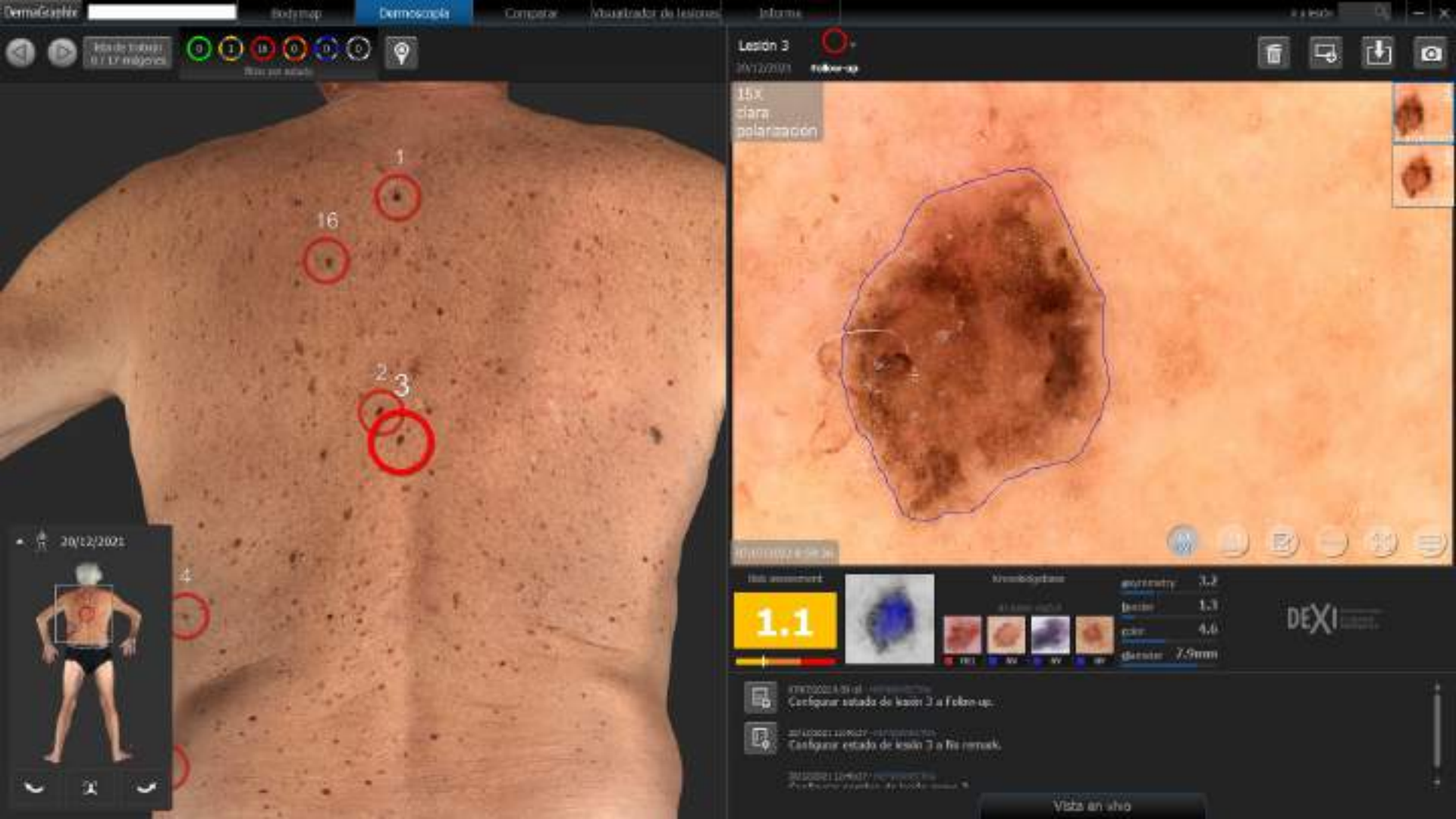
CLINICAL PROTOCOL HOSPITAL CLINIC OF BARCELONA

Inclusion criteria of patients
High-risk for melanoma due to multiple atypical melanocytic lesions +/- personal or familial melanoma +/- genetic sindromes

Schedule
1. Base line with full body exam +Dermoscopy-TBP+SDD
2. Follow-up: Imaging (detection of changes)- full body exam with Dermoscopy

Selection of lesions for Dermoscopy image
- Any lesion considered for excision;
- Lesions considered for follow-up with one or more of the following dermoscopic criterio: asymmetry, multicomponent pattern, negative of the pigmented network, regression structures, streaks, ring of globules or atypical vessels


DermaGraphix
Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 3
20/12/2021
follow-up
15x
clara
polarización
1
16
2
3
4
20/12/2021
Configurar estado de lesión 3 a Follow-up
Configurar estado de lesión 3 a No remark
Configurar nombre de lesión como 3.
Vista en vivo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Comparar
Visualizador de lesiones
Informe
Lesión 3
follow-up
15x
clara
polarización
1
16
2
3
4
20/12/2021
1.1
DEXI
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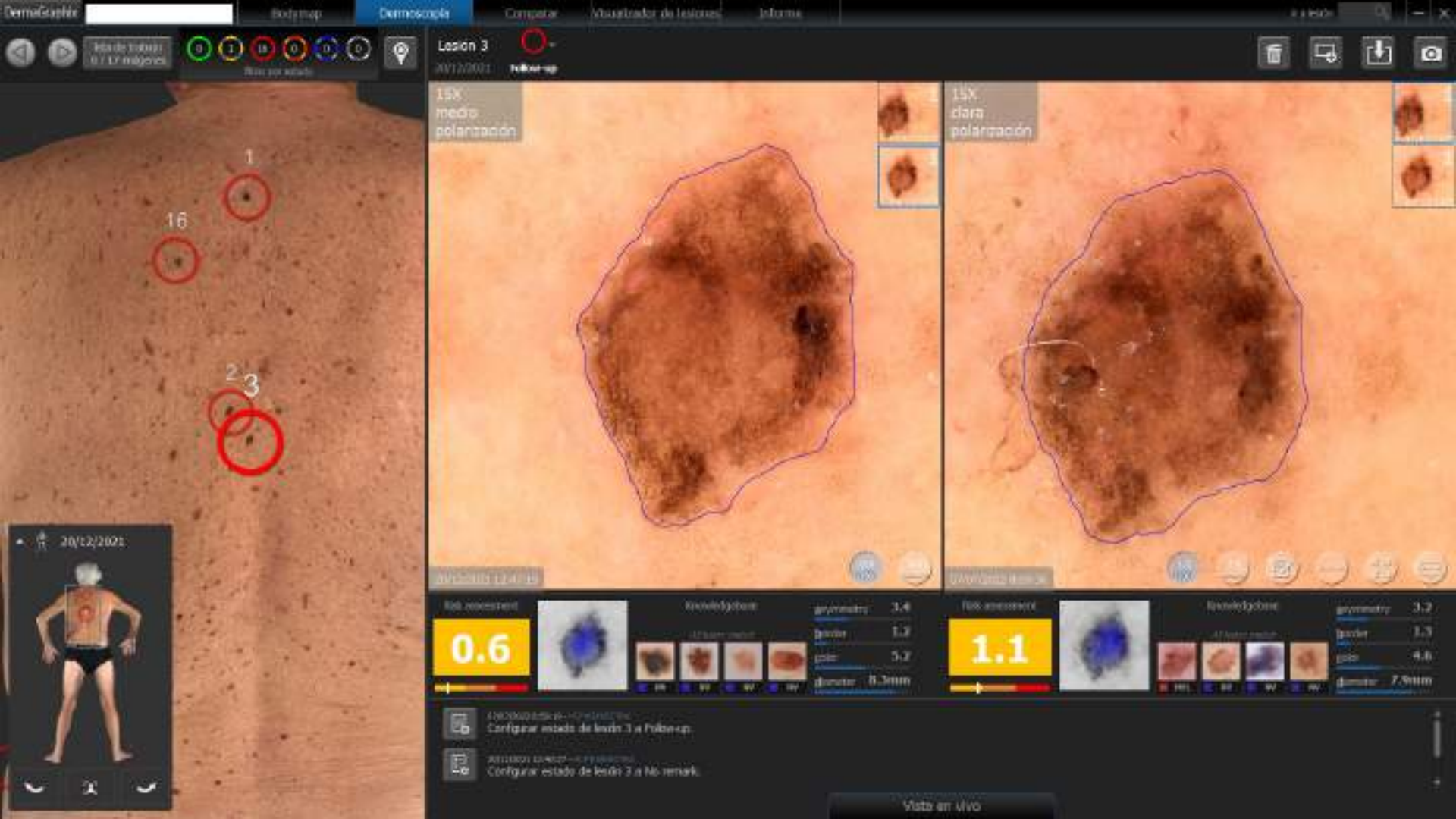
Vista en vivo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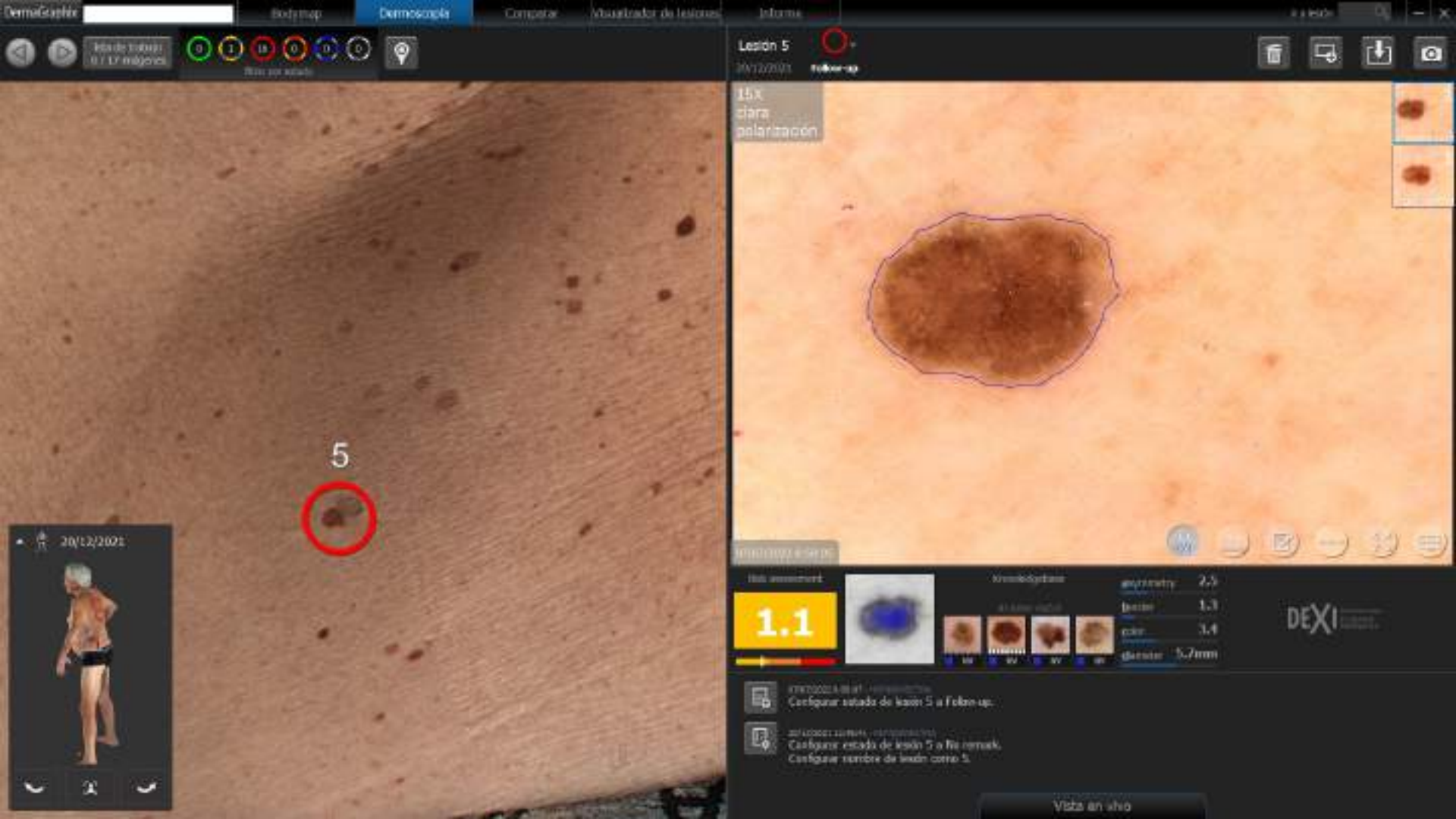
Comparar
Visualizador de lesiones
Informe
Lesión 3
15X
modo
polarización
15X
clara
polarización
0.6
1.1
Configurar estado de lesión 3 a Follow-up.
Configurar estado de lesión 3 a No remark.
Vista en vivo


DermaGraphix
Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 5
follow-up
15x
clara
polarización
5
20/12/2021
Configurar estado de lesión 5 a Follow-up
Configurar estado de lesión 5 a No remark
Configurar nombre de lesión como 5.
Vista en alto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Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 5
15x
clara
polarización
5
20/12/2021
1.1
DEXI
Configurar estado de lesión 5 a Follow-up.
Configurar estado de lesión 5 a No remark.
Configurar nombre de lesión como 5.
Vista en vivo


