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Viability of the head louse eggs in pediculosis capitis. A dermoscopy study.

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Summary The dermoscope without fluid may be useful to establish the viability of a head louse colony by differentiating viable head louse eggs from aborted eggs and from hatched empty nits, irrespective of their distance from the scalp. A nit, the metabolism of which stopped spontaneously or as a consequence of treatment, is characterized by a longitudinal or roundish depression of its wall -abortive dimple-.

Key words Pediculosis capitis, viable eggs, abortive eggs, dermoscope.

To establish in pediculosis capitis the precise time of clinical and biological recovery is still a problem (3, 6). Until now the diagnosis of active pediculosis capitis, in absence of self-moving elements, was essentially based on the distance of the nits from the scalp. Recently, morphological criteria of nit viability based on the use of dermoscope (DS) appeared in the relevant literature (3, 6). The DS, which has been already used in the study of scabies and other ectoparasitoses (1, 2, 3, 4, 6), could be useful in clarifying the problem of nit viability, thus enlarging that new research field shared by dermatologists and entomologists, which can be called "entodermoscopy".

This study was aimed at establishing some morphological parameters useful in recognizing the viability of nits, apart from their distance from the scalp, in order to evaluate their potential risk of contagiousness and/or the efficacy of treatment.

Material and methods

During the school year 2005-2006 one of us (SG) visited 387 students attending kindergarten or primary school with suspected pediculosis capitis. At the moment of the visit most of them had already started a home treatment with drugs such as malathion, permethrin, synergized pyrethrins and natural oils.

The clinical findings were observed by the naked eye in all the cases. In cooperating subjects also the study of the scalp was carried out with a dermoscope by a dry technique (Heine Delta 20, 10x) with alternated circular -at six diodes lighted- or lateral -3 diodes lighted- illumination. The DS was connected to an ordinary Digit-camera Minolta G350 (5Mp). Most nits were studied after pulling the hair and fastening it with a scotch on a white paper. Some nits were also photographed "in situ".

Results

In the nit one can distinguish a small and roundish bottom oriented towards the skin (proximal pole), a larger central body and finally a free border oriented towards outside (distal pole). With regard to the hair, to which it is cemented, the nit, especially the viable nit, describes an acute angle, with the proximal pole

Fig. 1: Translucent, empty nit without operculum (dermoscopy, 30x).

Fig. 2: Precocious viable nit before organogenesis (dermoscopy, 30x).

Fig. 3: Mature, viable nit, after organogenesis (dermoscopy, 30x).

Fig. 4: Abortive nit with abortive dimple (dermoscopy, 30x).

and central body attached to the hair, whereas the distal pole is free and separated by fractions of millimeters from the hair.

During the dermoscopic examination of the nits we noticed a first significant difference based on the presence or not of the operculum on their distal pole. The nits without operculum -open nits- are usually empty (Fig. 1) and more than 1 centimeter far from the scalp. On DS examination the latter are whitish, translucent with their distal border sometimes fissured (3). Some of these open nits, although lacking the operculum, are anyway occupied by material reminiscent of the embryo or parts of it.

The nits with operculum -close nits (CN)- have variable morphology. On DS examination, some of CN are light brownish and translucent. They have amorphous content and uniformly tense and convex walls (Fig. 2). Finally they are the most close to the scalp -precocious viable CN-. Other nits with operculum are dark brown. Inside their convex and tense walls an embryo occupies all the available space without significant void space. In case of advanced organogenesis the limbs and an eye macule can be seen (Fig. 3). These mature viable nits are a bit more far from the scalp as compared with precocious viable CN.

Finally, on physical examination other nits with operculum -abortive CN- have not uniformly convex and tense walls. On the other hand, they show a roundish or longitudinal depression. The abortive CN (Fig. 4, 6, 7, 8) are not uniform in color, being partly brown and partly white, and show some air (Fig. 5) around the embryo. The latter is contracted or fragmented in more points. These abortive CN are not uniformly far from the scalp. They can be very close to the scalp or far from it more than 5 millimeters.

