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Dermoscopic Evaluation Improves Clinical Diagnosis of Oral Melanotic Macules: A Study In 50 Patients With Oral Pigmented Lesions

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ABSTRACT

BACKGROUND: Dermoscopy is a non-invasive in vivo method rarely used for the diagnosis of oral pigmented lesions.
OBJECTIVE: To analyze clinical, dermoscopic, and histologic features of Oral Melanotic Macules (OMMs), and to evaluate the usefulness of dermoscopy in the diagnosis of OMMs by analyzing its sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and positive and negative likelihood ratio.
METHODS: Fifty patients aged 18 years or more, presenting solitary or multiple circumscribed pigmented lesions in the oral mucosa were included. Clinical, dermoscopic, and histological characteristics were analyzed.
RESULTS: OMMs were diagnosed in 19 patients (84% women and 16 % men); 52 % of patients had multiple lesions, 48% had one lesion. Lesion sites in decreasing order of frequency were the labial mucosa (63 %), gingiva (31.57 %), cheek mucosa (26.31%), labial semimucosa (21%), palate (10.52 %), alveolar ridge (5.26 %) and tongue (5.26 %). The dermoscopic pattern of OMMs was linear in 89 % of cases (47% parallel line, 35% fish scale-like, and 17% hyphal patterns). Histological analysis showed increased melanin in the basal cell layer in all cases with a linear dermoscopic pattern, slight acanthosis in 14 cases, and a slight increase in number of basal melanocytes in 13 cases. Globules were seen in 21% of cases corresponding histologically with increased melanin or melanophages in the lamina propria. Three cases of OMMs located on keratinized mucosa showed structureless dermoscopic pattern. There were no significant differences in

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the clinical or demographic features of patients with OMMs and those diagnosed with other lesions, in the populations studied here. Comparison of OMMs with the remaining lesions showed no significant differences in shape, border, symmetry or color. The diagnostic ability of clinical impression improves after dermoscopy. The dermoscopic observation of symmetrical lines further enhances the diagnostic ability of dermoscopy in OMMs, with 73.68% sensitivity, 87.1% specificity, 77.78% positive predictive value, 84.38 % negative predictive value, 5.71 positive likelihood ratio, and 0.30 negative likelihood ratio.

CONCLUSIONS: Dermoscopy may play a role in improving noninvasive diagnosis of oral pigmented lesions occurring on several areas of non-keratinized mucosa.

Keywords: dermoscopy; Oral Pigmented Lesions; Oral Melanotic Macule; Non-invasive Diagnosis
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1. INTRODUCTION

Oral pigmented lesions can largely be classified in two groups: 1) melanocytic lesions, characterized by an increase in the number of melanocytes, as is the case of nevi and melanoma; and 2) non-melanocytic lesions, associated with the deposition of endogenous or exogenous pigment (melanin, exogenous tattoo, hemosiderin) (Ho et al., 2014).

Pigmented lesions at the mucocutaneous junction and oral mucosa include a wide range of disorders, such as oral melanotic macule (OMM), melanocytic nevus, malignant melanoma, Laugier-Hunziker syndrome, Peutz-Jeghers syndrome and oral melanoacanthoma in circumscribed lesions (either solitary or multiple), and smokers melanosis, racial melanosis, Addison's disease, drug-induced hyperpigmentation in diffuse lesions (Meleti et al., 2008; Yago et al., 2008; Caldeira et al., 2010; Galletta et al., 2011; Li et al., 2012).

Given the clinical similarities of circumscribed pigmented lesions and the difficulty in differentiating benign from malignant lesions with the naked eye alone, biopsy for histological diagnosis is warranted in most cases.

OMM (previously also termed labial lentigo, oral melanosis and oral freckle) has been described as a flat blue, brown or black lesion, usually less than 10 mm in diameter, mainly affecting the lower lip, specifically the lower semi mucosa, and characterized histologically by an excess of melanin in the basal cell layer, sometimes increased melanin or melanophages in the upper lamina propria, and no or a non-significant increase in the number of melanocytes in the basal cell layer (Buchner & Hansen, 1979; Kaugars et al., 1993; Bregni et al., 2007). Although it is a benign condition, the main challenge in diagnosing this lesion is to differentiate it from other entities, such as nevi and melanoma, which require entirely different management and follow up.

