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Research Article

Association Between Sublingual Varices and Hypertension: A Cross-Sectional Study

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Abstract

Background: Sublingual varices are dilated and tortuous veins located on the ventral surface of the tongue. Their etiology is unknown, but several risk factors have been proposed, including hypertension. ***Objective***: To evaluate the association between sublingual varices and hypertension. ***Methods***: Patients were classified according to blood pressure measurements into three groups: normal, Grade 1 hypertension, and Grade 2 hypertension. Hypertension status was further categorized as controlled or uncontrolled. Sublingual varices were clinically assessed, and their morphological features were described. The presence of venous dilation in other sites was also recorded. ***Results***: Sublingual varices were identified in 58.4% of participants. Increasing age and the presence of hypertension were significant predictors of sublingual varices. Hypertensive patients were 2.7 times more likely to present with sublingual varices compared with normotensive individuals. Patients with uncontrolled hypertension showed the highest prevalence (79.5%; p=0.001). Although a higher prevalence was observed in patients with Grade 1 and Grade 2 hypertension, these differences were not statistically significant. Two morphological patterns of sublingual varices were observed: linear branching pattern (63.6%) and papular pattern (36.4%). Fifteen percent of patients had venous dilation in the sublingual caruncle area. ***Conclusions***: The presence of sublingual varices may reflect vascular alterations associated with elevated blood pressure and could serve as a visible clinical marker for hypertension.

Keywords: Hypertension; Oral varix; Sublingual varices; Sublingual caruncle; Sublingual varicosities.

العلاقة بين دوالي تحت اللسان و ارتفاع ضغط الدم: دراسة مقطعية

الخلاصة

الخلفية: الدوالي تحت اللسان أوردة متوسعة ومتعرجة على السطح البطني للسان. سبب حدوثها غير معروف، وتم اقتراح عدة عوامل خطورة محتملة، من بينها ارتفاع ضغط الدم. **الهدف**: تقييم العلاقة بين دوالي تحت اللسان وارتفاع ضغط الدم. **الطرائق**: تم تصنيف المرضى وفقًا لقياسات ضغط الدم إلى ثلاث مجموعات: ضغط دم طبيعي، ارتفاع ضغط الدم من الدرجة الأولى ومن الدرجة الثانية. وتم تصنيف حالة ارتفاع ضغط الدم إلى مسيطر أو غير مسيطر عليه. وقد تم تقييم الدوالي تحت اللسان سريريًا، ووصف خصائصها المورفولوجية. كما تم تسجيل اذا وجد توسع وريدي في مواقع أخرى. **النتائج**: وجدت الدوالي تحت اللسان لدى 58.4٪ من المشاركين. وكان زيادة العمر ووجود ارتفاع ضغط الدم من العوامل المتنبئة الهامة لحدوث الدوالي تحت اللسان. كان مرضى ارتفاع ضغط الدم أكثر عرضة بمرتين وسبعة أعشار لوجود الدوالي تحت اللسان مقارنة بالأشخاص ذوي الضغط الطبيعي. أظهر مرضى ارتفاع ضغط الدم غير المسيطر عليه أعلى نسبة انتشار 79.5٪ P=0.001 وعلى الرغم من ملاحظة ارتفاع الانتشار لدى مرضى الدرجة الأولى والثانية من ارتفاع ضغط الدم، إلا أن هذه الفروقات لم تكن ذات دلالة إحصائية. تم رصد نمطين مورفولوجيين للدوالي تحت اللسان: النمط الخطي المتفرع (63.6٪) والنمط الحليمي (36.4٪). كما لوحظ توسع وريدي في منطقة فتحة الغدة اللعابية تحت اللسان لدى 15٪ من المرضى. **الاستنتاجات**: ترتبط الدوالي تحت اللسان بشكل كبير بالعمر وارتفاع ضغط الدم و قد تعكس تغييرات وعائية مرتبطة بزيادة ضغط الدم، وقد تمثل علامة سريرية مرئية لارتفاع ضغط الدم.