Discussion

Particular attention was paid to the method of observation of the nits. A direct observation of the nits with DS requires a cooperating patient. Anyway, the direct observation allows to see whether there is the operculum or not and whether the nit is empty or full. Also taking a photo of the nit "in situ" does not always allows physicians to obtain all the information, due to the changeable orientation of the nit. This is why the more significant nits were studied pulling the hair and fastening it with a scotch on a white paper. A white, light and reflecting basis shows very well the inside of the nit, whereas the removal of the plate puts in evidence the alterations of the surface of the nit and the tridimensionality of the structures. The magnification achievable by this system varied according to the use of the optical zoom of the camera (3x) and the digital one, when the observation on the monitor was made at the full size (further 3x).

With regard to the morphology of the nits, the open ones, namely without operculum, the shape of which is reminiscent of a cup, represent the involucre remaining after the discharge of the nymph. Their shape was reported even from a dermoscopy point of view (3, 6). In the clinical practice these nits correspond to the white granules, leading to the diagnosis, unfortunately late, in most cases. Occasionally, open nits with residua of the embryo body can be seen. The latter, which are usually closer to the scalp as compared with the empty ones, could follow the use of pediculicide products and/or of the mechanic activity of egg removing combs.

Literature lacks a deep study of the closed nits, particularly of those ones we called aborti-

Fig. 5: Abortive nit with contracted embryo and surrounding void space (dermoscopy, 30x).

Fig. 6: Abortive nit with introflexed wall and void space on the top (dermoscopy, 30x).

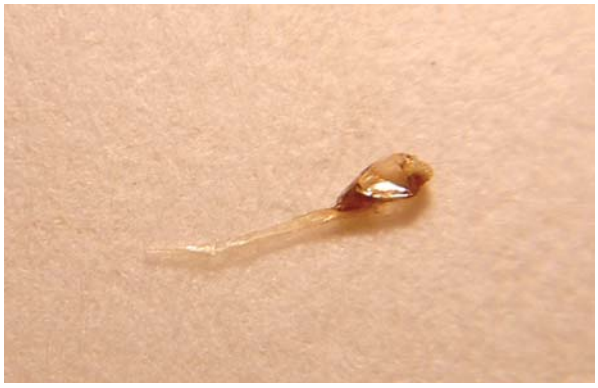

Fig. 7: Abortive nit collected after combing (dermoscopy, 30x).

Fig. 8: Coerced abortive nit with void space (dermoscopy, 30x).

ve CN, hypothesizing the death of the embryo contained in them. In our temperate zone a fertile nit, in absence of favoring factors such as scarves or turtleneck pullover, is not far more than 1 cm from the skin and thus is hardly seen as compared with empty nits. The dermoscope can be useful in detecting early an infesting colony of lice, putting them in evidence when yet few and close to the scalp.

The precocious viable CN correspond to their first stage of development before an evident organogenesis, whereas the mature viable CN represent more advanced stages of development of the embryo. The maturation of the latter takes about ten days, but can stop inside the nit due to natural or therapeutic factors. Among the natural factors we should remember temperature and humidity. When the latter is less than 70%, the nymph is less capable to completely emerge from the nit after having opened the operculum, a phenomenon best described as a stillbirth (5). The same phenomenon can be observed even after treatment with pediculicidal drugs (5). The latter likely damage the embryo entering the nit through the doughnut-shaped holes of the operculum, which under normal conditions allow air and water vapor to enter the nit. Some Authors (4) also showed that a fully developed nymph is more susceptible than an embryo in an early stage, namely present in a recently laid nit, to the damaging activity of pediculicides (5).

The actual report shows that the embryo damage can manifest itself even with other morphological alterations of the nit, such as contraction and fragmentation of the embryo body, presence of air cavities inside the nit and mainly of roundish or longitudinal depression -abortive dimple- on the nit walls.

When nits with abortive dimple develop during treatment, they could be expression of the damaging activity on the eggs of pediculicides. However, before attributing this meaning to dimples of the nit walls, it is necessary to clarify whether the abortion of the embryo material can occur spontaneously. If the latter occurs spontaneously, it is also necessary to clarify what is its natural rate and which are the predisposing environmental conditions. A better knowledge of these mechanisms would play a significant role not only in the treatment, but also in controlling the spreading of the disease in a community.

In conclusion, the actual reports shows that the embryo damage can manifest itself with peculiar features such as contraction and fragmentation of the embryo body, presence of air cavities inside the nit and above all roundish or longitudinal depression of its wall -abortive dimple-.

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