DermaGraphic
Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesion 5
15X
medio
polarización
15X
clara
polarización
0.6
1.1
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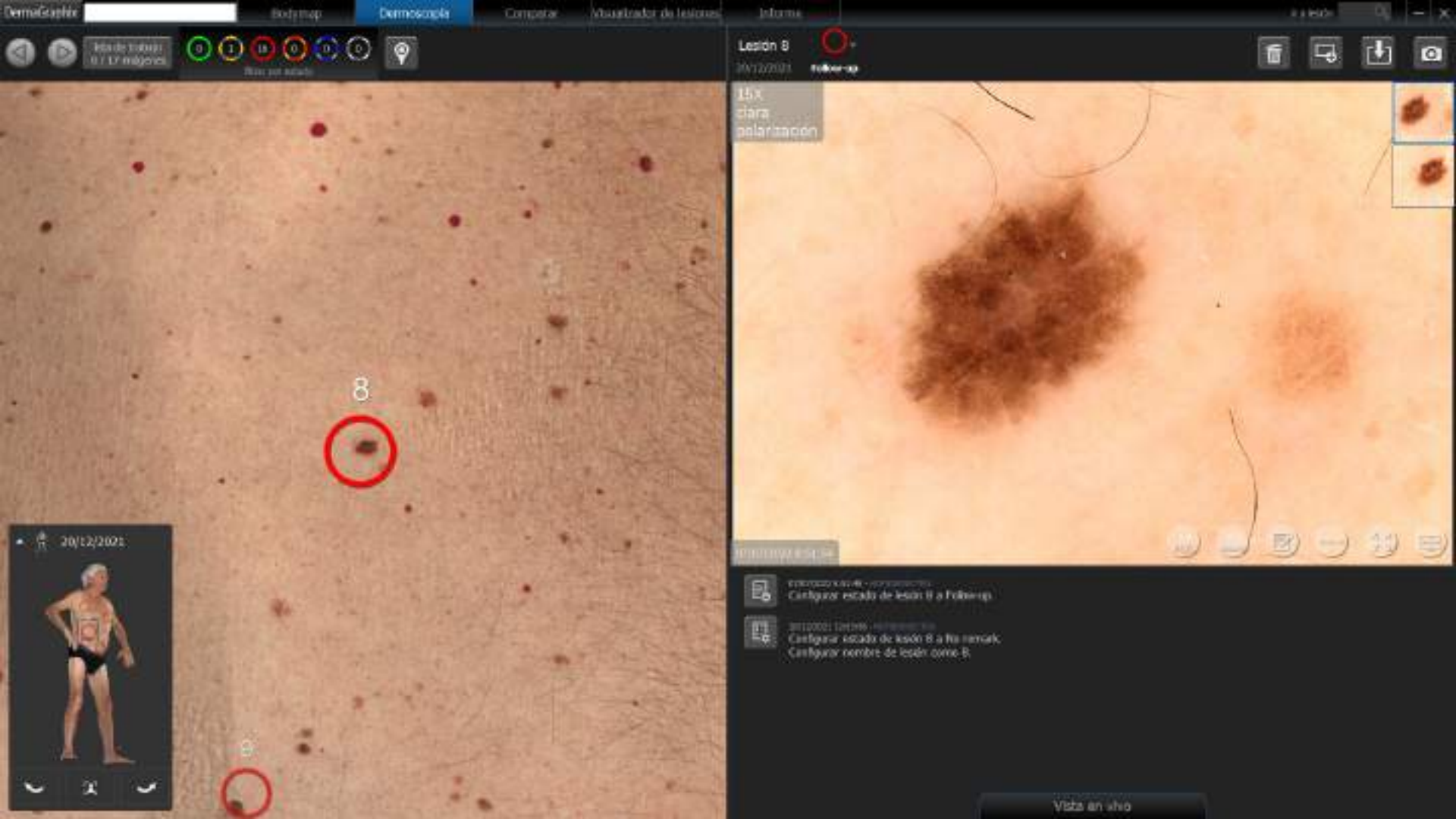
Vista en vivo
5
20/12/2021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Comparar
Informe
Lesión 8
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clara
polarización
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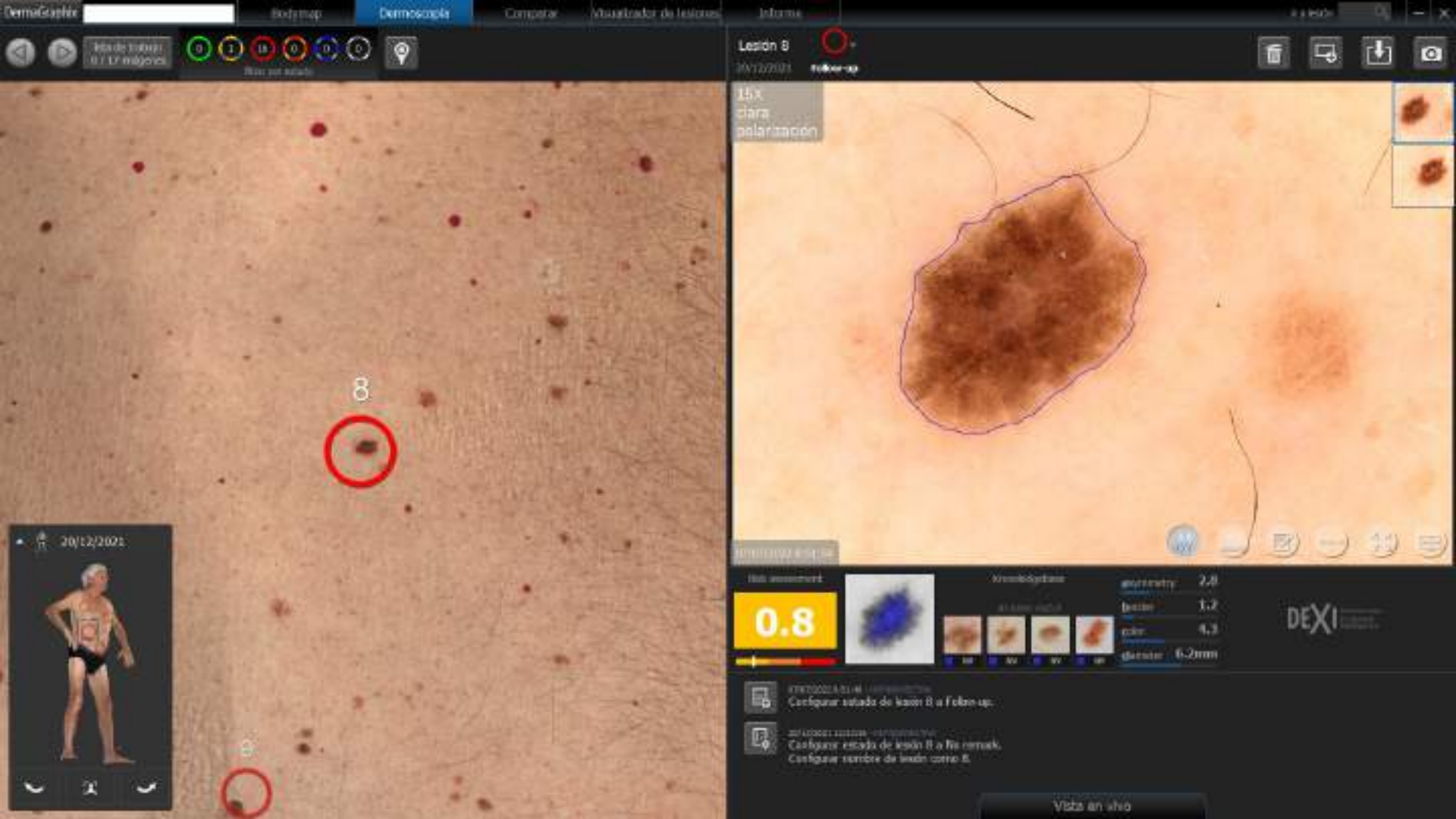
Configurar nombre de lesión como 8
Vista en vivo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Visualizador de lesiones
Informe
Lesión 8
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clara
polarización
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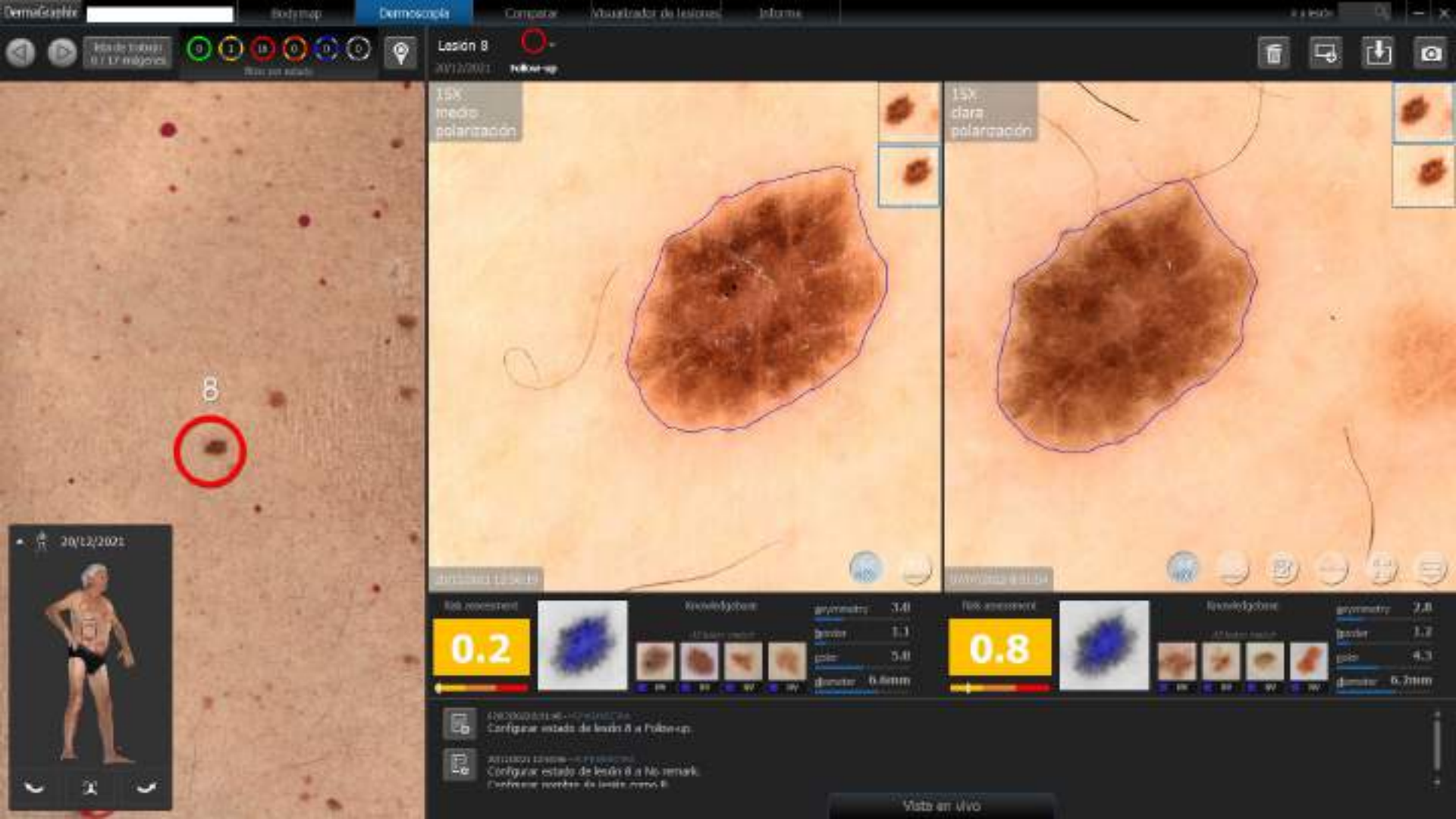
Configurar nombre de lesión como 8.
Vista en vivo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Informe
Lesión 8
15X
medio
polarización
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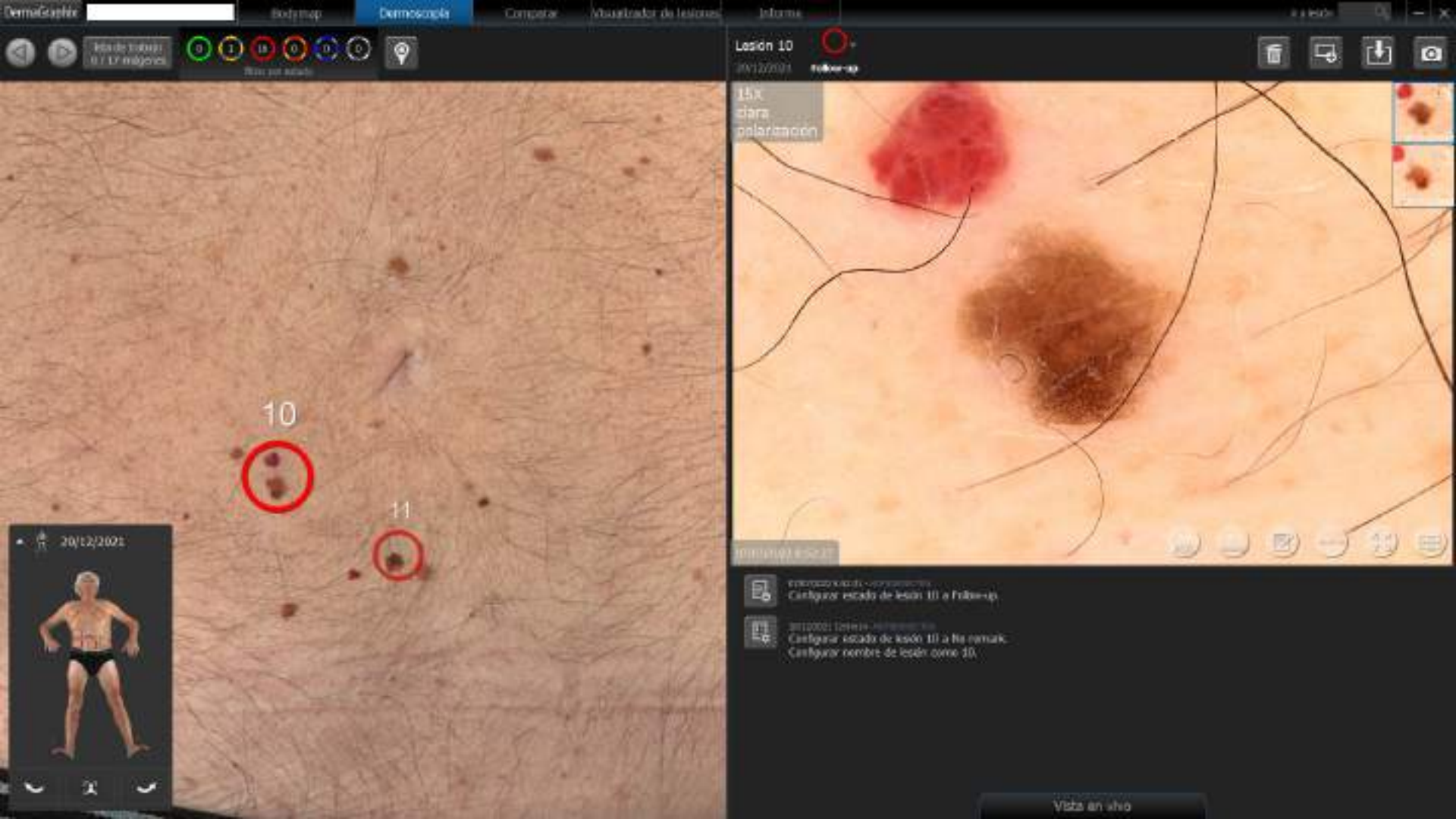
Vista en vivo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Comparar
Informe
Lesión 10
15x
clara
polarización
10
11
20/12/2021
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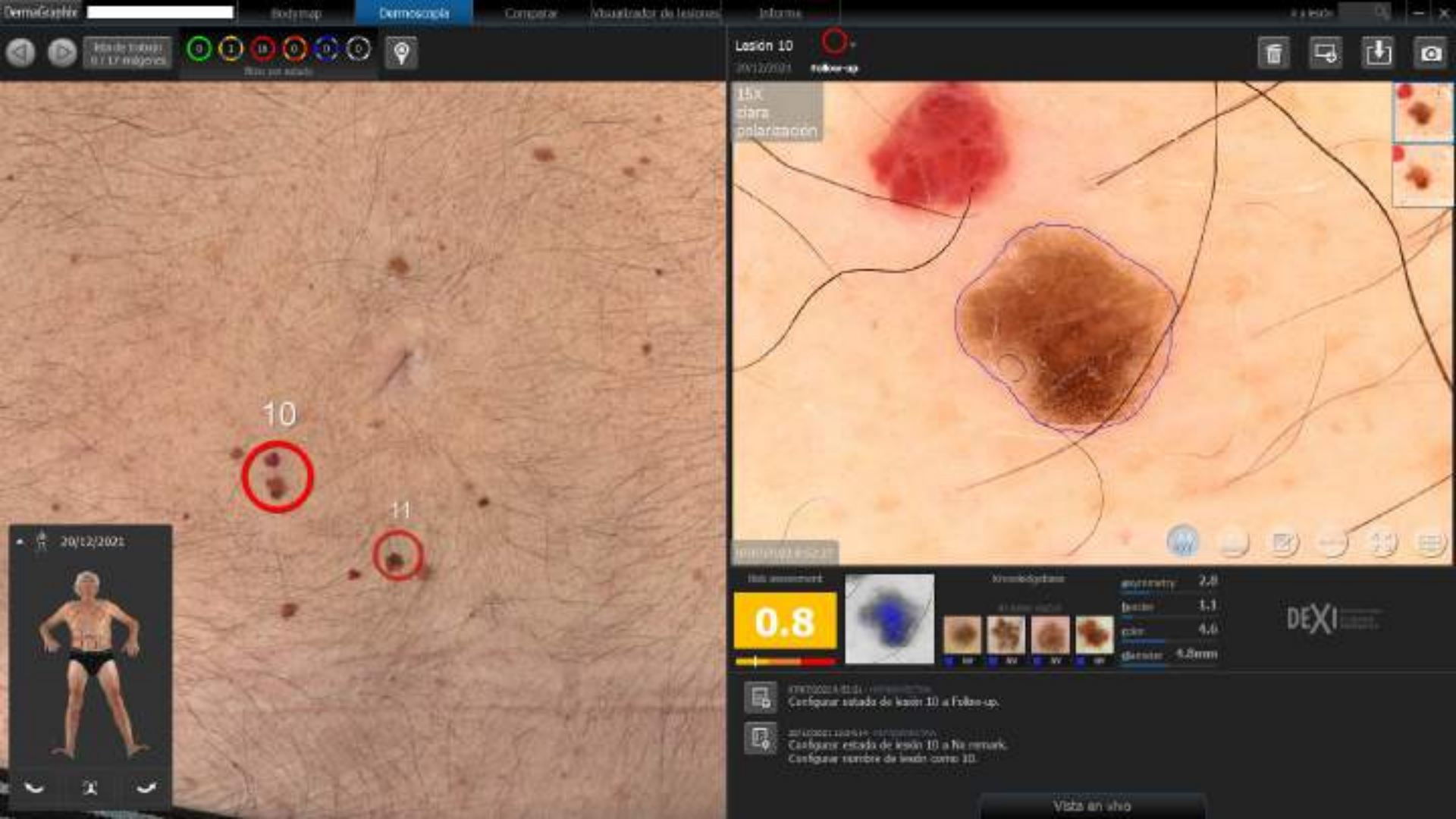
Vista en vivo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Lesion 10
follow-up
15x
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polarización
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11
20/12/2021
0.8
Configurar estado de lesión 10 a Follow-up.
Configurar estado de lesión 10 a No remark.
Configurar nombre de lesión como 10.
Vista en vivo


