



Assessment of Oral Leukoplakia Extension using Artificial intelligence: A Prognostic Experience

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INTRODUCTION

Oral leukoplakia is one of the most common oral potentially malignant disorder (OPMD). According to the grading system proposed by Van der Waal et al. (1), the clinical assessment of leukoplakia currently includes the evaluation of surface texture, margins, and extension along the major axis. However, several studies have highlighted that lesion extension, in particular, represents an important prognostic factor. This suggests that clinicians may perform additional non-invasive analyses of clinically visible leukoplakia by capturing images with a smartphone camera. The aim of this study is to propose the use of artificial intelligence for the clinical evaluation of Oral leukoplakia extension, which could serve as a prognostic factor in routine clinical follow-up.

METHODS

We recruited 15 patients presenting with clinical evidence of white lesions diagnosed as leukoplakia. For each patient, a Williams periodontal probe was positioned adjacent to the lesion to serve as a reference scale. The lesions were then stained with Lugol's iodine to enhance their contours, and images were captured using a smartphone camera. These images were analyzed with ChatGPT, an artificial intelligence-based software. The lesion margins were delineated using this software, and the lesion area was calculated in square millimeters, based on the scale provided by the probe in the image. In addition, the maximum diameter of each lesion was measured. Following the calculation of lesion area, grading and staging were determined according to Van der Waal's classification.

RESULTS

Table 1 presents the results for the 15 lesions evaluated. The patients had a mean age of 53.33 ± 14.58 years, with a male-to-female ratio of 3:2. The leukoplakias exhibited a mean extension of 106.05 ± 83.78 mm..

Patient	Gender	Age (yrs)	Smoker	Alcohol	Lesion site	Lesion area (mm ²)	Months	Dysplasia
1	M	50	yes	yes	Hard palate	201.49	10	no
2	F	80	yes	no	Lower alveolar mucosa	249.67	14	yes
3	M	63	no	no	Lower gingiva	12.89	12	no
4	M	35	yes	yes	Upper gingiva	71.23	9	no
5	M	41	no	yes	Hard palate	209.01	13	no
6	F	45	yes	yes	Upper gingiva	67.88	24	yes
7	M	70	yes	no	Ventral tongue surface	20.01	6	no
8	F	68	yes	yes	Floor of the mouth	55.76	3	no
9	F	42	yes	no	Soft palate	35.31	7	no
10	M	45	yes	yes	Right cheek mucosa	114.97	12	no
11	M	37	yes	yes	Lower gingiva	234.68	5	no
12	F	73	yes	yes	Floor of the mouth	103.66	3	no
13	M	38	yes	no	Left edge of the tongue	35.67	20	yes
14	M	55	no	no	Upper gingiva	158.22	4	no
15	F	58	yes	yes	Left edge of the tongue	20.33	16	no
M:F = 3:2		53.33 ± 14.58	80% yes	60% yes	Gingiva = 33.33%, tongue = 20%, floor of the mouth = 13.33%, right cheek mucosa = 6.67%, palate = 20%, lower alveolar mucosa = 6.67%.	106.05 ± 83.78	10.53 ± 6.24	20% yes

Table 1. The table presents the results obtained from the study of the 15 evaluated lesions.

Figure 1. Lingual leukoplakia stained with Lugol's solution (a) and subsequently contoured using AI (b).

