RNO

REVISTA NAVAL DE ODONTOLOGIA

NAVAL DENTAL JOURNAL

MARINHA DO BRASIL

ANO/YEAR 2025 | VOL 52 | N 1

ISSN PRINT 0102-7506 E-ISSN 1983-7550

RNO

NAVAL DENTAL JOURNAL

Year 2025 - Vol 52 N 1

ISSN (Print): 0102-7506
ISSN (Online): 1983-7550

ODONTOCLÍNICA CENTRAL DA MARINHA
Praça Barão de Ladário s/nº - Centro - 1º Distrito Naval
20.091-000 Rio de Janeiro-RJ, Brazil
https://portaldeperiodicos.marinha.mil.br/index.php/odontoclinica
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SUMMARY

RNO
NAVAL DENTAL JOURNAL
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ORIGINAL ARTICLE

ORAL HEALTH OF PREGNANT WOMEN TREATED IN SÃO PEDRO DA ALDEIA-RJ

SAÚDE BUCAL EM GESTANTES ATENDIDAS NO MUNICÍPIO DE SÃO PEDRO DA ALDEIA-RJ

Debora Granha De Oliveira Barbosa[1], Ésio De Oliveira Vieira[2]

ABSTRACT

Poor dental care during pregnancy may negatively impact pregnant women´s oral health. This study aimed to understand the oral health conditions of pregnant women living in São Pedro da Aldeia, Rio de Janeiro State. In total, 100 pregnant women undergoing prenatal care were included in the Women's, Children's, and Adolescents' Healthcare Program (PAISMCA) study during their gestational period from 14 to 40 weeks, from April to July 2023. Data were collected via clinical dental examinations, semi-structured interviews, and sociodemographic questionnaires. The general Decayed, Missing, and Filled Permanent Teeth (DMFT) index was level 6 (low), 16% of the pregnant women exhibited good gingival health, whereas 84% needed basic and advanced therapy. Despite the oral health condition of the pregnant women evaluated in this study being superior when compared to other studies, the high prevalence of periodontal diseases reflects the need to improve dental and prenatal care in the municipal health network. However, adjustments such as promotion and dissemination of information on dental care for pregnant women, both for dentists and other healthcare professionals, are essential to improve the quality of care provided.

Keywords: Periodontal Diseases, Pregnancy Complications, Infectious, Oral Health, Dental Caries, Prenatal Education.

RESUMO

O acompanhamento odontológico deficiente durante a gestação impacta negativamente a saúde bucal das gestantes. Este estudo teve como objetivo avaliar as condições de saúde bucal das gestantes do município de São Pedro da Aldeia-RJ. Foram incluídas no estudo 100 gestantes em acompanhamento pré-natal no Programa de Atenção à Saúde da Mulher, Criança e Adolescente (PAISMCA) no período gestacional entre 14 e 40 semanas, durante os meses de abril a julho de 2023. Os dados foram coletados mediante aplicação de exame clínico odontológico, entrevista semiestruturada e questionário sociodemográfico. O índice de dentes permanentes cariados, perdidos e obturados (CPOD) médio da população foi 6 (baixo) e 16% das gestantes apresentavam boa saúde gengival, contrapondo 84% que requeriam terapia periodontal básica ou avançada. Embora a condição de saúde bucal das gestantes avaliadas tenha se mostrado superior em comparação a outros estudos, a alta prevalência de doenças periodontais reflete a necessidade de melhoramento do pré-natal odontológico na rede municipal. Medidas como a promoção e divulgação de informações sobre o atendimento odontológico para gestantes, voltadas tanto para cirurgiões-dentistas quanto para outros profissionais de saúde, são essenciais para melhorar a qualidade do cuidado prestado.

Palavras-chave: Doenças Periodontais, Complicações Infecciosas na Gravidez, Saúde bucal, Cárie Dentária, Educação Pré-Natal.

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How to cite this article: Barbosa DGO, Vieira EO. Oral health of pregnant women treated in São Pedro da Aldeia-RJ. Nav Dent J. 2025;52(1):3-8.