DermaGraphix
Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 10
15X
medio
polarización
15X
clara
polarización
10
11
20/12/2021
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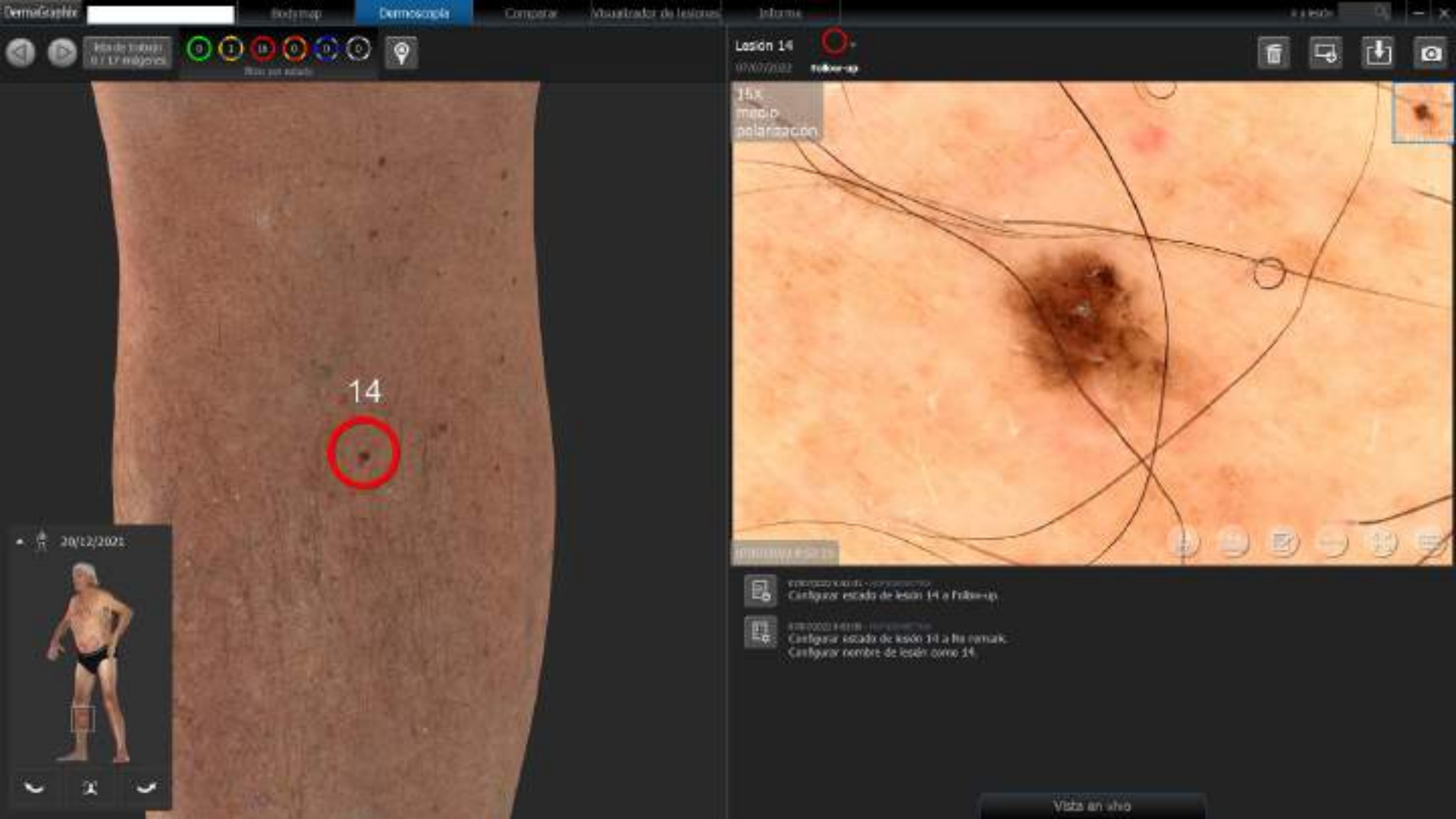
Vista en vivo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Informe
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follow-up
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modo
polarizacion
14
20/12/2021
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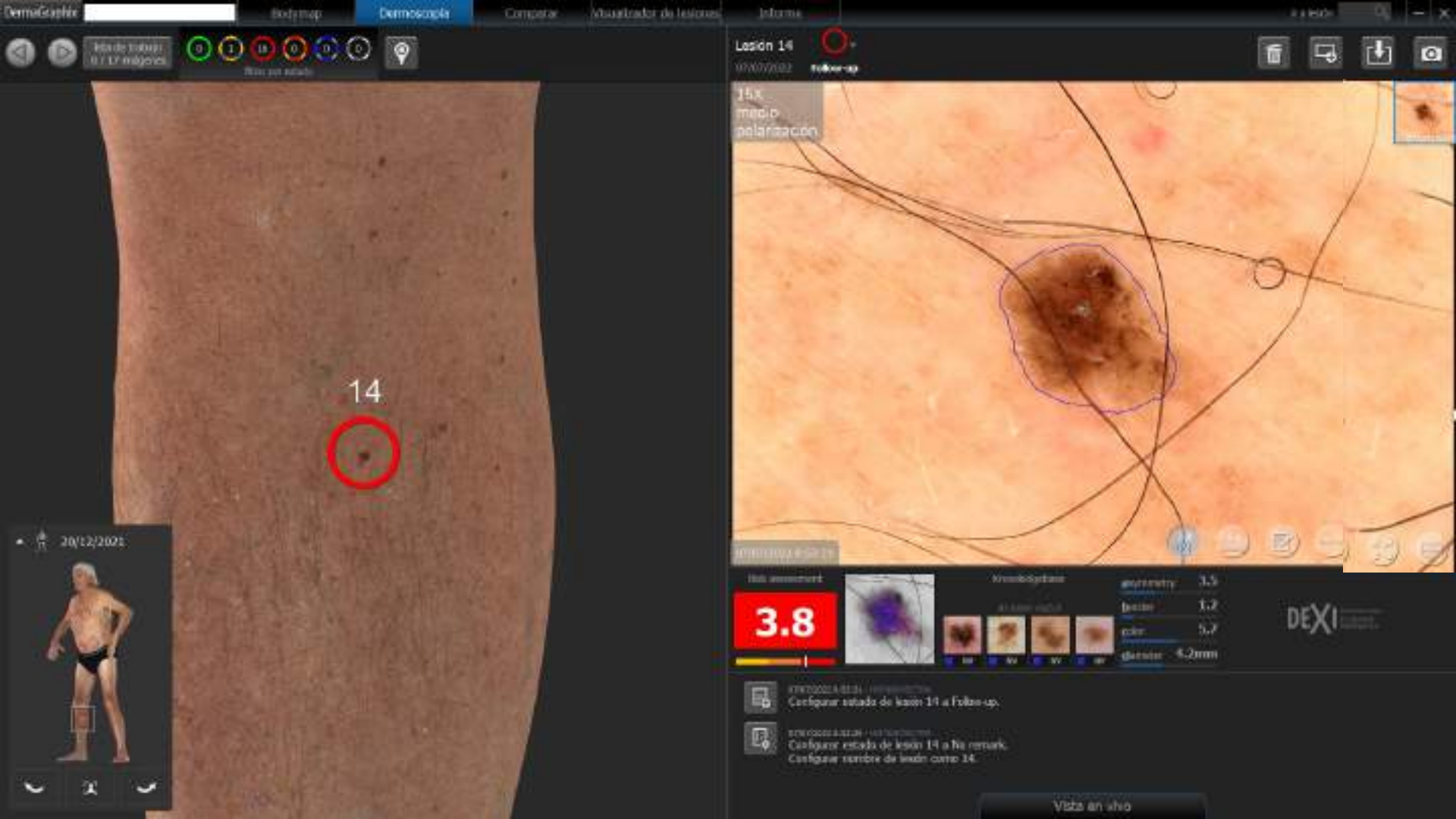
Vista en vivo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Informe
Lesion 14
14
20/12/2021
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polarizacion
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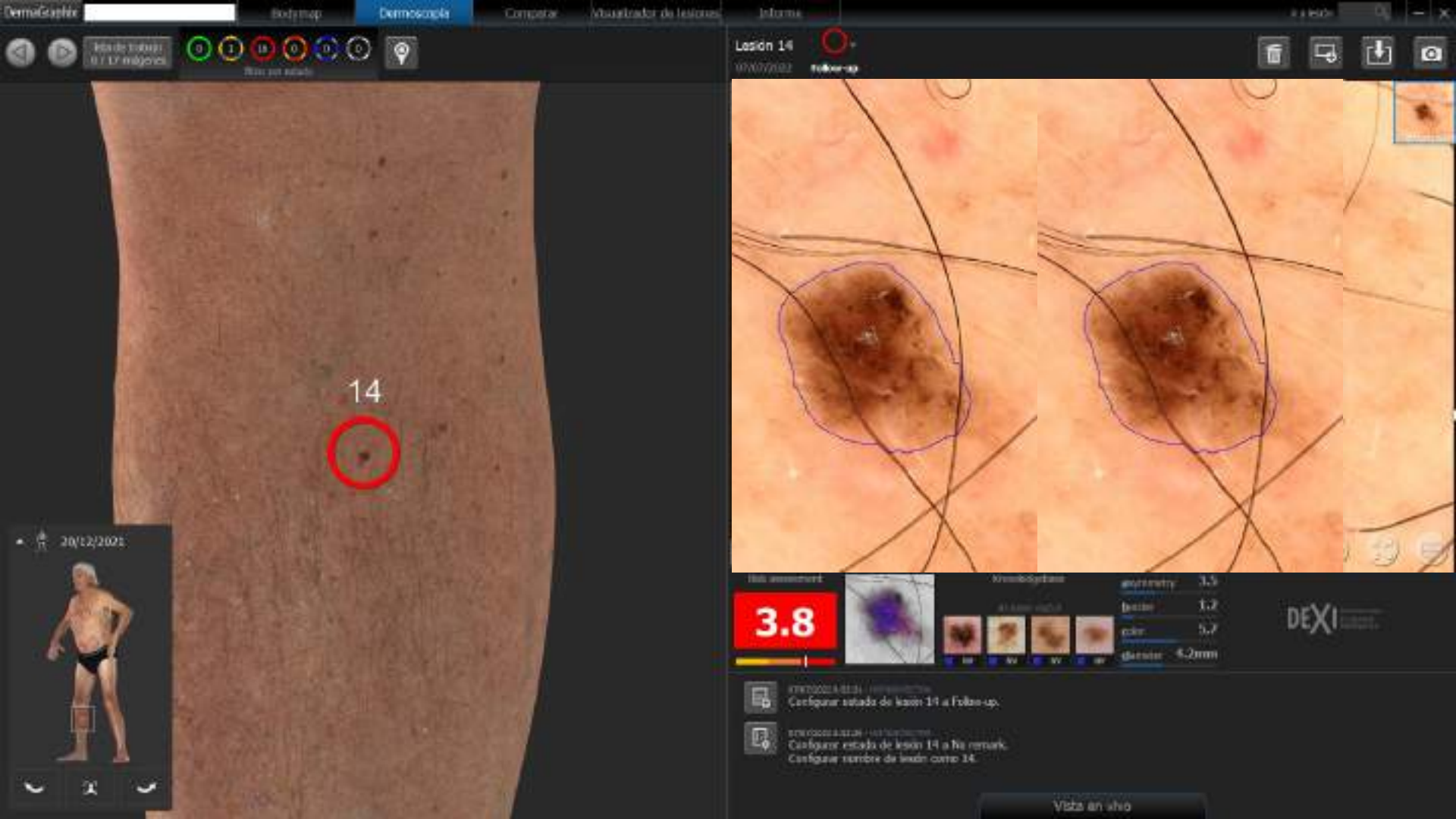
Vista en vivo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follow-up
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20/12/2021
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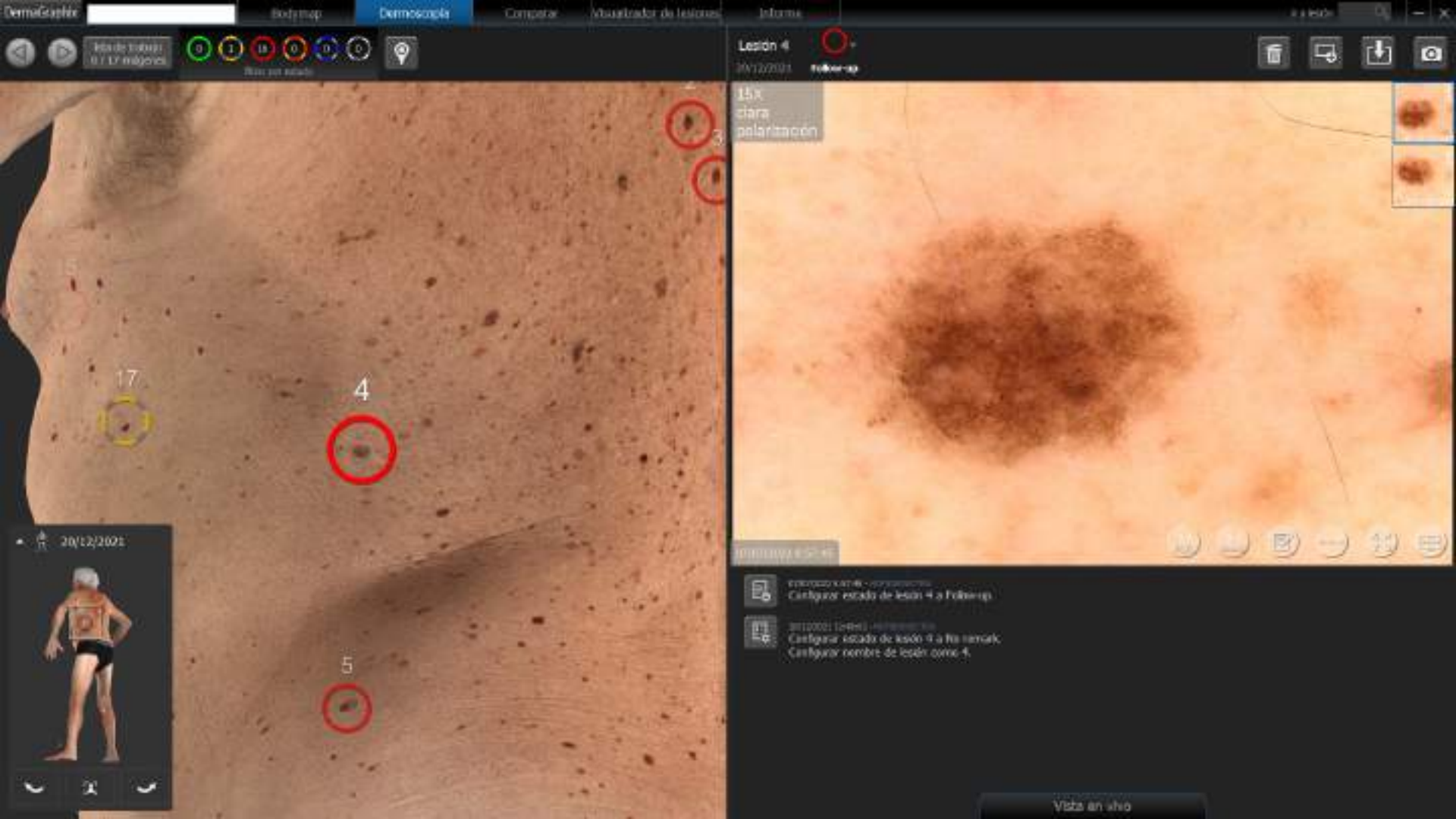
Vista en vivo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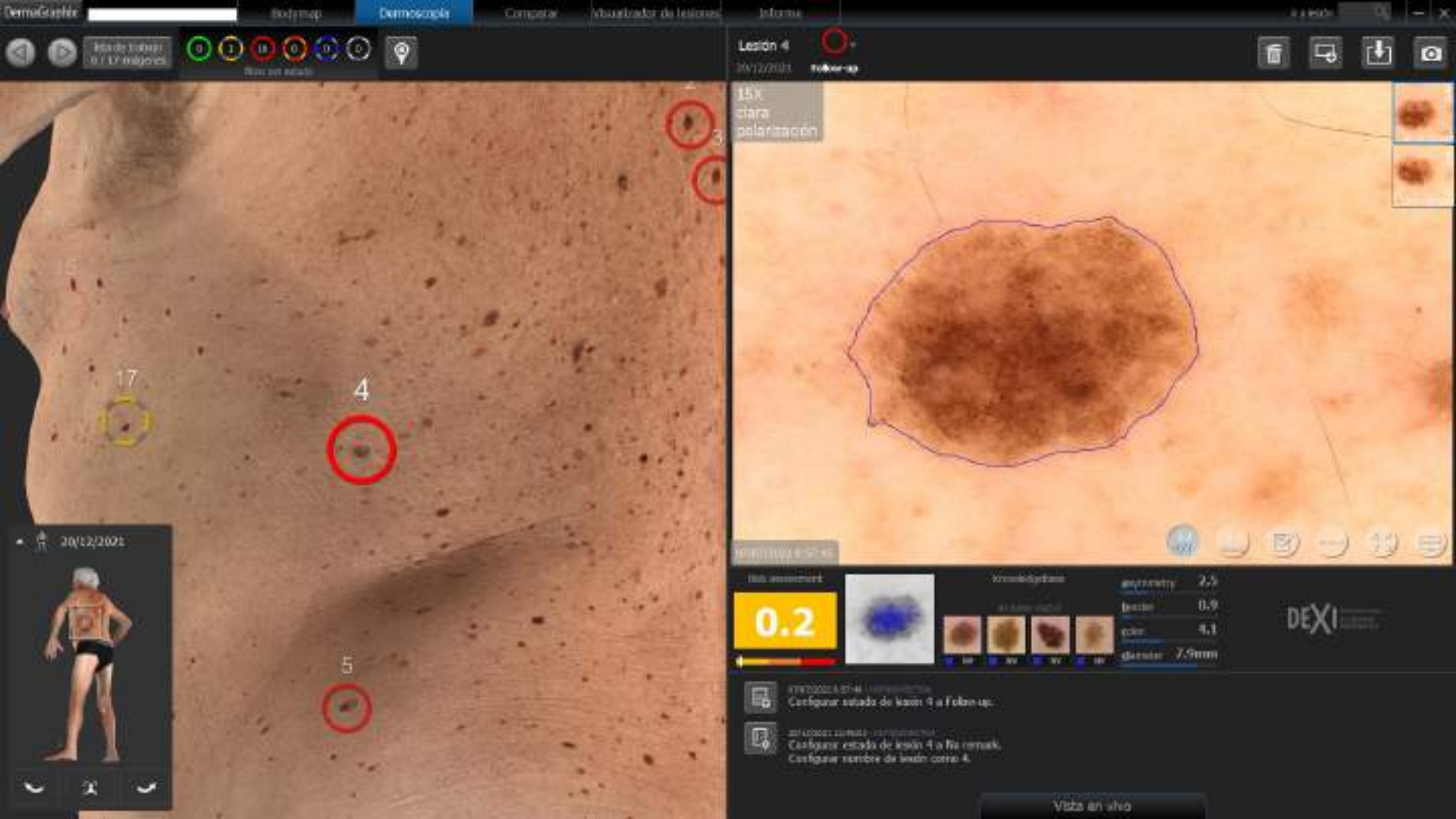
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 4
15x
clara
polarización
Configurar estado de lesión 4 a Follow-up
Configurar estado de lesión 4 a No remark
Configurar nombre de lesión como 4
Vista en vivo
17
4
5
3
20/12/2021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Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 4
15x
clara
polarización
0.2
DEXI
Configurar estado de lesión 4 a Follow-up.
Configurar estado de lesión 4 a No remark.
Configurar nombre de lesión como 4.
Vista en vivo


