Published in final edited form as:

J Eur Acad Dermatol Venereol. 2018 August ; 32(8): 1263–1271. doi:10.1111/jdv.14729.

Dermoscopic features and patterns of poromas: A multicenter observational case-control study conducted by the International Dermoscopy Society (IDS)

M.A. Marchetti, M.D.¹, M.L. Marino, M.D.¹, P. Virmani, M.D.¹, S.W. Dusza, DrPH¹, A.A. Marghoob, M.D.¹, G. Nazzaro, M.D.², A. Lallas, M.D.³, C. Landi, M.D.⁴, H. Cabo, M.D., Ph.D.⁵, R. Quiñones, M.D.⁶, E. Gomez, M.D.⁷, S. Puig, M.D.⁸, and C. Carrera, M.D., Ph.D.^{1,8}

¹Dermatology Service, Department of Medicine, Memorial Sloan Kettering Cancer Center, New York, NY, U.S.A

²Department of Physiopathology and Transplantation, University of Milan. Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy

³First Department of Dermatology, Aristotle University, Thessaloniki, Greece

⁴Dermatologic Unit, Surgical Department, "Infermi" Hospital, Rimini, Italy

⁵Chief, Dermatology Section, Medical Research Institute, University of Buenos Aires, Buenos Aires, Argentina

⁶Instituto Dermatológico de Jalisco, Guadalajara, Jal. Mexico

⁷Dermatology Center "Dr Ladislao de la Pascua", Mexico City, Mexico

⁸Melanoma Unit, Department of Dermatology, Hospital Clínic Barcelona, Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), University of Barcelona, Centro de Investigación Biomédica en Red de Enfermedades Raras (CIBERER), Barcelona, Spain

Abstract

Background—Poromas are benign cutaneous sweat gland tumours that are challenging to identify. The dermoscopic features of poromas are not well characterised.

Objective—To determine the clinical-dermoscopic features of poromas.

Methods—Cross-sectional, observational study of 113 poromas and 106 matched control lesions from 16 contributors and eight countries. Blinded reviewers evaluated the clinical and dermoscopic features present in each clinical and dermoscopic image.

Results—Poromas were most commonly non-pigmented (85.8%), papules (35.4%), and located on non-acral sites (65.5%). In multivariate analysis, dermoscopic features associated with poroma

Corresponding Author: Cristina Carrera, M.D., Ph.D. Melanoma Unit, Department of Dermatology, Hospital Clínic Barcelona. University of Barcelona, Villarroel 170. 08036 Barcelona. Spain. ccarrera@clinic.ub.es Fax: +34 93 2275438.

Conflicts of Interest: None declared.

Statement on prior presentation: Preliminary data of this study was presented as an oral presentation at the annual meeting of the American Academy of Dermatology on Friday, March 3, 2017.

Financial disclosure of the authors: The authors state no financial disclosures.

included white interlacing areas around vessels (OR: 7.9, 95% CI: 1.9–32.5, $p=0.004$), yellow structureless areas (OR: 2.5, 95% CI: 1.1–6.0, $p=0.04$), milky-red globules (OR: 3.9, 95% CI: 1.4–11.1, $p=0.01$), and poorly visualised vessels (OR: 33.3, 95% CI: 1.9–586.5, $p=0.02$). The presence of branched vessels with rounded endings was positively associated with poromas but did not reach statistical significance (OR: 2.4, 95% CI: 0.8–6.5, $p=0.10$). The presence of any of these five features was associated with a sensitivity and specificity of 62.8% and 82.0%, respectively.

Conclusion—We identified dermoscopic features that are specific to the diagnosis of poroma. Overall, however, the prevalence of these features was low. Significant clinical and dermoscopic variability is a hallmark of these uncommon tumours, which are most prevalent on non-acral sites.

Introduction

Poromas are uncommon, benign cutaneous sweat gland tumours that clinically simulate other neoplasms. The classical description of a poroma consists of a solitary reddish nodule on the palms or soles that bleeds easily when traumatised and is surrounded by an indented moat with collarette scale.^{1, 2} Dermoscopic features of poromas are poorly characterised and limited to small case series; in particular, no blinded study using control lesions to define dermoscopic features associated with poromas has been performed. The dermoscopic features of poromas have been reported to mimic those found in pyogenic granulomas, angiomas, seborrheic keratosis (SK), dermatofibromas, nevi, squamous cell carcinomas (SCC), basal cell carcinomas (BCC), and melanomas.³ In this study, we sought to determine the dermoscopic features associated with poromas and to estimate the sensitivity and specificity of a diagnostic model for poroma. A secondary objective was to identify and classify poromas into clinical and dermoscopic patterns to improve their recognition.

Materials and Methods

The Hospital Clinic Barcelona Institutional Review Board exempted this study from review because all images of lesions remained anonymous, patients consented for photography at their respective clinical centres, and data were de-identified.

