

## Unraveling oral psoriasis and its relationship with geographic tongue: A literature review

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### Abstract

Differentiating between oral psoriasis and geographic tongue is difficult and controversial because some patients with geographic tongue do not necessarily have psoriasis. Furthermore, the number of clinical studies, reporting histopathological and genetic evidence for the definitive diagnosis of oral psoriasis, is limited. The aim of this literature review was to obtain data for supporting the diagnosis of oral psoriasis with particular emphasis on the relationship between psoriasis and geographic tongue. Based on the current data, it can be concluded that geographic tongue is the most common oral lesion in psoriasis, and histopathological, immunohistochemical, and genetic similarities have been observed between the two diseases. This review also emphasizes the importance of conducting oral examinations in patients with psoriasis and skin examinations in patients with geographic tongue.

**Key words:** Psoriasis; Geographic tongue; Oral psoriasis; Benign migratory glossitis

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**Core tip:** The occurrence of oral lesions in psoriasis is rare; however, some authors consider geographic tongue as an oral manifestation of psoriasis. Furthermore, the number of clinical studies, providing histopathological and genetic evidence for the definitive diagnosis of oral psoriasis, is limited. The aim of this literature review was to investigate the current data on oral psoriasis with an emphasis on the relationship between psoriasis and geographic tongue.

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## INTRODUCTION

Psoriasis is a chronic, inflammatory, cutaneous-articular disease that affects 1%-3% of the world's population<sup>[1,2]</sup>. The occurrence of oral lesions in psoriasis is rare, and the relationship between these lesions and the disease is controversial because of a limited number of cases with definitive histopathological diagnosis<sup>[3-7]</sup>. Schultz first reported oral lesions in psoriasis in 1898; he presented three cases of psoriasis on the buccal mucosa<sup>[8]</sup>. Subsequently, Oppenheim provided evidence of oral psoriasis in 1903 when he confirmed a clinical diagnosis by histopathology<sup>[9]</sup>. There is substantial variability in the location and presentation of these lesions, and they are often described as plates or white patches, ulcers, pustules, papules, and erythematous lesions<sup>[8,10-17]</sup>. In general, oral lesions in psoriasis can be divided into the following two categories: the first category includes true psoriatic lesions (confirmed by biopsy) accompanied by a parallel clinical course of skin lesions<sup>[3,18,19]</sup> and the second category, which includes majority of oral findings in psoriasis, contains non-specific lesions, including fissured tongue and geographic tongue<sup>[3,4,7,18-20]</sup>. Patients with psoriasis frequently exhibit geographic tongue, showing clinical, microscopic, and genetic similarities between the two diseases. However, the condition still does not have a well-defined etiology<sup>[21-24]</sup>. The diagnosis of geographic tongue as oral psoriasis is controversial and difficult as some patients with geographic tongue do not suffer from psoriasis<sup>[3]</sup>. Additionally, the number of clinical studies, providing histopathological and genetic evidence on a plausible definitive diagnosis of oral psoriasis is limited<sup>[3,18,22]</sup>. Considering the importance of obtaining accurate data, the aim of this literature review was to assess the current data on oral psoriasis with particular emphasis on the relationship between the disease and geographic tongue.

## LITERATURE RESEARCH

A systematic literature search was conducted using PubMed and the Cochrane Library. The search terms used were "geographic tongue", "oral psoriasis", "psoriasis", and "benign migratory glossitis". In total, 65 relevant studies were included in the review.

## ORAL MANIFESTATIONS OF PSORIASIS

Although psoriasis affects up to 3% of the world's population, there are a limited number of studies that focus on involvement of the oral mucosa<sup>[1,5]</sup>.

