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Standardization of Dermoscopic Terminology and Basic Dermoscopic Parameters to Evaluate in General Dermatology (Non-Neoplastic Dermatoses): An Expert Consensus on Behalf of the International Dermoscopy Society — Source link

Enzo Errichetti, Iris Zalaudek, Harald Kittler, Zoe Apalla ...+33 more authors

Institutions: Misericordia University, University of Trieste, Medical University of Vienna, Aristotle University of Thessaloniki ...+15 more institutions

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DR ENZO ERRICHETTI (Orcid ID : 0000-0002-7152-6136)
DR ZOE APALLA (Orcid ID : 0000-0002-9255-8196)
DR RALPH BRAUN (Orcid ID : 0000-0003-1253-8206)
PROFESSOR CATERINA LONGO (Orcid ID : 0000-0002-8218-3896)
DR ELVIRA MOSCARELLA (Orcid ID : 0000-0001-5160-8997)
DR CHRYSSOULA PAPAGEORGIOU (Orcid ID : 0000-0003-4768-1758)
DR TERESA RUSSO (Orcid ID : 0000-0003-1792-9716)
PROFESSOR LUC THOMAS (Orcid ID : 0000-0002-8329-7262)

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E. Errichetti,[1] I. Zalaudek,[2] H. Kittler,[3] Z. Apalla,[4] G. Argenziano,[5] R. Bakos,[6] A. Blum,[7] R. Braun,[8] D. Ioannides,[4] F. Lacarrubba,[9] E. Lazaridou,[10] C. Longo,[11] G. Micali,[9] E. Moscarella,[5] J. Paoli,[12] C. Papageorgiou,[4] T. Russo,[5] A. Scope,[13] G. Stinco,[1] L. Thomas,[14] R. J. Toncic,[15] P. Tschandl,[3] H. Cabo,[16] A. Hallpern,[17] R. Hofmann-Wellenhof,[18] J. Malvehy,[19] A. Marghoob,[17] S. Menzies,[20] G. Pellacani,[11] S. Puig,[19] H. Rabinovitz,[21] L. Rudnicka,[22]
E. Vakirlis,[4] P. Soyer,[23] W. Stolz,[24] M. Tanaka,[25] A. Lallas[4]

1. Institute of Dermatology, “Santa Maria della Misericordia” University Hospital, Udine, Italy
2. Department of Dermatology, University of Trieste, Italy
3. Department of Dermatology, Medical University of Vienna, Austria
4. First Department of Dermatology, Aristotle University, Thessaloniki, Greece
5. Dermatology Unit, University of Campania “Luigi Vanvitelli”, Naples, Italy
6. Department of Dermatology, Hospital de Clınicas de Porto Alegre, Porto Alegre, Brazil
7. Public, Private and Teaching Practice of Dermatology, Konstanz, Germany
8. Department of Dermatology, University Hospital Zürich, Zürich, Switzerland
9. Dermatology Clinic, University of Catania, Italy
10. Second Department of Dermatology-Venereology, Aristotle University Medical School, Thessaloniki, Greece
11. Department of Dermatology, University of Modena and Reggio Emilia, Modena, Italy
12. Department of Dermatology, Institute of Clinical Sciences, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
13. Medical Screening Institute, Sheba Medical Center and Sackler School of Medicine, Tel Aviv University, Israel
14. Department of Dermatology, Lyon University, France
15. Dermoscopy Unit, University of Zagreb, Croatia
16. Dermatology Institute of Medical Reserch, University of Buenos Aires, Argentina
17. Memorial Sloan Kettering Cancer Center, Hauppauge, New York
18.Department of Dermatology, Medical University of Graz, Graz, Austria
19.Melanoma Unit, Dermatology Department, Hospital Clinic Barcelona, Universitat de Barcelona IDIBAPS, Barcelona, Spain
20. Discipline of Dermatology, Sydney Medical School, The University of Sydney and Sydney Melanoma Diagnostic Centre, Royal Prince Alfred Hospital, Camperdown, NSW Australia
21. Skin and Cancer Associates, Plantation, FL, U.S.A.
22. Department of Dermatology, Medical University of Warsaw, Poland
23. Dermatology Research Centre, The University of Queensland Diamantina Institute, Australia

24. Department of Dermatology, Allergology, and Environmental Medicine Clinic Thalkirchen, Hospital Munich
25. Department of Dermatology, Tokyo Women's Medical University Medical Center East, Japan

Corresponding author:
Enzo Errichetti
Institute of Dermatology, "Santa Maria della Misericordia" University Hospital.
Piazzale Santa Maria della Misericordia, 15. 33100-Udine, Italy
Tel: (+39) 0432559822. E-mail: enzoerri@yahoo.it

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What's already known about this topic?
Over the last few years, several papers have been published in attempt to describe the dermoscopic features of non-neoplastic dermatoses, yet there is poor consistency in the terminology among different studies.

What does this study add?

The present expert consensus provides a set of standardized basic dermoscopic parameters to follow when evaluating inflammatory, infiltrative and infectious dermatoses in order to enhance the reproducibility and comparability of existing and future research findings and uniformly expand the universal knowledge on dermoscopy in general dermatology.

Abstract:

Background: Over the last few years, several articles on dermoscopy of non-neoplastic dermatoses have been published, yet there is poor consistency in the terminology among different studies.

Objective: We aimed to standardize the dermoscopic terminology and identify basic parameters to evaluate in non-neoplastic dermatoses through an expert consensus.

Methods: The modified Delphi method was followed, with two phases: (I) identification of a list of possible items based on a systematic literature review and (II) selection of parameters by a panel of experts through a three-step iterative procedure (blinded email interaction in Round 1 and 3 and face-to-face meeting in Round 2). Initial panellists were recruited via email from all over the world based on their expertise on dermoscopy of non-neoplastic dermatoses.

Results: Twenty-four international experts took part in all the rounds of the consensus and 13

further international participants were also involved in Round 2. Five standardized basic parameters were identified: (I) vessels (including morphology and distribution); (II) scales (including colour and distribution); (III) follicular findings; (IV) "other structures" (including colour and morphology); and (V) "specific clues". For each of them, possible variables were selected, with a total of 31 different sub-items reaching the agreement at the end of the consensus (all the 29 proposed initially + 2 added in the course of the consensus procedure). **Conclusion:** This expert consensus provides a set of standardized basic dermoscopic parameters to follow when evaluating inflammatory, infiltrative and infectious dermatoses. This tool, if adopted by clinicians/researchers of the field, is likely to enhance the reproducibility and comparability of existing and future research findings and uniformly expand the universal knowledge on dermoscopy in general dermatology.

Introduction:

Besides its well-established use in the assessment of skin neoplasms,[1] dermoscopy is increasingly gaining appreciation as a supportive tool in the diagnosis of various non-neoplastic dermatological diseases, including inflammatory, infiltrative and infectious dermatoses.[2-5] Over the last few years, several papers have been published in attempt to describe the dermoscopic criteria seen in numerous dermatoses, but there is poor consistency in the terminology among different studies. The dermoscopic terms used are usually metaphoric and often poorly comprehensible.[2-5] The high variability in terminology is also explained by the lack of a widely accepted structured approach for the analysis of dermoscopic images of non-neoplastic dermatoses.[2-5] Indeed, most of the criteria described in the literature are based on authors' arbitrary description.[2-5]

This heterogeneity poses significant limitations in evaluating the results of different studies comparatively, in designing new studies on the basis of pre-existing evidence and, overall, in expanding and spreading the existing knowledge on dermoscopy of dermatologic diseases. Indeed, dermoscopy in general dermatology is still seen with reservation by some colleagues and has not yet acquired a standard role in the daily practice for applications other than skin neoplasms,[6] despite of evidence suggesting that it improves the diagnostic accuracy.[7]

In 2015, the International Dermoscopy Society published a consensus paper on standardization of dermoscopic terminology.[8] This consensus proposed a set of dermoscopic criteria that were assessed as highly recognizable and reproducible and were defined both

with analytic (descriptive) and metaphoric terms. The consensus focused mainly on skin neoplasms and only a few criteria seen in inflammatory diseases were included. Therefore, the 2015 consensus is considered inadequate for applying dermoscopy in diseases other than skin neoplasms.

Based on the design and the methods used in the 2015 Consensus, we aimed to standardize the dermoscopic terminology and identify basic parameters to be evaluated in non-neoplastic dermatoses through a consensus among international experts.

Methods:

The study was performed on behalf of the International Dermoscopy Society. The consensus was performed according to the modified Delphi method[9,10] and consisted of two phases: (I) identification of a list of possible basic dermoscopic parameters based on a systematic literature review; and (II) selection of parameters by a panel of experts through a three-step iterative procedure designed as two rounds of email questionnaires with an intermediate face-to-face meeting. The Delphi method is an iterative process aiming to gain expert consensus on variable issues lacking adequate evidence, by using at least two rounds of questionnaires and involving at least five to ten participants.[11,12] The modified Delphi method additionally allows interaction among experts, offering the opportunity to present arguments and justify or modify viewpoints, and is generally considered as superior to the classic procedure.[9,10]

Identification of possible basic dermoscopic parameters

First, one of the authors (E.E.) searched the PubMed database to identify articles written in English that were published up to the 31st of December 2016 by using the key words "dermoscopy" or "dermatoscopy"; the search displayed 3943 publications. Abstracts and titles were screened independently by the two coordinators of the consensus (E.E. and A.L.) to identify papers reporting dermoscopic features of at least one inflammatory, infiltrative or infectious dermatosis. The final selection was performed in consensus among the two authors above and a third author (I.Z.). In total, 363 articles were selected for full-text review. Reviews, articles on neoplastic lesions, and articles on hair, nail and mucous membranes diseases were excluded.

All the retrieved studies were classified according to standard definitions for diagnostic accuracy studies[13-15] and their level of evidence was assigned based on *The Oxford*

2011 Levels of Evidence.[16] The full-text review included 208 single case reports, 139 case series, 11 case-control studies and 5 cross-sectional studies. More than 95% of the studies had a level of evidence of V, while in 16 studies the level of evidence ranged from II to IV. A total of 195 different dermatoses and 902 dermoscopic findings were analysed.

The two coordinators of the consensus (E.E. and A.L.) identified five main morphologic parameters that need to be evaluated and proposed all the possible values that each variable might take. The selection of the basic parameters followed a previously proposed classification,[2-5] which was slightly modified, and was based on the frequency of described features in the literature, on the histopathological correspondence of each feature and on experts' personal opinion. In detail, the previous classification included the following basic parameters: vessels morphology/distribution, scales distribution, background colours, follicular abnormalities and specific clues.[2-5] In the present consensus, we also considered scales colour and replaced the parameter "background colour" with "other structures" (i.e. non-scaling, non-vascular and non-follicular findings), with evaluation of their colour and morphology. For each parameter, several possible sub-items were identified and proposed, for a total of 29.

In line with the 2015 consensus on terminology, metaphoric terms were avoided as much as possible.

Panel selection

The panel of experts was selected via email from all over the world based on expertise in the field of dermoscopy in general dermatology and dermoscopy in general, as justified by published studies, books, and active roles in scientific societies and congresses. Specifically, all the members of the Executive Board of the International Dermoscopy Society were invited to join the panel, as well as researchers who published at least five peer-reviewed papers on such a topic as either first or last author. Overall, 38 international experts were invited as panel members. Panellists' assessment remained anonymous during the whole consensus process, with the exception of the face-to-face meeting.