Lesion Selection

In 2014, the study aims and methodology were placed on the International Dermoscopy Society website by the study principal investigator (C.C.). Contributors were asked to provide high-quality clinical and dermoscopic images of histopathologically-verified poromas and corresponding controls. Selection of control lesions was at the discretion of individual contributors but controls were required to be similar in clinical appearance, morphology, and anatomical location to provided cases. In addition to de-identified and anonymised images, contributors were asked to submit the patient age and sex, as well as the anatomical location and histopathological diagnosis for each lesion. Contributors did not specify the imaging modality (polarised v. non-polarised) and technique (contact v. non-contact). Data collection was from September 2014 to December 2015.

Sixteen contributors from 8 countries (Turkey, Spain, Mexico, Italy, Argentina, Greece, and USA) submitted 232 lesions for potential inclusion. The median (min-max) number of

poromas submitted by each contributor was 4.5 (1–39). After excluding 13 lesions (2 poromas) because of inadequate image quality and/or missing requisite metadata, 219 lesions (113 poromas) were finally included. Control diagnoses included: BCC (n=22), SK (n=21), melanocytic nevus (n=13), angioma (n=7), SCC (n=7), spitz nevus (n=4), Kaposi sarcoma (n=4), dermatofibroma (n=4), melanoma (n=3), pyogenic granuloma (n=3), verruca vulgaris (n=2), and one (n=1) each for acrochordon, actinic keratosis, angiofibroma, callus, clear cell acanthoma, comedo, cutaneous T-cell lymphoma, drug rash, ecchymosis, keratoacanthoma, lichenoid keratosis, molluscum contagiosum, mucous cyst, neurofibroma, and neuroma.

Blinded lesion evaluation

Images of poromas and controls were curated and randomised into a single PowerPoint® file by one investigator (P.V.). Subsequently, M.M. and C.C. reviewed the clinical and dermoscopic image of each lesion for the consensus presence or absence of clinical and dermoscopic features. A third reviewer (M.L.) resolved feature evaluations without consensus. Reviewers were blinded to case status as well as the diagnoses of controls.

Clinical images were reviewed for the presence/absence of pigmentation, asymmetry, and border irregularity. Lesion morphology (macule, papule, plaque, nodule, tumour), number of colours, and maximum diameter (in millimetres) were recorded. A comprehensive list of dermoscopic structures reported to be present in poromas was created (Supplementary materials).^{3–21} After careful appraisal of previous descriptions and consensus amongst the reviewers, cherry-blossom vessels, flower-like vessels, floral vessels, chalice-like vessels, and leaf-like vessels were categorised as structure called branched vessels with rounded endings, defined as branched vessels with looped or coiled terminal endings that characteristically have a rounded silhouette. We considered milky-red areas, pink-white structureless areas, pink homogenous area, and creamy red background as one feature called milky-red areas, defined as structureless areas with pink to white-red areas. Interlacing white cords, mesh bands, and frog eggs appearance were considered one feature called interlacing white areas around vessels, defined as a white interlacing background surrounding vessels of any morphology. We considered red lagoons, reddish-white globule-like structures, reddish globule/lacuna-like structures, and milky-red lacuna-like areas to be either milky-red globules or red lacunes.²² We considered beige lobular structures to be one feature called yellow structureless areas.

Each dermoscopic image was reviewed for the presence/absence of poroma-associated (Supplementary materials), melanoma-associated, BCC-associated, SCC-associated, and SK-associated dermoscopic features, given the reported variability in appearance of published cases of poromas.^{3, 22} In addition, lesions were reviewed for vessel morphologies.²² Lesions with one vessel morphology were considered monomorphous; those with any combination of 2 vessels were considered polymorphous. As a learning curve was anticipated, two additional blinded evaluations of all dermoscopic images took place to ensure consistency in feature recognition. Since the dermoscopic appearance of vessels is dependent on the physical pressure placed on the lesion during imaging and we evaluated the clinical and dermoscopic image of each lesion, we created a variable “poorly visualised

vessels” to indicate lesions that appeared pink and vascularised on a clinical image but for which vessels and a pink hue were not apparent on the dermoscopic image. In addition, for branched vessels with rounded endings we recorded “definite” and “possible” for cases with 100% confidence and 50% confidence, respectively, given the impact that imaging technique appeared to have on its visualisation. We recorded the vessel distribution as diffuse, focal, or multifocal. After review of both the clinical and dermoscopic image for each lesion, the reviewers stated their primary diagnostic considerations.

Unblinded poroma evaluation

After blinded analyses, M.M. and C.C. examined the dermoscopic images of all poromas in an unstructured, unblinded analysis for consensus agreement of possible dermoscopic patterns. Poromas that did not fit into a pattern via unanimous consensus were considered to have no pattern. Patterns were defined as lesions with similar appearance based on clinical and dermoscopic presentation.