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INTRODUCTION

Sublingual varices (SV) are dilated and tortuous veins located on the ventral surface of the tongue. Clinically, they appear as bluish or dark red dilations of the ranine veins [1]. Normally, the maximum width of the sublingual veins and collateral vessels does not exceed 2.7 mm; values greater than this threshold are classified as dilated [2]. Sublingual varices are asymptomatic, discovered incidentally during routine dental examination and relatively common in older individuals [3]. Oral varices most commonly affect the tongue, though involvements of the lips and buccal mucosa have also been reported [4]. While the etiology of sublingual varices is not fully elucidated, age-related weakening of the perivascular connective tissue and elastic fiber degeneration leading to vessel wall thinning have been proposed as key contributing factors [5]. Several studies have investigated the relationship between sublingual varices and possible etiological risk factors, including smoking, denture wearing, cardiovascular diseases, diabetes, and vitamin intake [6]. Among these factors, hypertension has received the greatest attention [7]. Hypertension is defined by systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg. According to the World Health Organization Global Report in 2023, hypertension affects approximately 33% of adults aged 30–79 worldwide. Despite its high prevalence, a substantial proportion of affected individuals remain undiagnosed or inadequately treated [8]. This emphasizes the necessity of improved strategies for

early identification and referral. Dental settings may provide an invaluable opportunity for the detection of systemic conditions such as hypertension and the referral of individuals who may be unaware [9]. In this context, the presence of sublingual varices has been proposed as a potential clinical indicator associated with hypertension [10]; however, existing evidence remains inconsistent, with conflicting prevalence rates and varying diagnostic criteria, and the influence of hypertension severity and control status has not been adequately clarified. Therefore, the present study aimed to evaluate the association between sublingual varices and hypertension. Secondary objectives included assessing the relationship between SV prevalence and hypertension control status and blood pressure grade, as well as describing the morphological characteristics of SV and their localization.

METHODS

Study design and participants

This cross-sectional study recruited patients aged ≥40 years who visited the Prosthodontic Clinic at the School of Dentistry between October 1, 2024, and May 1, 2025. Consecutive patients were invited to participate, and informed consent was obtained from all participants. Demographic information, including age, sex, and smoking history, as well as medical history (including prior diagnoses of hypertension and other systemic conditions and current medications), was collected.

Inclusion criteria

Patients aged ≥ 40 years and patients who attended the clinic and consented to participate in the study.

Exclusion criteria

The presence of lesions on the ventral surface of the tongue or the floor of the mouth that prevented visualization. The presence of tongue vascular malformations or hemangiomas. Patients with an unknown history of hypertension: If a patient exhibited elevated blood pressure readings during measurement but reported no prior history of hypertension, they would be referred to a physician for diagnostic confirmation. Patients who did not follow up with a physician would be excluded from the study.

Smoking status

During history taking, patients were classified as smokers if they were current and daily users of cigarettes, shisha, pipes, or any other form of tobacco.

Evaluation and diagnosis

Sublingual varices (SV) were assessed following the diagnostic features described by Lazos et al. (2020) [12]. Lesions were identified based on the presence of prominent, dilated ranine veins; multiple main trunks; dilated collateral branches; increased ramification of branches; or papule-like rounded dilations (caviar lesions). Patients were instructed to elevate the tongue without contacting the palate (to avoid compression or engorgement of the ranine veins) and to move it laterally to both sides. The intraoral examination was performed using a dental mirror and included inspection of the ventral and lateral surfaces of the tongue, as well as the floor of the mouth, including the sublingual caruncle area and other oral sites (buccal mucosa, palate, and labial mucosa). After examination, participants were noted as either having no visible sublingual varices (Figure 1A–B) or exhibiting visible varices.

