

## CLINICAL REPORT

# Comparison of Classical Dermatoscopy and Acrylic Globe Magnifier Dermatoscopy

Henrik F. LORENTZEN<sup>1</sup>, Rikke LØVENDAHL EEFSEN<sup>2</sup> and Kaare WEISMANN<sup>2</sup>

<sup>1</sup>The Naevus Clinic, Department of Dermatology, Odense University Hospital, Odense and <sup>2</sup>Dermatological Clinic, Hørsholm Hospital, Hørsholm, Denmark

**Dermatoscopic asymmetry of melanocytic skin lesion is pivotal in most algorithms assessing the probability of melanoma. Larger lesions cannot be assessed by dermatoscopy and the Dermaphot in a single field of vision, but this can be performed using the acrylic globe magnifier. We examined the diagnostic accuracy of the acrylic globe magnifier and compared it with classical dermatoscopy. A total of 119 patients successively referred to our naevus clinics had Dermaphot and acrylic globe magnifier pictures taken. Lesions were excised and assessed by histopathology. Observers blinded to histopathology diagnoses, assessed dermatoscopic and acrylic globe magnifier photo-slides according to the dermoscopic risk stratification. The observed agreement over all categories between acrylic globe magnifier dermatoscopy and classical dermatoscopy was 94% and Cohen's kappa coefficient was 90% (95% confidence interval 83–97%). Sensitivity for melanoma, benign melanocytic naevi and basal cell carcinoma was 100%, 98% and 85%, respectively. Specificity was 95%, 94% and 100% for melanoma, naevi and basal cell carcinoma. Acrylic globe dermatoscopy enables a diagnostic accuracy similar to epiluminescence microscopy. Key words: dermatoscopy; epiluminescence microscopy; method comparison.**

(Accepted August 20, 2007.)

Acta Derm Venereol 2008; 88: 139–142.

Henrik F. Lorentzen, Department of Dermatology, Odense University Hospital, DK-5000 Odense, Denmark. E-mail: lorentzen@dadlnet.dk

Over the last decade dermatoscopy has supplemented the clinical examination of pigmented skin lesions. Two meta-analyses have substantiated the improvement of methods in diagnostic performance compared with examination with the naked eye (1, 2). Argenziano et al. (3) reported odds ratios for (2-axis) asymmetry of 13.7 and 43.8 for the dermatoscopic ABCD rule and Menzies rule, respectively. It is important to emphasize that asymmetry refers to asymmetry of dermatoscopic distribution of colours and differential structures.

Heine or Welch Allyn dermatoscopes are widely used with the Heine Dermaphot or newer digital systems for photo documentation. Larger lesions, however, are not

covered by these tools. A Petri disc has been suggested (4), but does not provide magnification. We suggested the use of globe magnifiers with paraffin oil or ethanol as contact fluid (5) (Fig. 1).

The smallest dermatoscopic structures are dots. Black dots are, by definition, less than 0.1 mm in diameter and cannot be seen with the naked unaided eye. In order to see details of an object, it is brought as close to the eye as possible. The distance is called the near point of the eye and for a young adult it is in the order of 0.25 m (Fig. 2). Ultimately, 2 objects can be seen as discrete, when they are separated by an angle of  $5 \times 10^{-4}$  rad (the visual acuity or minimum separable). The 2 objects may be margins of a black dot. With the above-mentioned near point, the visual acuity can be calculated to be approximately 0.125 mm, which is more than the diameter of black dots that thus cannot be seen by the naked eye. The focal length of the acrylic globe magnifier is 5–6 cm, giving an angular magnification (near point/focal length) of  $\times 4$ , under which, for example, black dots appear to have a diameter of 0.4 mm (Fig. 2 for explanation). The aim of the present study was to compare acrylic globe dermatoscopy with classical dermatoscopy.



Fig. 1. Globe magnifiers. The globe in the centre is made of acrylic. The magnifying power is easily seen. The globe on left is made of glass, which gives a yellow hue to pictures. The globes consist of a curved surface, which is a converging lens and a cylindrical basis, the height of which equals the focal length of the lens.