Psoriatic lesions have mostly been observed in the jugal mucosa, labial mucosa, skin of the lips (vermilion),

hard and soft palate, floor of the mouth, gums, and tongue. The presentation of these lesions is highly variable, and they have been described as striae, white plaques, grayish white spots, white scales, mottled erythema, brown plaques, ulcers, pustules, papules, and atrophic lesions (Table 1)<sup>[8,10-17]</sup>. In 1933, Usher examined 100 patients with cutaneous psoriasis and found that the oral mucosa was affected in two of them. Years later, Pisanty and Ship<sup>[10]</sup> (1970) described a case of a male patient who exhibited an asymptomatic white plaque in the upper and lower lips for a duration of 2 mo. The patient had a personal and family history of psoriasis. Using histopathological analysis, the authors confirmed a diagnosis of oral psoriasis.

DeGregori *et al.*<sup>[25]</sup> described a 53-year-old psoriasis patient with a family history of the disease and diffused erythema on the gingiva and tongue, symptoms that were histopathologically compatible with oral psoriasis. The authors demonstrated that up to the date of publication of their study, only 15 cases of oral psoriasis had been reported, and only two of them showed involvement of the gingival tissue.

Salmon *et al.*<sup>[9]</sup> reported a case of psoriasis with oral involvement where the patient reported pain and itching in the lips and tongue. The tongue and lips exhibited irregular ulcers with erythematous borders, and a diagnosis of oral psoriasis was confirmed by histopathology.

White *et al.*<sup>[12]</sup> described a case of a 43-year-old patient with psoriasis and erythematous lesions in the attached gingiva, labial mucosa, and soft palate, whereas Cataldo *et al.*<sup>[26]</sup> described a case of a 47-year-old patient with white and raised lesions on their tongue and lips.

Hietanen *et al.*<sup>[21]</sup> evaluated the oral mucosa of 200 patients with psoriasis, most of whom presented with disseminated skin psoriasis. Amongst these, fissured tongue was present in 9% of the patients, geographic tongue was observed in 1%, and angular cheilitis in 3%. Biopsies were performed in 20 patients, four of which had outcomes that were consistent with psoriasis.

Hubler<sup>[27]</sup> reported five cases from three families who presented with generalized pustular psoriasis and tongue injuries. The author concluded that geographic tongue was an oral manifestation of generalized pustular psoriasis and that the two diseases were polygenic and episodic, had identical clinical histopathology, and manifested due to the influence of external factors.

Sklavounou *et al.*<sup>[28]</sup> reported a case where intraoral examination revealed white lesions with erythematous areas that were slightly raised, well circumscribed, and located on the dorsum of the tongue. Lesions similar to geographic tongue were also observed on the lateral edge of the tongue. Although no skin disorder was diagnosed until the evaluation, the daughter was a carrier of psoriasis. A biopsy and HLA typing were performed, and the results of the microscopic analysis and the presence of B13 antigen confirmed a diagnosis of oral psoriasis.

Younai *et al.*<sup>[29]</sup> reported an unusual case of oral lesions with the characteristics of psoriasis. The intraoral