Statistical Analysis

Descriptive statistics and graphical methods were used to evaluate the distribution of study variables. Bivariate associations between poroma status and all clinical and dermoscopic variables were performed using Student's t-test for continuously scaled variables and Pearson's chi-square and Fisher's exact test for nominally scaled variables. Due to low prevalence of some of the dermoscopic features, and the resultant small cell counts observed in the bivariate associations, a penalised logistic regression approach, using the Firth method, was applied.²³ Penalised regression reduces the potential bias in the maximum likelihood estimates, compared to a standard logistic regression model when data are sparse. In all models, the outcome variable was case status, poroma versus control lesions. Variables included in the modelling approach were those found to be significant in the univariate analysis. Model diagnostics were performed by visually assessing predicted probability and resultant residuals. Analyses were performed using Stata v.14.1 Stata Corporation, College Station, TX.

Results

The mean (SD) age of patients with poromas was 61.6 (17.8) years and the majority occurred in males (n=59, 53.2%). The mean (SD) maximum diameter of poromas was 8.3 (5.8) mm and sixteen (14.2%) were pigmented. Poromas were located most frequently on the hands/feet (n=38, 34.6%), followed by the trunk (n=28, 25.5%), extremities not hands/feet (n=26, 23.6%), and head/neck (n=18, 16.4%). The primary morphology of poromas was papule (n=40, 35.4%), nodule (n=33, 29.2%), plaque (n=29, 25.7%), tumour (n=10, 8.9%), and macule (n=1, 0.9%). There were no differences in the age, diameter, sex, anatomic location, pigmentation status, symmetry, border irregularity, primary morphology, or number of colours between poromas and controls (Table 1).

Univariate analysis

Dermoscopic features positively associated with a diagnosis of poroma in univariate analysis included polymorphous vessels (36.3% v. 20.8%, p=0.008), yellowish structureless areas

(31.9% vs. 10.4%, $p<0.001$), any branched vessels with rounded endings (30.1% v. 6.6%, $p<0.001$), coiled vessels (26.6% v. 12.3%, $p=0.008$), white interlacing areas around vessels (23% v. 1.9%, $p<0.0001$), milky-red globules (19.5% v. 4.7%, $p=0.001$), definite branched vessels with rounded endings (15.9% v. 0%, $p<0.001$), atypical hairpin vessels (13.3% v. 4.7%, $p=0.03$), poorly visualised vessels (8.9% v. 0%, $p=0.002$), and white halo surrounding vessels (6.2% vs. 0.9%, $p=0.04$) (Table 2). No poromas presented with comma vessels, which were negatively associated with a diagnosis of poroma (0% v. 4.7%, $p=0.02$). Dermoscopic features with relatively high prevalence in poromas but without a statistically significant association included blood spots (37.2% v. 28.3%, $p=0.16$), erosions/ulcers (25.7% v. 20.8%, $p=0.39$), and milky-red areas (17.7% v. 13.2%, $p=0.36$). Seventy-eight (69%) poromas had identifiable vessels of any morphology on dermoscopy.

Multivariate analysis

Using multivariate analysis, features associated with poromas included white interlacing areas around vessels (OR: 7.9, 95% CI: 1.9–32.5, $p=0.004$), yellow structureless areas (OR: 2.5, 95% CI: 1.1–6.0, $p=0.04$), milky-red globules (OR: 3.9, 95% CI: 1.4–11.1, $p=0.01$), and vessels poorly visualised (OR: 33.3, 95% CI: 1.9–586.5, $p=0.02$). The presence of any branched vessels with rounded endings (either definite or possible) was associated with poromas but did not reach statistical significance (OR: 2.4, 95% CI: 0.8–6.5, $p=0.10$). Using the presence of these five features to indicate a diagnosis of poroma, the sensitivity, specificity, and ROC was 62.8%, 82.0%, and 0.72, respectively.

Reviewers' blinded diagnoses

Of 113 poromas, readers exclusively considered poroma in 44 lesions (40%); poroma was listed as one of multiple diagnoses in 24 additional lesions. Diagnoses considered for poromas included melanoma ($n=24$, 21.2%), SCC ($n=12$, 10.6%), BCC ($n=11$, 9.7%), SK ($n=10$, 8.8%), nevus ($n=8$, 7.1%), metastasis ($n=5$, 4.4%), pyogenic granuloma ($n=3$, 2.7%), verruca ($n=3$, 2.7%), collision tumour ($n=3$, 2.7%), dermatofibroma ($n=2$, 1.8%), lichen planus ($n=1$, 0.9%), lentigo ($n=1$, 0.9%), neuroma ($n=1$, 0.9%), angioma ($n=1$, 0.9%), fibrokeratoma ($n=1$, 0.9%), clear cell acanthoma ($n=1$, 0.9%), molluscum contagiosum ($n=1$, 0.9%), scar ($n=1$, 0.9%), sebaceous tumour ($n=1$, 0.9%), and xanthogranuloma ($n=1$, 0.9%). Poroma was considered in the diagnosis of 17 of 106 non-poroma controls.