Received: 06/18/2024
Accepted: 01/07/2025

DOI: https://doi.org/10.22491/1983-7550-52-1-1

INTRODUCTION

The pregnancy-puerperium period is characterized by a series of physiological and psychosocial changes, which prepare the woman for pregnancy and childbirth, making continuous support from the family nucleus essential (1-4). Proper dental care during this period is crucial not only for the mother's oral health but also for the baby's healthy development (2). However, emotional, environmental, and cultural factors influence the adherence of pregnant and postpartum women to preventive and dental care practices, such as breastfeeding, prenatal dental consultation, tongue-tie assessment, and oral health maintenance, creating significant challenges for this population (2,3,5-10).

Several popular beliefs exist regarding the oral health of pregnant women: increased pain sensitivity, weakening of teeth, and removal of calcium from the mother's teeth by the fetus (9,10,12). When it comes to myths related to dental care, it is common for pregnant women to believe in the impossibility of using dental anesthesia for procedures, performing X-rays, and other types of dental treatment, which may lead to harmful consequences for baby's health (9,11,12).

Another factor that may contribute to the spread of false information about the oral health of this group is the insufficient training of the dentist in the clinical management of pregnant women: Ignorance or fear regarding the approach to this population can lead to the postponement of procedures or even to interventions that are not very effective (4,13-15). Interdisciplinarity in care and the inclusion of dental follow-up in prenatal care can increase the comprehensiveness of patient care (16-18). Considering the reality of pregnant women and the epidemiological situation of the general population is essential for planning and executing health actions. This study aimed to evaluate the oral health conditions of pregnant women in the municipality of São Pedro da Aldeia, Rio de Janeiro (RJ) State, Brazil.

MATERIAL AND METHODS

This study was approved by the Research Ethics Committee of the Marcílio Dias Naval Hospital, under Opinion No. 5,689,972 and Certificate of Presentation of Ethical Appreciation (CAAE): No. 62842022.4.0000.5256.

This is a cross-sectional study. From April to June 2023, an epidemiological survey was conducted in the municipality of São Pedro da Aldeia-RJ among pregnant women registered in the Women's, Children's, and Adolescents' Healthcare Program (PAISMCA).

Pregnant women in the gestational period between 14 and 40 weeks were included in the study, since the second and third trimesters are considered safer stages of pregnancy. Pregnant women not interested in participating in the research (n=3) were excluded from the sample. Pregnant women who presented with immunodeficiency (n=0) or physical or mental incapacity (n=0) should also be excluded, as in these cases, gingivitis resulting from hormonal changes due to pregnancy could be confused with those from immunological changes or self-care incapacity.

Data were collected through interviews, and oral assessments of the pregnant women was conducted at PAISMCA by directly invitation to those present at the prenatal consultation. Clinical examinations of teeth and gingiva were conducted by a single examiner (DGOB). The Community Periodontal Index of Treatment Needs (CPITN) and the Decayed, Missing, and Filled Teeth (DMFT) index were used.

Each pregnant woman was examined once, and, through a semi-structured interview, they were able to share their own oral health, in addition to responding to preformulated questions.

Sterile periodontal probes and plain mouth mirrors were used for dental and gingival evaluation. For the assessment of the CPITN index, the following criteria were used: TN0: no pockets and no bleeding, with no need for treatment; TN1: bleeding in one or more sites, with an indication only for oral hygiene instruction. TN2: the presence of bleeding and pocket of 4 to 6mm, with an indication for scaling and root planing; TN3: the presence of bleeding and pocket greater than 6mm, requiring advanced periodontal therapy.

The presence of bleeding and the probing depth, which consists of measuring from the gingival margin to the bottom of the sulcus or pocket, were considered for the analysis. For standardization, inaccurate measurements were rounded up; for example, a 7.5mm pocket was recorded as 8.0mm. The total number of decayed, missing, and filled permanent teeth was estimated and divided by the number of individuals examined to obtain the clinical caries index.