**Table 1 Oral psoriasis - case reports**

| Ref.                                      | Age (yr) | Sex (M/W) | Affected areas                    | Clinical aspects   | Histopathological diagnosis | Cutaneous psoriasis |
|---|----------|-----------|-----------------------------------|--|-----------------------------|---------------------|
| Pisanty <i>et al</i> <sup>[10]</sup>      | 47       | Man       | Labial mucosa                     | White plaques  | Yes                         | Yes                 |
| DeGregori <i>et al</i> <sup>[25]</sup>    | 53       | Man       | Tongue gingiva                    | Diffuse erythema   | Yes                         | Yes                 |
| Salmon <i>et al</i> <sup>[9]</sup>        | 45       | Woman     | Tongue labial mucosa              | Erythematous ulcers  | Yes                         | Yes                 |
| White <i>et al</i> <sup>[12]</sup>        | 43       | Woman     | Gingiva labial mucosa soft palate | Erythematous spot  | Yes                         | Yes                 |
| Cataldo <i>et al</i> <sup>[26]</sup>      | 47       | Woman     | Tongue lip                        | White plaques  | Yes                         | Yes                 |
| Sklavounou <i>et al</i> <sup>[28]</sup>   | 42       | Woman     | Tongue                            | White plaque with erythematous areas                         | Yes                         | No <sup>1</sup>     |
| Younai <i>et al</i> <sup>[29]</sup>       | 65       | Woman     | Tongue lip                        | Multiple pustules within the atrophic and erythematous areas | Yes                         | No                  |
| Rozell <i>et al</i> <sup>[30]</sup>       | 18       | Man       | Gingiva                           | Erythematous lesions   | Yes                         | No <sup>1</sup>     |
| Brice <i>et al</i> <sup>[14]</sup>        | 77       | Man       | Tongue, palate and gingiva        | Erythematous lesions   | Yes                         | Yes                 |
|   | 51       | Man       | Labial mucosa and gingiva         | Erythematous plaques with white border                       |                             |                     |
| Ariyawardana <i>et al</i> <sup>[31]</sup> | 11       | Woman     | Buccal mucosa                     | Erythematous plaque  | Yes                         | Yes                 |
| Binmadi <i>et al</i> <sup>[15]</sup>      | 72       | Man       | Tongue                            | Ulcers associated with fissured tongue                       | Yes                         | Yes                 |
| Reis <i>et al</i> <sup>[32]</sup>         | 35       | Woman     | Gingiva palate                    | Erythematous patches   | Yes                         | No                  |
| Mattsson <i>et al</i> <sup>[33]</sup>     | 52       | Woman     | Buccal mucosa and gingiva         | Diffuse patchy erythema                                      | Yes                         | Yes                 |
|   | 40       | Man       | palate                            | red areas  |                             |                     |

<sup>1</sup>Patient with familiar history of psoriasis.

examination revealed geographic and fissured tongue, as well as an injury on the upper lip that was covered by a crust which could be easily removed by scraping to reveal a surface with minimal bleeding and white dots. No skin lesions were observed in the extra-oral examination. Lip biopsies were performed and the histopathological results were suggestive of psoriasis.

Rozell *et al*<sup>[30]</sup> showed that the presence of skin lesions was not necessary for the manifestation of oral psoriasis in some cases. For example, an 18-year-old male who was studied for 12 years showed no clinical signs of cutaneous psoriasis during this period, although he exhibited erythematous lesions in the gums. An initial biopsy performed when he was 6 years old yielded classic histopathologic results of psoriasis. A second biopsy performed 12 years later gave the same result. His family history was positive for psoriasis, but none of the family members with dermal psoriasis presented any oral manifestations.

Brice *et al*<sup>[14]</sup> reported two cases with an initial diagnosis of cutaneous psoriasis who exhibited injuries in the attached gingiva. Histopathological examination revealed signs that were compatible with psoriasiform mucositis. Although rare, oral involvement of psoriasis may occur and the correct diagnosis depends on clinical and histopathological evaluation.

Ariyawardana *et al*<sup>[31]</sup> reported a case of intraoral psoriatic psoriasis in an 11-year-old child with red lesions in the jugal mucosa, and psoriasis was histopathologically confirmed in this case.

Binmadi *et al*<sup>[15]</sup> described a case of a psoriasis patient presenting with painful ulcers and fissured tongue for

5 wk. Histopathological examination revealed evidence supporting a diagnosis of psoriasis. In this study, the authors emphasized the importance of an oral examination in patients with psoriasis.

Yesudian *et al*<sup>[5]</sup> concluded that oral lesions are rare, with evidence found in fewer than 100 publications in the literature. They also suggested that it is unclear whether oral psoriasis is a distinct entity, or if, indeed, it exists at all.

Reis *et al*<sup>[32]</sup> reported a case of a non-psoriatic patient with diffuse erythematous taint on their gums and palate. A histopathological examination of the lesions revealed a diagnosis of psoriasis.