Poroma patterns of presentation

In the unblinded analysis of poromas, four clinical-dermoscopic patterns were identified (Table 3).

Pattern 1 ($n=27$, $n=23.9\%$) was most common on the hands/feet ($n=24$, 88.9%), and often had a collarette ($n=12$, 44.4%), blood spots ($n=16$, 59.3%), yellow structureless areas ($n=13$, 48.2%), milky-red globules ($n=11$, 40.7%), milky-red areas ($n=10$, 37%), and branched vessels with rounded endings ($n=10$, 37%) (Fig. 1, a–c).

Pattern 2 ($n=20$, 17.7%) was found only on the trunk or non-acral extremities ($n=20$, 100%) and a plurality had polymorphous vessels ($n=18$, 90%), white interlacing areas around vessels ($n=12$, 60%), and branched vessels with rounded endings ($n=12$, 60%) (Fig. 1, d–f).

Pattern 3 (n=29, 25.7%) was characterised by small size (mean diameter 5.5 millimetres) and location anywhere on the body, often without vessels (n=10, 34.5%) and sometimes having branched vessels with rounded endings (n=9, 31%). Although lesions with this pattern clinically simulated nodular basal cell carcinoma, arborizing vessels were rare (n=1, 3.5%) (Fig. 1, g–i).

Pattern 4 (n=11, 9.7%) occurred anywhere on the body, lesions were large in size (mean diameter 13.3 millimetres) and sometimes had pigmentation (n=4, 36.4%), with frequent blood spots (n=7, 63.6%), keratin/scale (n=6, 54.6%), and atypical hairpin vessels (n=4, 36.4%), suggesting a keratinising/pseudoepitheliomatous tumour (Fig. 1, j–l).

Twenty-six (23%) poromas were not classified into a pattern. The presence of vessels (n=8, 30.8%) or poroma-associated features such as white interlacing areas (n=1, 3.9%), yellow structureless areas (n=4, 15.4%), branched vessels with rounded endings (n=2, 7.7%), and milky-red globules (n=0) was rare in these lesions (Fig. 2).

Discussion

We evaluated the association between dermoscopic features previously reported to occur in poromas via case reports, namely white interlacing areas around vessels, branched vessels with rounded endings, yellow structureless areas, and milky-red globules, with poroma diagnosis. These features, despite having low prevalence, were specific for the diagnosis of poroma. However, poromas had considerable heterogeneity in their appearance; indeed only one third were located on hands/feet and 15% had collarette scale. The varied clinical presentation is also supported by the dermoscopic findings, frequently simulating melanoma, BCC, SCC, and SK or showing non-specific or no features (Fig. 3); thus, the diagnostic accuracy of our model showed modest sensitivity and specificity. Highlighting this diagnostic difficulty, despite the reviewers' knowledge of half of the study lesions being poromas, they considered poroma in the differential diagnosis in only 60% of cases; this is in line with previous reports describing the marked polymorphism in the clinical and dermoscopic appearance of poromas.^{3, 24}

Our classification schema into patterns of presentation may help clinicians discriminate poromas from other skin lesions. Pattern 1 appeared to be most similar to the classical descriptions of poromas and pattern 4 fit keratotic and/or pigmented descriptions.³ On the other hand, patterns 2 and 3 were relatively non-specific in clinical appearance, and seemed to simulate BCC, dermal nevus, or vascular tumours. The absence of characteristic dermoscopic features of these diagnoses as well as the presence of poroma-specific features herein described can be clues to the correct diagnosis in these lesions. However, in order not to miss a malignancy, any lesion with polymorphous vessels, ulceration, and/or shiny white structures should be biopsied to rule out amelanotic melanoma, melanoma metastasis, and SCC.^{25–28}

There are multiple limitations of our study. First, we did not require centralised pathology review; thus, we do not know the exact correlation of dermoscopic findings and the relative prevalence of eccrine vs. apocrine poromas and cannot exclude the possibility that

intraepidermal (hidroacanthoma simplex) or dermal (dermal duct tumours) poromas, or collision tumours may have been included in our study. Second, images were taken under varying conditions (e.g., camera type, dermoscopic modality and technique), which likely impacted the prevalence and associations of vessel morphologies. Thus, we cannot rule out the association of poorly visualised vessels with quality conditions of images; however, another possible explanation is that out-of-focus vessels may be specific to poromas due to inherent optical properties of these tumours and/or their stroma. Third, we used a convenience sample of control lesions. However, we included over 26 unique diagnoses among controls and found no apparent differences in the clinical features between poromas and controls, suggesting they were similar in appearance. Fourth, we did not perform inter- and intra-observer agreement studies for features that are not well recognised in the standardised lexicon of dermoscopy.²² Further studies are required to validate their reproducibility. Fifth, there is a lack of standardisation of terminology used in previous descriptions of the dermoscopic features of poromas; we consolidated terms into existing or solitary features to improve the generalisability of our findings; thus, it is possible that we did not use or recognise previously reported features that subsequently may be found to be specific for the diagnosis of poroma. Finally, our study was not designed to identify lesions that should forgo biopsy, such as porocarcinoma or other malignant tumours. We do not advocate that readers use the features described herein to establish a clinical diagnosis of poroma without histopathological confirmation.