Round 1

The list of proposed items was circulated via email to all recruited panellists, along with a detailed description of the aims and instructions of the consensus process. Participants were

asked to judge on a 5-point scale the relevance of each variable and its possible values and their agreement rate on the term used. The relevance scale ranged from: 0: don't know; 1: not at all relevant; 2: slightly relevant; 3: moderately relevant; 4: relevant; and 5: very relevant. Whereas, the scale used to rate the terminology was the following: 1: no agreement; 2: low agreement; 3: moderate agreement; 4: agreement; 5: strong agreement. Experts were also given the opportunity to provide comments and suggest additional variables/values that may not have been included in the proposed list. Each parameter/sub-item was admitted to the second round of the consensus procedure if more than 80% of the experts rated it 4 or 5 out of 5 in both relevance and terminology. Of note, the agreement threshold of 80% was chosen according to the literature recommendation on Delphi consensus.[12]

Round 2

Parameters that received consensus during the Round 1 were showed to the attendees of the International Dermoscopy Society consensus meeting during the 76th American Academy of Dermatology annual meeting in San Diego, USA. All the attendees were asked to evaluate the selected parameters/sub-items in their relevance and terminology (separately) through a show of hands to express agreement (corresponding to a score of 4 or 5) or disagreement (corresponding to a score of 3 or less). Participants could also provide comments and suggest additional parameters/sub-items other than those selected from Round 1. According to literature data,[12] 80% of agreement was chosen as an appropriate cut-off to include each parameter/sub-item in the final document. Possible parameters/sub-items not reaching 80% agreement in their relevance and/or terminology would be modified according to feedback provided during the face-to-face meeting and redistributed, along with new proposed parameters/sub-items, to the panel of experts for Round 3.

Round 3

In the final round, the panel of experts had to assess new parameters/sub-items proposed during Round 2 and revise parameters/sub-items that did not reach 80% agreement in the second round following the same methods as the first round. Parameters/sub-items for which more than 80% of the experts gave a score of 4 or 5 in both relevance and terminology would be included in the final document.

Results:

Twenty-four panellists took part in all the rounds of the consensus and 13 further participants were involved in Round 2 (face-to-face meeting), for a total of 37 participants. All the five originally proposed parameters, including 29 sub-items (Table 1), reached the agreement in both relevance and terminology during the first round of the consensus procedure and were therefore admitted to the evaluation of the second round. In this step, all the selected parameters/sub-items reached full approval from the participants (100.0% agreement), thereby being considered suitable for the inclusion in the final document without going through the third round of evaluation. Agreement rates/mean scores for Rounds 1 and 2 are shown in Table 1.

Of note, the addition of three further sub-items [i.e. brown colour for the parameter 2 (i.e. "scales") and purple and rainbow-like colour for the parameter 4 (i.e. "other structures")] was proposed during Round 2. Therefore, all these sub-items went through Round 3 of the consensus process, but only brown and purple colour achieved the agreement in both relevance and used terminology (Table 1). In contrast, rainbow-like colour did not reach the agreement threshold in relevance and terminology (Table 1) and was, therefore, excluded. Consequently, at the end of the consensus, a total of five parameters and 31 sub-items (all the 29 proposed initially + 2 added in the course of the consensus procedure) were identified.

Table 2 summarizes all the parameters and sub-items selected in the present consensus, with their previous nomenclature (if any), histological background and main dermatoses characterized by each sub-item.

1. *Vessels*

1.1 Vessels morphology

Four vessels morphologies were included in the consensus, namely dotted, linear (without bends and/or branches), linear with branches and linear curved (Figure 1).

Dotted vessels include roundish vessels of any size, without differentiating dotted from pinpoint, globular or glomerular vessels. This is because it has been suggested that most of the inflammatory diseases may display dotted vessels of variable diameter and there is no indication that categorization by diameter could have any diagnostic significance when using low-magnification (hand-held) dermoscopes.[2-5] Dotted vessels histologically correspond to the tips of vertically arranged, dilated vessels in dermal papillae[17,18] and have been initially

described as a typical finding of psoriasis (Figure 2a), but subsequent studies have showed that they can be found in many other inflammatory dermatoses (e.g. dermatitis, lichen planus, pityriasis rosea and porokeratosis).[2-5] Dotted vessels represent the most frequently seen morphologic type of vessels in non-neoplastic entities.

Linear vessels are dermoscopically visible in several dermatoses and correspond to dilated dermal vessels that are located in parallel to the skin surface. Linear vessels can be seen in mycosis fungoides (Figure 2b), rosacea, lichen planus, discoid lupus erythematosus, etc.[2-5] Linear vessels are also seen in case of epidermal atrophy of any cause (e.g. induced by chronic sun exposure or steroids).[2-5]

Linear vessels with branches are quite common in neoplasms and represent the dermoscopic hallmark of basal cell carcinoma.[17,18] In the field of general dermatology, linear vessels with branches can mainly be found in granulomatous diseases (Figure 2c) and discoid lupus erythematosus.[2-5]

Finally, linear curved vessels include comma-shaped, chalice-shaped, hairpin-like and linear-helical (displaying more than one curves around a central axis) vessels. Grouping together these vascular morphologic types was based on the obvious overlap among them and on the lack of any evidence suggesting or even indicating a diagnostic benefit when discriminating among them.[2-5] Histologically, linear curved vessels usually correspond to convoluted dermal vessels that may be found in several inflammatory dermatoses, such as plasma cell balanitis (Figure 2d), granulomatous disorders, mycosis fungoides, etc.[2-5]

1.2 Vessels distribution

The distribution pattern of the vascular structures on the lesion's surface is equally important to their morphologic type. The vessels can be distributed in five main patterns: uniform, peripheral, clustered, reticular and unspecific (Figure 3).

Uniform: vascular structures equally and homogeneously arranged all over the surface of the lesion. It typifies psoriasis but can also be seen in case of lichenification (Figure 4a).[2-5]

Clustered: vessels aggregated in small groups. This pattern may be seen in dermatitis (Figure 4b), and results from vessels dilation in focally elongated dermal papillae (focal papillomatosis).[2-5]

Peripheral: vessels mainly arranged at the periphery of the lesion. This distribution pattern is classically seen in dermatoses typified by significant epidermal changes in the

central part of the lesions, e.g. discoid lupus erythematosus (Figure 4c) and lichen planus.[2-5]

Reticular: vascular structures in a network-like arrangement. This may be seen in psoriasis (dotted vessels), also known as "red globular rings" or "string of pearls", and rosacea (linear vessels) (Figure 4d), also called "polygonal" vascular pattern.[2-5]

Unspecific (also known as asymmetric or patchy arrangement): vascular structures are arranged randomly without following any of the other patterns. It can be seen in many diseases, such as dermatitis, mycosis fungoides (Figure 2b) and pityriasis rosea.[2-5]

2. *Scales*

2.1 Scale colour

Three possible scale colours have been identified, namely white, yellow and brown (Figure 5). Each of these reflects a specific histological background.

White scales typify dermatoses characterized by hyperkeratosis (especially parakeratosis) without serum exudation, such as psoriasis, lichen planus, discoid lupus erythematosus, mycosis fungoides, pityriasis lichenoides chronica, pityriasis rubra pilaris (Figure 6a), and many others.[2-5]

Yellow scales are often associated with yellow crusts. They represent a result of exudation or serum that might dry (crusts) or might be admixed with keratin (scales). Yellow scales/crusts are the dermoscopic hallmark of all types of dermatitis, histologically corresponding to the underlying spongiosis.[2-5] They are also visible in other conditions characterized by serum extravasation, including acantholytic dermatoses such as pemphigus vulgaris (Figure 6b) and Darier's disease.[2-5]

Brown scales result from a mixture of keratin and either exogenous or endogenous pigment, i.e. dirt or melanin. Terra firma-forme dermatosis and dermatosis neglecta (Figure 6c) represent two typical examples.[19]

2.2 Scales distribution

Four scales distribution patterns have been selected in the consensus, i.e. diffuse, central, peripheral and patchy (Figure 7).

Diffuse: scales covering all the surface of the lesion. It cannot be considered specific of any diagnosis, since diffuse scales can be seen in several hyperkeratotic dermatoses, yet it is very commonly seen in psoriasis (Figure 8a).[2-5]

Central: scales predominantly located in the centre of the lesion. Again, this pattern cannot be considered as specific because it is visible in many conditions, e.g. hypertrophic lichen planus, pityriasis lichenoides chronica and discoid lupus erythematosus (Figure 8b).[2-5]

Peripheral: scales sparing the centre and distributed mainly at the periphery. It is a classic sign of pityriasis rosea (Figure 8c) but can also be seen in tinea corporis, erythema annulare centrifugum, and other entities which have centrifugal pattern of expansion.[2-5]

Patchy: random and asymmetric distribution of scales. It is the less specific arrangement as it may be seen in many diseases (Figure 8d).

3. *Follicular findings*

The four proposed follicle-associated dermoscopic criteria include follicular plugs, follicular red dots, perifollicular white colour, and perifollicular pigmentation (Figure 9).

Follicular plugs represent the most frequent finding and correspond to follicular hyperkeratosis, which is a histological feature of several dermatoses, e.g. cutaneous leishmaniasis, discoid lupus erythematosus, hypertrophic lichen planus, lichen sclerosus (Figure 10a), follicular mycosis fungoides, and follicular mucinosis.[2-5] The colour of the plugs may be white (keratin alone), yellow (keratin + serum) and, less commonly, brown (keratin + melanin or exogenous pigment). Of note, more than one colour may be seen, alone or in combination.[2-5] Importantly, white keratotic plugs in inflammatory lesions may appear as four white points arranged as a 4-leaf clover (the so-called “rosettes”) on polarized dermoscopy.[20]

Follicular red dots reflect the presence of perifollicular inflammation and may be found in common diseases, such as early stage of discoid lupus erythematosus, as well as less frequent dermatoses, including follicular mucinosis (Figure 10b) or follicular mycosis fungoides.[2-5]

Perifollicular white colour may histologically correspond to perifollicular fibrosis (e.g. discoid lupus erythematosus) (Figure 10c), to epidermal hyperplasia (e.g. hypertrophic lichen planus), or to perifollicular depigmentation (e.g. vitiligo).[2-5]

Perifollicular pigmentation may be found in several pigmentary diseases, but its relevance is higher in vitiligo, where it represents the first sign of repigmentation (Figure 10d).[2-5,21]

4. *Other structures*

This parameter includes structures other than vessels, scales and follicular findings. This is, by definition, a heterogeneous group of dermoscopic structures that might result from different histological alterations, such as epidermal changes, cellular infiltrations, or deposits of melanin or other substances. According to the present consensus, the structures should be classified according to their colour and morphology.

4.1 *Colour*

Seven different colours have been selected in the consensus, i.e. white, brown, grey, blue, orange, yellow, and purple; each of them corresponds to specific histological findings (Table 2). The colour might be the main characterizing feature of a specific disease. For example, it is well-known that granulomatous skin diseases are classically typified by orange colour, which reflects the presence of a compact cellular infiltrate in the dermis ("mass effect").[23]

4.2 *Morphology*

Four types of morphologies may be identified, namely structureless areas, dots/globules, lines (which may be parallel, reticular, perpendicular, angulated, or unspecifically arranged), and circles (Figure 11). Of note, structureless areas may be diffuse (resulting in a relatively homogeneous background) or focal coloured zones of unspecific shape, without any recognizable structure. Figures 12a-d show some examples featuring the four possible morphologies.