Dermoscopy is a simple non-invasive in vivo method, which is widely used for diagnosing skin lesions. Traditional dermatoscopes use non-polarized illumination against an oil or alcohol interface to decrease light reflection, refraction, and diffraction, making the epidermis more translucent (immersion fluid dermoscopy). Others use cross-polarized light, which eliminates the need for immersion fluid, with or without skin contact, together with optical magnification to visualize structures of the epidermis, dermo-epidermal junction, and the dermis. Both allow the identification of many structures not visible to the naked eye (Braun et al., 2003; Olszewska et al., 2008; Rao & Ahn, 2012).

Although there are different dermoscopic approaches to analyze melanocytic skin lesions (algorithms, ABCD rule, patterns) the present work will focus on pattern analysis. The term "pattern" is used in dermoscopy to define a group of multiple individual elements that occupy a considerable part of the image, i.e. a single line does not constitute a linear pattern. Pattern analysis refers to the simultaneous assessment of the diagnostic value of all dermoscopy features shown by the lesion.

There are many basic dermatoscopic patterns, and their description is beyond the scope of the present study. Nevertheless, the patterns observed in the lesions analyzed here will be described briefly (lines, globules, dots, structureless areas).

The line pattern can be classified as reticular, parallel or curved. The reticular or pigment network is observed in melanocytic lesions, typically in nevi. The image is similar to a grid of brown or black lines on a paler background, and is caused by melanocytes along the rete ridges (Hirokawa & Lee, 2011; Rao & Ahn, 2012).

Parallel or curved lines (forming circles, a ring-like, fish-scale like, hyphal pattern, or forming semi-circles) can be observed in pigmented lesions, whether melanocytic or not, and correspond with an increase in melanocytes or melanin in some zones of the basal layer of the epidermis. They may be present in acral zones such as soles and palms and in mucous membranes **(**Lin et al., 2009; Hirokawa & Lee, 2011; Blum et al., 2011).

The globular pattern is characterized by the presence of well-delimited, brown or black round or oval structures measuring more than 0.1mm in diameter, which correspond histologically with deposits of melanin, melanocytes or melanophages in the dermis. This pattern is usually observed in nevi with an intradermal component, or in lesions with pigment incontinence (Rao & Ahn, 2012). The dots are brown

or black round structures measuring less than 0.1 mm, and they correspond with pigment in the upper layers of the epidermis, such as the corneal epithelium and are seen in nevi and melanoma (Hirokawa & Lee, 2011). When the lesion shows none of the basic patterns**,** the pattern is defined as structureless (Rao & Ahn, 2012) (Figure 1).

Pattern analysis is the most commonly used diagnostic method to evaluate skin lesions, and allows differentiation of non-melanocytic pigmented lesions (seborrheic keratosis, hemangioma, pigmented basal cell carcinoma) from melanocytic lesions like nevi and melanoma (Rao & Ahn, 2012).

Because each dermoscopic pattern corresponds with distinct histological features, pattern analysis allows differentiating skin lesions. The use of dermoscopy has improved the diagnostic accuracy of pigmented skin lesions, and the diagnostic algorithms for pigmented lesions on the skin have been well defined. This has substantially reduced unnecessary excision of benign lesions for histopathological examination, and has increased sensitivity and specificity of clinical examination (Vestergaard et al., 2008; Rosendahl et al., 2011).

However, the role of dermoscopy in the diagnosis of pigmented lesions in the oral mucosa is not well established. Many recent reports of these lesions are either relatively small series of cases or include different anatomic regions, such as the oral, genital, anal and conjunctival mucosa. Moreover, reports in the literature on pigmented lesions that included lesions in the oral mucosa only analyzed lesions located in the semi mucosa or lips (Lin et al., 2009; Blum et al., 2011).

Studies reported to date have included OMMs in the semimucosa and labial mucosa. Our case series includes OMMs in intraoral sites other than the semimucosa and labial mucosa, thus expanding the scope of dermoscopy to include assessment of pigmented lesions located at oral mucosa sites, which to our knowledge, has not been described to date.

The aim of the present report was to contribute clinical, dermoscopic, and histological data on OMMs to the existing body of knowledge, and to evaluate the usefulness of dermoscopy in the diagnosis of OMM by analyzing its sensitivity, specificity, PPV, NPV and positive and negative likelihood ratio.