In summary, use of dermoscopy may allow recognition of specific dermoscopic features and corresponding patterns of poromas. Dermatologists should be aware of the heterogeneity in appearance of poromas. Given the significant overlap in appearance with malignancies, including melanoma, metastases, BCC, and SCC, all lesions clinically suspected to be poroma should be biopsied for diagnostic confirmation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

None

We thank the International Dermoscopy Society members who contributed with less than 5 cases of poroma who are not included as coauthors; I.K. Karaarslan, M.D., P. Zaballos, M.D., J. Bañuls, M.D., R. Bronfenbrener, M.D., A. Karatas-To ral, M.D., H. Collgros, M.D., M.R. García la Fuente, M.D., V. Borges, M.D., C. Gasparini, M.D.

Funding Sources: This research was funded in part through the NIH/NCI Cancer Center Support Grant P30 CA008748.

References

1. James, WD, Berger, TG, Elston, DM. Epidermal Nevi, Neoplasms, and Cysts. *Andrews' Diseases of the Skin Clinical Dermatology*. 10. Elsevier Inc.; 2006. 665–6.
2. McCalmont, T. Adnexal Neoplasms. In: Bologna, JL, Jorizzo, JL, Rapini, RP, editors. *Dermatology*. Elsevier Limited; 2008. 1704–5. 2
3. Lallas A, Chellini PR, Guimaraes MG, et al. Eccrine poroma: the great dermoscopic imitator. *J Eur Acad Dermatol Venereol*. 2016; 30:e61–e3. [PubMed: 26333195]

4. Kuo HW, Ohara K. Pigmented eccrine poroma: a report of two cases and study with dermoscopy. *Dermatol Surg.* 2003; 29:1076–9. [PubMed: 12974711]
5. Altamura D, Piccolo D, Lozzi GP, et al. Eccrine poroma in an unusual site: a clinical and dermoscopic simulator of amelanotic melanoma. *J Am Acad Dermatol.* 2005; 53:539–41. [PubMed: 16112378]
6. Nicolino R, Zalaudek I, Ferrara G, et al. Dermoscopy of eccrine poroma. *Dermatology.* 2007; 215:160–3. [PubMed: 17684381]
7. Ferrari A, Buccini P, Silipo V, et al. Eccrine poroma: a clinical-dermoscopic study of seven cases. *Acta Derm Venereol.* 2009; 89:160–4. [PubMed: 19326001]
8. Aviles-Izquierdo JA, Velazquez-Tarjuelo D, Lecona-Echevarria M, et al. [Dermoscopic features of eccrine poroma]. *Actas Dermosifiliogr.* 2009; 100:133–6. [PubMed: 19445878]
9. Aydingoz IE. New dermoscopic vascular patterns in a case of eccrine poroma. *J Eur Acad Dermatol Venereol.* 2009; 23:725–6. [PubMed: 19298489]
10. Nishikawa Y, Kaneko T, Takiyoshi N, et al. Dermoscopy of eccrine poroma with calcification. *J Dermatol Case Rep.* 2009; 3:38–40. [PubMed: 21886728]
11. Minagawa A, Koga H, Takahashi M, et al. Dermoscopic features of nonpigmented eccrine poromas in association with their histopathological features. *Br J Dermatol.* 2010; 163:1264–8. [PubMed: 20825405]
12. Minagawa A, Koga H. Dermoscopy of pigmented poromas. *Dermatology.* 2010; 221:78–83. [PubMed: 20516657]
13. Shalom A, Schein O, Landi C, et al. Dermoscopic findings in biopsy-proven poromas. *Dermatol Surg.* 2012; 38:1091–6. [PubMed: 22540934]
14. Sgouros D, Piana S, Argenziano G, et al. Clinical, dermoscopic and histopathological features of eccrine poroid neoplasms. *Dermatology.* 2013; 227:175–9. [PubMed: 24080919]
15. Espinosa AE, Ortega BC, Venegas RQ, et al. Dermoscopy of non-pigmented eccrine poromas: study of Mexican cases. *Dermatol Pract Concept.* 2013; 3:25–8.
16. Almeida FC, Cavalcanti SM, Medeiros AC, et al. Pigmented eccrine poroma: report of an atypical case with the use of dermoscopy. *An Bras Dermatol.* 2013; 88:803–6. [PubMed: 24173189]
17. Oiso N, Matsuda H, Kawada A. Biopsy-proven pigmented poroma with no vascular structure in dermoscopy. *Int J Dermatol.* 2014; 53:e334–5. [PubMed: 24527868]
18. Ito T, Yoshida Y, Furue M, et al. Poroma with sebaceous differentiation: dermoscopy for the diagnosis of skin tumor with sebaceous differentiation. *Indian J Dermatol.* 2015; 60:85–7. [PubMed: 25657405]
19. dos Santos BS. Clinical and dermoscopic features of eccrine poroma. *Indian J Dermatol Venereol Leprol.* 2015; 81:308–9. [PubMed: 25851755]
20. Bombonato C, Piana S, Moscarella E, et al. Pigmented eccrine poroma: dermoscopic and confocal features. *Dermatol Pract Concept.* 2016; 6:59–62. [PubMed: 27648386]
21. Iwasaki J, Yoshida Y, Yamamoto O, et al. Poroma with sebaceous differentiation of the eyelid: a rare site of occurrence. *Acta Derm Venereol.* 2008; 88:166–7. [PubMed: 18311449]
22. Kittler H, Marghoob AA, Argenziano G, et al. Standardization of terminology in dermoscopy/dermatoscopy: Results of the third consensus conference of the International Society of Dermoscopy. *J Am Acad Dermatol.* 2016; 74:1093–106. [PubMed: 26896294]
23. Firth D. Bias Reduction of Maximum Likelihood Estimates. *Biometrika.* 1993; 80:27–38.
24. Moore TO, Orman HL, Orman SK, et al. Poromas of the head and neck. *J Am Acad Dermatol.* 2001; 44:48–52. [PubMed: 11148476]
25. Menzies SW, Kreusch J, Byth K, et al. Dermoscopic evaluation of amelanotic and hypomelanotic melanoma. *Arch Dermatol.* 2008; 144:1120–7. [PubMed: 18794455]
26. Pizzichetta MA, Talamini R, Stanganelli I, et al. Amelanotic/hypomelanotic melanoma: clinical and dermoscopic features. *Br J Dermatol.* 2004; 150:1117–24. [PubMed: 15214897]
27. Costa J, Ortiz-Ibanez K, Salerni G, et al. Dermoscopic patterns of melanoma metastases: interobserver consistency and accuracy for metastasis recognition. *Br J Dermatol.* 2013; 169:91–9.
28. Jaimes N, Halpern JA, Puig S, et al. Dermoscopy: an aid to the detection of amelanotic cutaneous melanoma metastases. *Dermatol Surg.* 2012; 38:1437–44. [PubMed: 22587541]

