

Acrylic Globe Magnifier Dermatoscopy. A New Approach to Dermatoscopy of Large Pigmented Skin Lesions

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Summary

Acrylic globe magnifier dermatoscopy is described. The method allows inspection of large pigmented skin lesions (PSLs) and analogous as well as digital photography. The calculated angular magnification of the globe magnifier is in agreement with the notion that all relevant dermatoscopic substructures can be observed with the acrylic globe magnifier.

Clinical diagnosis of malignant melanoma (MM), basal cell carcinoma and benign PSLs is often difficult, resulting in false positive as well as false negative diagnoses.

A false positive MM diagnosis leads to unnecessary and potentially disfiguring surgery. A false negative diagnosis may result in disease progression or choice of a treatment such as curettage or tangential excision which make a precise histopathological evaluation (Breslow thickness, Clark level) difficult.

Dermatoscopy is a non-invasive clinical investigation based on: 1) magnification, 2) a light source, 3) elimination of reflection from the skin surface, and 4) reduction of the blood flow in the area. This is obtainable by using a handheld dermatoscope with a light source, a 10 × magnification lens and a plane glassplate (objective) (Heine Delta 10 and Heine Delta 20 dermatoscope, Heine Optotechnic, Herrsching, Germany, and Welch Allyn episcopes, Welch Allyn Inc., Staneateles, New York).

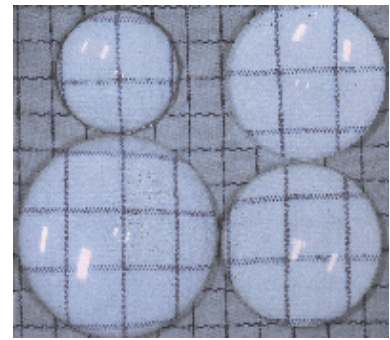
A contact fluid (ethanol or immersion oil) is applied to eliminate reflection from the skin surface. Hereby it is possible to study pigmented substructures and patterns in epidermis, the junctional zone and the upper dermis (1).

Dermatoscopy performed by a trained clinician improves the diagnostic sensitivity and specificity significantly as documented in two metaanalysis (2, 3).

An acrylic globe magnifier which assembles surrounding light collometrically is a simple alternative to handheld dermatoscopes and fulfils the above-mentioned criteria for dermatoscopy.

Acrylic globe magnifier and magnification definitions

Globe magnifiers either of glass or acrylic materials consist of a spheric top on a cylindrical base (4) (Fig. 1).



The lens is semiconvex with a focal length which is the height of the cylinder. When placed on the skin, the surface will be in focus. Globe magnifiers of glass have a faint yellow colour. Acrylic globes are brighter with an undisturbed colour reproduction. The typical height and diameter is 5–6 cm (Fig. 1). Acrylic globes are cheaper, about US\$ 30 versus about US\$ 500 for the handheld dermatoscopes.

Magnification can be described in two ways, linear magnification and angular magnification. Linear magnification indicates how many times the picture is enlarged compared with its natural size. Angular magnification indicates how close the picture can be brought to the eye. The angle at which adjacent points can be perceived as separate is determined by the presence of an unexcited retinal tap between two excited taps. The linear magnification is an empty magnification (poster magnification) whereas the angular magnification describes

the lens' power to discriminate small dermatoscopic structures such as "black dots" (<0.1 mm) and small capillaries (1).

With the aid of a supplementary magnifying glass or a photographic macrolens the magnification can be increased (Fig. 2) (4).

If you want to study an object it is brought as close to the eye as possible. The point is called the nearpoint of the eye, in grown-up persons it is about 25 cm. Due to the structure of the retina two adjacent points can just be separated if they are seen under an angle of 5×10^{-4} rad. This is the visual acuity. With a nearpoint of 25 cm, this corresponds to a distance of approximately 0.125 mm, which is more than the diameter of "black dots", so they cannot be seen. If the focal length of the acrylic globe magnifier is 6 cm, the angular magnification (nearpoint /focal length) is $25/6 = 4X$ (small angles are expressed as



tangens to the angle). With the acrylic globe "black dots" will be seen with a diameter of about 0.5 mm and thus clearly visible. "Black dots" are the smallest structures to be studied.