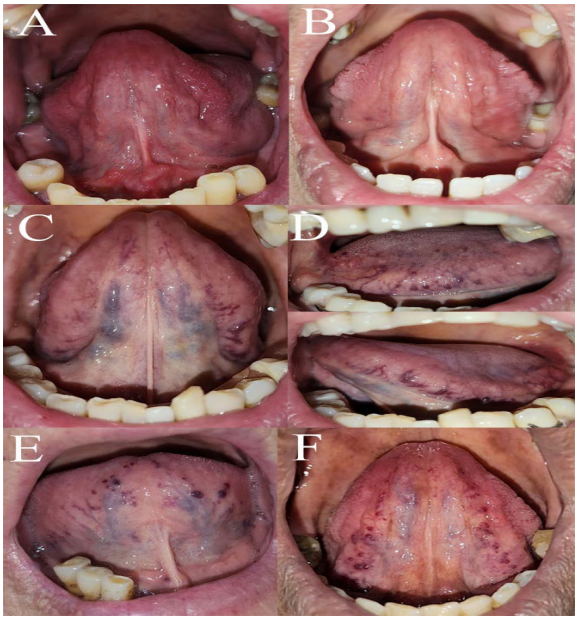

Figure 1: (**A** and **B**) Two patients with no visible sublingual varices at both the ventral surface of the tongue and sublingual caruncle. **(C)**: Linear branches pattern. Ventral surface of the tongue with dilated main trunk of the ranine vein on both sides. **(D)**: Same patient as (**C**) Upper photo showing further ramifications (branches) on the lateral view along with small papules. Lower photo showing prominent dilated branches on the other side **(E** and **F)**: Papular pattern in two patients. appears as round, papule-like dilations accompanied by dilation of the main sublingual vein and collateral vessels.

Among participants with visible sublingual varices, lesions were described based on their appearance. To ensure internal validity and minimize observer bias, the assessment of sublingual varices was performed prior to the measurement of blood pressure. Digital photographs of the tongue were taken for case documentation. Clinical examinations were performed by a single examiner, a specialized dentist in the field of oral pathology. The examiner underwent training and standardization using validated case photographs obtained from textbooks and previous studies to ensure consistent application of the diagnosis criteria. Following the data collection period, all recorded photographs were reviewed to ensure consistency in the identification of sublingual varices and adherence to the diagnostic criteria. However, no formal intra-examiner reliability analysis was conducted.

Blood pressure measurement and hypertension classification

Blood pressure was measured using an electronic blood pressure monitor (Jumper, model: JPD-HA300) with the patient seated upright after a rest period of at least five minutes. Blood pressure readings were classified into three categories according to the 2018 guidelines of the European Society of Cardiology and the European Society of Hypertension [11]. For statistical analysis, normal and high-normal categories were combined: 1) Normal: 120–129/80–84 mmHg; High Normal: 130–139/85–89 mmHg; 2) Hypertension grade 1: 140–159/90–99 mmHg; and 3) Hypertension grade 2: 160–179/100–109 mmHg. Individuals without a prior diagnosis of hypertension but with elevated blood pressure readings during the clinic visit were referred to a physician for confirmation. Participants were categorized into three groups based on blood pressure and prior hypertension history: 1) Healthy (normotensive) group: Individuals with blood pressure <140/90 mmHg and no prior history of hypertension or use of antihypertensive medications; 2) Controlled hypertension group: Patients with a prior diagnosis of hypertension who were on antihypertensive therapy and had blood pressure less than 140/90 mmHg at the time of measurement; and 3) Uncontrolled hypertension group: Patients with blood pressure ≥140/90 mmHg.

Ethical considerations

This study was approved by the Ethics Committee of the university (Reference No. ISU.10.1.24) on 30.6.2024. The reporting of this study is in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and in line with the Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. Both written and verbal informed consent was obtained from all patients prior to enrolling in this study and taking photographs.

Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Continuous variables were presented as means, standard deviations, and ranges, while categorical variables were summarized as frequencies and percentages. The Chi-square test and logistic regression analysis were used to assess associations between variables. A p-value of less than 0.05 was considered statistically significant. A binary logistic regression analysis was performed to identify independent predictors of sublingual varices. Variables included in the model were age, hypertension status, sex, and smoking history, selected based on prior literature and clinical relevance. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to quantify the association between each predictor and the presence of sublingual varices.