Mattsson *et al*<sup>[33]</sup> described two cases of lesions in the gums and jugal mucosa with psoriasiform histopathological characteristics, which clinically presented as erythema and serpiginous white areas, respectively. These patients reported a history of cutaneous psoriasis.

In 1993, Gonzaga *et al*<sup>[34]</sup> concluded that the prevalence of oral lesions in patients with psoriasis would be much greater if a rigorous intraoral examination was carried out. Similarly, Picciani *et al*<sup>[4]</sup> studied the prevalence of oral lesions in 203 psoriatic patients and found a high frequency of nonspecific oral lesions, thereby demonstrating the relationship between geographic tongue/fissured tongue and psoriasis.

Despite the aforementioned reports of lesions where clinical and histopathological examinations were compatible with oral psoriasis, the most common oral manifestations include nonspecific lesions such as geographic tongue and fissured tongue. Therefore, additional studies are required in order to define geographic tongue as a true oral lesion



Figure 1 Clinical aspects of geographic tongue (black arrow) and fissured tongue (white arrow).

of psoriasis<sup>[4,35]</sup>.

## ASSOCIATION OF GEOGRAPHIC TONGUE AND/OR FISSURED TONGUE WITH PSORIASIS

### Clinical aspects

Several authors suggest an association between psoriasis and geographic tongue or fissured tongue (Figure 1)<sup>[4,7,18,19,22,36]</sup>. Approximately 10% of patients with psoriasis present with geographic tongue<sup>[4]</sup>, and it is more commonly associated with the pustular form of the disease<sup>[37]</sup>.

Fissured tongue is the oral condition most commonly associated with geographic tongue, and the prevalence of the condition is increased in patients with psoriasis. Although most injuries in psoriasis are transient, some lesions can have a more permanent course. Therefore, it is possible that geographic tongue is a transient expression of oral psoriasis, while fissured tongue is a delayed and more permanent expression of the disease. However, a common genetic marker for the three conditions is yet to be found<sup>[38]</sup>.

Previous studies have demonstrated that the prevalence of fissured tongue ranges from 9.8% to 47.5%, whereas that of geographic tongue ranges from 5.6% to 18.1%<sup>[4,7,19,20,24,36,37]</sup>.

Geographic tongue, also known as benign migratory glossitis, was first described by Reiter in 1831. Although this condition has no defined etiology, it has a chronic profile with inflammatory and immune-mediated elements. It affects approximately 0.6%–4.8% of the world's population, and occurs most commonly in children and women<sup>[39–41]</sup>. It is clinically characterized by erythematous lesions (due to loss of filiform papilla) with whitish irregular edges, particularly on the dorsum and side edges of the tongue. The white border consists of filiform papilla on regeneration and a mixture of keratin and neutrophils. The lesions tend to change location, pattern, and size over time due to epithelial peeling at one location along with simultaneous proliferation elsewhere. There are periods of exacerbation as well as remission, the latter being asymptomatic and

not requiring treatment. Some patients complain of pain or burning, particularly during intake of spicy or acidic foods. Diagnosis of geographic tongue is based on patient history and a physical examination. However, histopathology may be necessary in unusual cases<sup>[41–44]</sup>.

Very rarely, other sides of the tongue may be affected, and this is known as geographic stomatitis or benign migratory erythema<sup>[45,46]</sup>.

Gonzaga *et al.*<sup>[47]</sup> examined the association between alcohol, tobacco, and stress in 129 patients with psoriasis, 399 patients with geographic tongue, and 5472 healthy individuals. Their results showed high levels of alcohol consumption in psoriatic patients and a strong relationship between psoriasis and geographic tongue and psychosomatic factors. They concluded that the interactions between environmental factors and psoriasis differed from those that occur with geographic tongue, and they suggested that these differences accounted for the different manifestations of the two diseases. However, they considered both conditions to be part of the same disease.