5. *Specific clues*

Specific clues are considered features that, when present, are strongly suggestive of only one diagnosis (in general or among a limited number of differential diagnoses) as they are related to highly specific histological findings (Figure 13).[17] Several specific clues have been reported in the literature so far, but probably many others are yet to be described. Some examples include Wickham striae in lichen planus (related to hypergranulosis), peripheral keratotic structure with two free edges in porokeratosis (related to cornoid lamella) (Figure 14a) and the "jet with contrail" in scabies (corresponding to the anterior part of the mite with its burrow) (Figure 14b);[2-5] Table 2 includes more examples.

Discussion:

This Delphi study represents the first consensus on the classification and terminology of basic dermoscopic parameters to evaluate in inflammatory, infiltrative and infectious dermatoses. Indeed, so far, the description of dermoscopic features of several skin diseases have been arbitrary, variable and often confusing, based on the authors' personal view. This expert consensus provides five standardized basic parameters, with a total of 31 sub-items, that may be combined, like letters of the alphabet, to uniformly describe the dermoscopic pattern of non-neoplastic dermatoses (Table 2 and Figures 1-7). Notably, albeit dermoscopy usually reveals a homogeneous picture in the context of the same lesion, it has to kept in mind that dermosopic findings of these conditions may vary according to the stage of development of the lesions and dermoscopic examination may provide more useful information if performed on active lesions.

It is important to underline that the specific relevance of each parameter should be determined on a case-by-case basis according to its distribution in the context of the lesion, with "predominant" structures (i.e. those seen in the larger part of the lesion and prevailing other coexisting features) being more relevant. Indeed, every non-neoplastic dermatosis is usually typified by one/two predominant criteria, whose diagnostic accuracy must obviously be validated by controlled studies.[23]

Importantly, all the provided parameters/sub-items should be viewed as a basic guide, yet further details for each sub-item may be specified if found to be relevant to characterize and differentiate one or more conditions due to a strict correspondence with specific histological features. For example, both sarcoidosis and discoid lupus erythematosus may display linear vessels with branches, but, unlike the latter, in the former the vessels are focused due to the presence of a dense cellular infiltrate that pushes the dermal vessels towards the skin surface, thus appearing sharper.[2]

Despite the remarkable benefits of an expert consensus on a quite nebulous field like dermoscopy of non-neoplastic dermatoses, our work presents several limitations that need to be addressed. Firstly, although panellists numerosity in our study was higher than the minimum threshold suggested in the literature (i.e. 20 panellists),[47] nearly 40% (14/38) of the invited panel members did not take part to the study. Nevertheless, albeit reduced in size, the expert panel recruited for the consensus procedure had a higher experience background on dermoscopy of non-neoplastic dermatoses than the original potential panellists' composition.

Indeed, ten out of the 14 dermatologists not included in the study were Executive Board members of the International Dermoscopy Society who refused the invitation because their research activity/clinical experience was mainly focused on neoplastic dermatoses. Notably, the remaining four potential panellists not participating to the consensus were researchers who published at least five papers as either first or last author on dermoscopy of non-neoplastic dermatoses but did not respond at all to our invitation.

Importantly, even though recommendations provided in this paper are based on literature data and a structured consensus among experts on the topic, they are influenced by personal opinions and clinical experience of the panellists. Additionally, it is noteworthy to underline that the level of evidence of the available literature on dermoscopy of non-neoplastic dermatoses was quite low as more than 95% of the studies had a level of evidence of V.

Based on Delphi consensus guidelines,[12,48,49] in the present study the agreement on each parameter/sub-item was defined as a score of 4 or 5, while 80% was chosen as agreement threshold among the panellists. Albeit such cut-off rates are methodologically considered as appropriate according to the literature data, they cannot ensure an absolute agreement.[12,48,49] However, most of the parameters/sub-items of this consensus reached an agreement level among panellists of 100% (see Table 1).

Finally, in our document we did not address non-neoplastic conditions of nail, mucosae and hair/scalp as they have their own vocabulary/semeiology.

In conclusion, the present expert consensus provided for the first time a set of standardized basic dermoscopic parameters to follow when assessing inflammatory, infiltrative and infectious dermatoses. Adopting a structured and uniform method to describe dermoscopic findings will allow procedures which are necessary to validate published data, such as comparison among different studies and assessment of reproducibility. This is particularly relevant for future studies on dermoscopy in general dermatology, which we strongly recommend to be designed on the basis of the tool that this consensus provides.

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Figures legend:

Figure 1. Morphologic types of vessels: dotted vessels of variable diameter (a), linear vessels (not curved and without branches) (b), linear vessels with branches (c), and linear curved vessels (d).

Figure 2. Examples of the four vessels morphologies (images taken from representative lesions/lesional areas): Dotted vessels in psoriasis (a), linear vessels (distributed in an unspecific pattern) in mycosis fungoides (b), linear vessels with branches vessels in necrobiosis lipoidica (c), and linear curved vessels in Zoon's balanitis (d).

Figure 3. Possible distributions of vessels: uniform (a), peripheral (b), clustered (c) unspecific (d), and reticular (e).

Figure 4. Examples of vessels distributions morphologies (images taken from representative lesions/lesional areas): Uniform dotted vessels in lichen simplex chronicus (a), clustered dotted vessels in dermatitis (b), peripheral linear curved

vessels in discoid lupus erythematosus (c), and reticular linear vessels in rosacea (d).

Figure 5. Colour of scales: white scales (a), yellow crusts and scales (b), and brown scales (c).

Figure 6. Examples of the three scales colours (images taken from representative lesions/lesional areas): White in pityriasis rubra pilaris (a), yellow in pemphigus vulgaris (b), and brown in dermatosis neglecta (c).

Figure 7. Possible distributions of scales: diffuse (a), central (b), peripheral (c), and patchy (d).

Figure 8. Examples of the four scales distributions (images taken from representative lesions/lesional areas): Diffuse in psoriasis (a), central in discoid lupus erythematosus (b), peripheral in pityriasis rosea (c), and patchy in dermatitis (d).

Figure 9. Follicular features: follicular plugs (a), follicular red dots (b), perifollicular white colour (c), and perifollicular pigmentation (d).

Figure 10. Examples of the four follicular findings (images taken from representative lesions/lesional areas): Follicular plugs in lichen sclerosus (a), follicular red dots in follicular mucinosis (b), perifollicular white colour in discoid lupus erythematosus (c), and perifollicular pigmentation in vitiligo (d).

Figure 11. Other structures (shapes): focal structureless areas (a), dots (b), lines (c), and circles (d).

Figure 12. Examples of "other structures" (images taken from representative lesions/lesional areas): Diffuse structureless bright yellow area in plane xanthomatosis (a), brown dots in lichen pigmentosus (b), brown lines arranged in network-like structure in urticaria pigmentosa (c), and brown-grey/brown-blue circles in exogenous ochronosis (d).

Figure 13. Examples of specific clues: Wickham striae of lichen planus (a), white keratotic rim with double free edge of porokeratosis (b), and "jet with contrail" in scabies (c).

Figure 14. Three examples of specific dermoscopic clues (images taken from representative lesions/lesional areas): Wickham striae in lichen planus (a), white keratotic rim with double free edge in porokeratosis (b), and "jet with contrail" in scabies (c).

Table 1. Proposed basic dermoscopic parameters/sub-items with corresponding agreement rates (percentage of experts giving a score of 4 or 5) and mean scores for each Round

Parameter	Round 1		Round 2		Round 3	
	Terminology A.R. (M.S.) 0-100% (0-5)	Relevance A.R. (M.S.) 0-100% (0-5)	Terminology A.R. 0-100%	Relevance A.R. 0-100%	Terminology A.R. (M.S.) 0-100% (0-5)	Relevance A.R. (M.S.) 0-100% (0-5)
1. Vessels	100.0 (5.00)	100.0 (4.82)	100.0	100.0	N.P.	N.P.
1.1 Vessels morphology	100.0 (5.00)	100.0 (4.76)	100.0	100.0	N.P.	N.P.
Dotted	100.0 (5.00)	100.0 (4.65)	100.0	100.0	N.P.	N.P.
Linear (without bends or branches)	100.0 (4.83)	91.7 (4.32)	100.0	100.0	N.P.	N.P.
Linear with branches	100.0 (4.89)	91.7 (4.25)	100.0	100.0	N.P.	N.P.
Linear curved	83.3 (4.73)	83.3 (4.13)	100.0	100.0	N.P.	N.P.
1.2 Vessels distribution	100.0 (5.00)	100.0 (4.79)	100.0	100.0	N.P.	N.P.
Uniform	100.0 (4.57)	100.0 (4.73)	100.0	100.0	N.P.	N.P.
Clustered	91.7 (4.68)	83.3 (4.31)	100.0	100.0	N.P.	N.P.
Peripheral	100.0 (4.88)	83.3 (4.11)	100.0	100.0	N.P.	N.P.
Reticular	83.3 (4.21)	83.3 (4.08)	100.0	100.0	N.P.	N.P.
Unspecific	83.3 (4.13)	83.3 (4.43)	100.0	100.0	N.P.	N.P.
2. Scales	100.0 (5.00)	91.7 (4.68)	100.0	100.0	N.P.	N.P.
2.1 Scales colour	100.0 (5.00)	100.0 (4.83)	100.0	100.0	N.P.	N.P.
White	100.0 (5.00)	100.0 (4.74)	100.0	100.0	N.P.	N.P.
Yellow (scales and crusts)	100.0 (5.00)	100.0 (4.79)	100.0	100.0	N.P.	N.P.
Brown	-	-	-	-	100.0 (5.00)	83.3 (4.32)
2.2 Scales distribution	100.0 (5.00)	83.3 (4.22)	100.0	100.0	N.P.	N.P.
Diffuse	100.0 (4.82)	83.3 (4.31)	100.0	100.0	N.P.	N.P.
Central	100.0 (4.77)	83.3 (4.18)	100.0	100.0	N.P.	N.P.
Peripheral	100.0 (5.00)	91.7 (4.42)	100.0	100.0	N.P.	N.P.
Patchy	83.3 (4.23)	83.3 (4.11)	100.0	100.0	N.P.	N.P.
3. Follicular findings	91.7 (4.42)	83.3 (4.31)	100.0	100.0	N.P.	N.P.
Follicular plugs	91.7 (4.78)	91.7 (4.57)	100.0	100.0	N.P.	N.P.
Follicular red dots	83.3 (4.23)	83.3 (4.12)	100.0	100.0	N.P.	N.P.
Perifollicular white colour	91.7 (4.89)	83.3 (4.18)	100.0	100.0	N.P.	N.P.
Perifollicular pigmentation	100.0 (4.91)	83.3 (4.09)	100.0	100.0	N.P.	N.P.
4. Other structures*	83.3 (4.25)	91.7 (4.71)	100.0	100.0	N.P.	N.P.
4.1 Colour	100.0 (5.00)	100.0 (4.77)	100.0	100.0	N.P.	N.P.
White	100.0 (5.00)	100.0 (4.83)	100.0	100.0	N.P.	N.P.
Brown	100.0 (5.00)	83.3 (4.23)	100.0	100.0	N.P.	N.P.
Grey	100.0 (5.00)	83.3 (4.18)	100.0	100.0	N.P.	N.P.
Blue	100.0 (5.00)	83.3 (4.24)	100.0	100.0	N.P.	N.P.

