

# Geographic Tongue - Does *Candida* Play a Role in its Pathogenesis

## SUMMARY

**Background/Aim:** Geographic tongue (GT), a benign self-limiting condition (inflammation) is commonly seen in practice. Although quite easy for clinical diagnosis, in clinical practice it is commonly misdiagnosed and treated as *Candida* infection. The main aim of this study was to compare the prevalence of *Candida* spp. on tongue in patients with GT and subjects with clinically healthy oral mucosa. Additional aims were to evaluate subjective symptoms, uncontrolled usage of prescribed or non-prescribed antifungal topical medications and the presence of the cancerphobia or other health concerns in patients with GT. **Material and Methods:** A total of 70 subjects were divided into two groups: Group B- patients with diagnosed Geographic tongue and group A - aged and gender matched controls with clinically health oral mucosa. Anamnestic charts designed for this study included information about symptoms (measured by Visual Analogue Scale), previous knowledge or fear about presence of GT and received therapy for this condition. Detection of *Candida* spp. from tongue was done using sterile cotton swab and Sabouraud dextrose agar. **Results:** At the time of this study, 18 (52.94%) of subjects with GT were aware of having this condition and even 12 of them (66.7%) used topical antifungal drugs prescribed by physician. Also, 66.7% of them experienced fear about the presence of GT at some moment. Detection of *Candida* spp. was similarly distributed in both groups (22.2% in group A and 17.6% in group B). **Conclusions:** Geographic tongue has frequently been treated by topical antifungal drugs. In this study, GT was not associated with presence of *Candida* spp.

**Key words:** *Candida*, Geographic tongue, Glossitis, Benign Migratory

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## Introduction

Geographic tongue (GT), a benign self-limiting condition (inflammation) is commonly seen in practice with the prevalence of 1.8%<sup>1</sup> to 12.7%<sup>2</sup>. Clinically, it is usual described as clearly delineated red areas of filiform papilla depapillation with surrounding yellowish borders which shows regenerating papillae and keratin hyperkeratosis, making a “map-like” appearance of the tongue<sup>3</sup> (Figure 1). Sometimes, only red areas without borders can be seen. Recently, Dafar et al. recommended classification according to the above - mentioned presence or absence of the border. Lesions were defined as ‘active’ if there were well-demarcated by white borders or as

‘passive’ in cases with missing borders, but still having depapillated areas<sup>4</sup>. An interesting characteristic of this condition is the ability of lesions to migrate over time from one location to another, so it has been also called benign migratory glossitis<sup>5</sup>. GT is often asymptomatic. However, in cases where symptoms are present they are usually mild, and include sensitivity to hot or spicy foods or a burning sensation<sup>6</sup>. Also, there are periods of remission when the lesion is resolved without scarring or any other clinical sign of GT. A condition which commonly follows GT is Fissured tongue (FT). It is characterized by the presence of grooves or fissures in the dorsal and lateral surfaces of the tongue, which gradually increases with age<sup>2</sup>.

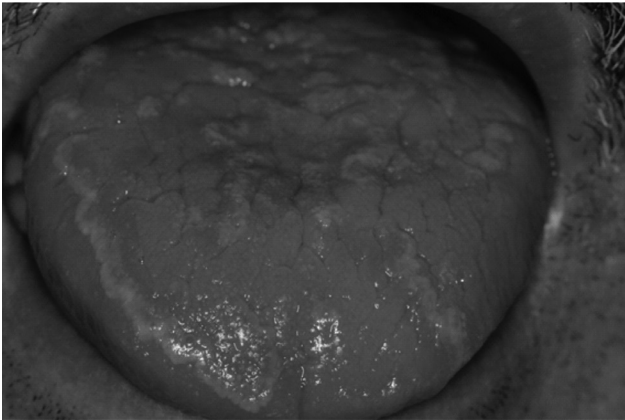


Figure 1. Geographic Tongue, clinical appearance

Given that the etiology GT and FT is unknown, many authors tried to connect it with some systematic conditions and disease, as diabetes mellitus<sup>7</sup>, anemia, allergy<sup>8,9</sup>, celiac disease<sup>10</sup>, anxiety and emotional stress<sup>11</sup> etc. Although GT has been even defined as oral psoriasis<sup>12</sup>, lately some authors found difference in clinical appearance between GT at psoriatic and non-psoriatic subjects<sup>13</sup>.