Daneshpazhooh *et al.*<sup>[37]</sup> conducted a case-control study, studying oral lesions in 200 psoriasis patients; These patients were divided into the following two groups: patients with psoriasis ( $n = 87$ , 43.5%) and the control group ( $n = 39$ , 19.5%). Fissured tongue was more frequently seen in the psoriatic group ( $n = 66$ , 33%) than the control group ( $n = 19$ , 9.5%). Geographic tongue was observed in 28 cases (14%) from the psoriatic group and 12 cases (6%) in the control group.

Zargari<sup>[36]</sup> conducted a prospective study examining the prevalence of lesions on the tongue of patients with psoriasis. The author observed that 47 patients (15%) had tongue lesions, 25 (8%) had fissured tongue, and 17 (6%) had geographic tongue (of which 7% of patients had early psoriasis and 1% with late psoriasis). The author concluded that the incidence of geographic tongue in early psoriasis was an indicator of disease severity.

Hernández-Pérez *et al.*<sup>[24]</sup> examined 80 patients with psoriasis and 127 healthy individuals and found that the number of patients with fissured tongue was more in patients with psoriasis (47%) than that in the control group (20%). Geographic tongue was present in 12% and 5% of patients in the psoriasis and control groups, respectively. The authors concluded that these lesions may be a predecessor of psoriasis or a marker of severity.

Picciani *et al.*<sup>[4]</sup> also reported that the prevalence of geographic tongue was at its highest in early psoriasis, whereas the prevalence of fissured tongue was highest in late psoriasis.

Singh *et al.*<sup>[7]</sup> evaluated 600 patients with psoriasis and concluded that prevalence of geographic tongue is increased in these patients and is related to the severity of the disease.

Picciani *et al.*<sup>[48]</sup> also examined the relationship between disease severity and the presence of geographic tongue in 284 patients with psoriasis through the PASI. They



found that severe psoriasis occurred in 25% of patients without geographic tongue and in 58% of patients with this oral lesion. The authors concluded that geographic tongue could be considered a marker for the severity of psoriasis.

Gonzaga *et al.*<sup>[49]</sup> conducted a study with 118 psoriasis carriers and 88 patients with benign migratory glossitis, and their results suggested that this lesion is a preceding manifestation of the cutaneous condition. They also identified the similarity between the fundamental lesions and symptoms of these diseases. In this tongue lesion, the erythematous lesions correspond to dermal peeling and, similar to psoriasis, follow a chronic course presenting periods of remission and exacerbation<sup>[49]</sup>. The chewing and speech processes, which are constant trauma factors in the tongue that could correspond to the Koebner phenomenon, may stimulate the emergence of geographic tongue. The authors concluded that the prevalence of oral lesions of psoriasis may be much higher than currently reported because, in general, patients are not subjected to a thorough oral examination<sup>[49]</sup>.

### Histopathological aspects

For several authors, the clinical and histopathological similarities between psoriasis and geographic tongue support the theory that the latter is an oral manifestation of the former (Figure 2)<sup>[13,17,18,24]</sup>.

The histopathological features of psoriasis include uniform elongation of the rete ridges, dilated blood vessels, thinning of the supra-papillary plate, intermittent parakeratosis, perivascular infiltration of lymphocytes, and the presence of occasional neutrophil aggregates in the epidermis. Histopathological diagnosis is made by comprehensively evaluating these findings<sup>[50]</sup>.

Since the diagnosis of geographic tongue is based on clinical examination, few histopathological studies have been conducted on this condition, and this has hindered the general understanding of the etiopathogeny of the oral lesion and its relationship with psoriasis.

Femiano<sup>[18]</sup> conducted a histopathological comparison of 40 patients with geographic tongue: 20 with psoriasis and 20 without the cutaneous disease. In the psoriasis group, all the fragments showed the histopathological features of psoriasis, while only 80% of the patients in the non-psoriasis group exhibited these characteristics. Thus, the author concluded that geographic tongue is an oral lesion of psoriasis and can exist as a subclinical form of the condition.