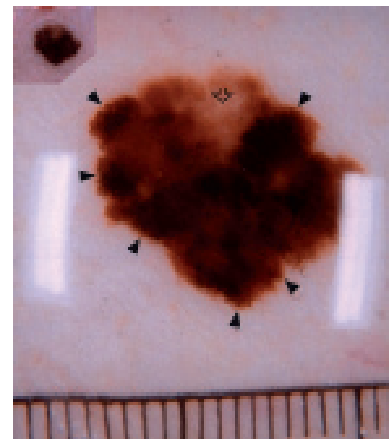
There is no definition of an optimal magnification for dermatoscopy (1-4). It is the diagnostic accuracy of the procedure which decides whether the method should be designated dermatoscopy, rather than an arbitrarily chosen order of magnification. As with conventional dermatoscopes it is essential that the investigator using the acrylic globe is educated and trained in dermatoscopy.

Dermatoscopic substructures

The pigment network is the most important structure to be studied. It is due to melanin accumulation in the epidermal basal cell layer and the structure of the rete ridges. It therefore appears honey-comb-like on trunk and extremities (1).

Large PSLs are suitable for dermatoscopy by globe magnifier which covers an area of 6 cm in diameter. A fading, fine-meshed pigment network indicates a benign melanocytic naevus. An abrupt cut-off thick network with broken lines at the periphery (also designated pseudopods or streaming) indicates a MM (Fig. 3).

According to the risk stratification method a heterogeneous pigment network with uneven pigment accumulation at the periphery ("bird's nets"), indicates a possible MM (6).



"Black dots" are due to melanin in stratum corneum or high in the epidermis. They are typically unevenly distributed at the periphery in MM. Regular distribution of "black dots" together with brown globules (representing melanocytes at the papillary tips) at the periphery indicates benign growth of a melanocytic lesion as seen in childhood and after sun exposure.

Single and double asymmetry and variation of colour are additional dermatoscopic parameters of MM (1).

Diagnostic patterns of non-melanocytic PSLs are among others red sacculate structures or lagoons (=cutaneous angioma), horn pseudocysts

with comedo-like openings and a moth-eaten border (=seborrheic keratosis) (Fig. 4), and arborized "retinal" vessels together with ovoid slate grey pigment lumps and amber-coloured crusts (=basal cell carcinoma) (1,4).

Photography with the acrylic globe magnifier

We have taken ordinary colour dias of acrylic globe dermatoscopy with a Nikon E 3 digital camera and a Micro Nikkor 105 mm macro lens or a Nikon F-series SLR camera with a Nikkor 100-mm macro lens (Nikon Corp., Tokyo, Japan). A 100 ASA film with a colour temperature of 21°C (Ektachrome 100, Kodak Ltd, UK) was used (4). The best results were obtained using a ring flash as light source. Flash reflections from the globe may disturb the picture. This can be overcome by keeping the flash



at one side of the globe magnifier and placing a piece of white cardboard at the opposite site.

Discussion

Large PSLs can be studied by acrylic globe magnifiers by more than one person at the same time. One-axis or two-axis asymmetry of the element, colour variation, and the various substructures used for dermatoscopy can be investigated with the method.

We have compared the diagnostic sensitivity and specificity of acrylic globe magnifier dermatoscopy with conventional dermatoscopy (Heine Delta 10 dermatoscope) in a study comprising 119 PSLs (7).

There was no statistical difference between the diagnostic accuracy of the two methods. All 24 cases of MM were diagnosed correctly, and with both methods the sensitivity in case of pigmented naevus and basal cell carcinoma was 98% and 85%, respectively. The variation between the two methods was of the same order as the intra-observer variation of experts using handheld dermatoscopes (5).

The acrylic globe magnifier and the handheld dermatoscopes appear to be supplementary diagnostic tools for dermatoscopy.

Conflict of interest statement: K. Weismann is scientific adviser for Kivex A/S.

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