Orange	100.0 (5.00)	100.0 (4.72)	100.0	100.0	N.P.	N.P.
Yellow	100.0 (5.00)	83.3 (4.21)	100.0	100.0	N.P.	N.P.
Purple	-	-	-	-	100.0 (5.00)	100.0 (4.68)
Rainbow-like	-	-	-	-	62.5 (3.17)	58.3 (2.11)
4.2 Morphology	100.0 (5.00)	100.0 (4.81)	100.0	100.0	N.P.	N.P.
Structureless (diffuse – as a background – or focal)	100.0 (4.21)	100.0 (4.75)	100.0	100.0	N.P.	N.P.
Dots/globules	100.0 (4.86)	91.7 (4.61)	100.0	100.0	N.P.	N.P.
Lines**	100.0 (4.74)	91.7 (4.21)	100.0	100.0	N.P.	N.P.
Circles	91.7 (4.43)	83.3 (4.13)	100.0	100.0	N.P.	N.P.
5. Specific clues* **	91.7 (4.28)	100.0 (4.76)	100.0	100.0	N.P.	N.P.

A.R.: Agreement rate

M.S.; Mean score

N.P.: Not performed

* Structures other than vessels, scales and follicular findings

** Parallel, reticular, perpendicular, angulated or unspecifically arranged

*** Features that, when present, are strongly suggestive of only one diagnosis (in general or among a limited number of differential diagnoses) as they are related to highly specific/sensitive histological findings

Table 2. Basic dermoscopic parameters selected in the expert consensus

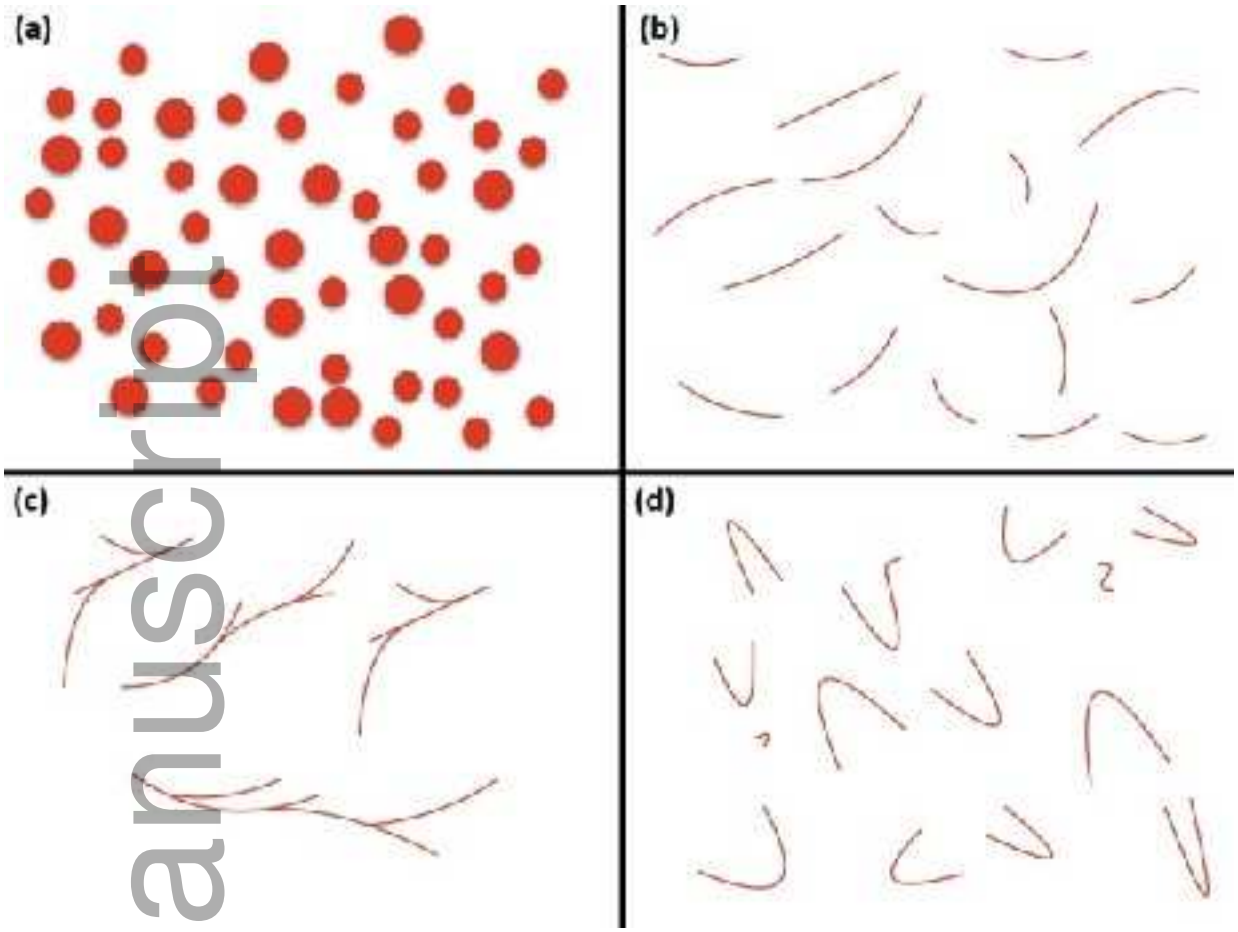
Parameter*	Previous nomenclature/included findings	Corresponding histological findings	Main dermatoses
1. Vessels			
1.1 Vessels morphology			
Dotted	Dotted, pinpoint, glomerular and globular	Dilated vessels in elongated dermal papillae	Psoriasis (all variants),[2] dermatitis,[7] lichen planus,[7] pityriasis rosea,[7] porokeratosis,[2] lichen simplex chronicus,[3] secondary lichenification,[3] tinea corporis,[3] PLEVA,[24] impetigo[2,3] and plane warts[25]
Linear (without bends or branches)	Linear	Dilated dermal vessels located in parallel to the skin surface	Mycosis fungoides,[26] rosacea,[2] lichen planus,[7] granulomatous dermatoses,[22,27] PLEVA[24] and atrophic skin[3]
Linear with branches	Arborizing, branched and crown-like	Branching dermal vessels	Discoid lupus erythematosus,[2] granuloma faciale,[2] granulomatous dermatoses,[22,27] molluscum contagiosum[25] and pityriasis lichenoides chronica[24]
Linear curved	Comma-shaped, chalice-shaped, hairpin-like, linear-irregular, tortuous, corkscrew-like, spermatozoa-like and linear-helical	Convoluted dermal vessels	Zoon's balanitis,[28,29] pityriasis lichenoides chronica,[24] granulomatous dermatoses,[22,27] discoid lupus erythematosus[2] and telangiectasia macularis eruptive perstans[2]
1.2 Vessels distribution			
Uniform	Regular, homogeneous and diffuse	-	Psoriasis (all variants),[2] lichen simplex chronicus,[3] secondary lichenification[3] and plane warts[25]
Clustered	Clustered and "in cluster"	-	Dermatitis,[7] common warts[25] and pityriasis rosea[7]
Peripheral	Peripheral	-	Lichen planus,[7] discoid lupus erythematosus,[2] pityriasis rosea,[7] PLEVA,[24] molluscum contagiosum[25]
Reticular	Regular, "in plexus", net-like and network-like	-	Rosacea,[2] psoriasis,[2] annular elastolytic giant cell granuloma[30] and telangiectasia macularis eruptive perstans[2]
Unspecific	Patchy, asymmetric, irregular, scattered, sparse and unspecific	-	Dermatitis,[7] pityriasis rosea,[7] pityriasis lichenoides chronica[24]
2. Scales			
2.1 Scales colour			
White	White and grey	Hyperkeratosis (especially parakeratosis)	Psoriasis (all variants, except pustular, genital and inverse psoriasis),[2] hypertrophic lichen planus,[2,3] discoid lupus erythematosus,[2] subacute lupus erythematosus,[31] pityriasis rosea,[7] mycosis fungoides,[26] pityriasis lichenoides chronica[24] and tinea corposis[2,3]
Yellow (scales and crusts)	Yellow	Serum ± hyperkeratosis	Dermatitis,[7] pemphigus vulgaris[3] and Darier's disease[32-34]
Brown	Brown	Keratin + melanin or exogenous pigment (e.g. dirt)	Terra firma-forme dermatosis[19] and dermatosis neglecta[19]

2.2 Scales distribution			
Diffuse	Diffuse, regular and homogeneous	-	Psoriasis[2] and lichen simplex chronicus[3]
Central	Central	-	Hypertrophic lichen planus,[2,3] discoid lupus erythematosus,[2] leishmaniasis[2] and pityriasis lichenoides chronica[24]
Peripheral	Peripheral, collarette scaling and squamous collarette	-	Pityriasis rosea,[7] tinea corporis[3] and erythema annulare centrifugum[3] and subacute lupus erythematosus[31]
Patchy	Patchy, irregular, sparse and scattered	-	Dermatitis,[7] mycosis fungoides,[26] pityriasis rubra pilaris,[3] lichen simplex chronicus,[3] lichen planus[7] and pityriasis lichenoides chronica[24]
3. Follicular findings			
Follicular plugs	Follicular plugs, yellow "tears", "Demodex tails", "Demodex follicular openings", comedo-like openings and rosettes	Follicular hyperkeratosis alone (white plugs) or combined with serum (yellow plugs) or melanin (brown plugs)	Hypertrophic lichen planus,[2,3] discoid lupus erythematosus,[2] leishmaniasis,[2] demodicosis[2] and lichen sclerosus[35]
Follicular red dots	Follicular red dots	Perifollicular inflammation	Early discoid lupus erythematosus,[2] follicular mycosis fungoides[3] and follicular mucinosis[3]
Perifollicular white colour	Perifollicular white halo and perifollicular depigmentation	Perifollicular fibrosis or epidermal hyperplasia and perifollicular depigmentation	Discoid lupus erythematosus,[2] hypertrophic lichen planus[2,3] and vitiligo[2]
Perifollicular pigmentation	Perifollicular pigmentation or hyperpigmentation	Perifollicular pigment deposits	Vitiligo[2]
4. Other structures			
4.1 Colour			
White	White and chalk-white	Fibrosis, reduction of melanocytes or melanin, epidermal hyperplasia (acanthosis or hypergranulosis), or calcium deposits	Lichen sclerosus,[35] morphoea,[35] necrobiosis lipoidica,[22] primary cutaneous B-cell lymphoma,[36] vitiligo,[2] idiopathic guttate hypomelanosis,[37] achromic pityriasis versicolor,[2] lichen nitidus,[38] molluscum contagiosum,[25] prurigo nodularis,[39] xanthogranuloma,[40] calcifications[3] and gouty tophi[3]
Brown	Brown	Melanin in the basal layer of the epidermis or superficial dermis	Melasma,[41] tinea nigra,[42] friction melanosis,[2] urticaria pigmentosa,[2,44] pityriasis versicolor,[2] lichen amyloidosis[2] and macular amyloidosis[2]
Grey	Grey	Melanin or ochronotic pigment in the papillary dermis	Lichen pigmentosus,[43] lichen planus,[7] melasma and exogenous ochronosis[41]
Blue	Blue	Melanin or ochronotic pigment in reticular dermis	Ashy dermatosis[43] and exogenous ochronosis[41]
Orange	Orange and salmon	Dermal granulomas and other dense cellular infiltrations, or hemosiderin deposits in the dermis	Granulomatous dermatoses,[22,27] xanthogranuloma,[40] primary cutaneous B-cell lymphomas,[36] Zoon's balanitis,[28,29] pityriasis lichenoides chronica,[34] pityriasis rubra pilaris,[3] papular syphiloderm[45] and pigmented purpuric dermatosis[2,3]
Yellow	Yellow	Lipid deposits in the dermis and	Necrobiosis lipoidica,[22] xanthelasma,[3] pustular