Picciani evaluated and compared the histopathological aspects of geographic tongue lesions as well as dermal lesions in patients with and without psoriasis. The study found that most of the classic histopathological features of psoriasis were observed in all cases as parakeratosis, acanthosis, suprapapillary epithelial atrophy, spongiosis, basal layer hyperplasia, crest fusion, exocytosis, and the presence of papillary superficial and inflammatory infiltrate. However, remarkable differences were observed in the peripheral areas of the geographic tongue lesions

in the two groups, with the oral lesions of patients with psoriasis showing hyperplastic, inflammatory, and vascular changes in the periphery. Examination of these peripheral changes could perhaps help distinguish geographic tongue from true oral psoriasis<sup>[51]</sup>.

The importance of angiogenesis in the pathological process of psoriatic lesions is well recognized. The balance between pro- and anti-angiogenic factors regulates the genesis of new blood vessels. Angiogenesis facilitates the disease progress in pathological processes such as tumor growth or chronic inflammation<sup>[52]</sup>. The vascular system is increased due to vasodilation and lengthening of existing vessels and also by the formation of new vessels. These morphological changes are observed even before epithelial hyperplasia of the psoriatic plaques<sup>[52]</sup>. Santos<sup>[53]</sup> qualitatively compared the geographic tongue lesions in patients with and without psoriasis and found that vascular ectasia associated with vascular tortuosity were the major changes associated with psoriasis accompanied by frequent geographic tongue lesions.

The evaluation of these aspects, especially in the peripheral areas of oral lesions, could perhaps help distinguish between geographic tongue and true oral psoriasis<sup>[53]</sup>.

Munro's micro-abscess (neutrophil collections in the corneal layer) is present in over 75% of psoriasis cases, whereas pustule of Kogoj (also a collection of neutrophils, but in the spinous layer) is mainly present in pustular psoriasis cases<sup>[54]</sup>. Picciani<sup>[51]</sup> recently demonstrated a high prevalence of pustules of Kogoj in geographic tongue injuries, and this finding strengthens the theory that geographic tongue represents a pustular manifestation of psoriasis<sup>[37]</sup>. Evaluating oral and cutaneous lesions in patients with pustular psoriasis could help improve the current understanding of this relationship.