2. MATERIALS AND METHODS

2.1 Subjects

A prospective, cross sectional study was performed at the Oral Medicine Department at the School of Dentistry, University of Buenos Aires, Argentina, from 2011 to 2014. Patients presenting solitary or multiple circumscribed dark (light brown, dark brown, black, blue) lesions in the oral mucosa seeking care at the Oral Medicine Department were

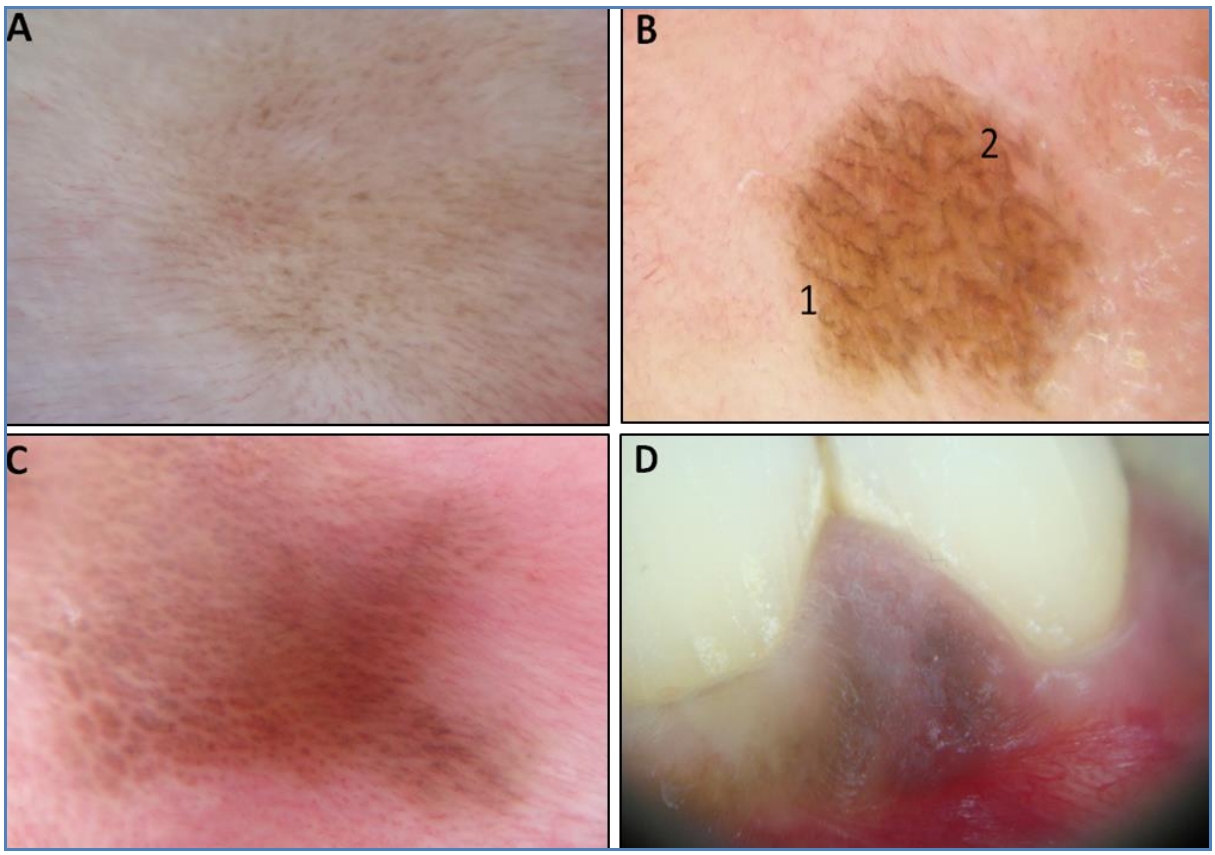

Figure 1. Dermoscopic patterns: **A)** parallel lines; **B1)** hyphal pattern; **B2)** fish-scale like; **C)** globules; **D)** structureless area.

referred to our section to assess their eligibility to participate in the study. Inclusion criteria were as follows: patients aged more than 18 years, presenting 1 or more circumscribed pigmented lesions in the oral mucosa. Patients presenting inflammatory and/or infectious oral lesions, oral mucosa disease that could cause secondary hyperpigmentation, racial pigmentation, or amalgam tattoo at the time of consultation were excluded from the study. Solitary lesions compatible with amalgam tattoo were analyzed radiographically to determine patient inclusion. Only lesions accessible for dermoscopic inspection were included in the study. Clinical, dermoscopic, and histological characteristics were analyzed in all cases. All included patients gave their written informed consent to participate in the study. The present study was approved by the Ethics Committee of the School of Dentistry, University of Buenos Aires, Argentina (School of Dentistry, University of Buenos Aires, Ethical Approval number 0013/2017)

2.2 Data Collection

The following demographic data were collected from each patient: age, gender, current and previous medications, sun exposure, PUVA exposure, racial type (Latin American mestizo, Caucasian), skin type (Fitzpatrick scale) and presence of hyperpigmented skin lesions.