DermaGraphix
Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesion 4
15X
modo
polarización
15X
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Configurar estado de lesión 4 a Follow-up.
Configurar estado de lesión 4 a No remark.
Vista en vivo
4
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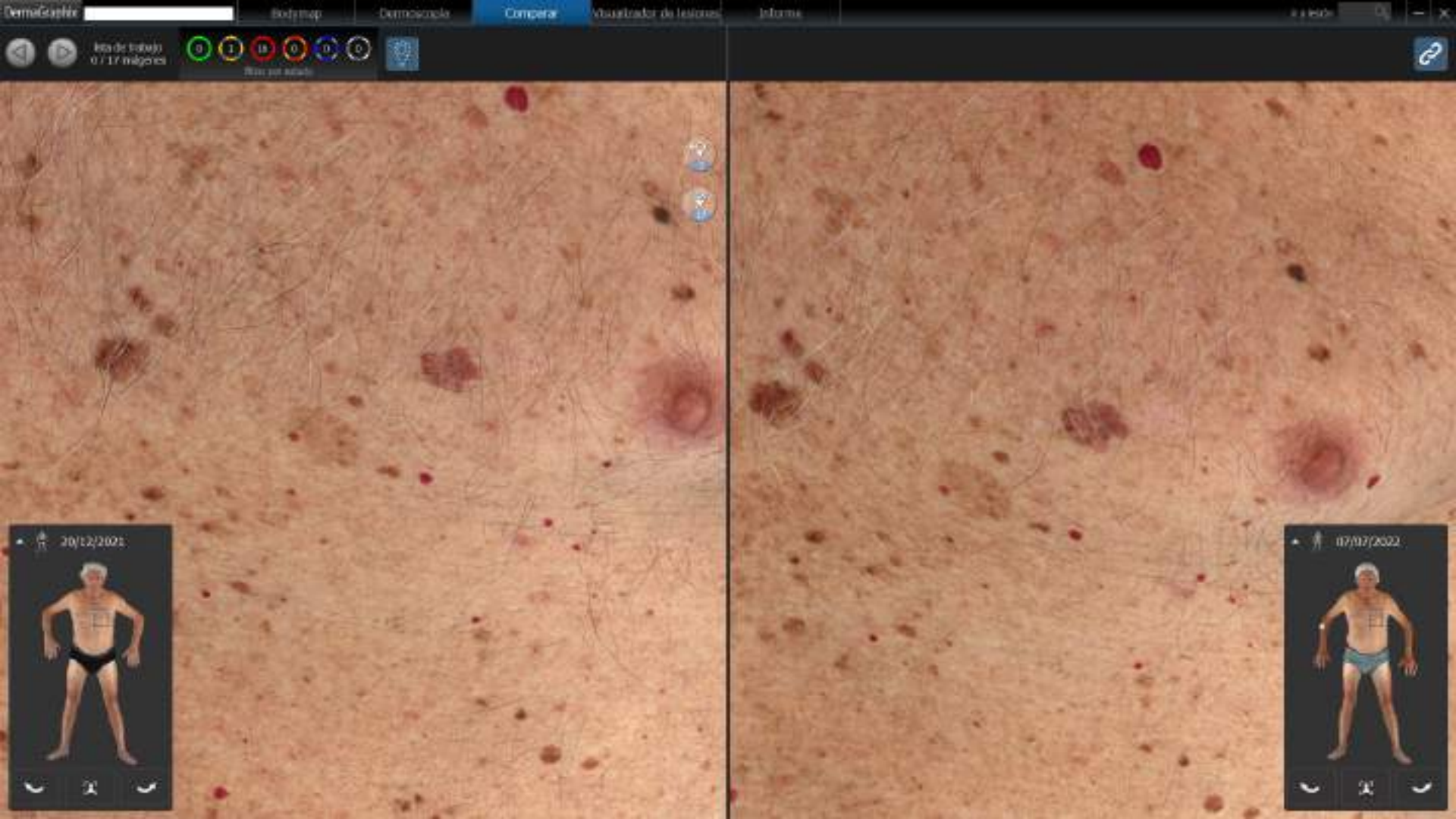
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Lista de trabajo
0 / 17 imágenes
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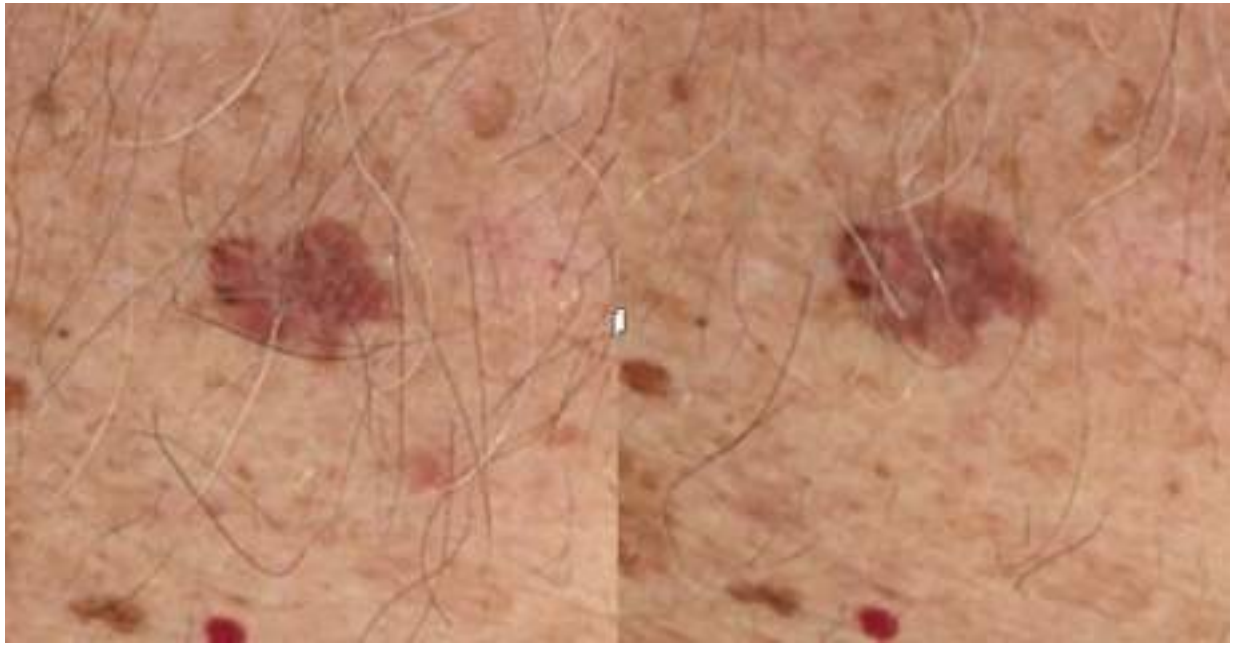
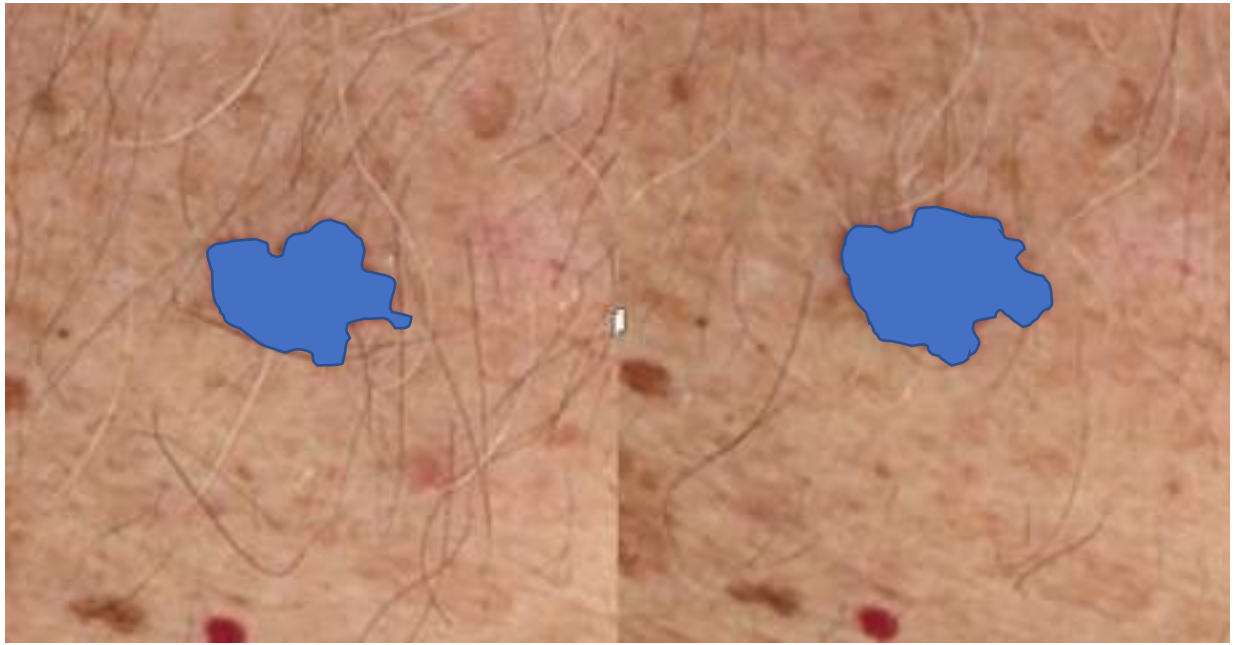
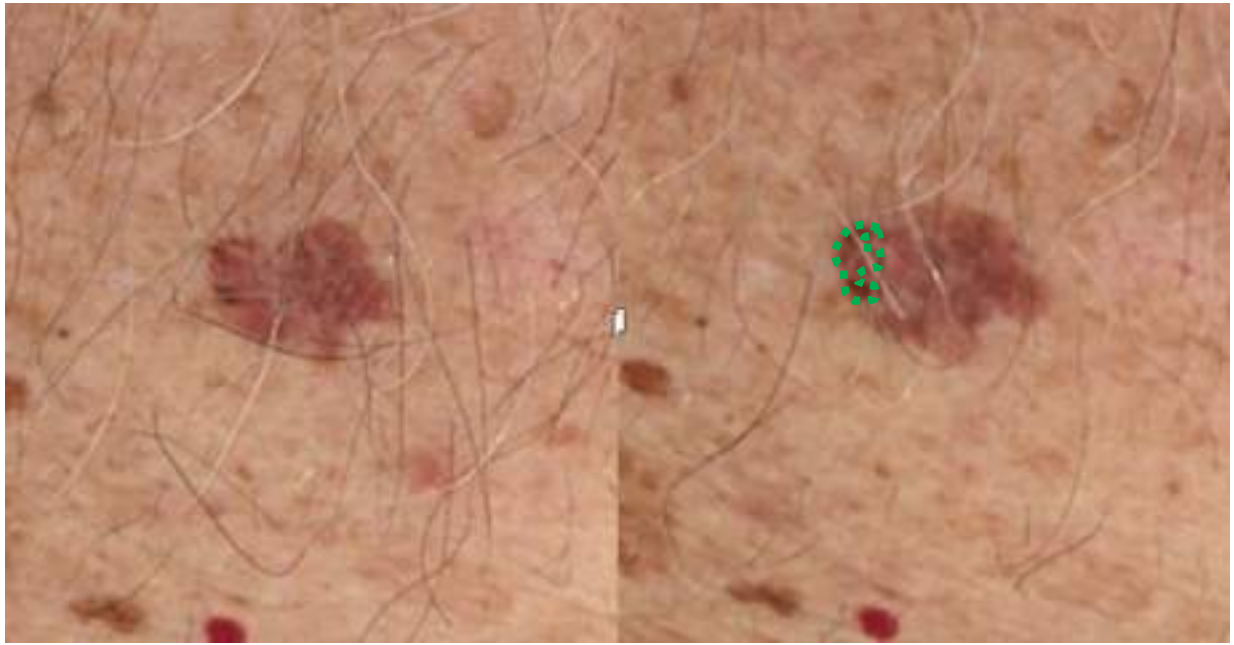
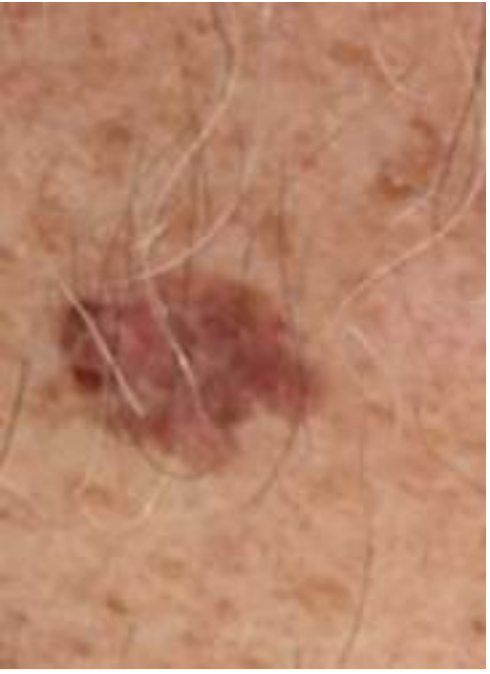
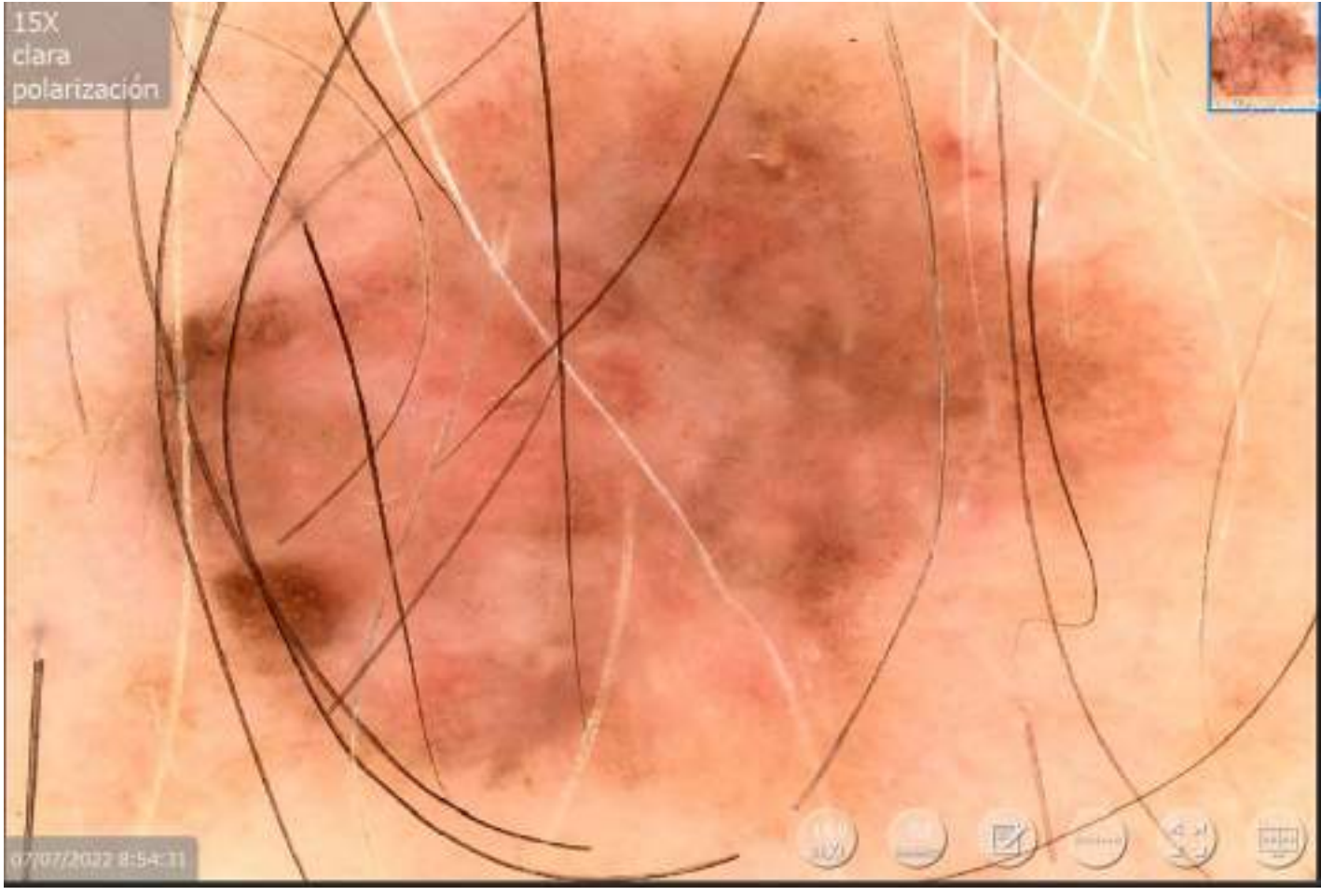
07/07/2022







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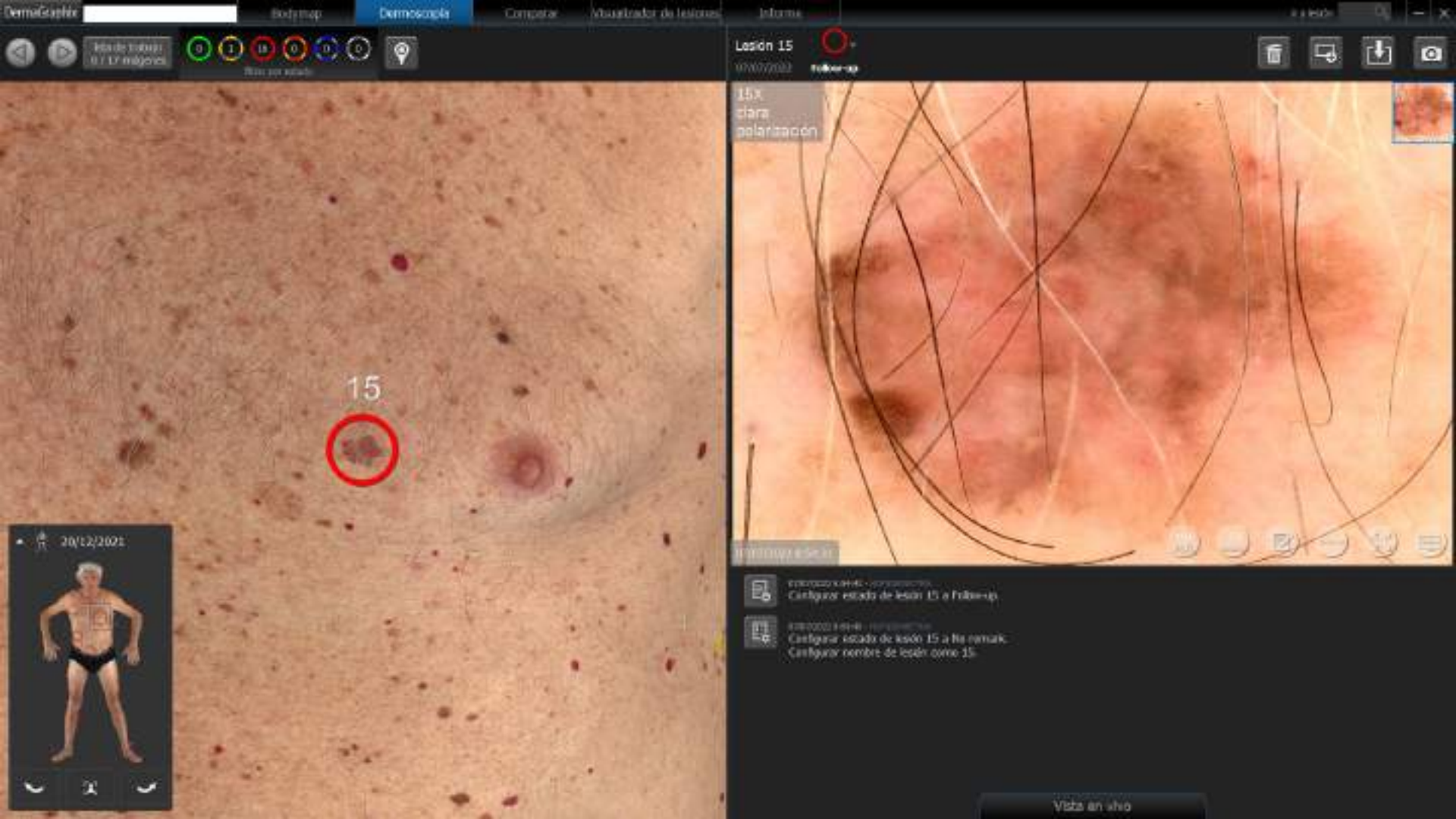
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Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 15
follow-up
15x
clara
polarización
15
20/12/2021
Configurar estado de lesión 15 a Follow-up
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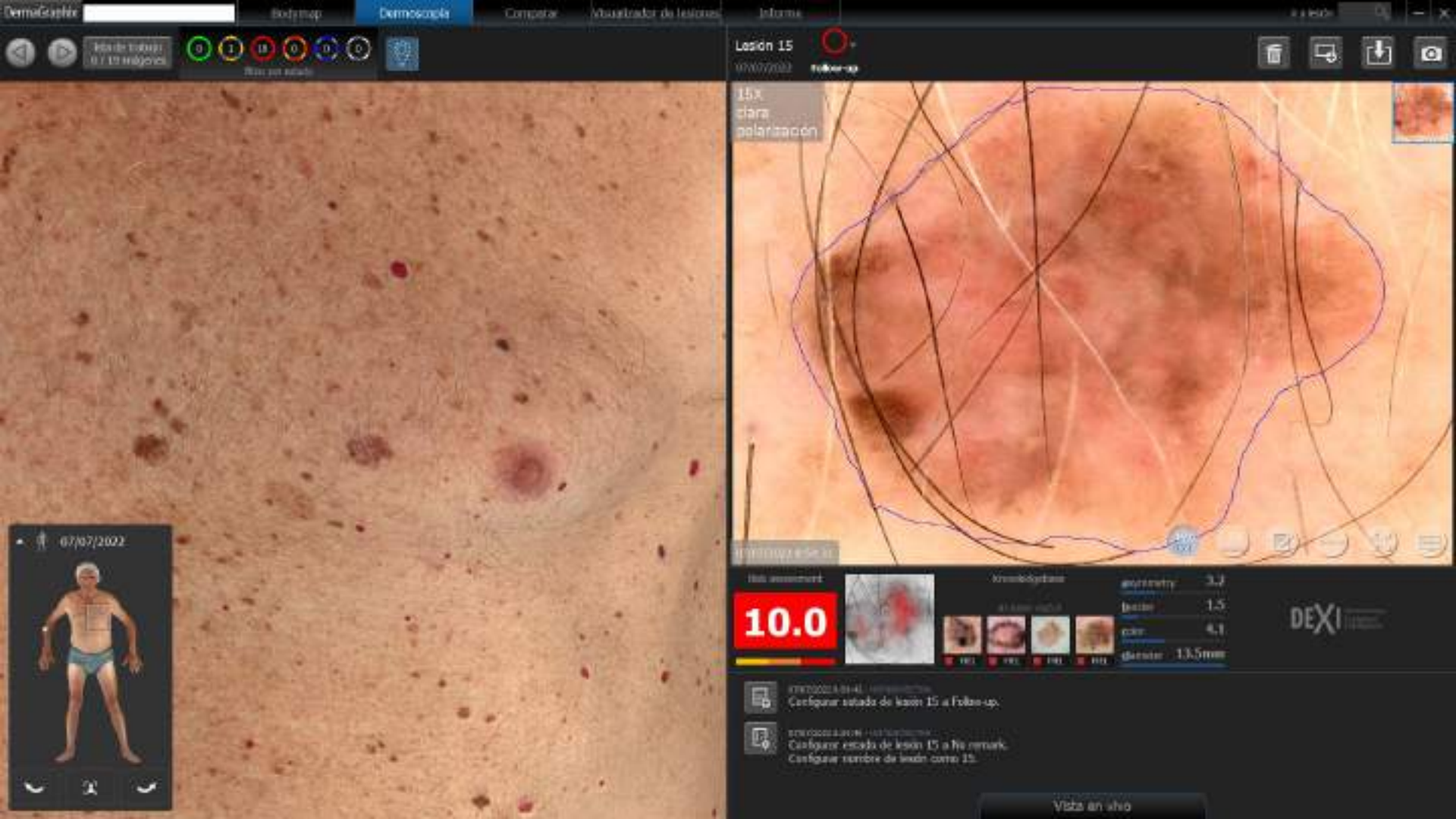
Configurar nombre de lesión como 15.
Vista en vivo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Bodymap
Dermoscopia
Comparar
Visualizador de lesiones
Informe
Lesión 15
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DEXI
Configurar estado de lesión 15 a Follow-up.
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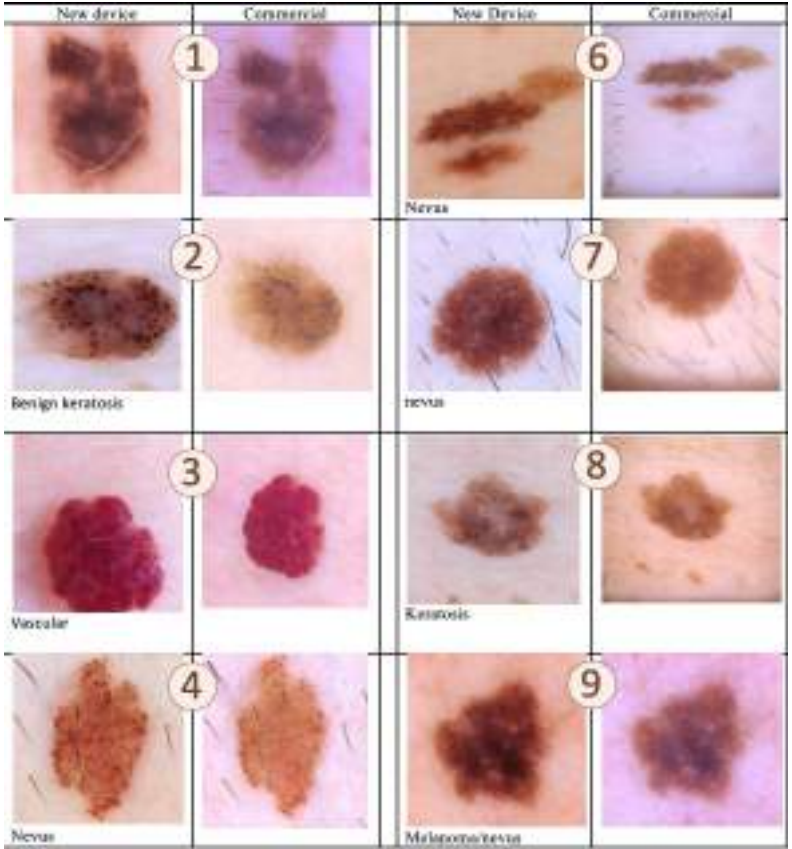
Configurar nombre de lesión como 15.
Vista en vivo