Figure 1. Poroma patterns type 1 (a–c), type 2 (d–f), type 3 (g–i), and type 4 (j–l)

Findings characteristic of pattern 1 poromas (a–c) included location on volar skin and dermoscopic features of blood spots, yellow structureless areas, milky-red globules, milky-red areas, and branched vessels with rounded endings. Findings characteristics of pattern 2 poromas (d–f) included non-volar location with dermoscopic features of polymorphous vessels, white interlacing areas around vessels, and branched vessels with rounded endings. Pattern 3 poromas (g–i) were small in size and presented as pink papules that clinically mimicked nodular basal cell carcinoma or vascular neoplasms. Dermoscopic findings included branched vessels with rounded endings or atypical hairpin vessels. Pattern 4

poromas (j–l) were large in size and resembled keratinising/pseudoepitheliomatous neoplasms, sometimes with pigmentation. Dermoscopically they were characterised by blood spots, keratin/scale, and atypical hairpin vessels.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Figure 2. Poromas without a pattern (a–c)

Approximately one quarter of poromas could not be classified into a pattern and they did not have characteristic dermoscopic findings.

Figure 3. Poromas mimicking other neoplasms clinically (a–c) and dermoscopically (d–f)
Examples of poromas that clinically were (a) basal cell carcinoma-like, (b) vascular neoplasm-like, and (c) seborrheic keratosis-like. Examples of poromas that dermoscopically were (d) basal cell carcinoma-like, (e) xanthomatous neoplasm-like, and (f) dermatofibroma-like.

Table 1

Cross-classification of participant and lesion clinical features with poroma case status.

Variable	Category		P-value
	Control	Poroma	
Age, Mean (SD)	59.3 (17.8)	61.6 (17.8)	0.40
Diameter, mean (SD) *	8.7 (4.8)	8.3 (5.8)	0.70
	n (%)	n (%)	
Sex			
Female	41 (53.3)	52 (46.9)	0.39
Male	36 (46.8)	59 (53.2)	
Anatomic location †			
Head/neck	22 (20.8)	18 (16.4)	0.480
Trunk	32 (30.2)	28 (25.5)	
Hands/Feet	27 (25.5)	38 (34.6)	
Extremities, not hands/feet	25 (23.6)	26 (23.6)	
Pigmentation			
No	83 (78.3)	97 (85.8)	0.14
Yes	23 (21.7)	16 (14.2)	
Asymmetry			
No	43 (41.4)	52 (46.9)	0.42
Yes	61 (58.7)	59 (53.2)	
Border irregularity			
No	39 (37.5)	44 (39.6)	0.75
Yes	65 (62.5)	67 (60.4)	
Morphology			
Macule	4 (3.8)	1 (0.9)	0.12
Papule	23 (21.7)	40 (35.4)	
Plaque	28 (26.4)	29 (25.7)	
Nodule	42 (39.6)	33 (29.2)	
Tumour	9 (8.5)	10 (8.9)	
Number of colours			
1	55 (52.9)	73 (65.8)	0.19
2	35 (33.7)	24 (21.6)	
3	13 (12.5)	12 (10.8)	
4	1 (1)	2 (1.8)	

* Diameter missing or unable to be calculated for 26 poromas and 47 controls.