The Fitzpatrick scale is a numerical classification for human skin color and skin response to sun and remains a recognized tool for dermatological research into human skin pigmentation. It includes the following six categories: Type I (always burns, never tans, includes pale white; blond or red hair; blue eyes; freckles); Type II (usually burns, tans minimally, includes white skin; fair; blond or red hair; blue, green, or hazel eyes); Type III (sometimes mild burn, tans uniformly, includes cream white skin, fair with any hair or eye color); Type IV (burns minimally, always tans well; moderate brown); Type V (very rarely burns, tans very easily, dark brown skin) and Type VI (never burns, never tans, deeply pigmented dark brown to darkest brown, black skin). Caucasian skin type corresponds to Fitzpatrick scale I to III and Latin American mestizo to Fitzpatrick scale IV and V.

The following clinical data of the oral lesions were recorded*:* number (1 or more), color (light brown, brown, black, blue), shape, outline, presence of ulceration, symmetry**,** and symptoms. Lesion site was recorded as semimucosa, labial mucosa, cheek mucosa, palate, gingiva, alveolar ridge, and tongue. The presence of more than one pigmented lesion with similar features was considered a multiple lesion.

2.3 Operative phase

The dermoscope used for this study was a DermLite II (3Gen, California), a hybrid dermatoscope that combines non-polarized illumination for immersion fluid dermoscopy with cross-polarized dermoscopy, with or without skin contact. It was used in the polarized mode with contact in all the studied cases since its LEDs (light emitting diodes) allow visualizing deeper pigmentation and vascularity.

Dermoscopic analysis was first performed in vivo (AM); dermoscopy images were then photographed by fitting the dermatoscope with a SONY Cyber-shot DSC- W710, 16.1-megapixel camera (AM). Dermoscopic diagnosis was performed upon examination of the lesion by a dermatologist with experience in dermoscopy (AM), and later confirmed by two certified dermatologists who reached a consensus diagnosis based on photographic images of the lesions (AM; HC).

Dermoscopy was performed prior to obtaining a biopsy for histological examination, and both observers were blind to the definitive histological diagnosis.

The following dermoscopic patterns were recorded: dotted, globular, linear (parallel, hyphal, fish scale-like or reticular network), and structureless (when none of the above could be found) patterns. Because the hyphal and fish scale-like patterns are considered to be variants of the parallel linear pattern, they were recorded separately but were considered linear for the purpose of the discussion.

The presence of a parallel linear pattern in any of its variants (hyphal or fish-scale like) was considered a diagnostic criterion for dermoscopic diagnosis of OMM.

All the biopsy samples were analyzed by the same certified dermatopathologist (GC). For diagnostic purposes, OMM was defined as a solitary or multiple circumscribed pigmented lesion that histologically shows an increase in melanin in the basal cell layer, with no or only a slight increase in the number of basal melanocytes. Clinical presumptive diagnosis was made following clinical examination of the patient, and presumptive dermoscopic diagnosis was made after dermoscopic inspection of the lesion. The histopathological diagnosis was considered the definitive diagnosis.

2.4 Statistical analysis

Continuous variables are described using mean and standard deviation, and categorical variables are described using relative frequency. Continuous variables were compared using Student's t test. Categorical variables were compared using Chi square or Fisher's test, as needed. Kendall's tau-b was used as a non-parametric measure of association for ordinal data. Statistical significance was set at a value of $p< 0.05$.

In order to determine the predictive capacity of dermoscopy as a diagnostic test, sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio and their respective 95% confidence intervals were calculated. The histopathological diagnosis was considered gold standard. STATA version 12 (StataCorp, College Station, TX, USA) was used for statistical analyses.