Some conditions that can be misdiagnosed as GT include oral candidiasis, vitamin deficiency glossitis, leukoplakia, systemic lupus erythematosus, lichen planus, drug reaction, and recurrent aphthous stomatitis<sup>14</sup>. Although there is a clear difference between GT and acute pseudomembranous candidiasis (Figure 2), in everyday clinical practice, GT it is usually misdiagnosed as mentioned yeast infection. This leads to uncontrolled usage of antifungal drugs and subsequently may lead to drug resistance.

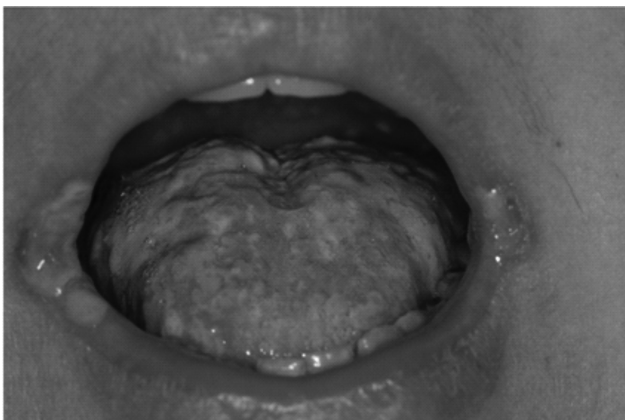


Figure 2. Pseudomembranous candidiasis, clinical appearance

The main aim of this study was to compare the prevalence of *Candida spp.* on tongue in patients with GT and subjects with clinically healthy oral mucosa. Additional aims were to evaluate subjective symptoms, uncontrolled

usage of prescribed or non-prescribed antifungal topical medications and the presence of the cancerophobia or other health concerns in patients with GT.

## Material and Methods

### Study design and subjects' selection

This cross-sectional study included 70 subjects divided into two groups. Study group (B) included 34 patients with clinically diagnosed GT who were referred to the Department of Oral Medicine and Periodontology, School of Dental Medicine, University of Belgrade while the control group (A) consisted of 36 age and sex matched subjects with clinically healthy oral mucosa. Study was approved by the Ethical Committee of the School of Dental Medicine, University of Belgrade (Ethics Approval no. 36/8).

### Anamnesis and clinical examination of subjects

Anamnestic data were obtained by a medical questionnaire designed for this study. This included identification of demographic and social data (gender, age, educational level), medical history, habits (smoking and alcohol consumption) and the presence of symptoms associated with GT/FT. Intensity of burning sensations were measured using 100 millimeter Visual Analogue Scale (VAS). Value „0“ represented no discomfort, while „10“ represented the worst imaginable pain. Patients were instructed to mark a point on the scale. Also, the occurrence of symptoms during food consumption was recorded. Information about the duration and changing pattern of lesions were recorded. Additionally, patients were questioned about the diagnosis (if GT was discovered by themselves or by a doctor), fear they experienced about lesions and about the usage of antifungal drugs as therapy for GT.

Every patient was examined by two dentists, a general dentist and a specialist in the field of Oral Medicine. Hard and soft oral tissues (lips, buccal mucosa, tongue, sublingual area, hard and soft palate) were examined using appropriate dental light and dental mirror. The presence of GT, FT, coated tongue or teeth impressions were recorded. Subjects with any other oral mucosal disorders were excluded from the study.

### Sample collection and cultivation

Swab samples were collected if patients did not use oral antiseptic or antifungal drugs for three months. Dorsal surfaces of the tongue were swabbed for ten times. Swab cultures were straightaway inoculated on Sabouraud dextrose agar (SDA) (Oxoid, Basingstoke, UK) at 25°C for 48 h. Presence of *Candida spp.* were recorded by two microbiologists, blinded for any subjects' data.

### Statistical data

Data were analyzed using SPSS 18.0 software package for Windows (SPSS inc., Chicago, USA). Descriptive data were presented as Mean  $\pm$  SD or the percentage for discrete measures. Non-parametric data were analyzed using the Mann-Whitney U test, while categorical variables were compared using the Chi Square Test ( $\chi^2$ ). Differences were considered significant when p-value was  $< 0.05$

## Results

Demographic data showed that groups were matched by age and gender (Table 1).