Data was tabulated in Excel©. For the sample estimation, the MedCalc® v.22 program was used. Considering a 95% reliability and a 5% margin of error, a minimum sample size of 72 pregnant women was estimated to be necessary for inclusion in the study. Based on this estimation and the application of exclusion criteria, a total of 100 pregnant women were selected to be interviewed. The association between fear of seeking dental care and gingival

health was assessed using the chi-square test. Statistical decisions were made at the significance level α= 0.05, considered significant when p<0.05.

RESULTS

Among the 100 pregnant women evaluated, 26% (n=26) were aged from 21 to 25 years, primiparas accounted for 31% (n=31), 56% (n=56) had a family income of up to 1 minimum wage, and 41% (n=41) had completed elementary education (Table 1).

Table 1 - Demographic data of pregnant women participating in the study

Characteristic	N	%
Age in the current pregnancy		
Up to 20 years	13	13
21 to 25	26	26
26 to 30	24	24
31 to 35	24	24
Above 36	13	13
Current pregnancy number		
1	31	31
2	29	29
3	12	12
4 or more	28	28
Family income (minimum wage)		
Up to 1	56	56
<1 and > 3	38	38
≥ 3 and < 4	5	5
4 or more	1	1
Schooling		
Completed Elementary School	41	41
Completed High School	41	41
Completed Technical School	9	9
Completed Higher Education	9	9

Regarding basic services in the homes of the interviewees, all participants (n=100) had electricity, 97% (n=97) had garbage collection, 96% (n=96) had piped water, and 68% (n=68) had access to sewage services for waste disposal (Table 2).

Table 2 - Housing conditions of the pregnant women in the study

Basic service	N	%
Electricity	100	100
Garbage collection	97	97
Piped water	96	96
Sewage	68	68

Table 3 shows the dental health habits and care of the pregnant women in the study.

Table 3 - Oral health habits and care among pregnant women in the study

Oral health habits and care	N	%
Had a dental consultation during current prenatal care	38	38
Number of dental consultations in the last year		
1	21	21
2	14	14
3	15	15
4	8	8
More than 5	10	10
None	32	32
Guidelines on care to prevent cavities	73	73
Guidelines on care to prevent Periodontal Disease	50	50
Daily toothbrushing frequency		
1	2	2
2	29	29
3	39	39
4	30	30
Only before sleeping	0	0
Dental consultations in the last 5 years		
1	8	8
2	11	11
3	15	15
4	17	17
More than 5	40	40
None	9	9
Guidelines on care to prevent Periodontal Disease	50	50
Sugar consumption throughout the day		
Very sweet	50	50
Never	3	3
Rarely	47	47
Other issues		
Afraid of the dentist	25	25
Would schedule an appointment today	81	81
Dental consultation during current prenatal care	35	35
Dental consultation in previous prenatal care	30	30

Table 4 shows the oral health complaints that motivated the last dental consultation performed by the pregnant woman.

Table 4 - Oral health complaints, reasons for the most recent consultation, and treatments performed by the pregnant women

Variable	N	%
Complaints about oral health	**39**	**39**
Complaints reported (open questions)	Absolute numbers	%
Dental caries	7	17.9
Dental pain	7	17.9
Missing teeth	3	7.7
Refused to answer due to pregnancy	7	17.9
Gingival bleeding	7	17.9
Gingival pain	5	12.8
Could not schedule an appointment	2	5.1
Third molar pain	2	5.1
Difficulty opening the mouth	1	2.6
Procedures at the last appointment	**58**	**58**
Procedures performed in the last appointment	Absolute numbers	%
Dental filling	33	56.9
Dental prophylaxis	9	15.5
Endodontic treatment	5	8.6
Dental evaluation	5	8.6
Tooth extraction	4	6.9
No oral health complaints	**61**	**61**

Regarding periodontal disease, Table 5 details the index that addresses the need for periodontal treatment according to the CPITN index.