3. RESULTS

The final sample comprised fifty patients (n=50) who had the following definitive histological diagnosis: oral melanotic macules (n=19), post-inflammatory hyperpigmentation

Table 1. Characteristics of the studied population

	MACULE			
	NO n= 31	**YES** n=19	**Total** n= 50	***p*-value**
Female patients (n)	27	16	43	0.542‡
Age (mean ± sd)	53.35 ± 16.13	52.47 ± 17.02	53.02 ± 16.31	0.855*
UV exposure (n)	10	8	18	0.481†
Ethnic group (n)				
Caucasian	21	13	34	0.791†
Mestizo	10	6	16	
Phototype (n)				
II	4	2	6	
III	12	11	23	0.480¥
IV	15	5	20	
V	0	1	1	
Pigmented lesion at a non-oral site (n)	**7**	**4**	**11**	**0.594‡**

Legend: ‡ Fisher's exact test, † *t* test,¥ Kendall's Tau-b, *χ^2 test

Table 2. Clinical features of the lesions

	MACULE			
	NO n=31	**YES** n=19	**Total** n=50	***p*-value**
Number of oral pigmented lesions				
Multiple	9	10	19	0.09*
Solitary	22	9	31	
Shape				
Irregular	8	5	13	
Oval	12	8	20	0.955*
Rounded	11	6	17	
Border				
Diffuse	12	4	16	0.195‡
Distinct	19	15	34	
Symmetry				
No	8	3	11	0.357‡
Yes	23	16	38	
Color				
Bluish	4		4	
Light brown	11	13	24	
Dark brown	3	3	6	0.138‡
Black	11	3	14	
Bluish black	1		1	
Brownish black	1		1	

Legend: ‡ Fisher's exact test, *χ^2 test

(n=15), amalgam tattoo (n=11), junctional nevi (n=2), melanoma (n=1), blue nevi (n=1), and hyper-pigmented actinic keratosis (n=1).

Oral melanotic macule was diagnosed in 19 patients, with an age range of 32-80 years and a mean age of 52 years; 84% of patients were women (n=16), and 16 % were men (n=3).

The characteristics of the population were analyzed according to the presence of OMMs (Table 1). No significant differences in any of the analyzed clinical or demographic features were found between patients with OMMs and patients diagnosed with other diseases.

No differences in shape, border, symmetry or color were observed between OMMs and the other lesions (Table 2).

However, the frequency of multiple lesions was higher in patients with OMMs, though the difference did not reach statistical significance, likely due to the small size of the sample.

Lesion site in the 9 OMMs cases presenting a solitary lesion was the lower semimucosa in 3 cases, labial mucosa in 4, gingiva in 1, and alveolar ridge in 1 case.

Considering all the oral regions affected by either solitary or multiple OMMs lesions, lesion site in decreasing order of frequency was the labial mucosa (63%, n=12), gingiva (31.57 %, n=6), cheek mucosa (26.31%, n=5), labial semi mucosa (21%, n=4), palate (10.52 %, n=2), alveolar ridge (5.26 %, n=1), and tongue (5.26 %, n=1).

Analysis of cases regarding skin type showed that 68.5% (n=13) of patients were Caucasian and 31.5% (n=6) were Latin American mestizos. Six (46%) patients in the former group presented a solitary lesion and 7 (54%) had multiple lesions, whereas 3 (50%) patients in the latter group had a solitary lesion and 3 (50%) had multiple lesions.

Regarding color of OMMs, the lesions observed in the 13 Caucasians were light brown (n=10), dark brown (n=2), and black (n=1), and OMMs in the 6 Latin American mestizos were light brown (n=2), dark brown (n=2), and black (n=2).

The dermoscopic characteristics observed in situ were consistent with the features observed on the photographs of the lesions.

A linear dermoscopic pattern was observed in 17 of 19 cases of OMMs; 8 (47%) of these cases followed a parallel linear pattern, 6 (35%) followed a fish scale-like pattern, and 3 (17%) a hyphal pattern. Despite the slight dermoscopic difference among these 3 types of lines, for purpose of the discussion all cases were considered to follow a linear pattern. Histological analysis of these 17 cases showed increased melanin in the basal cell layer in all cases, slight acanthosis in 14 cases, and a slight increase in the number of melanocytes in 13 cases.