Autonomous Dermoscopy Scanner

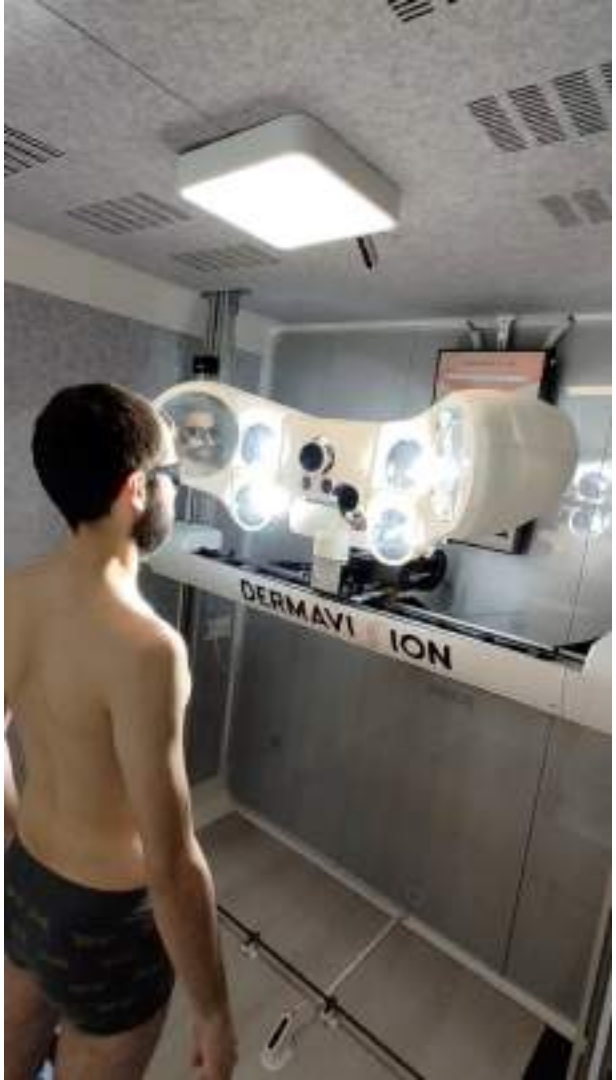


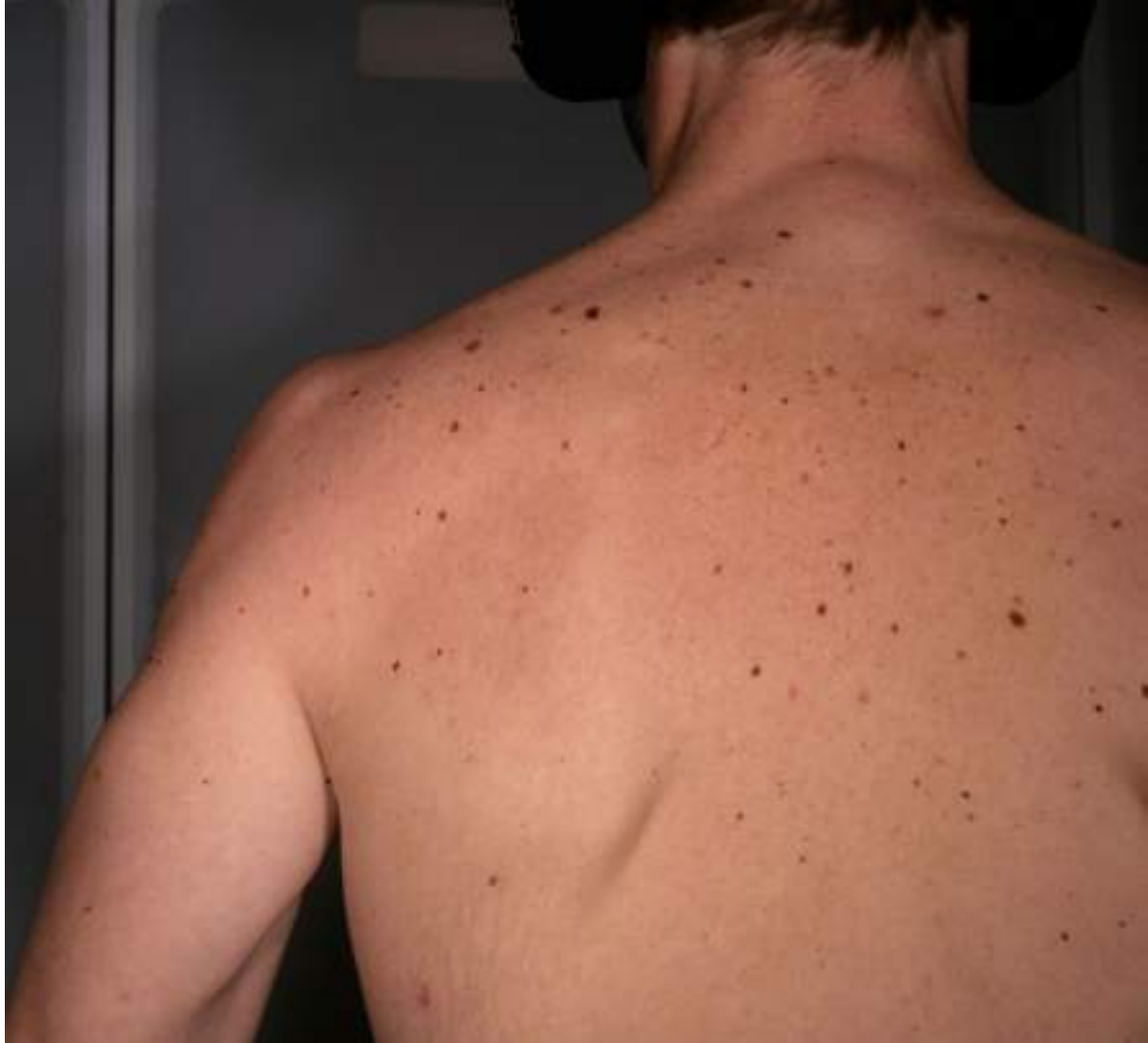
Autonomous scanner

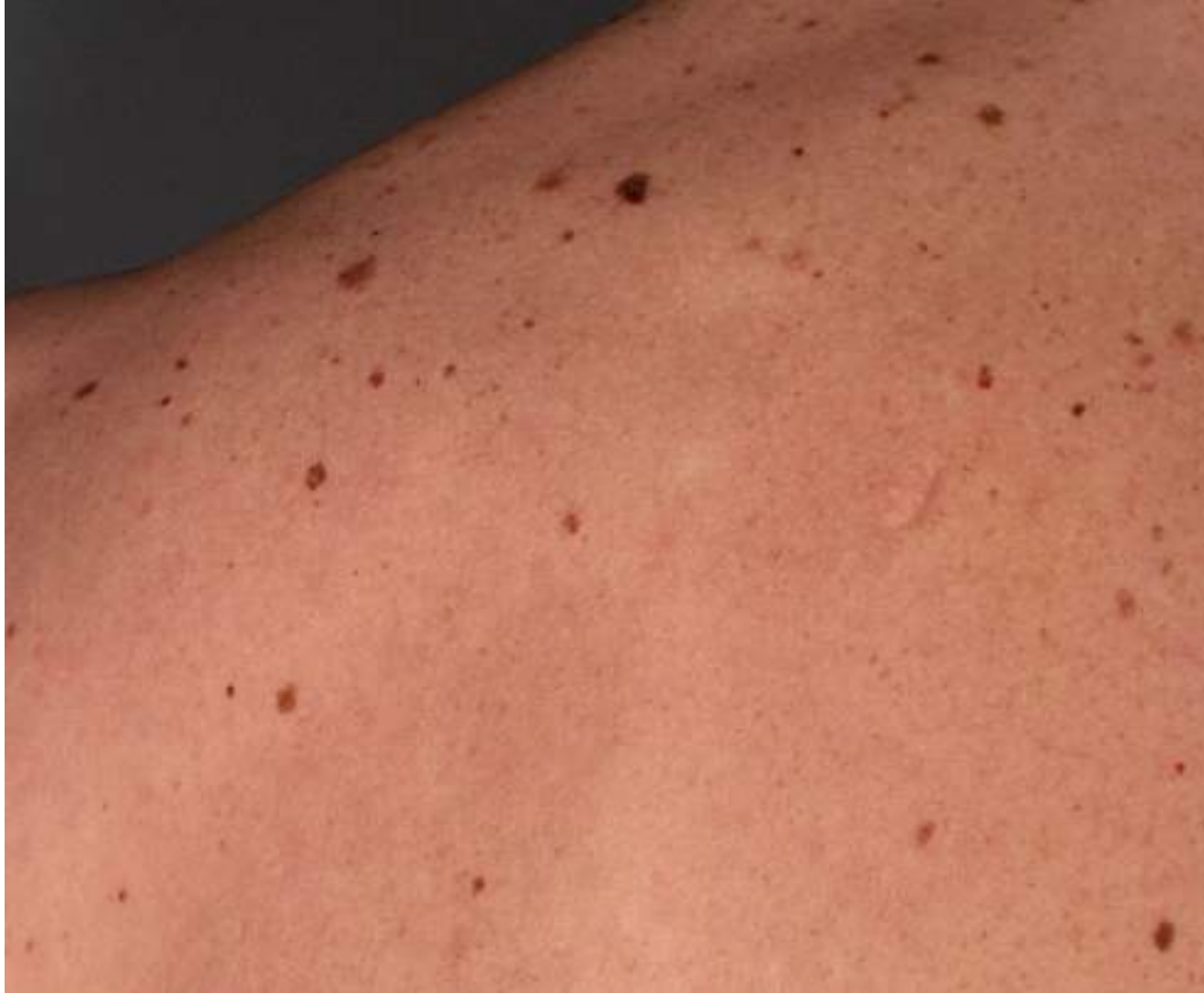
- Minimal human intervention for TBP and TBD
- High quality of imaging
- The patient follows the instructions of the robot
- Detection of body position
- TBP (n=36) with polarised light
- Software for the detection of lesions (Computer visión)
- Dermoscopic photos of the lesions

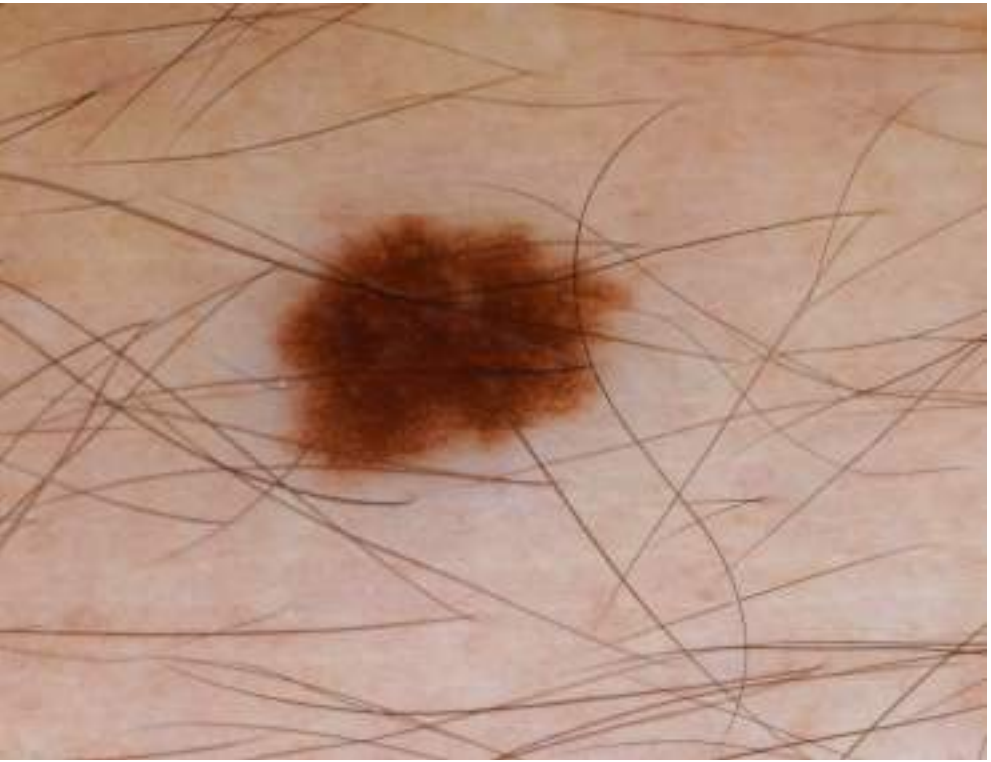
- Preliminary results in 50 volunteers
- Time of imaging = 10 min (6-12 min)
- Number of lesions = 40

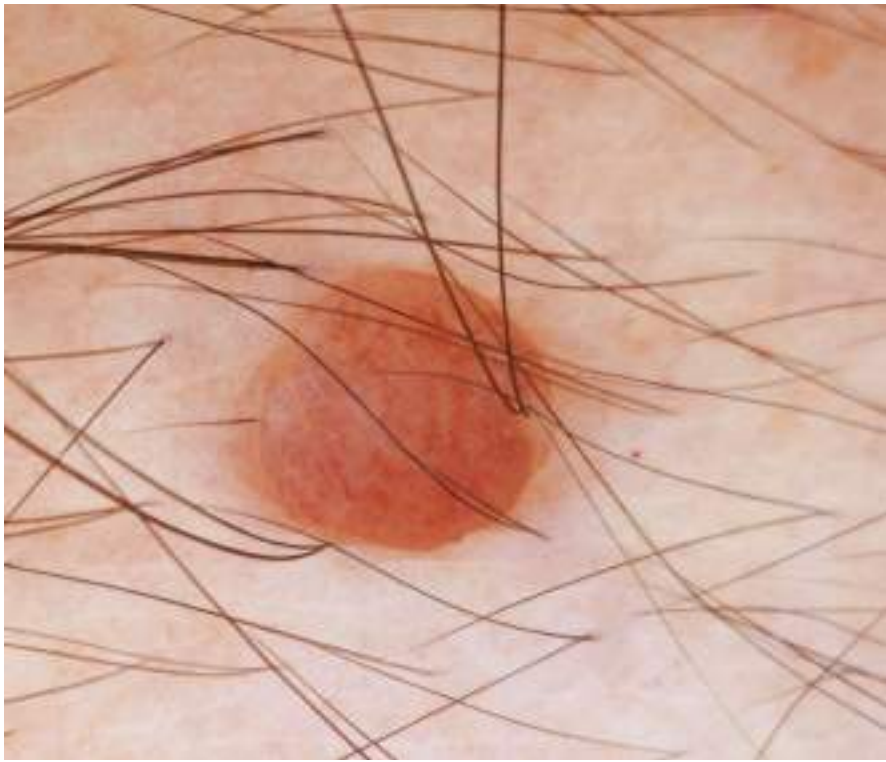
Comparative analysis of dermoscopic image quality obtained using a new automatised device and current manual dermoscope. N. Ricart, E. Campmol, N. Lobos, J. Gimenez, S. Andreani, L. Serra, J.Malvehy . EADO 2022