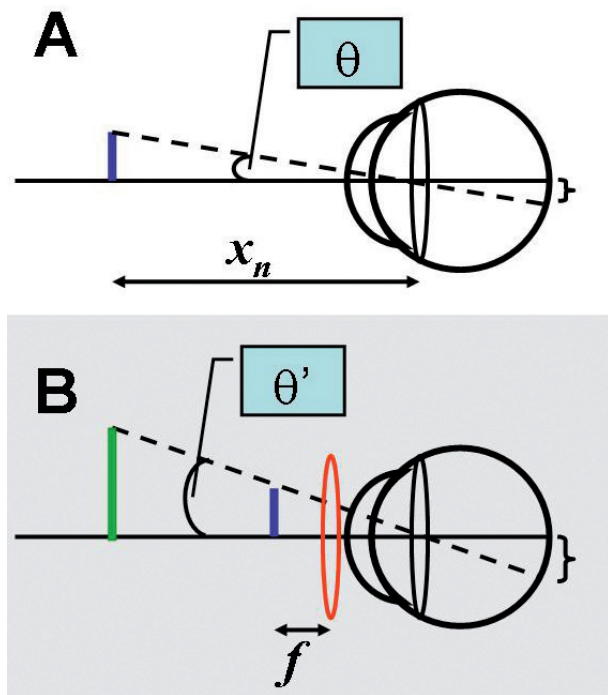


Fig. 2. Schematic and simplified diagram explaining angular magnification. (A) The object's height ( $y$ ; shown in dark blue) is imaged at the retina (brackets). If the height is less than 0.125 mm the tips of the object are so close to each other that the retinal image is not separated by one unexcited cone. The object therefore cannot be seen as it is smaller than the eye's visual acuity. Instead of stating the acuity at a given distance from the lens of the eye (here the near point = 25 cm for the young adult) the angular separation,  $\theta$  can be used. (B) If a simple magnifier (red) is inserted between the eye and the object, the object can be observed closer to the eye, i.e. at a larger angular separation,  $\theta'$ .  $f$  is the focal length of the lens. The green bar is the virtual image, i.e. how large the object would appear at the near point of the eye. The bracket demonstrates that the retinal image is much larger. Angular magnification ( $M$ ) =  $\theta'/\theta = (y'/f)/(y/x_n) = x_n/f$ . For the acrylic globe  $M = 25 \text{ cm}/6 \text{ cm} = 4 \times$ .

## MATERIALS AND METHODS

A total of 120 patients referred to our naevus clinics had their lesions photographed with the Heine Dermaphot and a Minolta X-300s camera and with the acrylic globe magnifier and a Nikon E4 SLR camera mounted with a Nikkor 105 mm macro-lens. Immersion-oil was used for Dermaphot pictures as well as for acrylic globe magnifier pictures. To avoid artefacts from air bubbles in the oil, an oil-drop was applied to skin and the flat surface of the acrylic globe was rolled onto the skin lesion. Reflection artefacts from the flash-light were minimized by using an operation lamp as light source or by dismounting the ring-flash and pointing it at a 30–45° angle towards the lesion.

Photo-slides were projected to a screen in a darkened room. The succession of the Dermaphot pictures and the globe magnifier pictures were randomized and mounted by a medical student not involved in the evaluation of the slides. The slides were evaluated on 2 different occasions with 3 week intervals by dermatologists who have performed dermatoscopy for 5–10 years, published scientific papers on dermatoscopy and carried out pre- and post specialist training in dermatoscopy. Evaluations were performed on printed entry-sheets and subsequently entered in an electronic database for cross-tabulation.

Cohen's kappa (6) was calculated for agreement beyond chance between classical dermatoscopy and acrylic globe magnifier dermatoscopy.

Lesions included in this study were excised and assessed by histopathology. In addition to haematoxylin-eosin staining, histochemistry was performed using S-100 (7) and HMB-45 (8) on suspect melanoma lesions.