† Poroma anatomic location missing for three lesions.

Percentages may not add to 100 due to rounding.

Table 2

Cross-tabulation of dermoscopic features and poroma status.*

Number of colours	control	poroma	Total	p-value
1	12 (11.3)	12 (10.6)	24 (11)	0.83
2	34 (32.1)	39 (34.5)	73 (33.3)	
3	37 (34.9)	43 (38.1)	80 (36.5)	
4	19 (17.9)	13 (11.5)	32 (14.6)	
5	3 (2.8)	4 (3.5)	7 (3.2)	
6	1 (0.9)	2 (1.8)	3 (1.4)	
White halo around vessels				
Absent	105 (99.1)	106 (93.8)	211 (96.4)	0.04
Present	1 (0.9)	7 (6.2)	8 (3.7)	
White interlacing areas around vessels				
Absent	104 (98.1)	87 (77.0)	191 (87.2)	<0.001
Present	2 (1.9)	26 (23.0)	28 (12.8)	
Shiny white structures				
Absent	92 (86.8)	98 (86.7)	190 (86.8)	0.99
Present	14 (13.2)	15 (13.3)	29 (13.2)	
Collarette				
Absent	96 (90.6)	96 (85)	192 (87.7)	0.21
Present	10 (9.4)	17 (15)	27 (12.3)	
Keratin/scale				
Absent	82 (77.4)	95 (84.1)	177 (80.8)	0.21
Present	24 (22.6)	18 (15.9)	42 (19.2)	
Yellow structureless areas				
Absent	95 (89.6)	77 (68.1)	172 (78.5)	<0.001
Present	11 (10.4)	36 (31.9)	47 (21.5)	
Vessel distribution				
Diffuse	34 (54.0)	48 (51.6)	82 (52.6)	0.905
Focal	16 (25.4)	23 (24.7)	18 (11.5)	
Multifocal	13 (20.6)	22 (23.7)	35 (22.4)	
Vessels				
None	53 (50.0)	35 (31.0)	88 (40.2)	0.008
Monomorphous	31 (29.2)	37 (32.7)	68 (31.0)	
Polymorphous	22 (20.8)	41 (36.3)	63 (28.8)	
Branched vessels with rounded endings, any				
Absent	99 (93.4)	79 (69.9)	178 (91.8)	<0.001
Present	7 (6.6)	34 (30.1)	41 (18.7)	
Branched vessels with rounded endings, possible				

Number of colours	control	poroma	Total	p-value
Absent	99 (93.4)	97 (85.8)	196 (89.5)	0.07
Present	7 (6.6)	16 (14.2)	23 (10.5)	
Branched vessels with rounded endings, definite				
Absent	99 (93.4)	79 (69.9)	178 (81.3)	<0.001
Definite	0 (0)	18 (15.9)	18 (8.2)	
Arbourizing vessels				
Absent	97 (91.5)	110 (97.4)	207 (94.5)	0.06
Present	9 (8.5)	3 (2.7)	12 (5.5)	
Lacunae				
Absent	105 (99.1)	110 (97.4)	215 (98.2)	0.34
Present	1 (0.9)	3 (2.7)	4 (1.8)	
Dotted vessels				
Absent	94 (88.7)	103 (91.2)	197 (90)	0.54
Present	12 (11.3)	10 (8.9)	22 (10.1)	
Comma vessels				
Absent	101 (95.3)	113 (100)	214 (97.7)	0.02
Present	5 (4.7)	0 (0)	5 (2.3)	
Coiled vessels				
Absent	93 (87.7)	83 (73.5)	176 (80.4)	0.008
Present	13 (12.3)	30 (26.6)	43 (19.6)	
Hairpin vessels				
Absent	103 (97.2)	111 (98.2)	214 (97.7)	0.60
Present	3 (2.8)	2 (1.8)	5 (2.3)	
Atypical hairpin vessels				
Absent	101 (95.3)	98 (86.7)	199 (90.9)	0.03
Present	5 (4.7)	15 (13.3)	20 (9.1)	
Vascular blush				
Absent	104 (98.1)	110 (97.4)	214 (97.7)	0.70
Present	2 (1.9)	3 (2.7)	5 (2.3)	
Milky red areas				
Absent	92 (86.8)	93 (82.3)	185 (84.5)	0.36
Present	14 (13.2)	20 (17.7)	34 (15.5)	
Milky red globules				
Absent	101 (95.3)	91 (80.5)	192 (87.7)	0.001
Present	5 (4.7)	22 (19.5)	27 (12.3)	
Blood spots				
Absent	76 (71.7)	71 (62.8)	147 (67.1)	0.16
Present	30 (28.3)	42 (37.2)	72 (32.9)	
Serpentine vessels				