DERMAVI ION









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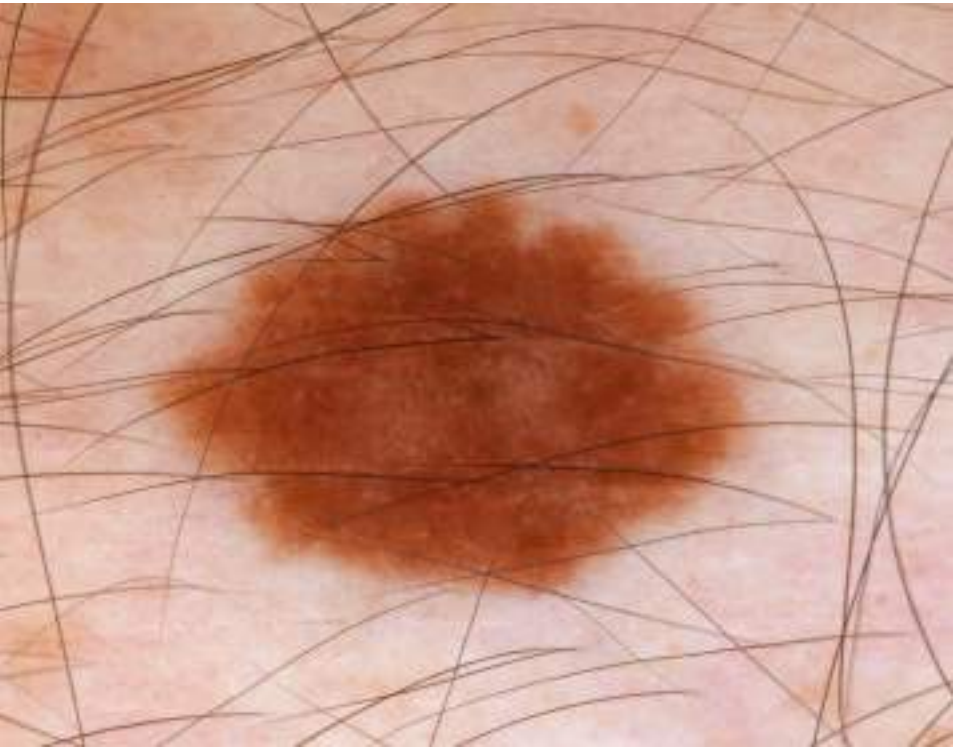

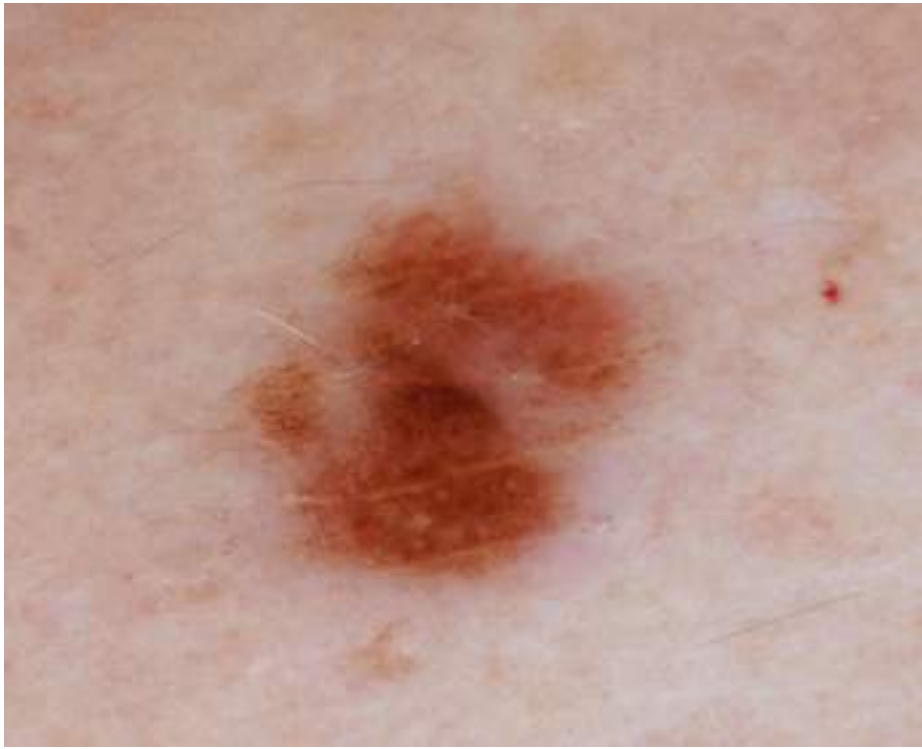

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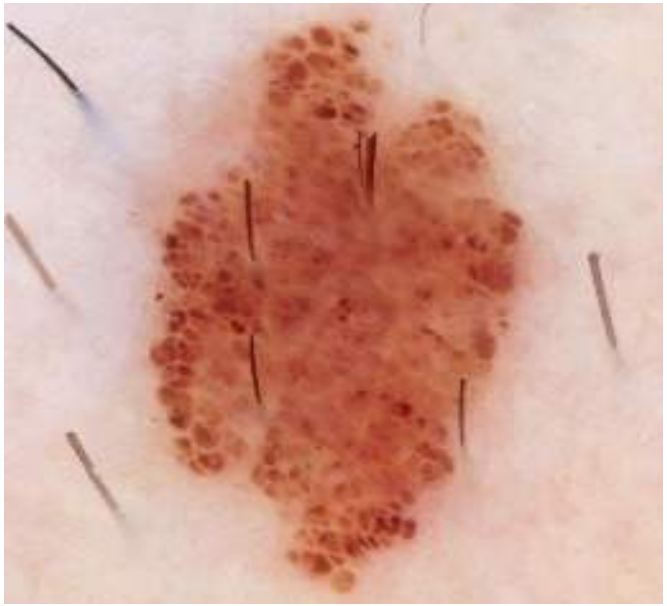

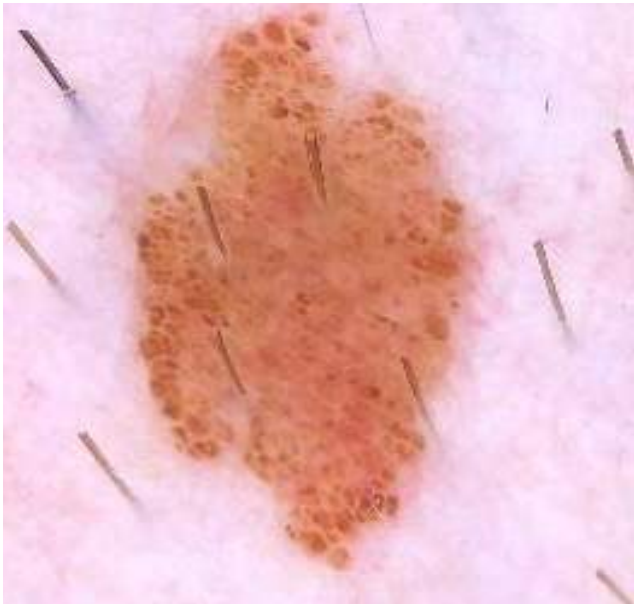

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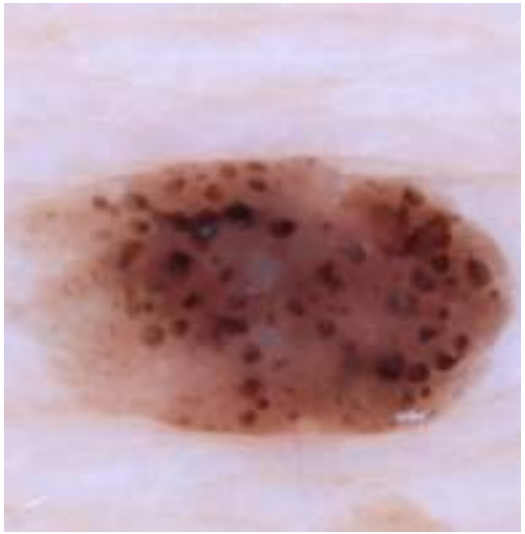

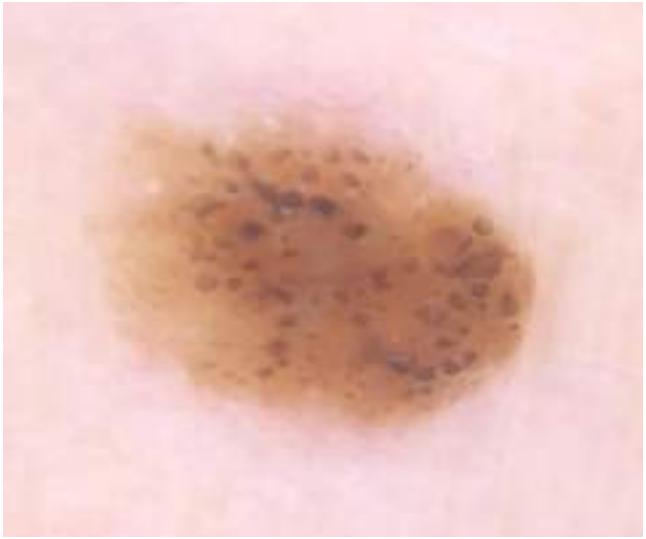

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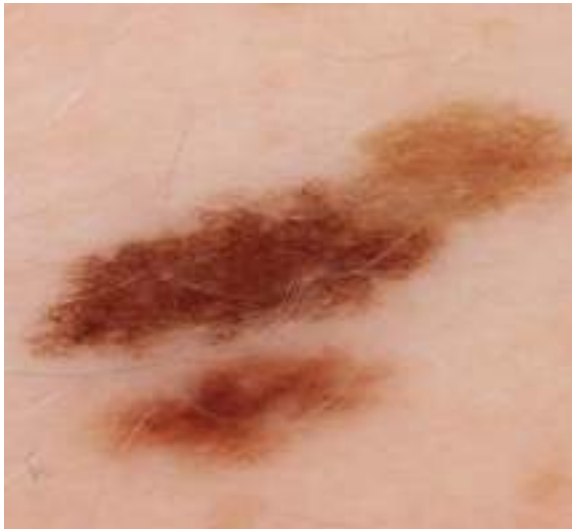

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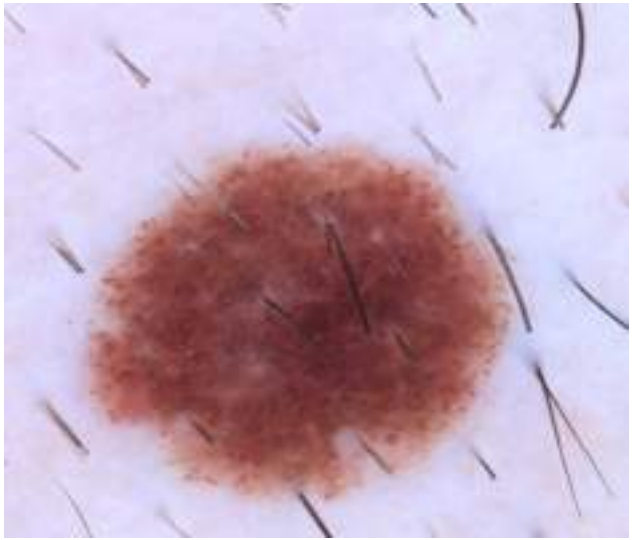

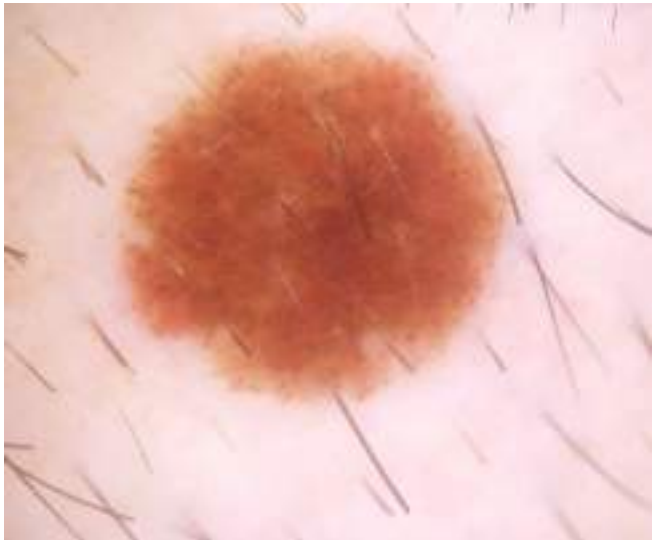

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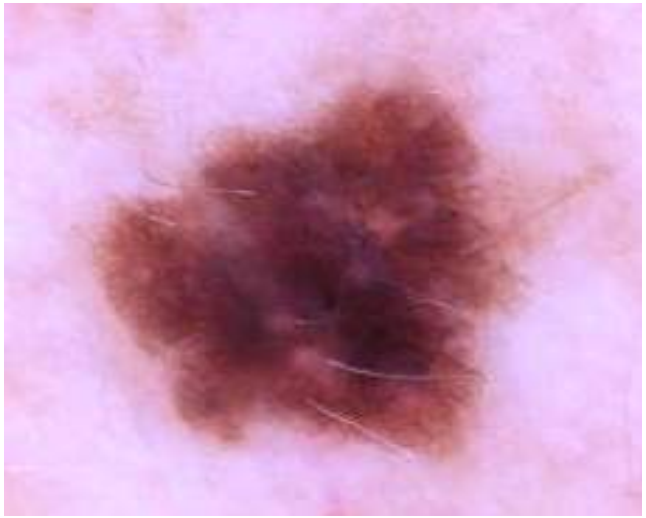

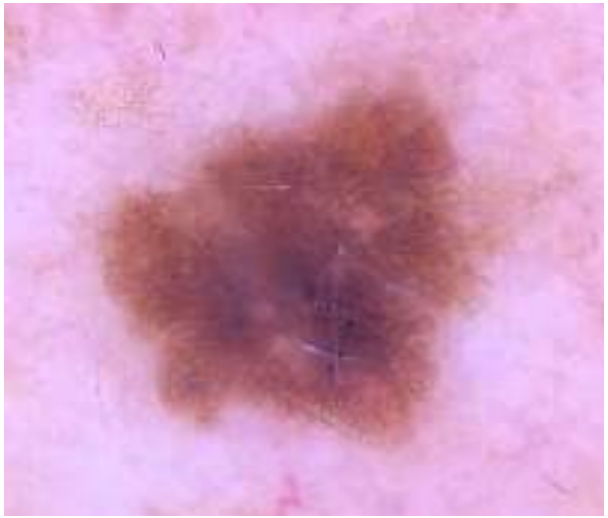

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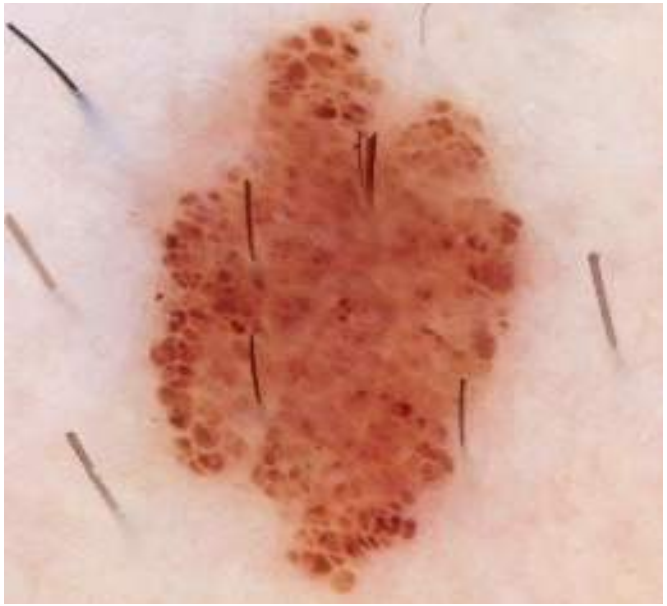

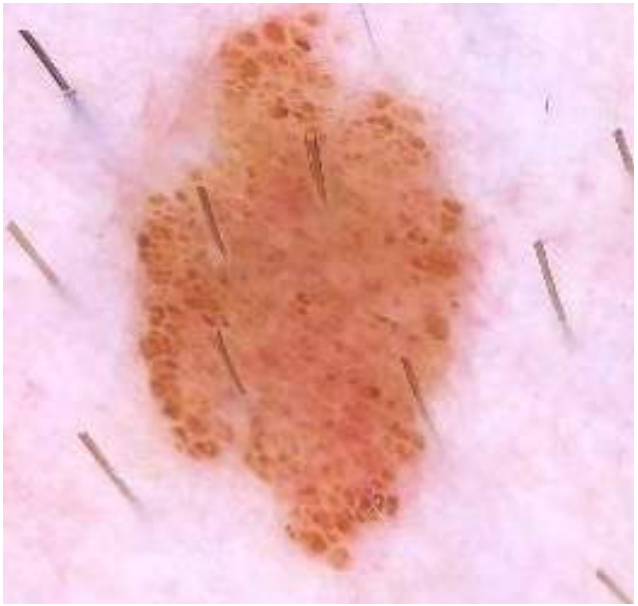

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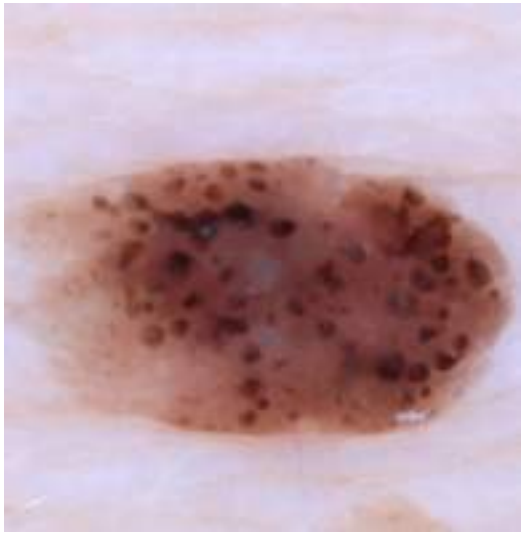