Globules were seen in 4 cases (21%) and corresponded

Figure 2. Dark brown macule on the lower labial mucosa

Table 3. Diagnostic accuracy of clinical impression and dermoscopic impression to detect OMM

	Clinical Impression	Dermoscopic Impression
Sensitivity % (95% CI)	84.21 (65.18-100.00)	94.74 (82.06-100.00)
Specificity % (95% CI)	45.16 (26.03-64.29)	74.19 (57.18- 91.21)
Positive predictive value % (95% CI)	48.48 (29.92-67.05)	69.23 (49.57-88.89)
Negative predictive value % (95% CI)	82.35 (61.29-100.00)	95.83 (85.76-100.00)
Positive likelihood ratio (95 CI)	1.54 (1.06-2.23)	3.67 (2.00-6.73)
Negative Likelihood ratio (95 CI)	0.35 (0.12-1.06)	0.07 (0.01-0.48)

histologically with increased melanin or melanophages in the lamina propia, below the hyper-pigmented rete ridges. An example of a case analyzed is shown in Figures 2, 3 and 4.

A structureless dermoscopic pattern was observed in 3 cases. This pattern was found to be the only dermoscopic feature in 2 cases, and was combined with lines and globules in the remaining case. All three cases were located in the attached gingiva, and histologically showed a great degree of acanthosis and the presence of keratinized epithelium as well as increased melanin in the basal cell layer. Evaluation of the diagnostic ability of dermoscopy showed the following (Table 3).

Analysis of line dermoscopic patterns (parallel, fish scale-like, hyphal) in symmetrical lesions showed that the presence of any of these patterns was the dermoscopic feature with best diagnostic ability for OMMs (Table 4).

Table 4. Diagnostic accuracy of line dermoscopic pattern to detect OMMs

	Line Dermoscopic Pattern
Sensitivity % (95% CI)	73.68 (51.25-96.12)
Specificity % (95% CI)	87.10 (73.68-100.00)
Positive predictive value % (95% CI)	77.78 (55.79-99.76)
Negative predictive value % (95% CI)	84.38 (70.23-98.52)
Positive likelihood ratio (95 CI)	5.71 (2.20-14.81)
Negative Likelihood ratio (95 CI)	0.30 (0.14-0.65)

4. DISCUSSION

OMM is the most common circumscribed pigmented lesion in the oral cavity, and may present as single or multiple. Several terms, including mucosal melanosis, oral lentigo and oral freckle have been used previously to describe this entity (Kaugars et al., 1993; Bregni et al., 2007). In agreement with the literature, a female predominance (84%) was also observed in the case series presented here (Kaugars et al., 1993; Bregni et al., 2007).

Analysis of the demographic characteristics of the population studied here (Table 1) shows that these features are not predictive for OMM, i.e. they do not allow presumptive diagnosis of OMM.

Evaluation of the clinical features of the lesions analyzed here (Table 2) showed that none of the features allowed differentiating OMMs from other pigmented lesions, even though the frequency of multiple lesions was higher in OMMs (53 % in OMMs vs. 29 % in non-OMMs; non-significant difference). Further studies in larger samples would allow confirming the latter observation, which is in contrast with reports showing OMM to be a predominantly solitary lesion (Buchner & Hansen, 1979; Kaugars et al., 1993).

Whereas studies in the literature have reported the most common location of OMMs to be the vermilion border followed by the gingiva (Buchner & Hansen, 1979; Bregni et al., 2007), lesion site in decreasing order of frequency in the cases studied here was the labial mucosa, gingiva, cheek mucosa, vermilion border, palate, alveolar ridge, and tongue. In cases presenting a solitary lesion, the labial mucosa was the most frequently affected site (45 %), followed by the semimucosa in 33 % of cases. This observation is in line with findings reported by Kaugars et al (Kaugars et al., 1993).

We found no significant difference in the frequency of solitary and multiple lesions between Caucasian and Latin American mestizo patients, although previous reports in the literature have shown that the latter group tends to present multiple oral lesions whereas Caucasians have solitary lip macules (Kaugars et al., 1993). This discrepancy may be accounted for by the small number of patients in each group in the present study. Overall, OMMs in Caucasian patients tended to be lighter in color than the lesions observed in Latin American mestizos, even though the small number of cases did not allow statistical analysis.

Previous dermoscopic studies have consistently found OMM to show a parallel linear pattern, corresponding with hyper-pigmentation in the basal cell layer. A slight increase in the number of melanocytes may be seen occasionally. Other dermoscopic patterns such as globules, or a reticular-like pattern occurring rarely on the lip have been reported less frequently. In these cases, dermoscopy cannot give a reliable clue to define OMM, for this pattern is usually observed in melanocytic lesions (Braun et al., 2003; Mannone et al., 2004; Lin et al., 2009).