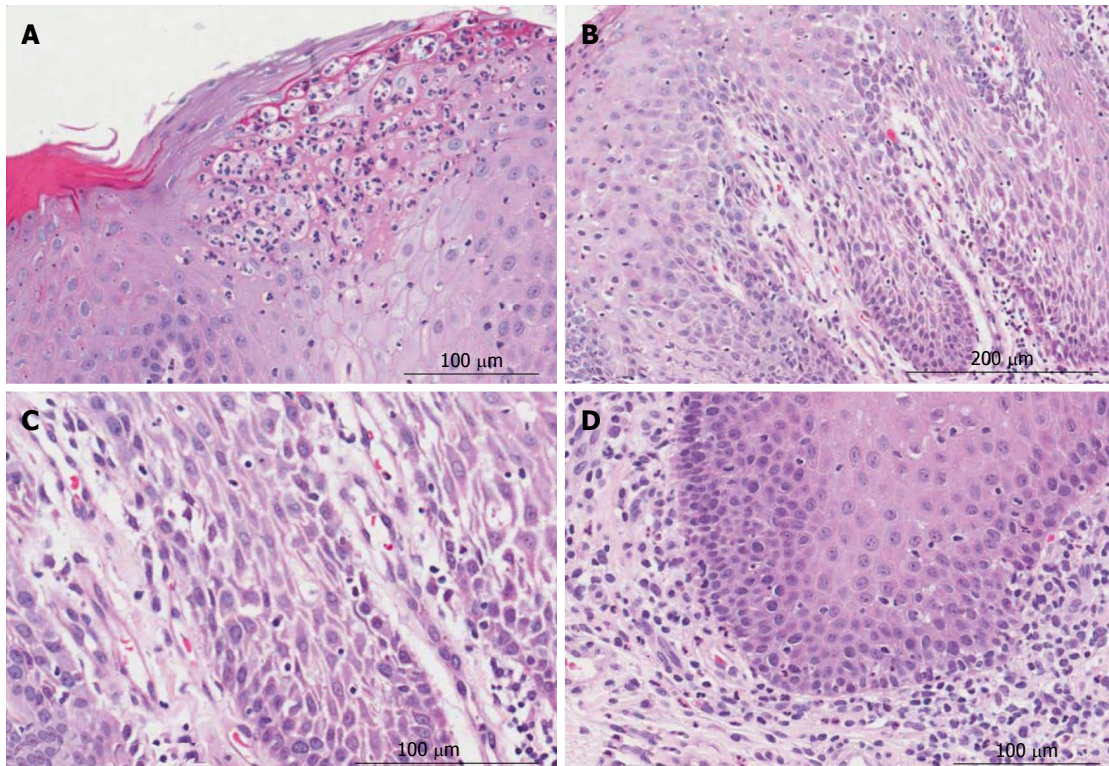
### Immunogenetic similarities

Although there is a paucity of studies examining immunogenetics in geographic tongue, the results of those that exist demonstrate that it is the oral lesion most commonly associated with psoriasis.

The inflammatory infiltrate in psoriasis consists mainly of T cells: CD4<sup>+</sup> in the dermis and CD8<sup>+</sup> in the epidermis. Macrophages are the major antigens observed in psoriatic cells, and the infiltrate in oral psoriatic lesions consists of macrophages and T cells, especially CD4. The few immunohistochemical studies conducted in patients with geographic tongue showed a similar abundance of CD4<sup>+</sup> cells<sup>[13,17,55]</sup>.

An immunohistochemical study of patients with geographic tongue demonstrated the presence of dilated and tortuous capillaries and intense cell proliferation (as evidenced by antibody Ki-67), similar to psoriatic lesions. However, a diagnosis of oral psoriasis was not established because of the absence of cutaneous manifestations<sup>[17]</sup>.

Espelid *et al.*<sup>[55]</sup> conducted an immunohistochemical study in geographic tongue lesions with CD3, CD4, CD8, CD22, and CD11c antibodies and HLA-DR. They demonstrated



**Figure 2 Histopathological aspects of geographic tongue.** A: Histopathologic appearance exhibiting parakeratosis, exocytosis of polymorphonuclear leukocytes, and Munro micro-abscesses; B: Acanthosis, elongation, and fusion of rete ridges; C: Dilated tortuous vessels and espongiosis; D: Basal layer hyperplasia and superficial lymphocytic chronic inflammatory cells (hematoxylin and eosin).

that sub-epithelial inflammatory infiltrate is predominantly composed of CD4<sup>+</sup> T lymphocytes, along with the presence of macrophages.

Ulmansky *et al.*<sup>[13]</sup> showed that CD4<sup>+</sup> T lymphocytes are the main cells in the inflammatory infiltrate from geographic tongue.

Based on this, the authors of the aforementioned studies concluded that there was a connection between geographic tongue and psoriasis<sup>[13,55]</sup>.

Picciani<sup>[51]</sup> investigated the inflammatory responses of patients with geographic tongue who either did or did not have psoriasis (using CD1a, CD3, CD4, CD8, CD20, and CD68 antibodies). They found that the oral and cutaneous lesions had similar qualitative and quantitative standard markings, regardless of the antibody used. Oral and skin lesions of patients with psoriasis revealed a higher prevalence of TCD3, CD4, and CD8 T cells.

With psoriasiform lesions such as geographic tongue causing difficulties in diagnosis, the measurable difference in the amount and pattern of distribution of CD4<sup>+</sup> and CD8<sup>+</sup> cells could aid diagnostic decision making, especially in cases with very similar histopathological features<sup>[56]</sup>.