Table 6 describes the DMFT indices of pregnant women.

Table 5 - CPITN-based oral examination of pregnant women in the study regarding the need for periodontal treatment

Index	N	%
TN 0	16	16
TN 1	22	22
TN 2	58	58
TN 3	4	4
Presence of bleeding with need for treatment	76	76
Need for dental treatment	39	39

Table 6 - Overall and age-group DMFT

General	6.05
By age group:	
Up to 19 years old (teenagers)	3.1
20 to 35 years (young adults)	5.7
Above 36 years (old adults)	9.6

DISCUSSION

The literature indicates that, on average, only 18% of pregnant women seek dental treatment. The main reasons for appointments include pain (10.5%), tooth extraction (3.7%), dental restoration (15.7%), and endodontic treatment (3.1%) (19). In our study, we observed a higher prevalence of 42%, with 6% seeking treatment for pain, 4% for extractions, 20% for restorations, and 1% for endodontic treatment. We highlight that these lower percentages may not reflect a lesser need for treatment but rather indicate difficulties in accessing services. Moreover, there are myths and beliefs both on the part of pregnant women and healthcare professionals, who often refuse to attend to them just because they are pregnant.

Regarding the frequency of dental appointments in the last year, 32% of pregnant women did not have any appointments during this period. The interval greater than one year between consultations may explain the higher incidence of pregnant women classified as TN2 and the high percentage of gingival bleeding, indicating the need for periodontal care.

In this study, 35% of pregnant women attended dental appointments during prenatal care, a rate lower than that found by Martinelli et al. (23), who recorded 91.2% follow-up. Moreover, this frequency is even lower than that observed in previous pregnancies, which was only 30%. This low rate can be attributed to a memory bias, as pregnant women may not remember having visited the dentist during their previous pregnancies.

When asked about fear of dental care, 25% (n=25) of pregnant women reported being afraid, which agrees with other studies (15,24,25). This considerable portion can partially justify the low demand for dental treatment during pregnancy. Our results also corroborate the study by Pomini *et al*. (26), indicating that 66.2% of women have at least one taboo or myth about dental care during pregnancy, which negatively impacts treatment adherence. We highlight that the low demand for dental care may also be associated with the refusal of professionals to attend to pregnant women, which was reported in other studies (15,16,25) with rates ranging from 16% to 22.4%. An association was also observed between the frequency of dental visits during prenatal care and fear related to dental care, which may justify the low demand for dental services during pregnancy.

The literature shows that gingivitis and periodontal changes are prevalent during pregnancy (3,15,17). We underline that gingival diseases have a chronic

course, making them barely noticeable over time. This feature may explain the 61% of pregnant women who reported no complaints related to oral health.

Regarding dental caries, the overall mean DMFT of 6.05 was considered low compared to the study by Jeremias *et al*. (27), which obtained a value of 13. When segmenting by age group, a very low DMFT was observed in adolescents, low in young adults, and moderate in older adults. Although pregnancy is not a determining factor for the development of dental caries, the biological and psychosocial conditions of most pregnant women, together with the limited knowledge about oral hygiene techniques, can contribute to the emergence of new carious lesions or worsen existing ones (28, 29). In this context, the fact that half of the studied population reported low consumption of sweets may explain the reduced DMFT. However, the 47% who claimed to rarely consume sweets, and the 3% who never consume them, may represent a false negative since certain habits and typical pregnancy symptoms, such as nausea or dietary restrictions imposed by obstetricians and nutritionists, may lead to a reduction in the consumption of sweets exclusively during the gestational period.

A large portion of the patients (76%) required some type of periodontal treatment, with 22% of the cases classified as preventive (TN1), 58% classified as TN2, and 4% as TN3. We found that 62% of pregnant women needed root planing, scaling, and/or correction of restorative margins. The study by Garbin *et al*. (28) identified similar results, with 66.8% of patients needing preventive care (TN1), 22.3% needing scaling and root planing and/or correction of restorative margins, and 10.9% needing more complex treatments, such as periodontal surgery (TN3).