Table 1. Demographic data in control (A) and Geographic tongue (B) groups

	Groups		P value
	Control group- A	GT group- B	
Male/Female; N(%)	14/22 (38.9/61.1)	12/22 (35.3/64.7)	*1.00
Age ( $\bar{x} \pm SD$ )	38.78 $\pm$ 18.23	37.76 $\pm$ 18.57	†0.782

GT- Geographic tongue; N- Number of subjects;  $\bar{x}$ - arithmetic mean; SD-standard deviation; \*Chi Square test; †Mann-Whitney U Test

Pain and burning sensations were measured by VAS. The mean values for these sensations in study group were 0.35 $\pm$ 1.45 (range: 0-6) and 1.94 $\pm$ 1.88 (range: 0-6) respectively. Even 26 (76.5%) of GT patients experienced burning sensations while consumption nuts, spicy or hot food.

At the time of this study, 18 (52.94%) of subjects with GT were aware of having this condition. Almost half of them, 8 (44.4%) noticed lesions by themselves, and even 12 of them (66.7%) used topical antifungal drugs. Also, 12 (66.7%) of them experienced fear about the presence of GT at some moment. Only 14 (41.2%) reported a changing pattern of GT.

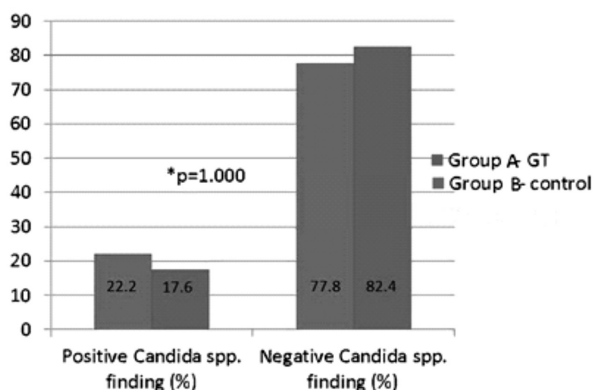


Figure 3. Frequency of *Candida* spp. detection on dorsal surface of tongue

GT- Geographic tongue ;\*Chi Square test

None of the GT patients had coated tongue. FT was present in 22 (64.7%) and teeth impressions in 12 (35.3%) of the subjects.

Statistical analysis of the frequency of *Candida* spp. isolation showed that it was similarly distributed in both groups (Figure 3).

## Discussion

Although the differential diagnosis of GT include several diseases/conditions such as oral candidiasis, leukoplakia, vitamin deficiency glossitis, lichen planus, systemic lupus erythematosus, drug reaction etc.<sup>14</sup>, our everyday clinical experience showed that GT has been most commonly misdiagnosed only as *Candida* infections. In acute pseudomembranous candidiasis, white to whitish-yellow creamy confluent plaques are present, but these plaques, unlike the yellowish borders of GT can be easily removed, leaving an underlying erythematous and occasionally bleeding surface<sup>14</sup>. Additionally, this form of acute candida infection is associated with disturbed immunity- diabetes, pregnancy, usage of antibiotics or corticosteroids, hematological patients etc.<sup>15</sup>, while GT can be seen in otherwise healthy persons. On the other hand, acute erythematous candidiasis is a relatively rare manifestation of candida infections. If located on tongue, it manifests as a painful localized depapillated area on the dorsum of the tongue. It is usually seen together with angular cheilitis. This form of candidiasis is almost always associated with usage of wide spectrum antibiotics or HIV infections<sup>15</sup>.