Cohen's kappa was also determined for agreement beyond chance between histopathology and acrylic globe magnifier dermatoscopy and classical dermatoscopy, respectively.

Cohen's kappa was calculated as (observed agreement – agreement by chance) / (1 – agreement by chance). Cohen's kappa-coefficient has been divided into 5 ordinal categories: 0–20% (poor agreement), 21–40% (fair agreement), 41–60% (moderate agreement), 61–80% (substantial agreement) and 81–100% (perfect or excellent agreement). MedCalc v. 7.2.1.0 was used for calculations of kappa coefficients, and for individual categories these were calculated using PAIRSetc v 0.84.

To minimize the number of diagnostic classes, one dermatofibroma was excluded from analysis and 4 benign lentigos were classified together with benign melanocytic naevi, thus leaving 119 cases for evaluation. Blue naevi were allocated to the group of melanocytic nevi. In the data analysis, possible groups were (numbers in parentheses refer to the histological diagnoses): cutaneous haemangioma ( $n=2$ ), basal cell carcinoma (BCC) ( $n=13$ ), dysplastic naevus ( $n=2$ ), malignant melanoma ( $n=24$ ), melanocytic naevi ( $n=68$ ) and seborrhoeic keratoses ( $n=10$ ). Assessments were performed according to the risk stratification and pattern analysis procedure as described by Kenet & Kenet (9) and Lorentzen et al. (10). Sensitivity was calculated as true positive diagnoses divided by (true positives plus false negatives) and specificity was calculated as true negative diagnoses divided by (true negatives plus false positives).

## RESULTS

All photo-slides were found acceptable for assessment. An example of acrylic globe magnifier dermatoscopy is described in Fig. 3.

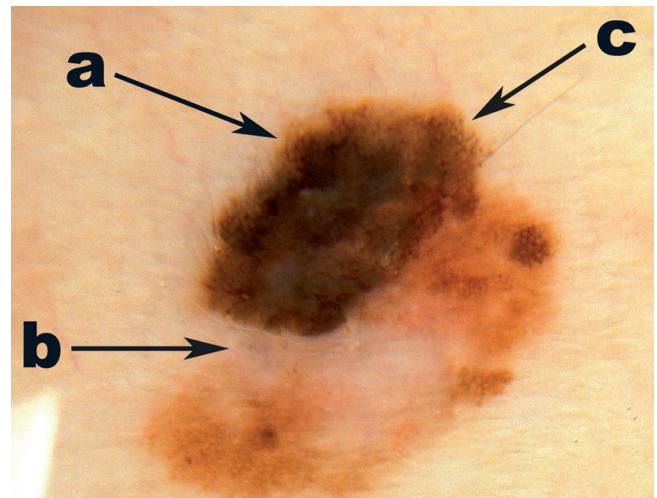


Fig. 3. Acrylic globe magnifier dermatoscopy of a pigmented skin lesion. The pigment network is clearly heterogeneous, with pigment confluence near the end of the lesion (we call this: "bird's nest" configuration). There are (a) thick dark lines at the periphery, (b) a pale structureless area of regression, and (c) peripheral globules. Stolz ABCD score: A2B3C3D4 = 6.4 and class 1 in Kenet's risk stratification indicating a malignant melanoma. (Nikon F-series SLR camera with a Nikkor 100 mm macro lens (Nikon Corp., Tokyo). HD: superficial spreading malignant melanoma, Clark level II, Breslow thickness 0.80 mm.

Observed agreement between histopathology and Dermaphot (ELM) dermatoscopy was 95% and agreement corrected for chance agreement, the kappa coefficient was 92% (95% confidence interval 83–97%), indicating almost perfect concurrence between histopathology and dermatoscopy (Table I).

The observed agreement between histopathology and acrylic globe magnifier dermatoscopy was 94% and the kappa coefficient was 90% (95% confidence interval 83–97%).