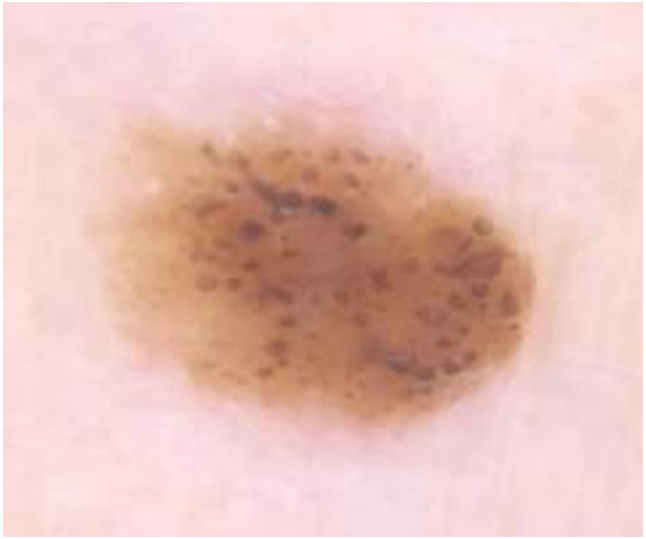

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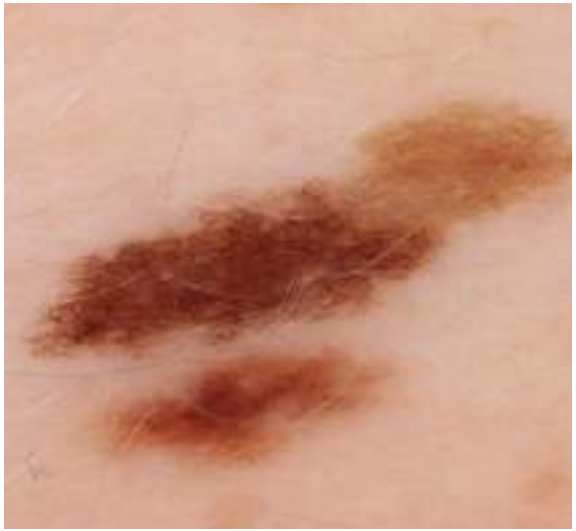

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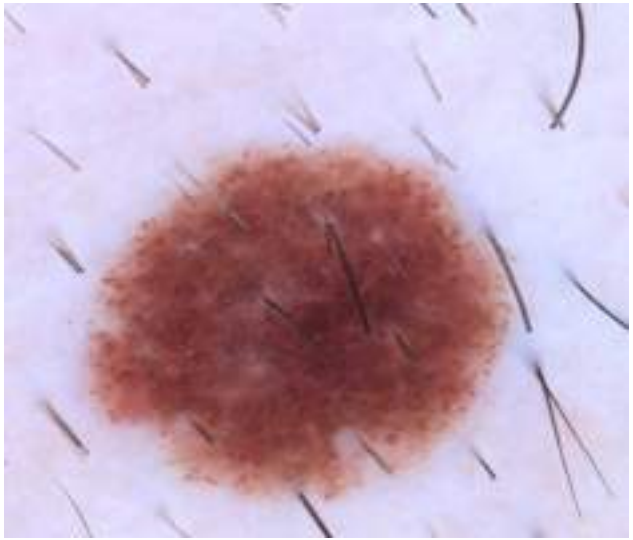

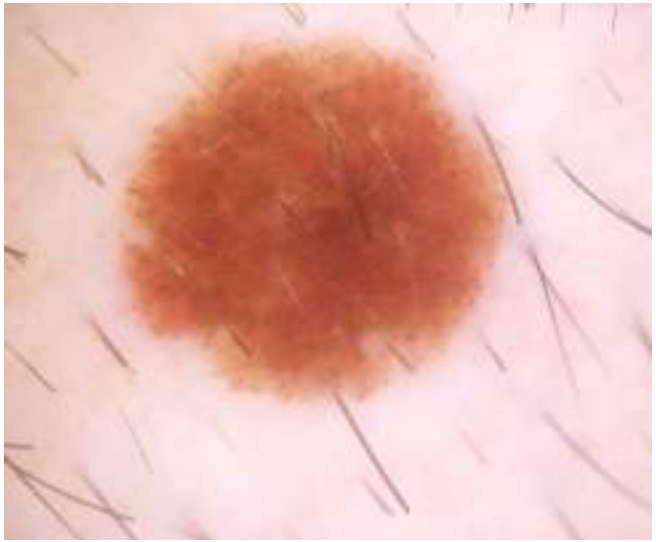

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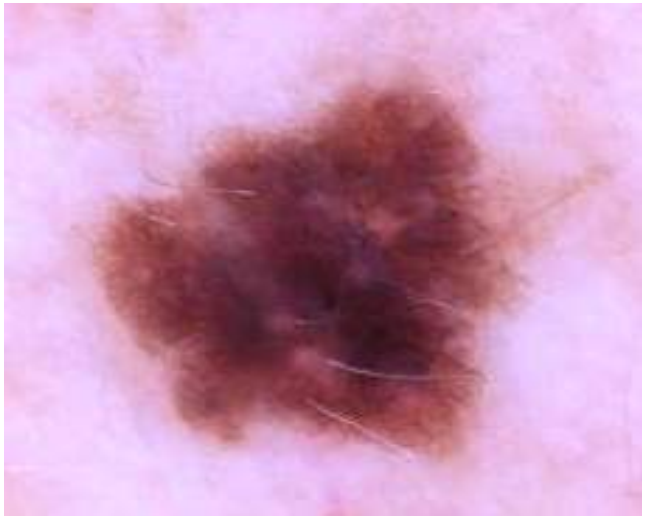

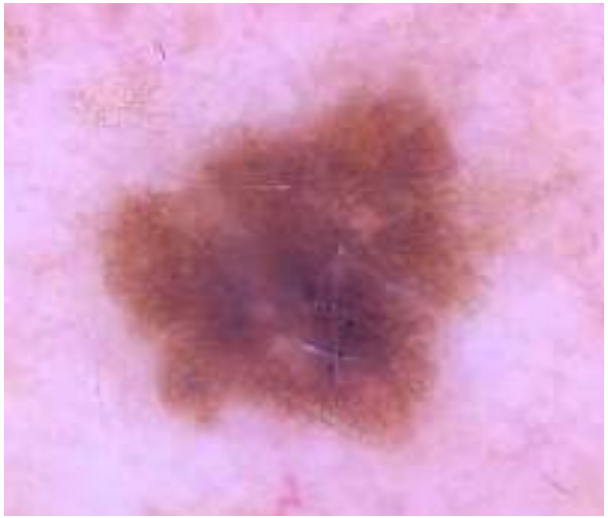

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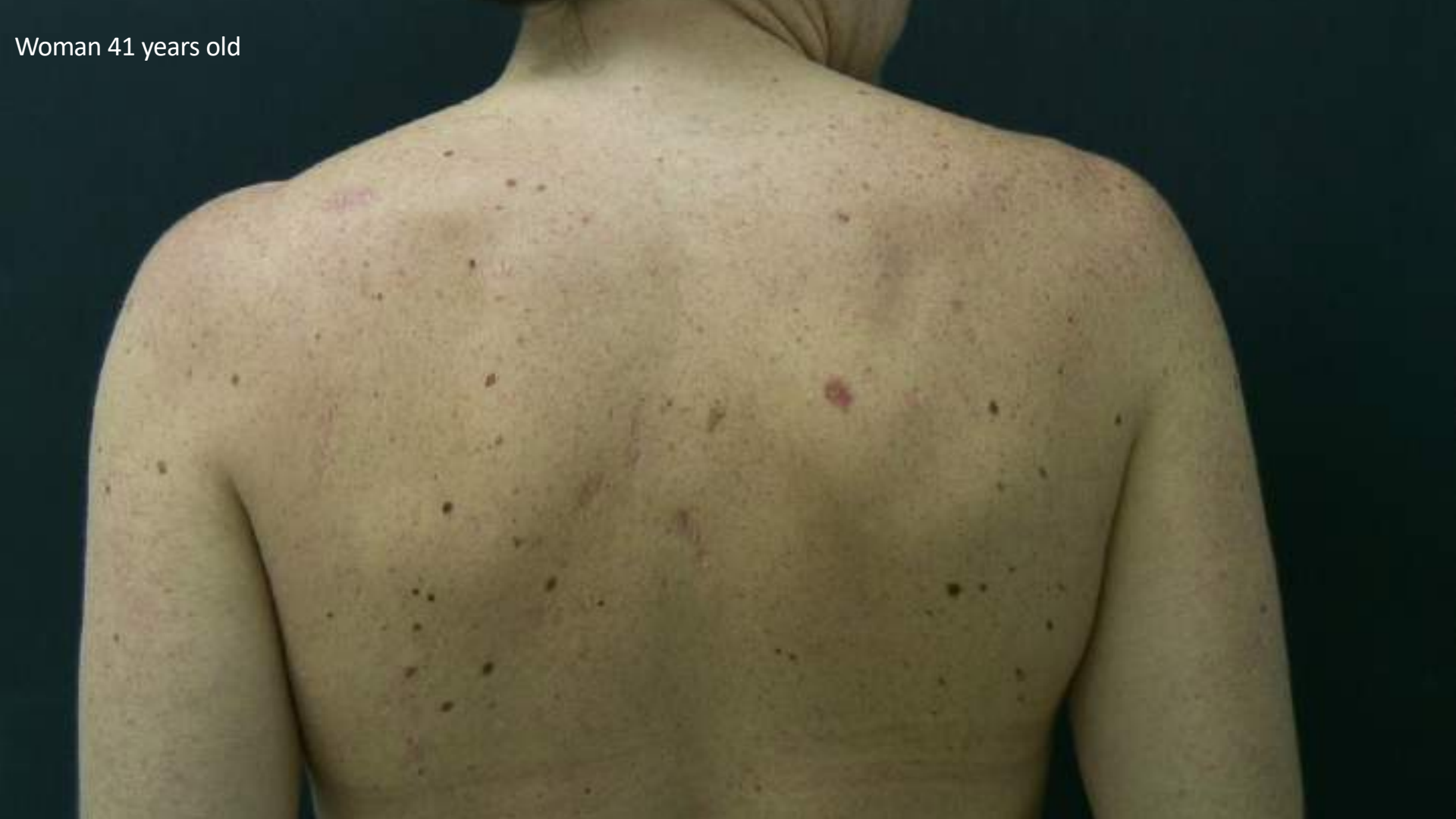
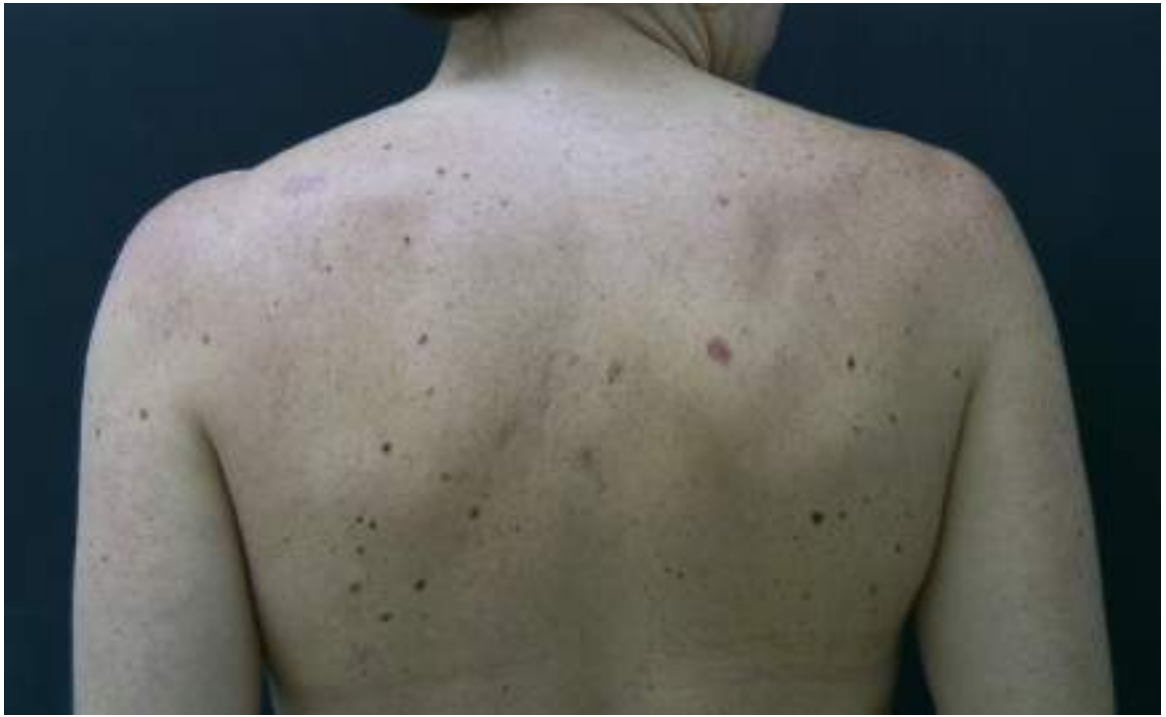

Woman 41 years old

MELANOMA RISK SCORE: DEEP PHENOTYPING



Deep imaging (phenotype)

- Skin type
  - Skin color (spectrophotometry)
  - Hair/eyes color
- Photoaging signature
  - Atrophy
  - Hypertrophy
  - Dyschromia
  - Solar lentigos
  - Field cancerization
- Atypical mole syndrome
  - Number of melanocytic lesions
  - Diameter, color, …
  - Distribution
- Dermoscopic characteristics
  - Pigmentation
  - Pattern: reticular, globular, homogeneous,…
- Other skin lesions

Clinical information

- *45 years old woman*
- *No medications*
- *Previous MM (n=2 ; stage 1A; trunk; 2011,2014)*
- *Familial MM (3 members; Lung Ca, Breast Ca)*

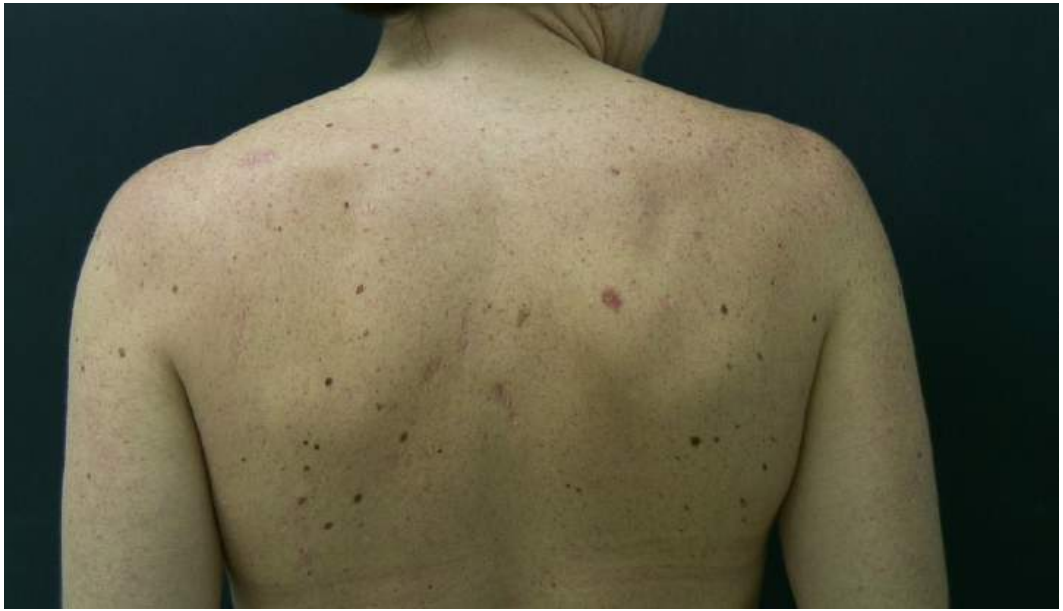
Phenotype

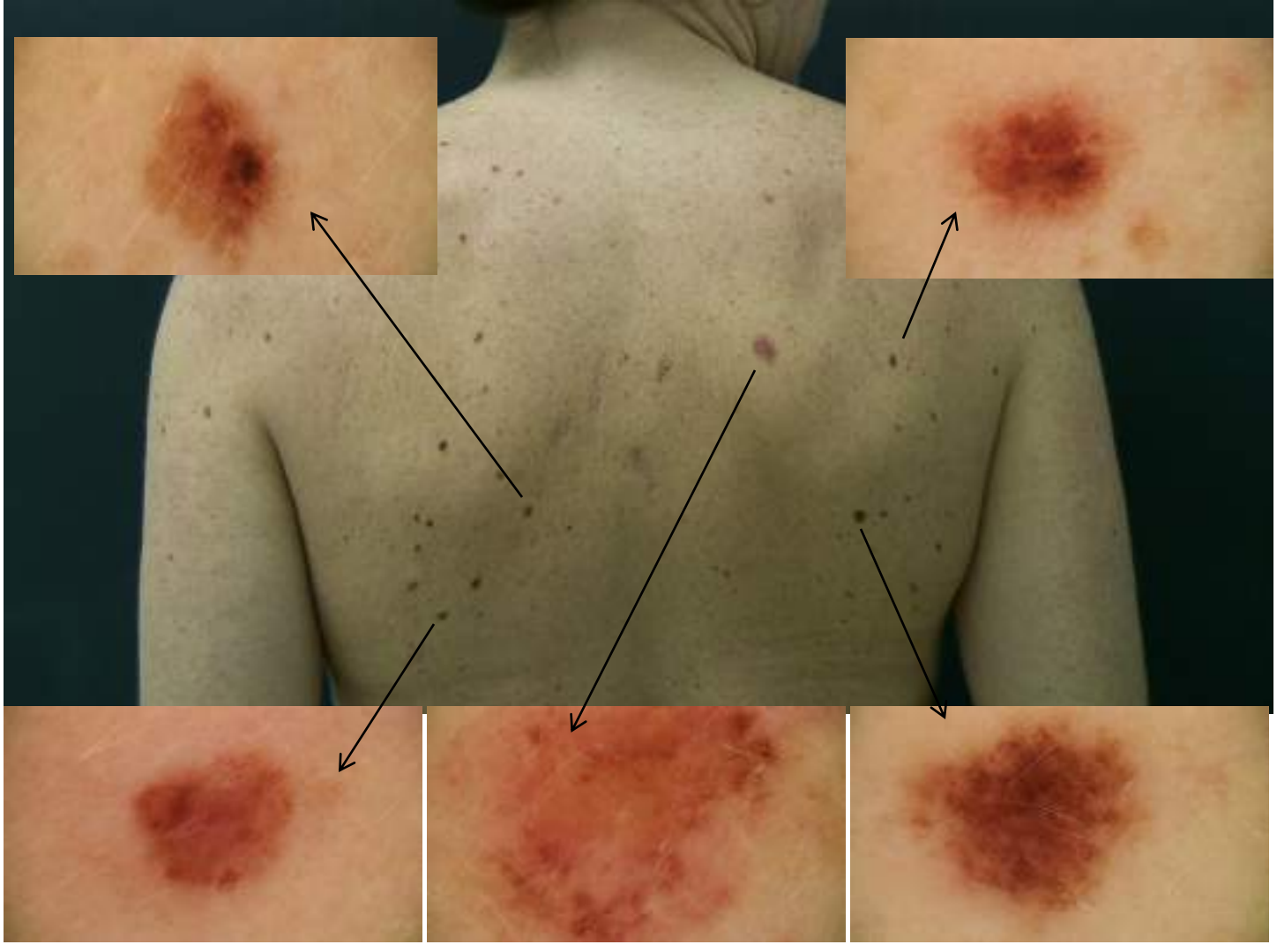
- *Skin color 3*
- *Photodamage= 3*
- *235 skin pigmented lesions*