Although there is a clear difference in clinical appearance of GT and mentioned infections and there is relatively easy way to exclude candida infection (by smear and microbiological finding), we frequently see patients with GT misdiagnosed as yeast infection. Consequently, these subjects use antifungal topical drugs for a long period, some of them for months or even years. Since there is growing resistance to antifungal drugs, predominantly of non-albicans species<sup>16</sup>, there is urgent need to reduce misuse of these agents. According to literature, therapy of GT is reassurance of patient, or in case of more pronounced symptoms usage of topical anesthetics, antihistamines or corticosteroids. Patients referred to our clinic who had been using antifungal drugs for a long period, believe that their lesion has disappeared with the help of mentioned therapy, but usage of antifungal drugs just coincidence with periods of remissions of GT. Although GT is quite common and easy to recognize, our experience shows that even physicians misdiagnose this condition and the wrong therapy is prescribed most often by general practitioners but also by general dentist and otorhinolaryngologists. In our study, 12 of 18 (66.7%) subjects who were aware of having

GT used topical antifungals, prescribed by doctor, what is quite a high percentage. There are few studies dealing with information about previously used treatment for GT, diagnosis or experienced fear. In a study by Espanol et al., only 4 out of 37 subjects sought for therapy, but 2 of them (which mean 50%) got antifungal therapy<sup>17</sup>. Additionally, some of patients with GT experienced fear of GT, believing that it is a precancerous lesion or even cancer. Some of them though they were contagious, especially if they were „diagnosed” as candidiasis, and consequently had lower quality of life. In our study, all subjects who were previously using antifungals (12 of 18), experienced fear of GT at some point. This study showed that only two of 34 (5.8%) reported glossodyniae independent of food consumption, but 76.5% of GT subjects experienced soreness with acidic food and drink, which is similar to another study<sup>17</sup>. Mean VAS score for GT subjects in this study was  $1.94 \pm 1.88$ , which is lower than results of a similar study conducted also in Serbia<sup>18</sup>. This could be explained by the fact that there were 14 out of 34 GT subjects without any symptoms (value „0” at VAS scale), but in the mentioned study only 1 out of 28 subjects were without symptoms<sup>18</sup>. On the other hand, Dudko et al. found that almost 2/3 of subject with GT did not experience any spontaneous burning symptoms<sup>19</sup>.

According to our clinical experience, the main goals of the study was to compare the prevalence of *Candida* spp. in subjects with clinically healthy oral mucosa and with GT. Detection of *Candida* spp. by swabbing in both groups were similar. These results may serve as proof that GT is not always connected to *Candida* infection. *Candida* spp. from oral mucosa can be isolated in about 50% of healthy persons without clinical signs of infection (*Candida* carriage)<sup>20</sup>, and in about 40% from dorsal surface of the tongue of healthy subjects with GT<sup>19</sup>. Among our participants it was isolated only in 20%. Such a low frequency may be explained by a relatively small number of subjects and sampling only from one oral site—the dorsum of tongue. Also, it is noteworthy that *Candida* carriage does not mean infection *per se*, so isolation of *Candida* spp. on tongue of subjects without clinical signs and symptoms of candidiasis does not require antimicrobial therapy. Anyhow, it is important to explain to subjects that it is possible to experience candidiasis at some point, especially if they are immunocompromised. It is interesting that there is a study which found that burning sensations were significantly more frequent in GT patients with fungi on the tongue<sup>19</sup>, but without explanation. The mentioned study did not describe the surface of atrophic areas and duration of lesions, so these symptoms may be related to clinical characteristics of GT more than the presence of yeasts. Also, it is important to underline that dorsal surface of tongue forms niche. In these niches, mechanical retention of bacteria is enabled by the papillae and additionally risk for microorganisms to be washed away by the saliva is reduced. In papillar

atrophy during GT, normal lingual niche are lost, which leads to change of the normal tongue ecology and, as a direct consequence, the immune system is induced to initiate inflammation<sup>21</sup>. Sometimes, these atrophic areas may serve as predilection sites for *Candida* overgrowth. Dafar et al.<sup>22</sup> using DNA sequencing proved that microbiota of GT is complex, and this condition is connected with dysbiosis. They did not connect GT with any pathological microorganism nor defined it as infection.

## Conclusions

Using ours and results of previous studies it can be assumed that Geographic tongue is not directly connected with candidiasis or *Candida* carriage, so it does not need antifungal medication. Also, if there are clinical signs and symptoms of candidiasis present at Geographic tongue subjects, they probably may be consequence of atrophy during GT, but not the cause of GT. Also, there is urgent need for education of practitioners to define and treat GT, with aim to avoid unnecessary fear for patients and therapy.

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