No malignant melanomas were missed in this series of patients (sensitivity 100%). Using classical dermatoscopy 3 false positive malignant melanomas diagnoses were made (histopathology diagnoses of these were: one pigmented BCC and 2 dysplastic naevi). Using the acrylic globe magnifier 4 false positive diagnoses were made (the above-mentioned 3 and one histological benign melanocytic naevus).

Twelve of the 13 (sensitivity 92%) BCCs were identified with classical dermatoscopy and 11 (sensitivity 85%) were identified with the acrylic globe magnifier. More than 98% of melanocytic naevi/ benign lentiginos were correctly diagnosed with the dermatoscope as well as when using the acrylic globe magnifier. Specificity was 95%, 94% and 100% for melanoma, naevi and basal cell carcinoma using the acrylic globe magnifier and 97%, 96% and 99% using classical dermatoscopy.

Table II shows assessments from acrylic globe dermatoscopy cross-tabulated with classical dermatoscopy. Observed agreement was 94% and the kappa coefficient was 91% (95% confidence interval 85–98%). Two dysplastic naevi were classified as malignant melanomas by both techniques. Confusion between pigmented BCC and malignant melanoma were observed for 2 lesions.

Kappa coefficients for the individual classes were also determined. Kappa for the diagnostic subclass of malignant melanoma was 0.93 between acrylic globe magnifier dermatoscopy and classical dermatoscopy, indicating perfect agreement between the 2 techniques.

Table I. Observed agreement between histopathology, classical dermatoscopy (d) and acrylic globe magnifier dermatoscopy (Acr). Bold numbers are agreeing pairs

Histology	HA		BCC		MM		NP		SK	
	d	Acr	d	Acr	d	Acr	d	Acr	d	Acr
HA (2)	<b>2</b>	<b>2</b>								
BCC (13)			12	11	1	1		1		
DN (2)					2	2				
MM (24)					<b>24</b>	<b>24</b>				
NP (69)			1			1	<b>68</b>	<b>68</b>		
SK (9)							2	2	7	7
κ	1	1	0.91	0.91	0.93	0.90	0.91	0.90	0.87	0.87

Final row indicates agreement corrected for chance, kappa (κ), for the individual diagnostic classes. HA: haemangioma; BCC: basal cell carcinoma; MM: malignant melanoma; DN: dysplastic naevus; NP: naevus pigmentosus; SK: seborrhoeic keratoses.

Table II. Observed agreement between acrylic globe magnifier dermatoscopy and classical dermatoscopy diagnoses. Bold numbers are agreeing pairs

Diagnoses	Acrylic globe magnifier dermatoscopy				
	HA	BCC	MM	NP	SK
HA	<b>2</b>				
BCC		<b>10</b>	1	2	
MM		1	<b>26</b>		
NP			1	<b>68</b>	1
SK				1	<b>6</b>
κ	1	0.81	0.93	0.91	0.85

Final row indicates agreement corrected for chance, kappa (κ), for the individual diagnostic classes. HA: haemangioma; BCC: basal cell carcinoma; MM: malignant melanoma; NP: naevus pigmentosus; SK: seborrhoeic keratoses.

DISCUSSION

Dermatoscopy is well-established as a diagnostic tool in skin cancer case-finding when performed by formally trained dermatologists (11). Malignant melanomas are more asymmetric, both with regard to lesion outline and differential structures, than benign melanocytic lesions (12) and asymmetry is evaluated in various dermoscopic algorithms (13, 14). Larger lesions cannot be examined in a single Dermaphot picture. Lesion (a-)symmetry therefore can only be assessed from multiple photo-slides or multiple electronically stored pictures. The lesions can be photographed easily and evaluated using the acrylic globe magnifier. For smaller lesions the dermatoscope is superior and acrylic globe magnifier dermatoscopy is advocated only for larger lesions. It, however, allows several observers to assess a lesion simultaneously and may serve as an educational supplement. Two factors are pivotal to introducing this method: concordance with findings of classical dermatoscopy and sufficient visual acuity. In this paper we have shown a perfect agreement between acrylic globe magnifier dermatoscopy and classical dermatoscopy as demonstrated by kappa coefficients between 80% and 100%. In this series of patients, sensitivity was 100% for diagnosing malignant melanoma, with a false positive rate less than 5% for both acrylic globe magnifier and classical dermatoscopy. This may indicate that the test series encompassed few borderline lesions.