RESULTS

A total of 118 patients were invited to participate in the study; two declined, and three were excluded. 113 patients were included, with a mean age of 56.1 ± 9.6 years; 54.9% were male. Thirty-three percent were current smokers. Overall, 72 patients (63.7%) were classified as hypertensive. Among hypertensive patients, 61.1% had uncontrolled hypertension (36.1% grade 1, and 25.0% grade 2), while 38.9% were controlled with medication. No patients met criteria for Grade 3 hypertension. Sublingual varices were observed in n=66 (58.4%) patients as shown in Table 1.

Table 1: Distribution of study sample by patients' characteristics

Variable	n(%)
Age (year)	
40 – 49	26(23)
50 - 59	48(42.5)
60 – 69	26(23)
≥ 70	13(11.5)
Sex	
Male	62(54.9)
Female	51(45.1)
Smoking status	
Current smoker	38(33.6)
Nonsmoker	75(66.4)
History of Hypertension	
Yes	72(63.7)
No	41(36.28)
Control Status of Hypertension (n= 113)	
Uncontrolled hypertension	44(38.9)
Controlled by medication	28(24.8)
Non-hypertensive patients	41(36.3)
BP in patients with a history of hypertension (n=72)	
Normal (Controlled)	28(38.9)
Grade 1 hypertension	26(36.1)
Grade 2 hypertension	18(25)
Total	72(100)
Sublingual Varices	
Yes	66(58.4)
No	47(41.6)
Sublingual morphological features (n=66)	
Papular pattern	24(36.4)
Linear Branching pattern	42(63.6)
Total	66(100)
Varices in other sites	
Sublingual caruncle	17(15)
None	96(85)

Values are presented as frequency and percentage.

Two distinct morphological patterns were identified on clinical evaluation. The linear branching pattern was characterized by prominent, dilated main veins on the ventral surface of the tongue, with lateral collateral linear branches forming a tree-like configuration (Figure 1C–D). The papular pattern was characterized by multiple rounded dilations on the ventral or lateral tongue surface, resembling caviar; these dilations typically occurred at the terminal portions of linear branches (Figure 1E–F). Overall, 42 patients (63.6%) exhibited the linear branching pattern, while 24 (36.4%) displayed the papular pattern (Table 1). Venous dilation in the sublingual caruncle region was observed in 17 patients (15%) (Table 1). Of these, 16 patients also exhibited sublingual varices on the ventral surface of the tongue (Figure 2A), while one patient showed varices confined to the sublingual caruncle (Figure 2B).

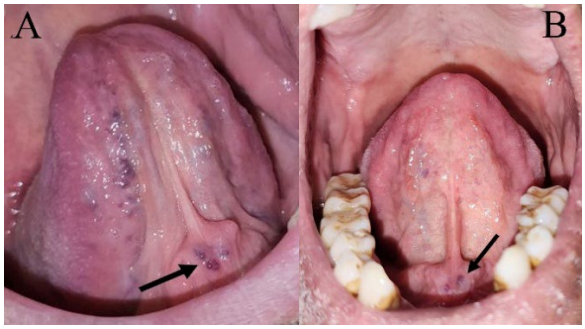

Figure 2: Oral varix in sublingual caruncle area (arrows). Patient with both sublingual varices and sublingual caruncle varices (**A**). Patient with sublingual caruncle varices only (**B**).

Ten cases (58.8%) occurred in patients with hypertension, a proportion comparable to that of the overall study population. The dilations in this area almost always appeared as multiple round blue to red papules. The chi-square test was used to assess associations between patient characteristics and the presence of sublingual varices (Table 2). A significant increase in prevalence was observed with advancing age (p= 0.006), reaching 76.9% among patients aged ≥70 years. There were no significant links between sex or smoking status. Hypertension was significantly associated with the presence of sublingual varices (p= 0.002), with the highest prevalence observed among patients with uncontrolled hypertension (79.5%). Although a higher prevalence was noted in grade 1 and grade 2 hypertension compared with normotensive patients, these differences were not statistically significant.