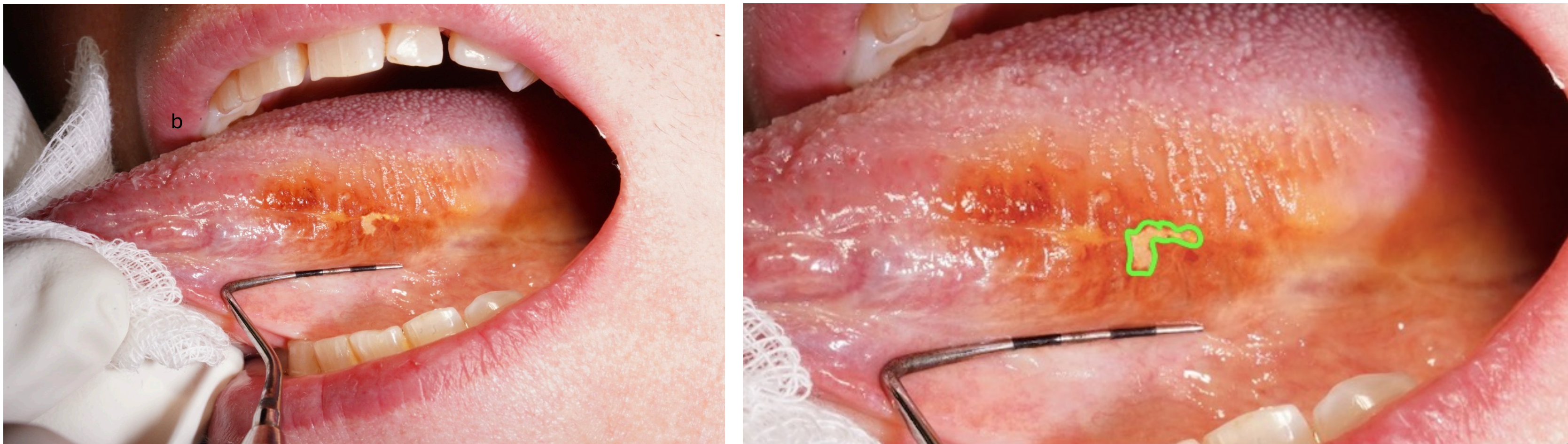
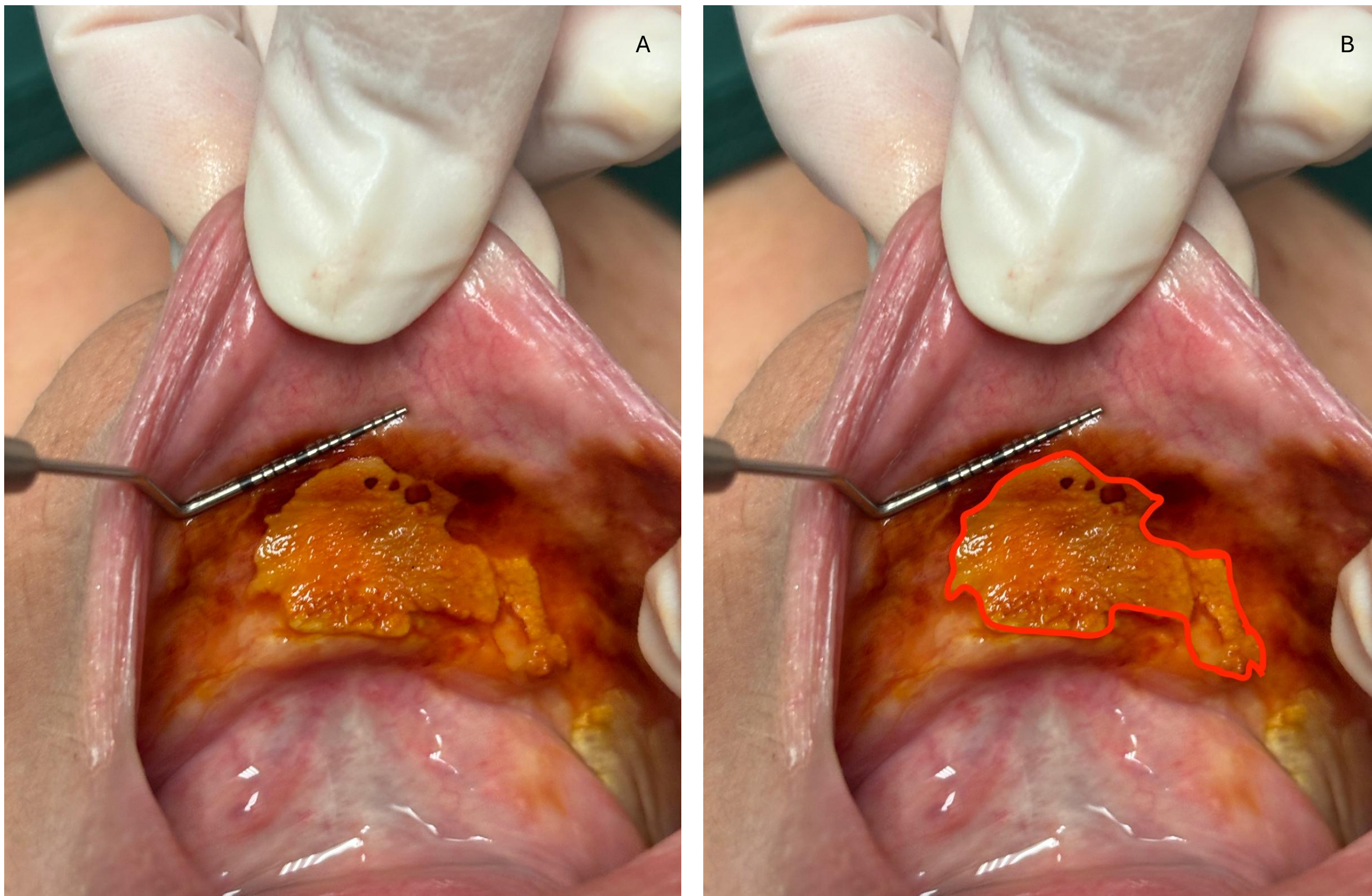


Figure 2. Extensive Gingival Leukoplakia of the Inferior Vestibular Fornix stained with Lugol's solution (a) and subsequently contoured using AI (b).



CONCLUSIONS

Our study demonstrated that the extent of leukoplakia is an important prognostic factor and suggests that clinicians can perform additional non-invasive analyses of clinically visible leukoplakia by capturing images with a smartphone camera and analyzing them with the aid of artificial intelligence. Longitudinal recording of lesion area may facilitate follow-up during therapy and contribute to the monitoring of potentially malignant disorders. In the future, the proposed methodology may be applied to the monitoring of leukoplakic lesions and could serve as a tool for the automatic recognition and classification of such lesions.

REFERENCES

1. Van der Waal I, Schepman KP, van der Meij EH. A modified classification and staging system for oral leukoplakia. *Oral Oncol.* 2000 May;36(3):264-6. doi: 10.1016/s13688375(99)00-092-5. PMID: 10793328.
2. Di Stasio D, Romano A, Russo D, Fiori F, Laino L, Caponio VCA, Troiano G, Muzio LL, Serpico R, Lucchese A. Photodynamic therapy using topical toluidine blue for the treatment of oral leukoplakia: A prospective case series. *Photodiagnosis Photodyn Ther.* 2020 Sep;31:101888. doi: 10.1016/j.pdpdt.2020.101888. Epub 2020 Jun 25. PMID: 32593778.