		pustules	psoriasis[2,3] and xanthogranuloma[40]
Purple	Purple, violet, haemorrhagic areas and petechiae	Extravasation of erythrocytes (purpura) or thrombosed vessels	Pigmented purpuric dermatosis,[3] vasculitis,[3] lichen sclerosus,[7] and common and plantar warts[25]
4.2 Morphology			
Structureless (diffuse – as a background – or focal)	Structureless (diffuse or focal), background, amorphous, blots, blotches and irregular	-	Granulomatous dermatoses,[22,27] primary cutaneous B-cell lymphomas,[36] lichen sclerosus,[35] pityriasis lichenoides chronica,[34] Zoon's balanitis,[28,29] xanthogranuloma,[40] friction melanosis,[2] urticaria pigmentosa,[2] xanthelasma,[3] pityriasis versicolor,[2] pigmented purpuric dermatosis[3] and solitary mastocytoma[44]
Dots/globules	Dots/globules, confetti-like, clouds, cloud-like, petaloid-like, milium-like cysts, corn pearls, hubs and globular	-	Lichen planus,[7] lichen pigmentosus,[43] ashy dermatosis,[43] lichen sclerosus,[35] molluscum contagiosum,[25] morphoea,[35] lichen amyloidosus,[2] macular amyloidosis[2] and pigmented purpuric dermatosis[3]
Lines (parallel, reticular, perpendicular, angulated or unspecifically arranged)	Streaks, crystalline-like/chrysalis, crystalline leaf venation, reticular, network-like, streaming lines, projections, radiant strips, spicules and bulb-like projections	-	Tinea nigra,[42] friction melanosis,[2] urticaria pigmentosa,[2,44] prurigo nodularis,[39] lichen amyloidosus,[2] macular amyloidosis,[2] xanthogranuloma[40] and common warts[25]
Circles	Circles, annular, arciform and curvilinear-worm like	-	Melasma,[41] exogenous ochronosis[41] and primary cutaneous B-cell lymphomas[36]
5. Specific clues**	Wickham striae, peripheral keratotic structure with two free edges, spongiotic vesicles, "jet with contrail", nits and lice, dilated follicular openings, etc.	Variable but highly specific and sensitive	Lichen planus,[7] porokeratosis,[2] chronic hand eczema,[46] scabies,[25] pediculosis,[25] granuloma faciale,[2] etc.

* Further details for each sub-item may be specified if found to be relevant to characterize and differentiate one or more conditions due to a strict correspondence with specific histological features

** Features that, when present, are strongly suggestive of only one diagnosis (in general or among a limited number of differential diagnoses) as they are related to highly specific/sensitive histological findings



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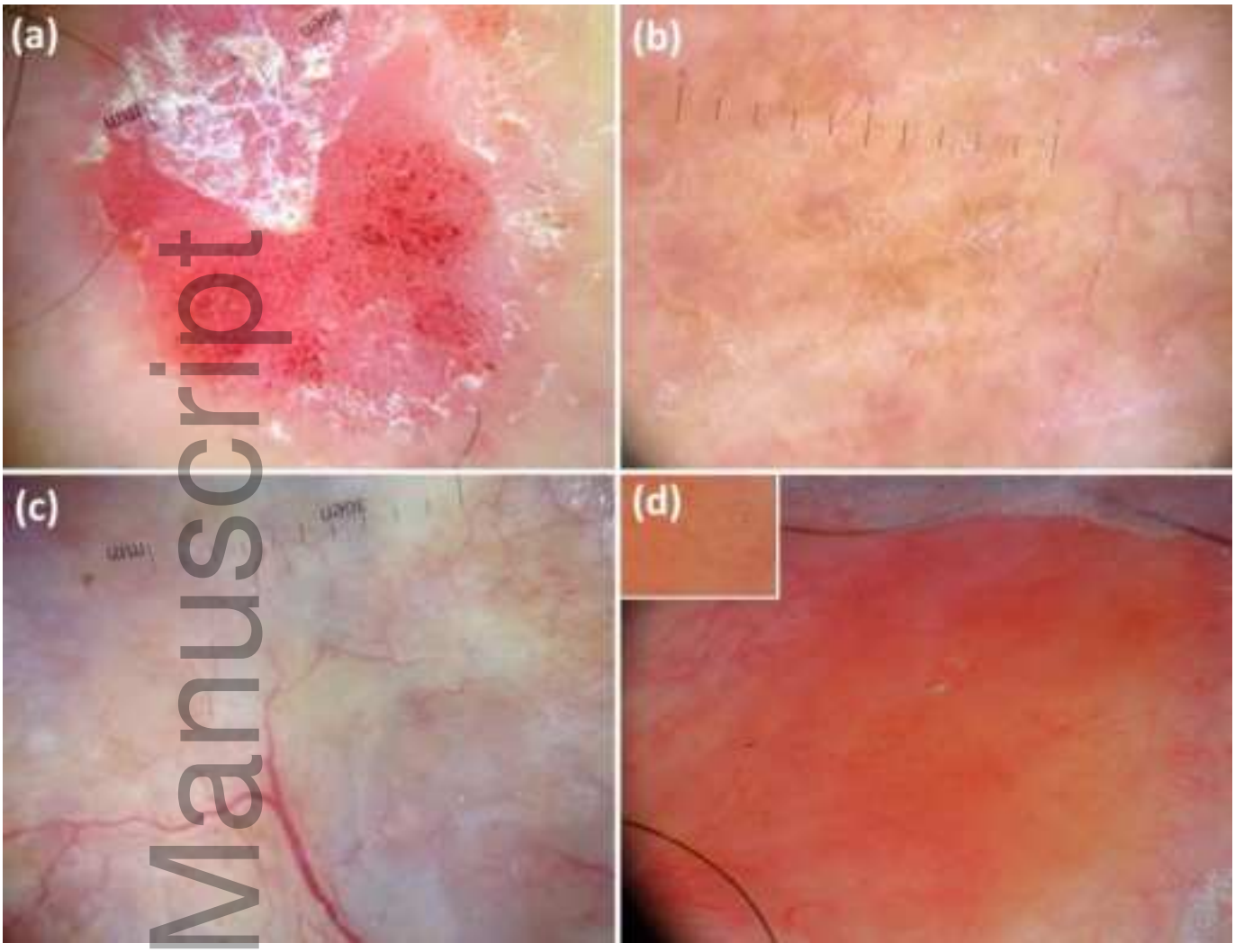

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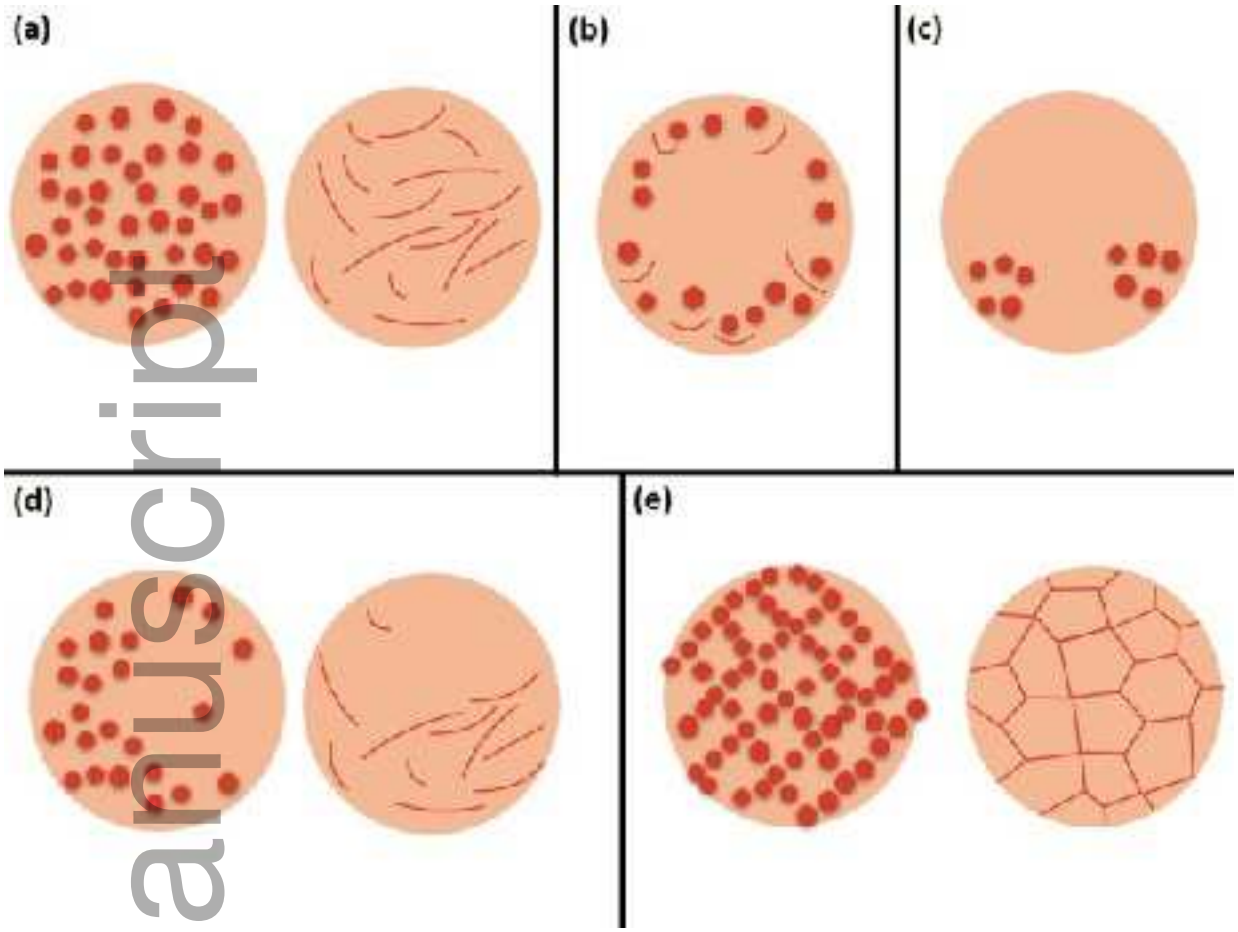