Lin et al. found that the dotted-globular pattern was mainly observed in OMMs and melanocytic nevi. However, the histopathological correlates of dots and globules in the OMMs and melanocytic nevi were different. The dots in OMMs were the result of aggregated melanin in the upper dermis, whereas

Figure 3. Dermoscopy: Parallel brown lines and globules

the dots and globules in melanocytic nevi correlated histopathologically with aggregated pigmented melanocytes or melanophages in the lamina propria (Lin et al., 2009).

Only two studies analyzing mucosal dermoscopic findings in a significant number of cases have been reported to date. Lin et al. investigated the dermoscopic patterns of 40 mucosal lesions, 27 of which involved the oral mucosa; lesion site was the lip in all cases, though the authors failed to clarify whether they were located in the semimucosa or labial mucosa. Twenty of the studied lip lesions corresponded to melanotic macules, and were found to present the dotted-globular, hyphal, fish scale-like, ring-like or homogeneous patterns.

The authors were the first to identify and describe the fish scale-like pattern and the hyphal pattern, and considered these patterns as variants of the ring-like pattern. They found all three patterns corresponded with the same histological features: hyperpigmentation of the rete ridges along the basal layer, with less or no pigmentation at the top of dermal papillae. The histological features of the hyphal pattern differed from the other patterns in the presence of hyperpigmented obliquely elongated rete ridges (Lin et al., 2009).

Blum *et al* also published a large series of cases, in which 76 of the 140 studied lesions affected the lips, and the remaining lesions involved the genital area. The authors analyzed the dermoscopic patterns and colors of each lesion with the aim to establish whether benign and malignant lesions differed significantly regarding the number of colors present in the lesion. They scored the presence of brown, black, blue, gray, red, purple, and white, and counted the number of colors present in each lesion. Their results showed that multiple colors were a better clue for differentiating malignant lesions than multiple patterns (Blum et al., 2011).

The dermoscopic patterns observed in our series of patients are in keeping with those described in the literature. Lines, following several patterns such as the hyphal, fish scale, and parallel linear patterns were found in most cases, corresponding with increased melanin in the basal cell layer at the bottom of rete ridges. The latter is the single histological criterion necessary for the diagnosis of OMM (Kaugars et al., 1993).

The linear pattern can be classified as reticular, parallel or curved. The reticular pattern, or pigment network, is observed in melanocytic lesions, typically nevi. In their study on 40 mucosal lesions, Lin et al. described new patterns such as the ring-like, the fish-scale like, and the hyphal patterns. The authors considered the fish-scale like pattern to be a variant of the ring-like pattern caused by tension produced when taking the image and considered the hyphal pattern to be a variant of the ring-like pattern since their histopathological findings were essentially the same, with the hyphal pattern differing only in its obliquely elongated rete ridges (Lin et al., 2009).

Blum et al refer to the ring-like pattern as circles, to the fingerprint pattern as lines, and to the hyphal pattern as fish-scale pattern (Blum et al., 2011).

Regardless of the different ways lines have been described in the different reports, whether as parallel lines or circles, based on the analysis of mucosal lesions presented here we consider that such patterns should be considered variants of the same pattern and should be grouped together for analysis.

In line with reports of lesions on the vermilion border, the presence of dermoscopically observed lines corresponded histologically with basal hyperpigmentation in all the analyzed oral sites. Lines were not observed in two cases of OMMs located in the gingiva.

Dermoscopy showed globules in few cases; the dermoscopic image corresponded with histological observation of a certain degree of melanin deposition in the superficial lamina propria, possibly due to some degree of pigmentary incontinence secondary to increased melanin in the basal cell layer above. No dots were observed dermoscopically in any of the lesions, which is consistent with the absence of pigment in the superficial layers of the epithelium, as observed histologically.

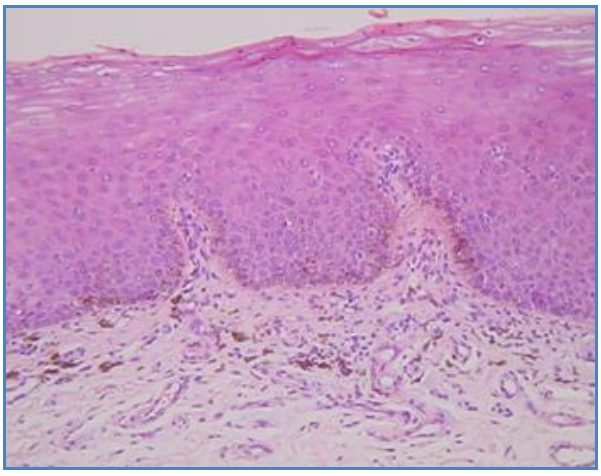

Figure 4. Histology: Increased melanin in the basal cell layer and upper lamina propria (hematoxylin and eosin, X10).