Table 2: Association between Sublingual varices and certain characteristics using Chi square test

Variable	Sublingual Varices		Total (n=113)	*p*-value
	Yes (n=66)	No (n=47)		
Age (year)				
40 - 49	8(30.8)	18(69.2)	26(23)	0.006
50 - 59	29(60.4)	19(39.6)	48(42.5)	
60 - 69	19(73.1)	7(26.9)	26(23)	
≥ 70	10(76.9)	3(23.1)	13(11.5)	
Sex				
Male	37(59.7)	25(40.3)	62(54.9)	0.762
Female	29(56.9)	22(43.1)	51(45.1)	
Smoking status				
Current smoker	20(52.6)	18(47.4)	38(33.6)	0.375
Nonsmoker	46(61.3)	29(38.7)	75(66.4)	
Hypertension diagnosis				
Yes	50(69.4)	22(30.6)	72(63.7)	0.002
No	16(39)	25(61)	41(36.3)	
Control Status of Hypertension				
Uncontrolled hypertension	35(79.5)	9 (20.5)	44(38.9)	0.001
Controlled by medication	15(53.6)	13(46.4)	28(24.8)	
Non-hypertensive patient	16(39)	25(61)	41(36.3)	
Grades of Hypertension (n= 72)				
Grade 1 hypertension	21(80.8)	5(19.2)	26(36.1)	0.064
Grade 2 hypertension	14(77.8)	4(22.2)	18(25)	
Normal	15(53.6)	13(46.4)	28(38.9)	

Values are presented as frequency and percentage.

Binary logistic regression analysis (Table 3) identified hypertension (OR= 2.68, 95% CI [1.10–6.53], p= 0.03) and age (OR= 1.08, 95% CI [1.02–1.14], p= 0.004) as significant predictors of sublingual varices. Smoking status and sex were not significantly associated. Overall, participants with hypertension were approximately 2.7 times more likely to present with sublingual varices, with the odds increasing by approximately 8% per additional year of age.

Table 3: Logistic regression of sublingual varices for hypertension, smoking, age and sex

Variable	*p*-value	Odds ratio	95% CI (lower-upper)
Hypertension	0.030	2.683	1.102 – 6.531
Smoking	0.374	1.604	0.566 – 4.541
Age	0.004	1.079	1.024 – 1.138
Sex	0.879	0.923	0.330 – 2.58

DISCUSSION

In the present study, sublingual varices were identified in 58.4% of the examined patients. The prevalence reported in the literature varies considerably, ranging from 21.8% to 70%. Specifically, Jamali et al. reported a prevalence of 21.8% [13], Hedström *et al.* 26.5% [5], Accardo *et al*. 28.1% [14], Lazos *et al*. 46% [12], Jafari *et al*. 56.7% [3], and Ahadian *et al*. 70% [15]. The variation in prevalence rates across studies may be ascribed to disparities in the age distribution of study populations, diagnostic criteria, and employed methodologies. A highly significant association was observed between the presence of sublingual varicosities and a diagnosis of hypertension (P < 0.002), as 69.4% of hypertensive patients in this study had sublingual varices. This finding is consistent with previous research [5,12-15] and aligns with two recent meta-analyses [7,16]. The underlying mechanism of this relationship remains unclear. Some researchers suggest that it may be related to circulatory anastomoses in the venous system of the tongue [1], while others attribute it to hemodynamic effects caused by arteriovenous shunts [17]. Elevated arterial blood pressure may be transmitted to the venous circulation, where the higher pressure relative to normal venous levels could lead to venous dilation and morphological alterations in the vein walls [16,18]. In addition, one longitudinal study of eight years reported that 19% of patients developed new sublingual varices. The development of new lesions was found to be associated with advanced age and a higher prevalence of cardiovascular diseases