More than half of the pregnant women evaluated (56%) live with a family income of around one minimum wage, and 41% have only elementary education. This reality of income and schooling level is directly reflected in the sanitary conditions of the residences: 32% did not have access to sewage collection, relying instead on cesspools and soakaways, and 4% did not have piped water, depending on artesian wells for consumption. Despite deficiencies in basic sanitation indicators and the lack of fluoridated water supply for the entire municipality population, the overall DMFT was considered low, indicating a low prevalence of dental caries.

This study presents some limitations: not all pregnant women in the Municipality of São Pedro da Aldeia are served by PAIMSCA. Moreover, as it is a cross-sectional study, it is impossible to establish a cause-and-effect relationship. Memory bias is also a potential limitation, as participants may have had difficulties recalling information about previous pregnancies. Despite these limitations, the study provides important epidemiological data that can inform healthcare guidelines in São Pedro da Aldeia. Therefore, further studies with different designs are needed to identify the underlying conditions hindering access to dental care during pregnancy.

CONCLUSION

Despite the low level of education and family income, the overall DMFT was considered satisfactory from a dental health perspective. However, gingival health requires attention, given the high percentage of pregnant women with gingival bleeding. According to the CPITN index, more than half of the pregnant women needed TN2 treatment, characterized by periodontal pockets of 4 to 6 mm, visible calculus, and plaque retention factors, thus requiring professional scaling. In this context, it is essential that the Municipal government promotes and widely disseminates information about the importance of dental care for pregnant women, including educational actions directed both at municipal network dentists and other health professionals, such as doctors, nurses, and community agents. These initiatives are essential to demystify the belief that dental treatment is unsafe during pregnancy and to spread the culture that this care is safe and necessary.

The authors declare that there is no conflict of interest.

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ORIGINAL ARTICLE

ARE YOUTUBE™ VIDEOS ABOUT PORCELAIN VENEERS USEFUL FOR PATIENT EDUCATION? CONTENT ANALYSIS

OS VÍDEOS DO YOUTUBE™ RELACIONADOS ÀS FACETAS DE PORCELANA SÃO ÚTEIS PARA INFORMAR AO PACIENTE? ANÁLISE DE CONTEÚDO

Aline Jardim Oliveira Vianna[1], Ivo Carlos Corrêa[1]

ABSTRACT

The internet plays a crucial role in disseminating information, with YouTube™ being one of the leading platforms for audiovisual content. However, the lack of quality control can compromise the accuracy of information, especially in the healthcare field. Videos about porcelain veneers have gained prominence in dentistry, but inaccurate information may influence patients' decision-making. This study aimed to assess the reliability and usefulness of the most-watched YouTube™ videos about porcelain veneers. This is a retrospective cross-sectional study based on Portuguese-language videos of up to 20 minutes in length, identified through Google Trends between January 30, 2019, and January 30, 2022. The source, target audience, reliability (DISCERN-adapted criteria), and usefulness (Hassona's method) were analyzed. Two independent researchers evaluated the videos, and discrepancies were resolved by consensus. The significance level was set at 5%. Of the 100 videos analyzed, 68 were included. Most 80.9% were produced by dentists, and 72.1% were intended for lay audiences. Reliability was classified as moderate 64.7%, while usefulness was predominantly low 67.6%. Videos produced by laypersons had higher usefulness (p=0.002), and those targeting lay audiences showed greater reliability (p=0.041) and usefulness (p=0.004). In conclusion, most videos analyzed exhibit moderate reliability but low usefulness, particularly regarding risks and contraindications. Greater rigor is essential in disseminating information about dental procedures on the internet.

Keywords: Social media; Aesthetics; Dental aesthetics; Dental veneers; Dental porcelain.