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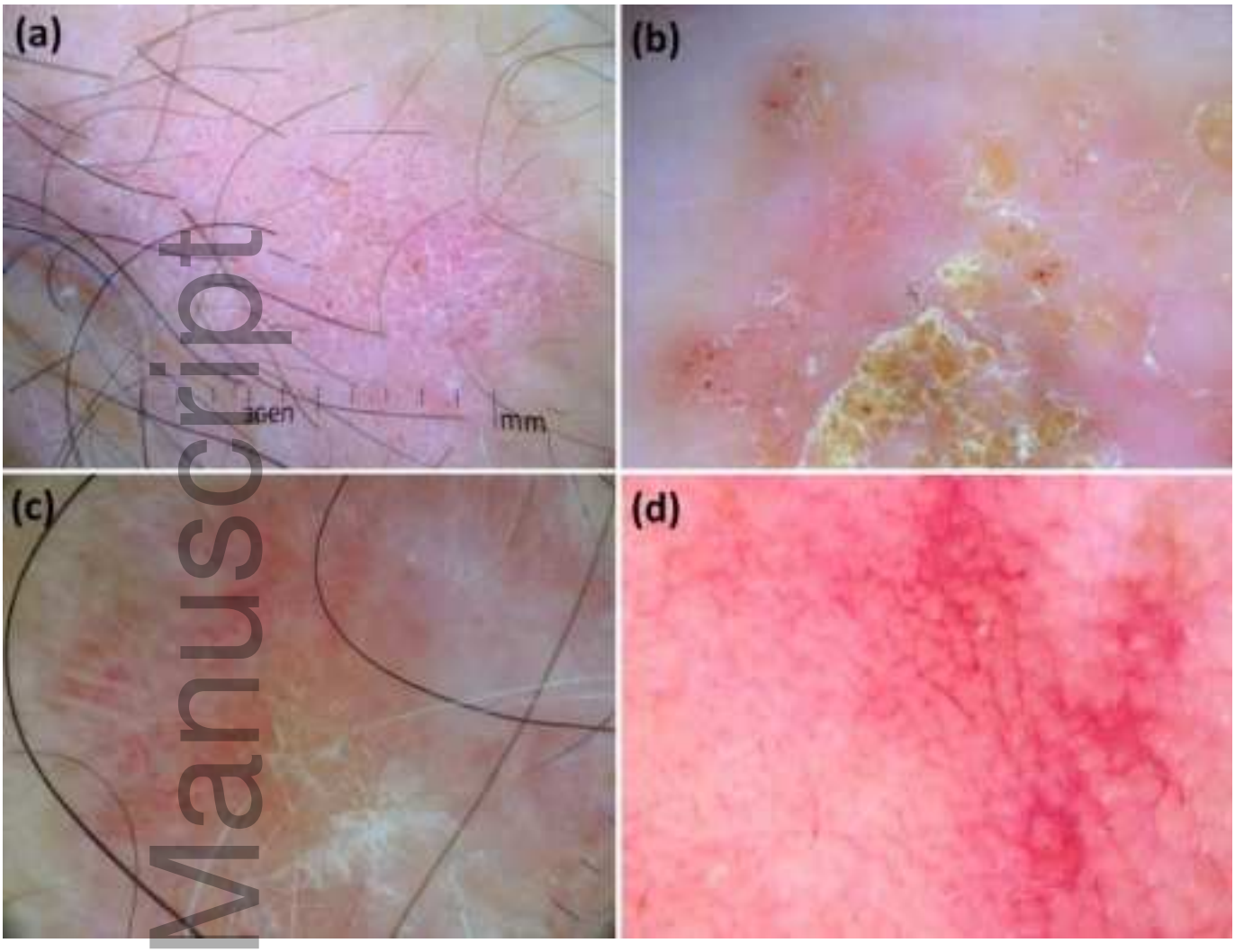

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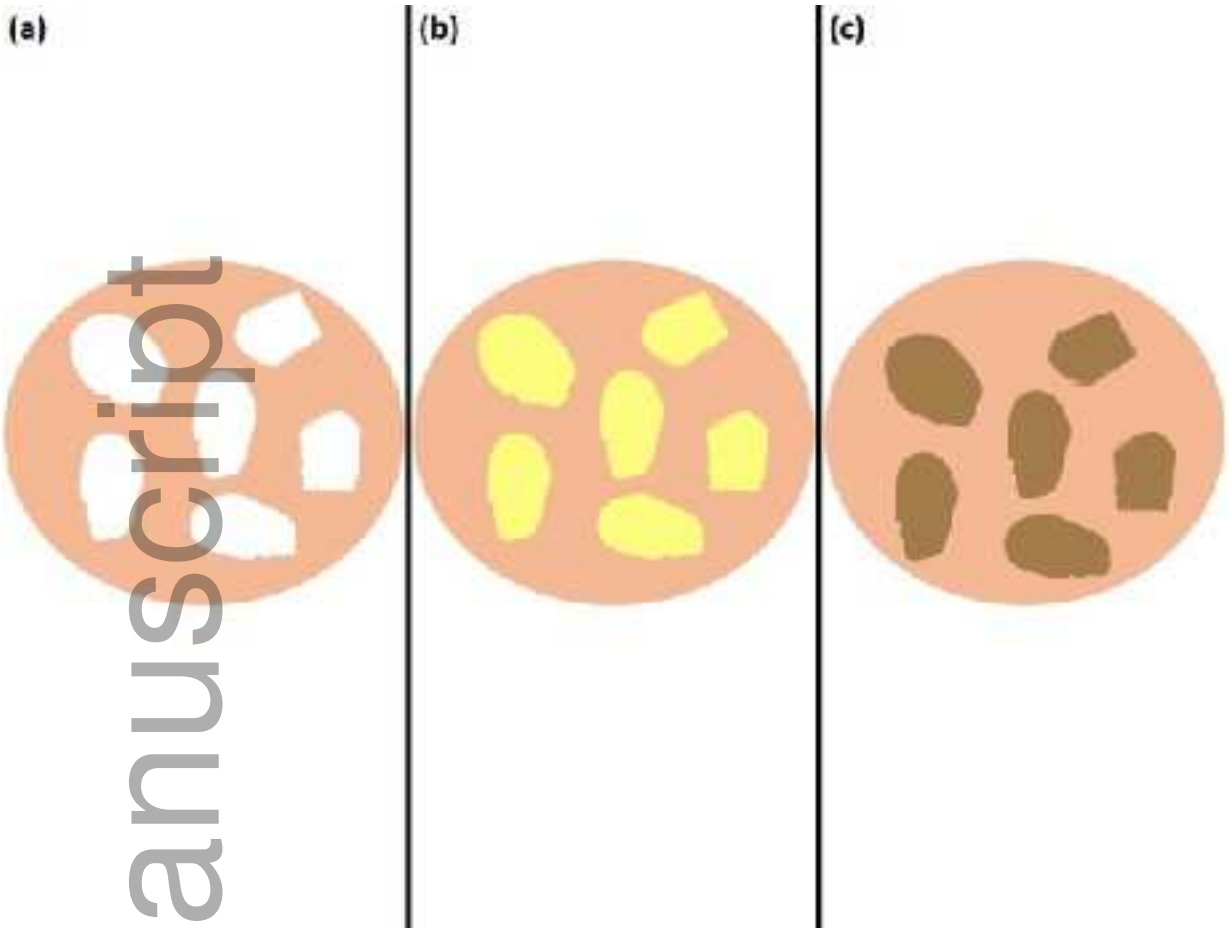

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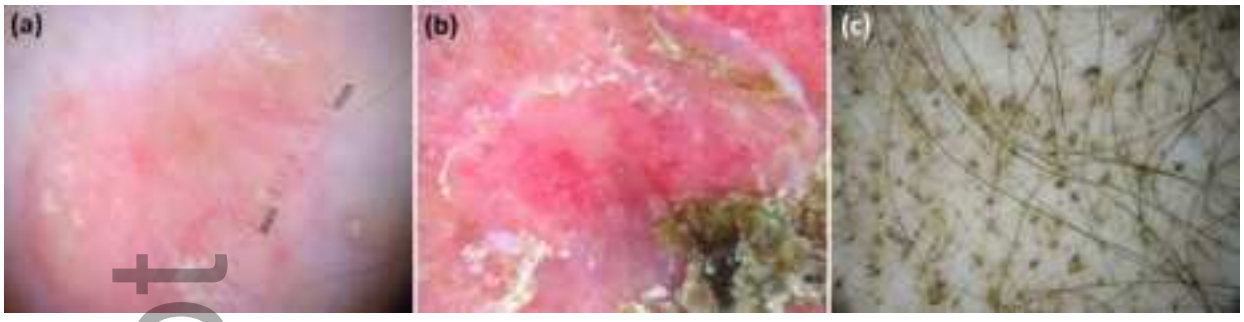

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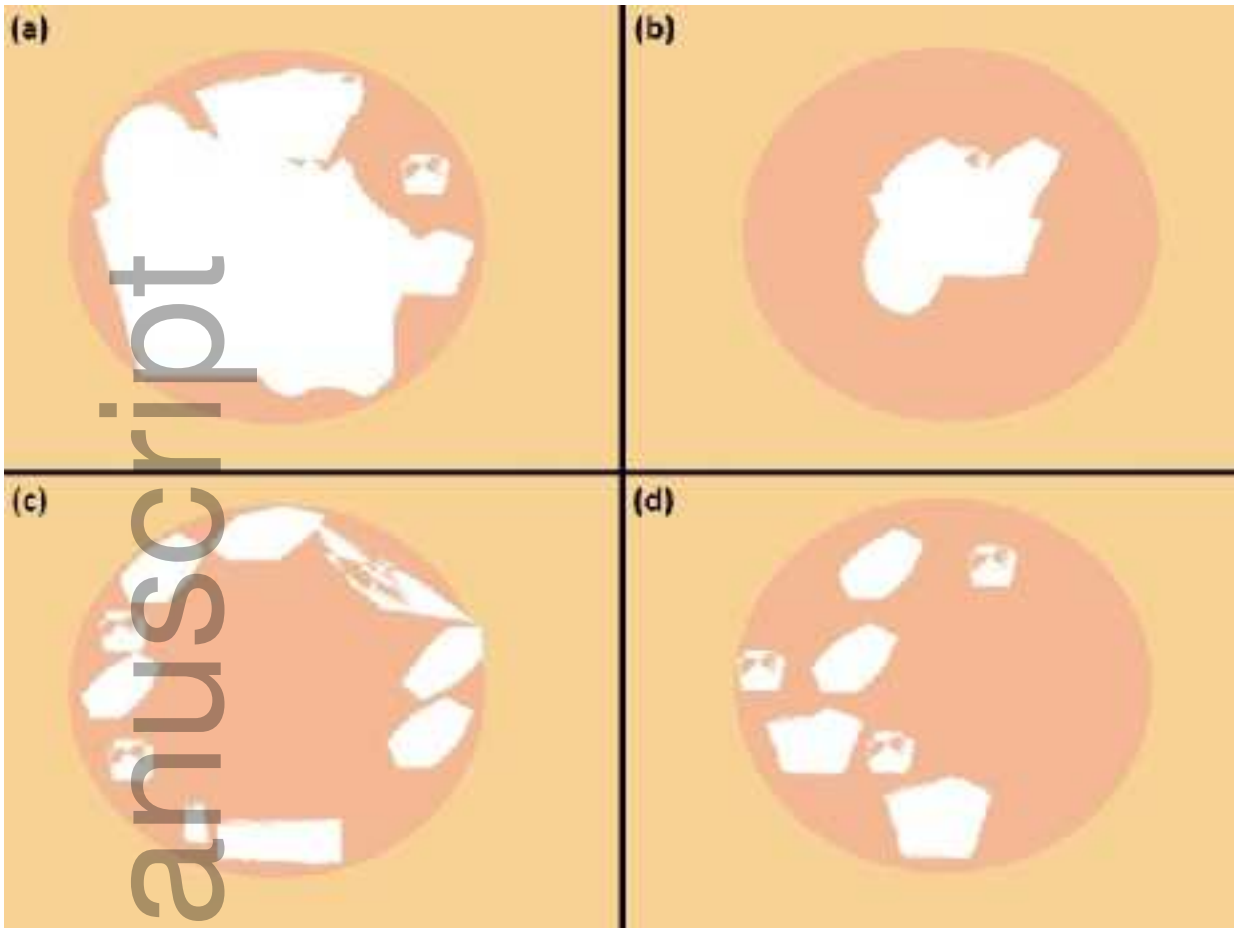