In a recent study, the concentration of TNF- $\alpha$  and IL-6 in the saliva of patients with geographic tongue and healthy individuals was examined. The results showed an increase of both proteins in patients with geographic tongue, and this finding strengthens the link between this condition and psoriasis<sup>[57]</sup>.

In the past decade, Th1 cytokines such as inter-

feron- $\gamma$  (IFN- $\gamma$ ) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) were considered to play a major role in psoriasis, but recent evidence points toward a greater role of IL-23 and IL-17A in the physio-pathogenesis of psoriasis<sup>[58]</sup>.

Domingos<sup>[59]</sup> (2015) conducted an analysis of the immunopositivity to antibodies directed against IL-6, IL-17, and IL-23 in skin lesions of psoriasis and geographic tongue lesions of patients with and without the cutaneous disease. The three antibodies showed a similar pattern of cytoplasmic labeling, predominantly basal and parabasal, in psoriasis as well as geographic tongue. In the sections where the basal layer hyperplasia was most significant, the markings were longer and more prominent<sup>[59]</sup>.

Cytokeratins are the main structural component of keratinocytes in various groups, and they are expressed during various stages of cellular differentiation<sup>[60,61]</sup>. In psoriasis, the present cytokeratins change in the pattern of expression, and they have been identified by immunohistochemical methods as differentiation markers and hyper-proliferation of keratinocytes<sup>[61]</sup>. Activated keratinocytes express keratins that differ from normal skin, such as CK6, CK16, and CK17. Santos<sup>[53]</sup> also evaluated the correlation between the patterns of distribution of CK6, CK16, and CK17 in skin lesions of psoriasis and in oral lesions of geographic tongue, and the immunohistochemical analysis showed a similar distribution in both lesions. A greater quantitative similarity was observed between geographic tongue lesions and skin lesions in patients with psoriasis, reinforcing the

association between the diseases.

In 1996, the association between psoriasis and geographic tongue was supported by genetic analysis for the first time when a common genetic marker, the human leukocyte antigen (HLA-Cw6) was determined. Thus, these two conditions apparently have a common genetic basis<sup>[22]</sup>. The genetic determinant of geographic tongue pathogenesis is under-reported in the literature, with only five papers correlating this oral lesion to HLA genes which are known to be important for susceptibility to psoriatic disease. Specifically, relationships were demonstrated with the HLA-B13, -B15, -B58, -CW6, -DR5, and -DRW6 alleles<sup>[22,62-65]</sup>.

Picciani *et al.*<sup>[65]</sup> conducted the first study using molecular methodology for HLA typification. They found associations between HLA-B × 57 and psoriasis vulgaris and HLA-B × 58 and geographic tongue. Both alleles are serological divisions of HLA-B17. The findings of this study strengthen the link between the two conditions.

The same authors<sup>[17]</sup> evaluated an isolated case of a patient with a family history of psoriasis and geographic tongue in association with benign migratory erythema and found histopathological, immunohistochemical, and immunogenetic features similar to those observed in dermatitis. However, a diagnosis of oral psoriasis was not completed because of the absence of cutaneous lesions in the patient.

Historically, the difficulty in accepting a diagnosis of geographic tongue as oral psoriasis arose from the fact that some patients with geographic tongue did not have psoriasis<sup>[3]</sup>. However, a detailed family analysis of these patients, including insights into the family history of psoriatic disease, may introduce new genetic markers that show increasingly significant correlations between the two conditions.

## CONCLUSION

Geographic tongue is the most prevalent oral lesion in psoriasis, with histopathological, immunohistochemical, and genetic similarities observed between the diseases. In order to confirm the relationship between geographic tongue and psoriasis, it will be necessary to conduct new studies that combine histopathology and immunogenetic analysis. This review also highlights the importance of conducting oral examinations in patients with psoriasis and skin examinations in patients with geographic tongue.

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