Number of colours	control	poroma	Total	p-value
Absent	83 (78.3)	98 (86.7)	181 (82.7)	0.10
Present	23 (21.7)	15 (13.3)	38 (17.4)	
Poorly visualised vessels				
Absent	106 (100)	103 (91.2)	209 (95.4)	0.002
Present	0 (0)	10 (8.9)	10 (4.6)	
Comedo-like openings				
Absent	95 (89.6)	106 (93.8)	201 (91.8)	0.26
Present	11 (10.4)	7 (6.2)	18 (8.2)	
Milia-like cysts				
Absent	96 (90.6)	105 (92.9)	201 (91.8)	0.53
Present	10 (9.4)	8 (7.1)	18 (8.2)	
Ridges and/or fissures				
Absent	101 (95.3)	111 (98.2)	213 (97.3)	0.22
Present	5 (4.7)	2 (1.8)	6 (2.7)	
Erosions and/or ulcers				
Absent	84 (79.3)	84 (74.3)	168 (76.7)	0.39
Present	22 (20.8)	29 (25.7)	51 (23.3)	

* Only dermoscopic structures with ≥ 2% prevalence in poromas or controls are shown.

Percentages may not add to 100 due to rounding

Table 3

Cross-tabulation of clinical and dermoscopic features and overall patterns of poromas

Variable	Coding	Pattern 1: 27 (23.9%)	Pattern 2: 20 (17.7%)	Pattern 3: 29 (25.7%)	Pattern 4: 11 (9.7%)	No pattern: 26 (23%)	Total:	p-value
Anatomical Location [‡]	Head or neck	0 (0)	0 (0)	9 (32.1)	3 (30.0)	6 (24.0)	18 (16.4)	
	Trunk	0 (0)	7 (35.0)	10 (35.7)	1 (10.0)	10 (40.0)	28 (25.4)	
	Hands/Feet	24 (88.9)	8 (40.0)	2 (7.1)	3 (30.0)	1 (4.0)	38 (34.6)	
	Extremities, not hands/feet	3 (11.1)	5 (25.0)	7 (25.0)	3 (30.0)	8 (32.0)	26 (23.6)	<0.001
Diameter, mm *	Mean (SD)	6.9 (3.7)	11.9 (5.5)	5.5 (5.9)	13.3 (7.5)	8.7 (4.5)	8.3 (5.6)	<0.001
Pigmented	Yes	2 (7.4)	1 (5)	0 (0)	4 (36.4)	9 (34.6)	16 (14.2)	<0.001
Vessel morphology	None	4 (14.8)	1 (5)	10 (34.5)	2 (18.2)	18 (69.2)	35 (31)	
	Monomorphous	13 (48.2)	1 (5)	12 (41.4)	6 (54.6)	5 (19.2)	37 (32.7)	
	Polymorphous	10 (37)	18 (90)	7 (24.1)	3 (27.3)	3 (11.5)	41 (36.3)	<0.001
	White interlacing areas around vessels	6 (22.2)	12 (60)	5 (17.2)	2 (18.2)	1 (3.9)	26 (23)	<0.001
Collarette	Present	12 (44.4)	3 (15)	1 (3.5)	1 (9.1)	0 (0)	17 (15)	<0.001
Keratin/scale	Present	4 (14.8)	2 (10)	1 (3.5)	6 (54.6)	5 (19.2)	18 (15.9)	0.003
Yellow structureless areas	Present	13 (48.2)	7 (35)	10 (34.5)	2 (18.2)	4 (15.4)	36 (31.9)	0.104
Branched vessels with rounded endings, any	Present	10 (37)	12 (60)	9 (31)	1 (9.1)	2 (7.7)	34 (30.1)	0.001
Atypical hairpin vessels	Present	0 (0)	7 (35)	2 (6.9)	4 (36.4)	2 (7.7)	15 (13.3)	0.001
Milky-red areas	Present	10 (37)	8 (40)	1 (3.5)	1 (9.1)	0 (0)	20 (17.7)	<0.001
Milky-red globules	Present	11 (40.7)	9 (45)	1 (3.5)	1 (9.1)	0 (0)	22 (19.5)	<0.001
Blood spots	Present	16 (59.3)	6 (30)	5 (17.2)	7 (63.6)	8 (30.8)	42 (37.2)	0.005

[‡] Poroma anatomic location missing for three lesions.

* Diameter missing or unable to be calculated for 26 poromas.

Percentages may not add to 100 due to rounding.