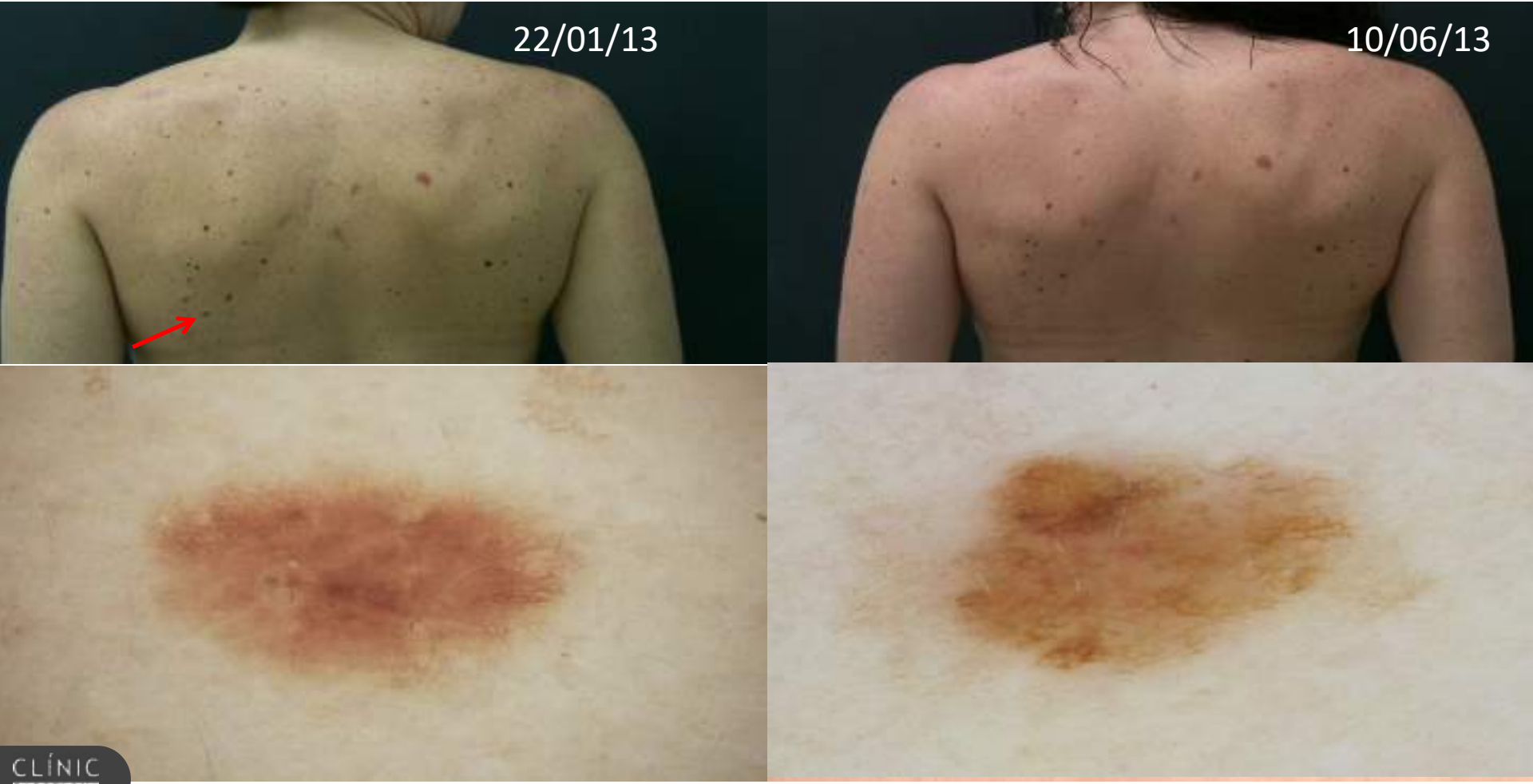
Reticular 70%; homogeneous 25%; Combination patterns 5%; Brown light and dark
Others: seb ker =3; angiomas= 11; Other: 12
Trunk=70%; lower extrem=20%; upper extre=7%;Other=3% ; special sites=0%

Genetics

*CDKN2A G*101w
MITF wt, POT-1 wt, TERT wt
MC1R wt
Polygenic risk score= 2,45



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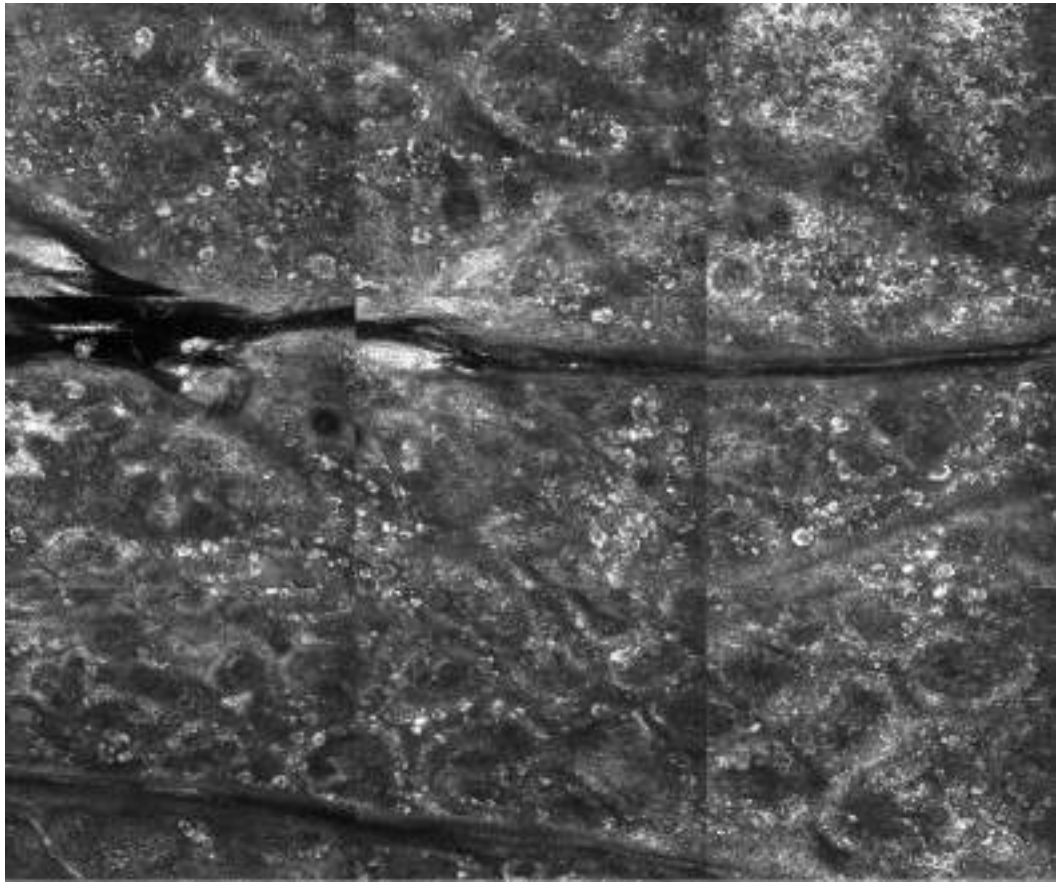

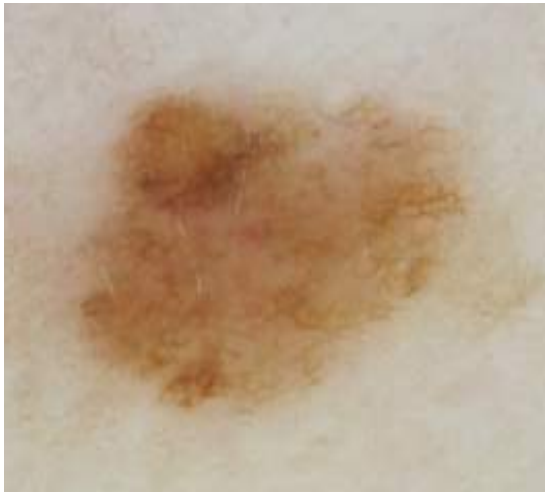

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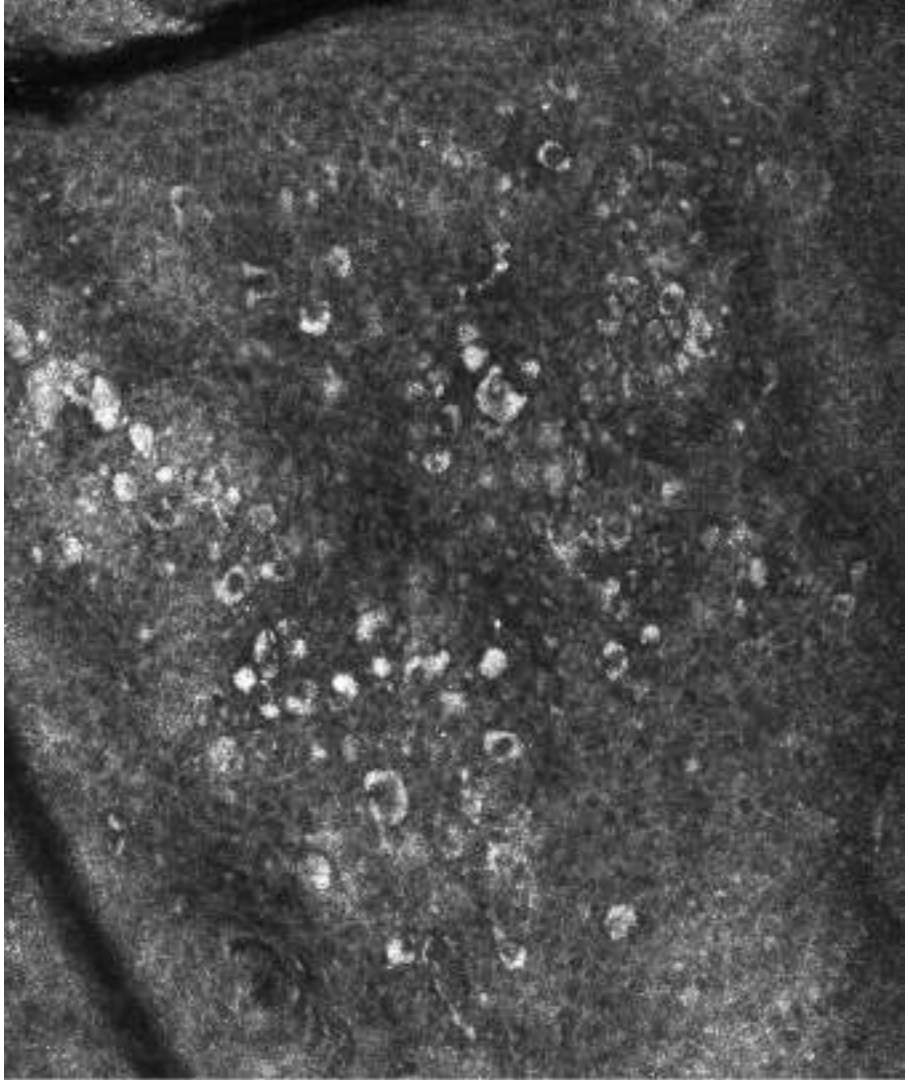
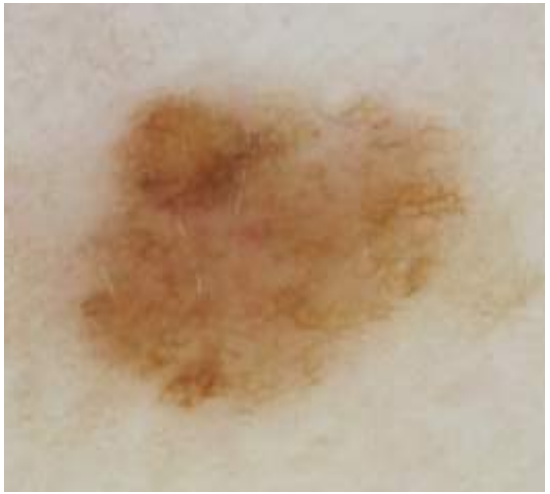
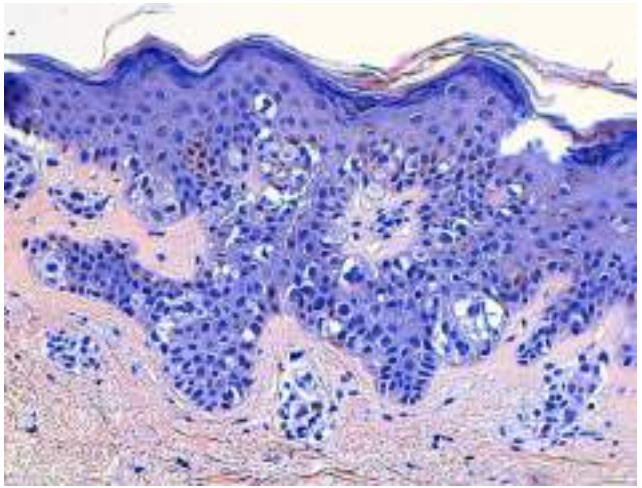
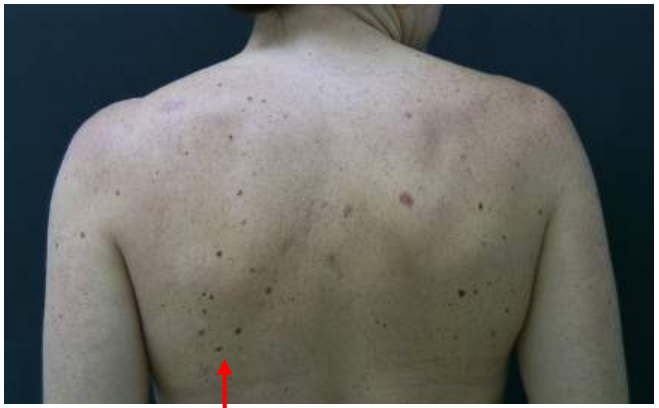
Stanganelli I, Longo C, et al. Integration of reflectance confocal microscopy in sequential dermoscopy follow-up improves melanoma detection accuracy. *Br J Dermatol. 2015 Feb; 172(2):365-71*

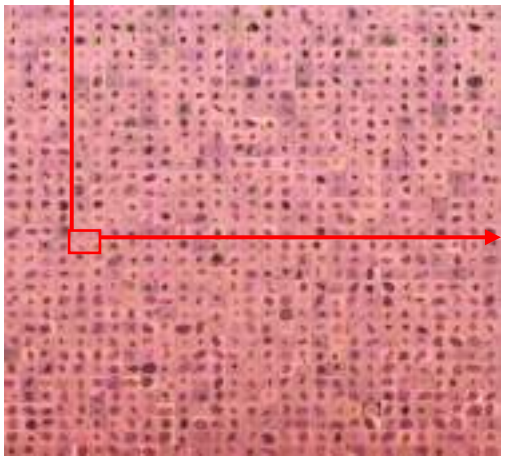


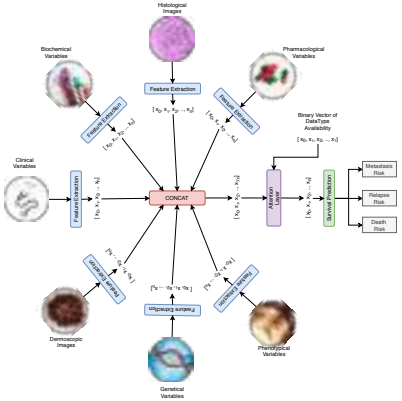




MELANOMA RISK SCORE: DEEP PHENOTYPING







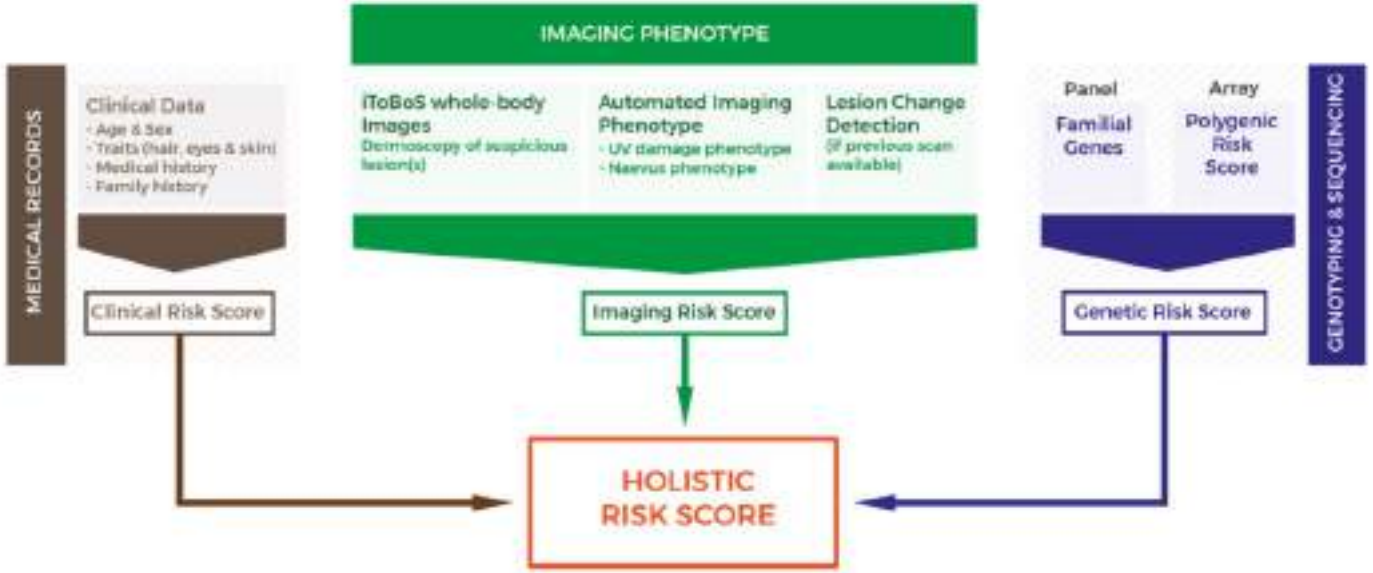
Age, sex, ethnicity, geography
Skin UV damage
Skin type (spectrophotometry)

CLINICAL
Clinical background
Previous MM
Familial MM
Medications

GENETIC
CDKN2A G101w
MITF wt, POT-1 wt, TERT wt
MC1R wt
Polygenic risk score

DEEP IMAGING
Full body Dermoscopy

HOLISTIC MELANOMA RISK STRATIFICATION



Courtesy of P.Soyer

CONCLUSIONS

- Best current estimates suggest that in patients at high risk of melanoma, TBP-SDD has an acceptable NNB, when compared with previous studies using standard clinical examination without TBP.
- New technologies with faster examination and computed aided
- The combination of Deep phenotyping with machine learning can improve detection of skin cancer and risk stratification of patients

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