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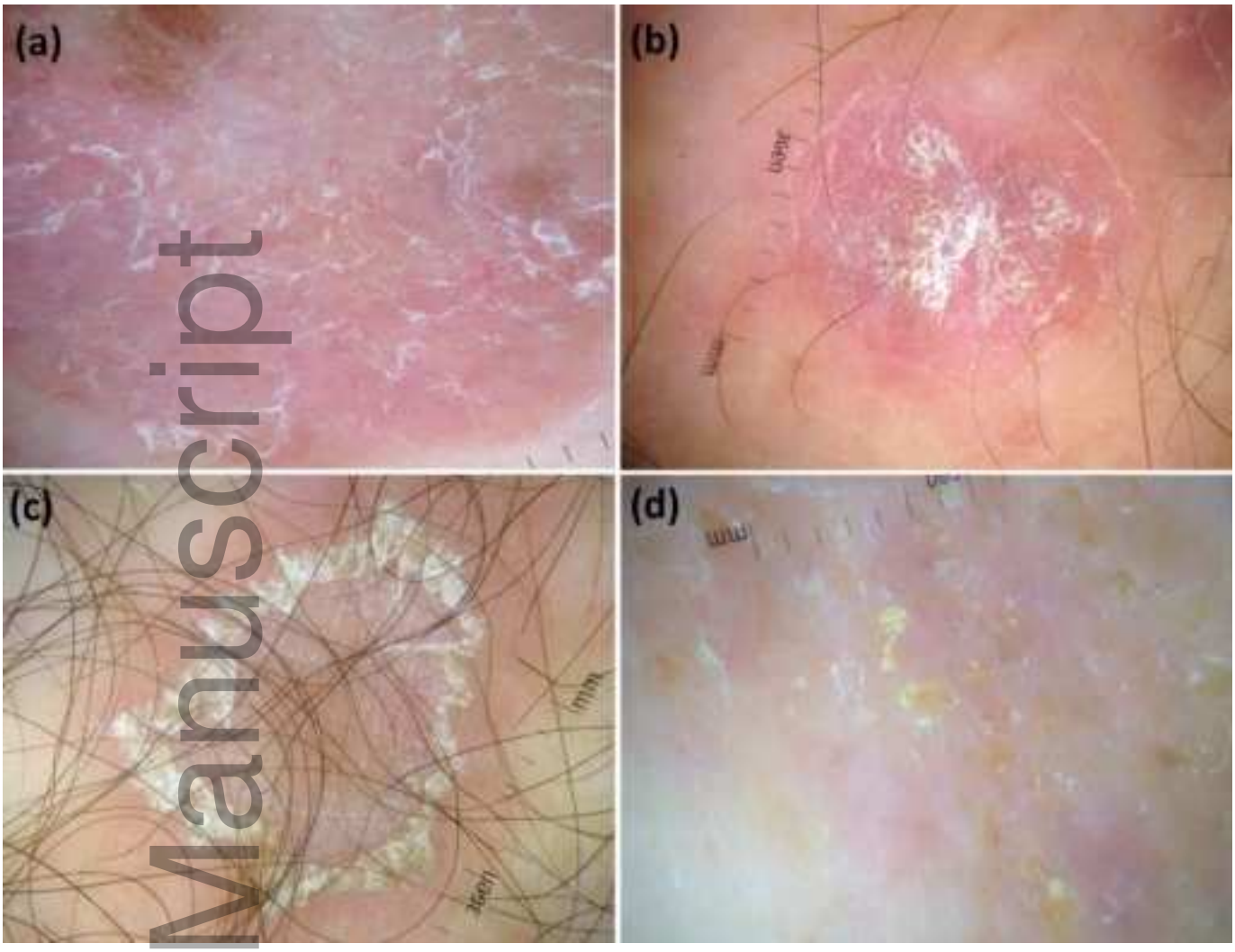

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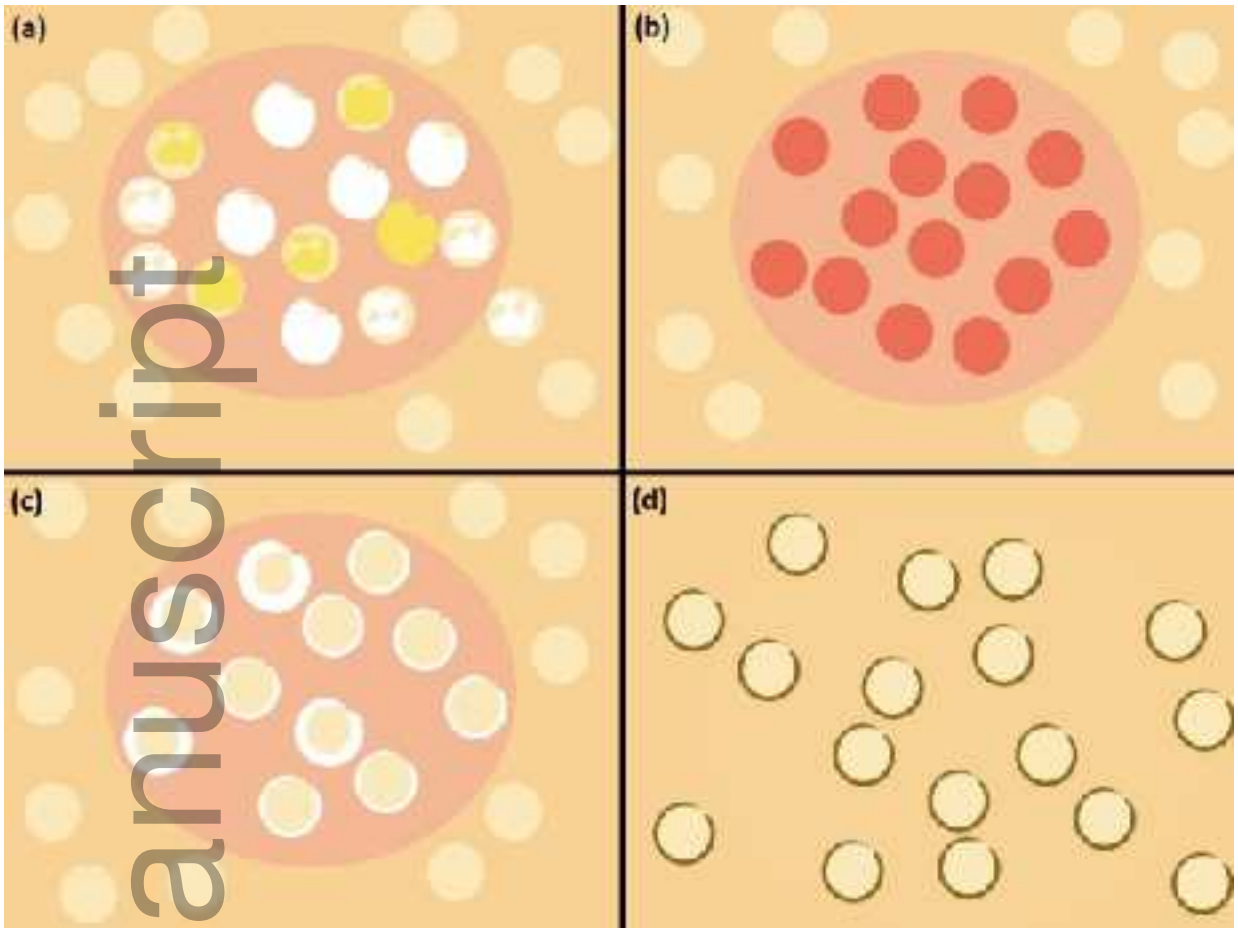

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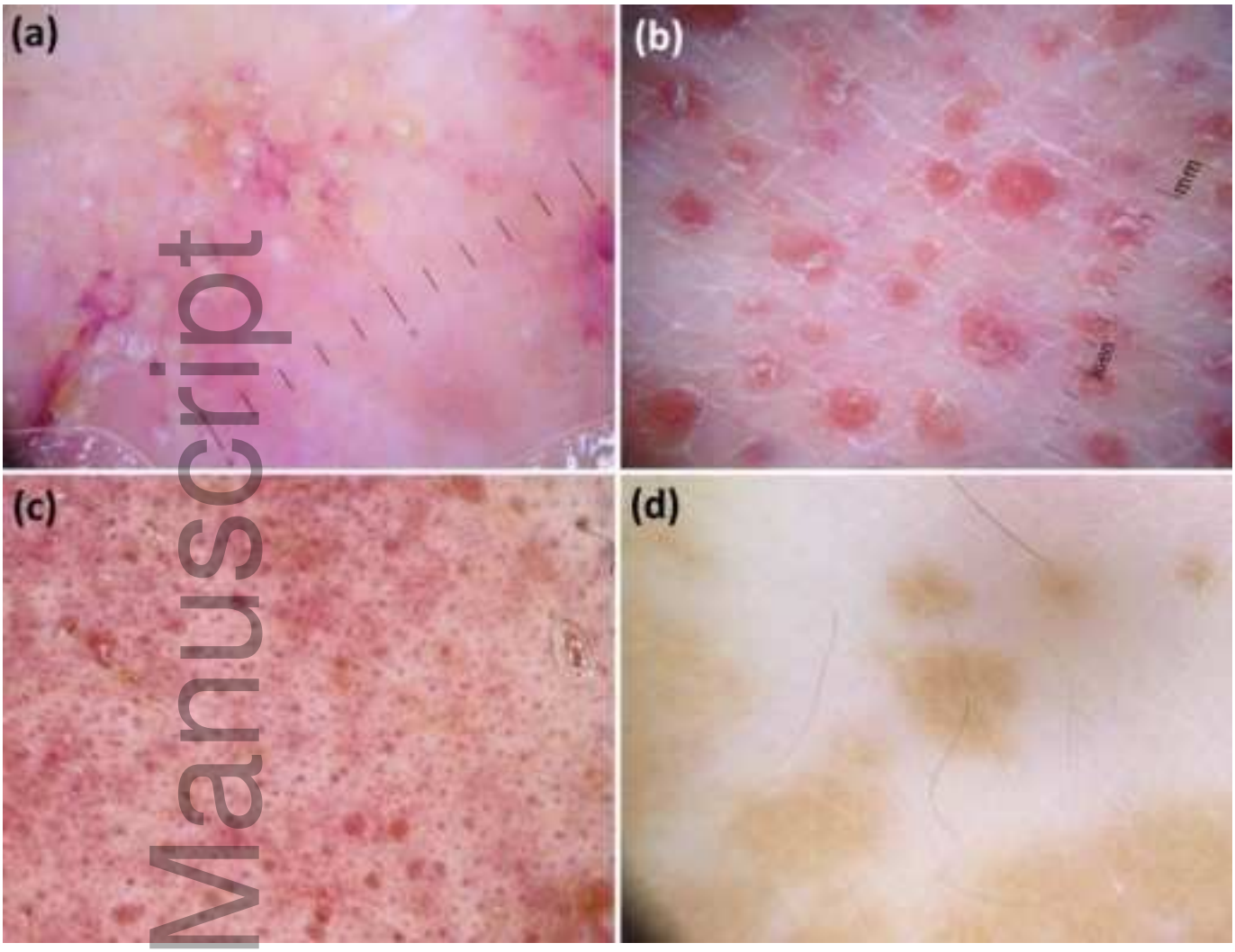