All 3 cases located in the attached gingiva showed a structureless dermoscopic pattern, corresponding histologically with a marked degree of acanthosis as well as increased melanin in the basal cell layer and keratinized epithelium. A structureless dermoscopic pattern can be associated with either benign or malignant lesions. In the case series reported by Blum, structureless zones were found in all malignant lesions as well as in 53.2% of benign lesions (Mannone et al., 2004; Blum et al., 2011), Therefore, the finding of a structureless dermoscopic pattern should raise suspicion of oral malignant melanoma.

Although it may also occur in benign lesions, the structureless pattern is misleading in these cases and does not contribute to establishing the dermoscopic diagnosis of OMM. It would therefore seem that dermoscopy might not be useful for assessing lesions on keratinized mucosa possibly because the increased thickness of the epithelium and the presence of keratinization do not allow visualizing structures deeper in the epithelium and lamina propria (basal layer with increase in melanin and/or melanocytes or melanophages in the lamina propria). In the sample studied here, a line pattern was not observed dermoscopically in 2 of the 3 cases involving the gingiva, although histologically they showed basal hyperpigmentation.

Despite the likelihood ratio of dermoscopic impression being low (likelihood ratio less than 5), comparison of the diagnostic ability of clinical impression and dermoscopic impression showed that the ability to diagnose OMM after dermoscopy was higher than that of clinical diagnosis alone (Table 3). Hence, dermoscopy improves the ability to predict the presence of OMMs.

According to the literature, the dermoscopic pattern most associated with basal hyperpigmentation (histological criterion of OMM), at least in the vermilion border, is the line pattern. Therefore, we only considered this dermoscopic feature for statistical analysis (Kaugars et al., 1993; Lin et al., 2009).

Our results showed that the dermoscopic finding of a line pattern (parallel, hyphal, or fish-scale like pattern) in symmetrical lesions further improves the diagnostic ability of dermoscopy in OMM, with 73.68% sensitivity, 87.1 % specificity, 77.78% positive predictive value, 84.38 % negative predictive value, 5.71 positive likelihood ratio, and 0.30 negative likelihood ratio (Table 4). This observation applies to OMMs at different oral sites, so that the dermoscopic patterns traditionally associated with OMM on the vermilion border or on the lip are also present in OMMs at other oral sites.

As explained above, it seems that the absence of a line pattern as well as the presence of a structureless pattern in keratinized mucosa, such as the gingiva, does not allow dermoscopic detection of OMMs in these localizations**.**

The diagnostic ability of dermoscopy to distinguish different types of oral pigmented lesions must be confirmed in further studies on a larger number of cases. Nevertheless, the usefulness of dermoscopy in diagnosing OMM, allowing visualization of the distinctive features of OMM that differentiate it from other similar pigmented lesions, is increasingly recognized. Given the benign nature of OMM, it is important to differentiate it from other lesions such as nevi and melanoma, which require entirely different management and follow-up.

Although there are studies on the use of dermoscopy in labial pigmented lesions, this is the first case report to evaluate the usefulness of dermoscopy in diagnosing OMMs at different oral sites, such as the cheek mucosa, gingiva, tongue and palate.

There are limitations to our study that must be pointed out. Firstly, dermoscopic diagnoses were established by consensus, but inter-observer agreement was not calculated. In addition, the study sample included too few nevi and melanomas to statistically analyze the usefulness of dermoscopy in differentiating these two large groups of lesions, i.e. OMMs, which follow a benign course, compared to nevi and melanomas, which are potentially malignant or malignant lesions.

Dermoscopy may play a role in improving noninvasive diagnosis of pigmented oral lesions, including lesions involving the lips and those involving non-keratinized oral mucosa. OMMs have well defined dermoscopic features and follow a benign clinical course. Dermoscopy would seem to be a useful tool to reduce the number of unnecessary biopsies in cases of OMMs. Further studies on larger number of cases are necessary to establish the usefulness of dermoscopy in diagnosing oral pigmented lesions. Until then, all lesions suspicious for malignancy must be biopsied for histological examination.

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Conflict of Interest

None

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