[19]. Regarding other variables, the prevalence of sublingual varices increased significantly with age ($p< 0.05$). This finding is consistent with most previous studies, which have also reported a positive association between age and the occurrence of sublingual varices [3,5,14,15]. Sublingual varices are believed to be an age-related process that results in weakening of the perivascular connective tissue, thus leading to more blood vessel dilation. However, no significant association was found between the presence of sublingual varices and smoking status. This contrasts with the results of several earlier studies [3,5,13,14,20] as well as with the systematic review and meta-analysis conducted by James *et al*. [7]. This discrepancy may be explained by the fact that most female participants in the present study were non-smokers, as smoking is socially discouraged among women in the region where the study was conducted. Regarding sex, no significant difference in the prevalence of sublingual varices was observed between male and female participants. This finding is consistent with previous studies [13,14] and with the results of the meta-analysis conducted by James *et al*. [7]. This study found a strong link between sublingual varices and high blood pressure. The prevalence of sublingual varices was higher among patients with uncontrolled hypertension (79.5%) compared to those with controlled hypertension (53.6%) and non-hypertensive individuals (39%). This finding aligns with the results reported by Accardo *et al*. (2021), who observed that patients with uncontrolled hypertension are more likely to develop sublingual varices than those with controlled or newly diagnosed hypertension. Such an association may be attributed to the greater extent of vascular damage typically observed in patients with poorly controlled blood pressure, which can lead to increased pressure on the vascular structures in the sublingual area, resulting in the formation of varices [14]. Patients with grade 1 and grade 2 hypertension had a higher rate of sublingual varices (80.8% and 77.8%, respectively) than those with normal or high normal blood pressure (53.6%). However, the difference was non-significant statistically. This result contrasts with the findings of Hedström *et al*., who reported a significant increase in the prevalence of sublingual varices from 21.8% among individuals with normal blood pressure to 30.8% in those with grade 1 and 43.6% in those with grade 2 hypertension [5]. The discrepancy between the two studies may be attributed to differences in hypertension staging methods. In the present study, hypertension staging was determined during a single dental clinic visit; these measurements may not accurately reflect patients' usual blood pressure levels, which could differ when assessed at home or during subsequent visits. This approach represents one of the limitations of the present study, as incorporating follow-up assessments with mean clinic or home blood pressure readings would have allowed for more accurate hypertension staging. Another possible explanation is the relatively small sample size (n= 113), which may have limited the statistical power to detect significant differences between blood pressure categories. The study may have been underpowered to demonstrate statistical significance, despite observing a higher prevalence in hypertensive groups. Future research incorporating larger sample sizes would help clarify the relationship between hypertension grades and sublingual varices. It is well established in the literature that the most common location for oral varices is the ventral and lateral surfaces of the tongue. Regarding the second most frequent site, some researchers have identified the lower lip as the next common location, suggesting a potential association with sun exposure [21]. Others have reported the floor of the mouth, particularly near the openings of the sublingual glands and Wharton's duct, as the second most common site [1]. Less frequently affected areas include the buccal mucosa [22]. Sublingual caruncle was the second most common site within the study sample, with 15% of patients exhibiting venous dilation in this area. Notably, such dilation may represent an extension of sublingual varices, but it can also occur independently in a few cases.

Limitations of the Study

This study has several limitations that should be acknowledged. Examinations were conducted by a single trained examiner, and although standardized diagnostic criteria were applied and all cases reviewed after the data collection period, intra-observer reliability testing was not performed. No independent examiner was involved, which could have strengthened external validation and reduced potential bias. Blood pressure measurements were taken at a single time point without follow-up, which may have affected hypertension staging. Additionally, the sample size was small, and a larger cohort would provide more accurate results. Despite these limitations, the study provides valuable observational data that can inform future research and guide more comprehensive investigations.

Conclusion

Advancing age and hypertension are significantly associated with sublingual varices, which frequently occur in patients with uncontrolled hypertension. These findings suggest that sublingual varices may reflect vascular alterations related to increased blood pressure and could represent a visible clinical marker for hypertension.

Conflict of interests

The author declares no conflict of interest.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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