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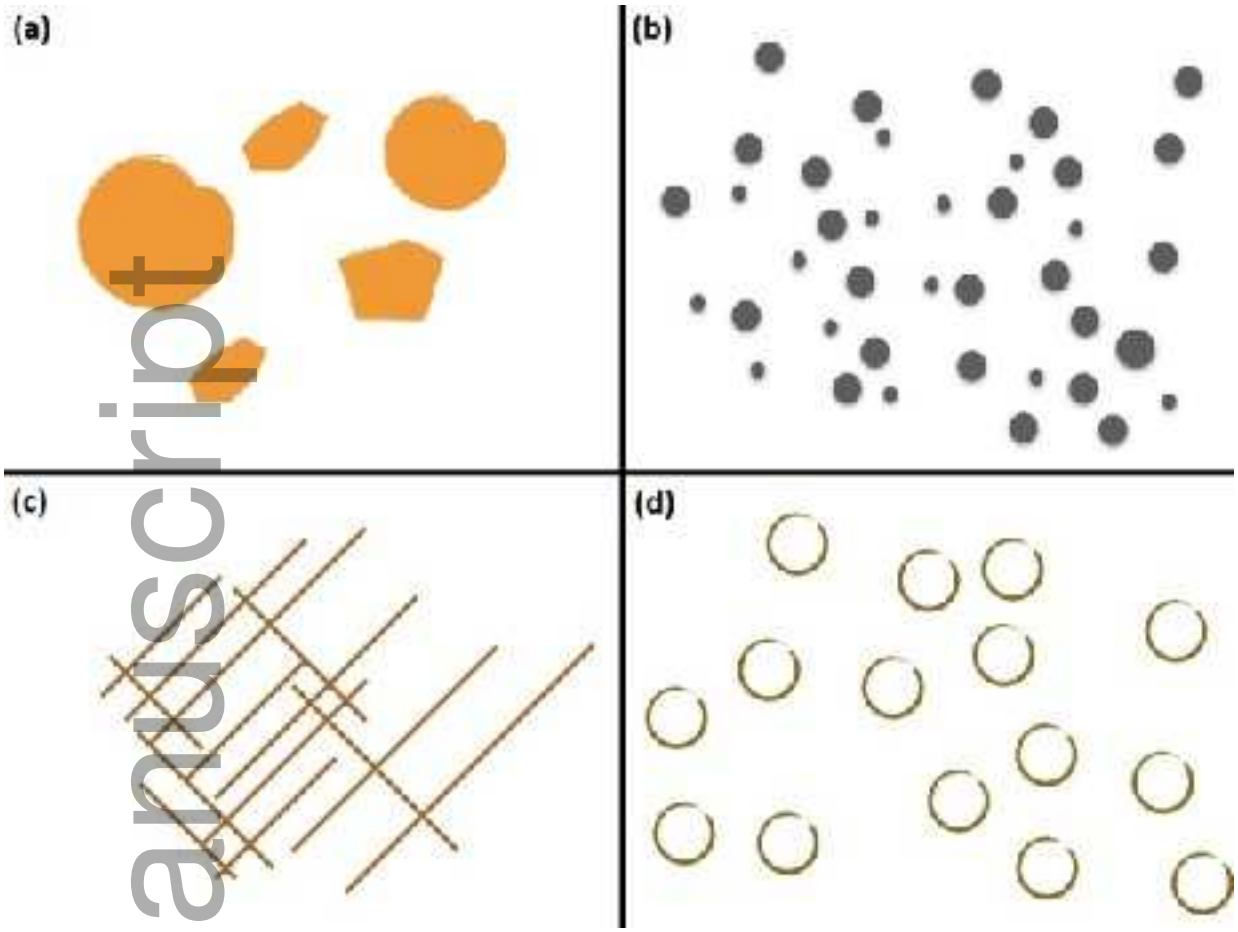

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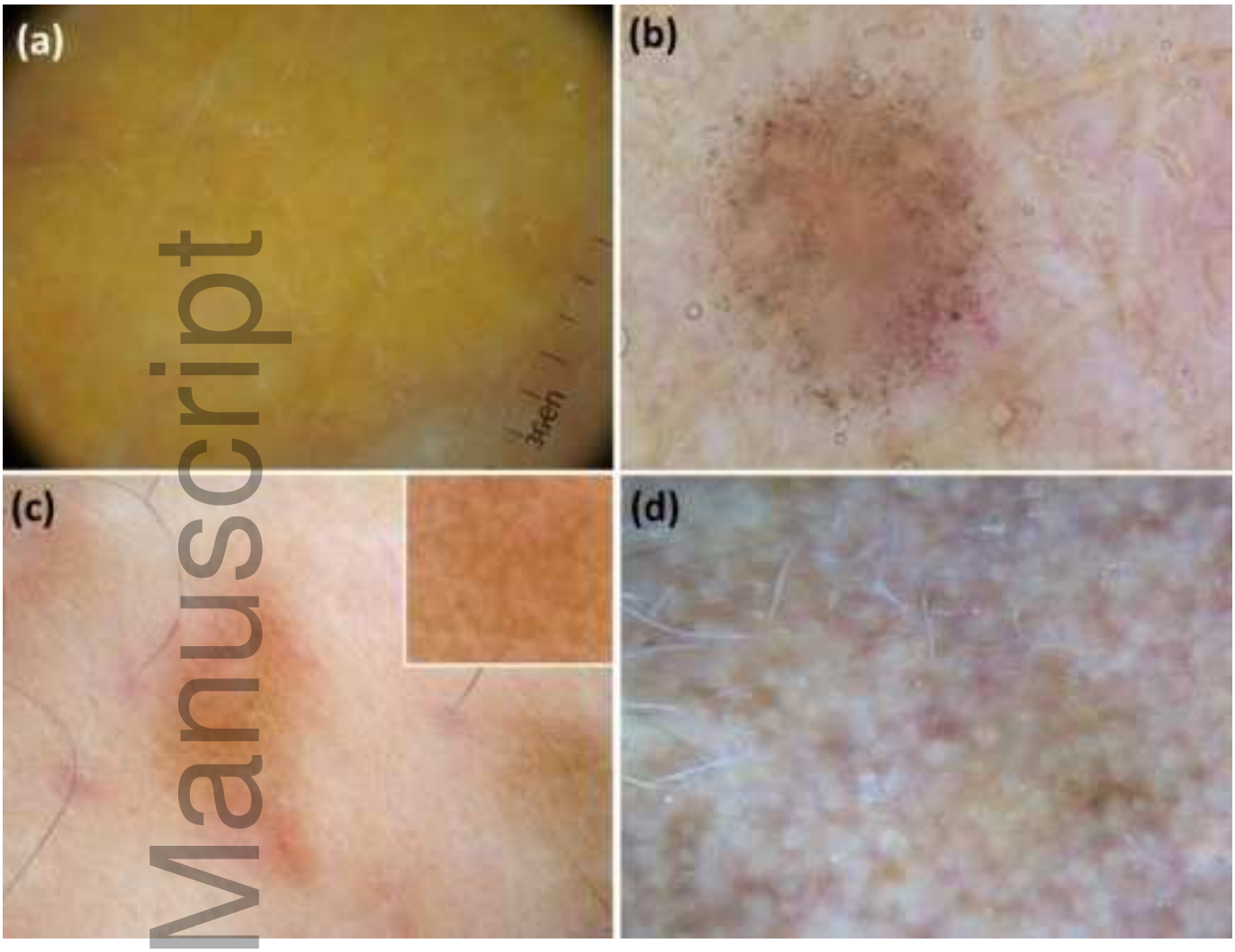

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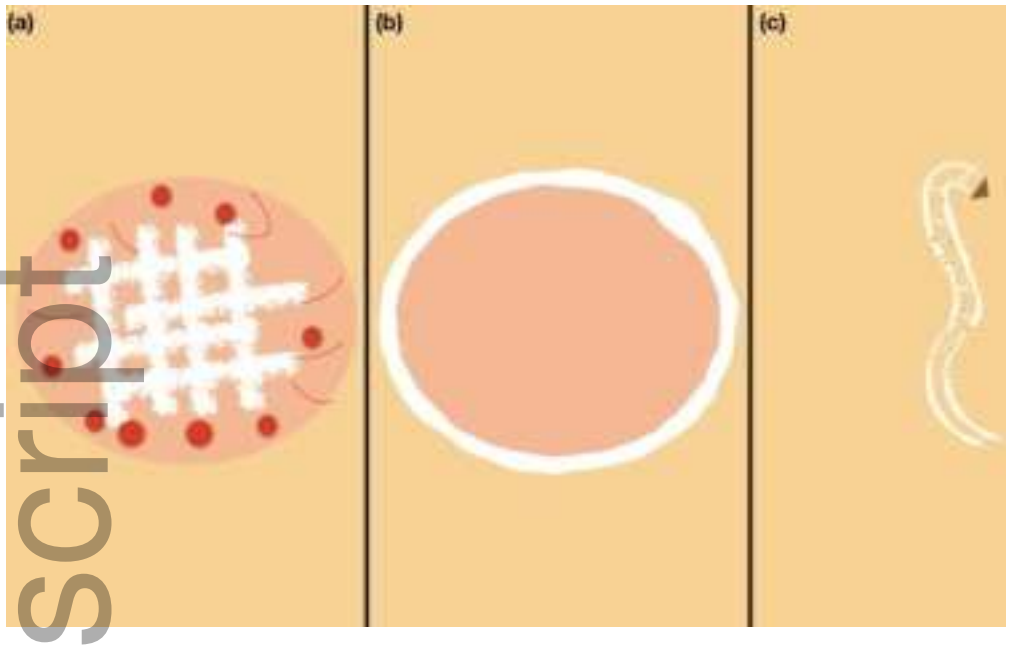

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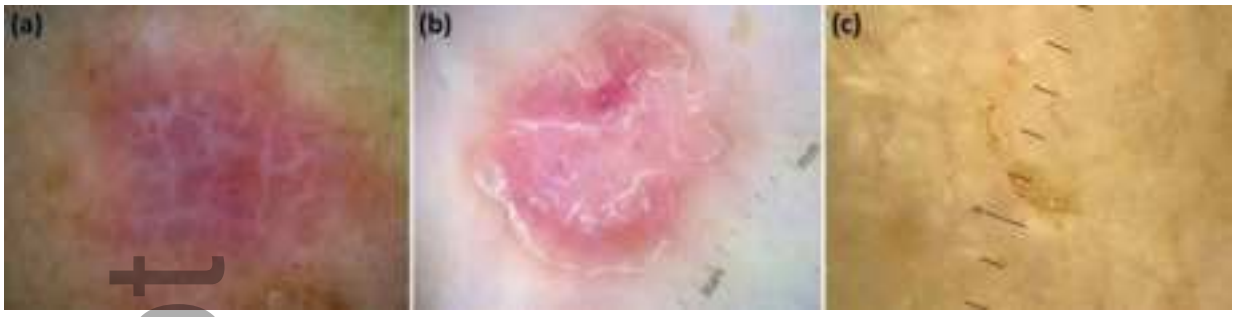

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