The present study demonstrates that acrylic globe dermatoscopy enables a trained investigator to perform pattern analysis with similar results to those for handheld dermatoscopy, as documented by dermatophotography.

REFERENCES

1. Bafounta ML, Beauchet A, Aegerter P, Saiag P. Is dermoscopy (epiluminescence microscopy) useful for the diagnosis of melanoma? Results of a meta-analysis using techniques adapted to the evaluation of diagnostic tests. Arch Dermatol 2001; 137: 1343–1350.

2. Kittler H, Pehamberger H, Wolff K, Binder M. Diagnostic accuracy of dermoscopy. *Lancet Oncol* 2002; 3: 159–165.
3. Argenziano G, Soyer HP, Chimenti S, Talamini R, Corona R, Sera F, et al. Dermoscopy of pigmented skin lesions: results of a consensus meeting via the Internet. *J Am Acad Dermatol* 2003; 48: 679–693.
4. Braun RP, Saurat J-H, Krischer J. Diagnostic pearl: unmagnified diascopy for large pigmented lesions reveals features similar to those of epiluminescence microscopy. *J Am Acad Dermatol* 1999; 41: 765–766.
5. Weismann K, Lorentzen HF, Grønhøj Larsen F. Diagnostic pearl: Brightfield globe magnifier diascopy for large pigmented skin lesions: a practical approach to epiluminescence microscopy. *J Am Acad Dermatol* 2002; 47: 304–306.
6. Cohen J. A coefficient of agreement for nominal scales. *Educational and psychological measurement* 1960; 20: 37–46.
7. Nakajima T, Watanabe S, Sato Y, Kameya T, Hirota T, Shimosato Y. An immunoperoxidase study of S-100 protein distribution in normal and neoplastic tissues. *Am J Surg Pathol* 1982; 6: 715–727.
8. Wick MR, Swanson PE, Rocamora A. Recognition of malignant melanoma by monoclonal antibody HMB-45. An immunohistochemical study of 200 paraffin-embedded cutaneous tumours. *J Cutan Pathol* 1988; 15: 201–207.
9. Kenet RO, Kenet BJ. Risk stratification. A practical approach to using epiluminescence microscopy/dermoscopy in melanoma screening. *Dermatol Clin* 2001; 19: 327–335.
10. Lorentzen H, Weismann K, Kenet RO, Secher L, Larsen FG. Comparison of dermatoscopic ABCD rule and risk stratification in the diagnosis of malignant melanoma. *Acta Derm Venereol* 2000; 80: 122–126.
11. Lorentzen H, Weismann K, Sand Petersen C, Grønhøj Larsen F, Skødt V. Clinical and dermatoscopic diagnosis of malignant melanoma – assessed by an expert and non-expert group. *Acta Derm Venereol* 1999; 79: 301–304.
12. Lorentzen H, Weismann K, Larsen FG. Structural asymmetry as a dermatoscopic indicator of malignant melanoma – a latent class analysis of sensitivity and classification errors. *Melanoma Res* 2001; 11: 495–501.
13. Stolz W, Braun-Falco O, Bilek P, Landthaler M, Coggnetta AB, editors. *Color atlas of dermatoscopy*. First English edn. Oxford: Blackwell Science Ltd, 1994.
14. Menzies SW, Crotty KA, Ingvar C, McCarthy WH, editors. *An atlas of surface microscopy of pigmented skin lesions*. Sydney, Australia: John Rowe, McGraw-Hill Book Co., Australia Pty Ltd, 1996. Ref Type: Serial (Book, Monograph).