RESUMO

A internet é fundamental na disseminação de informações, e o YouTube™ destaca-se como uma das principais plataformas de conteúdo audiovisual. No entanto, a falta de controle de qualidade pode comprometer a precisão das informações, especialmente na área da saúde. Vídeos sobre facetas de porcelana têm ganhado destaque na odontologia, mas informações imprecisas podem afetar a decisão dos pacientes. Este estudo teve como objetivo avaliar a confiabilidade e utilidade dos vídeos mais assistidos sobre facetas de porcelana no YouTube™. Trata-se de um estudo transversal retrospectivo, baseado em vídeos em português, com até 20 minutos de duração, identificados via Google Trends entre 30 de janeiro de 2019 e 30 de janeiro de 2022. Foram analisadas fonte, público-alvo, confiabilidade (critério adaptado DISCERN) e utilidade (método de Hassona). Dois pesquisadores independentes avaliaram os vídeos, e divergências foram resolvidas por consenso. O nível de significância adotado foi de 5%. Dos 100 vídeos, 68 foram incluídos. A maioria (80,9%) foi produzida por dentistas, e 72,1% eram destinados a leigos. A confiabilidade foi classificada como média (64,7%), enquanto a utilidade foi considerada baixa (67,6%). Vídeos produzidos por leigos apresentaram maior utilidade (p=0,002), e os voltados ao público leigo mostraram maior confiabilidade (p=0,041) e utilidade (p=0,004). Conclui-se que a maioria dos vídeos apresenta confiabilidade moderada, mas baixa utilidade, especialmente quanto aos riscos e contraindicações. É essencial que haja maior rigor na divulgação de informações sobre procedimentos odontológicos na internet.

Palavras-chave: Mídias sociais; Estética; Estética dentária; Facetas dentárias; Porcelana dentária.

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How to cite this article: Vianna AJO, Corrêa IC. Are YouTube™ videos related to porcelain veneers helpful in patient education? Content analysis. Nav Dent J. 2025;52(1):9-14.

Received: 12/20/2024
Accepted: 03/18/2025

DOI: https://doi.org/10.22491/1983-7550-52-1-2

INTRODUCTION

The Internet plays a crucial role in the dissemination of information, having reached 5.35 billion users in 2024, which corresponds to 66% of the world's population (1). Among digital platforms, YouTube™ stands out as the second most globally accessed network, behind TikTok™ only (1). Despite the ease of access, the lack of strict control over video production can compromise the accuracy of the information disseminated, especially in the health area (2), often used due to the cost of clinical appointments and failures in professional-patient communication (3).

In dentistry, videos on YouTube™ cover a variety of topics, such as dental avulsion (4), dental trauma (5), orthodontic treatment (6,7), Sjögren's syndrome (8), dental implants (9,10), endodontic treatment (11,12) and tooth whitening (13), with most of them presenting low quality in terms of the content covered (10). Recently, aesthetic dental procedures have gained prominence, driven by social media and the use of filters in selfies, which has increased the demand for porcelain veneers. However, videos with patient reports and inaccurate information can have a negative influence on decision-making, promoting the excessive use of veneers as an aesthetic solution without considering more conservative alternatives, such as tooth whitening or composite resin veneers (14,15).

In this context, this study evaluated the most-watched YouTube™ porcelain veneer videos, analyzing reliability and usefulness criteria to understand the type of information disseminated and its suitability for both dentists and patients interested in the procedure.

MATERIAL AND METHODS

This retrospective cross-sectional study used public domain data and did not require approval from the Research Ethics Committee. Videos related to ceramic laminates, also called "porcelain veneers," "dental contact lenses," and "porcelain lenses" were analyzed based on the search expression identified via Google Trends. A YouTube™ search was conducted regarding the subject between January 30, 2019 and January 30, 2022. The search filter used was "Sort by view count," resulting in the 100 most-watched videos (16-20).

The eligibility criteria were adopted in accordance with similar studies (19,21). Twenty-minute videos in Portuguese with content relevant to the topic were included. Videos in other languages, videos lasting more than 20 minutes, and those not directly related to the topic were excluded (22-24).

Video analysis

The videos were evaluated with regard to three aspects:

- **Technical Information:** video source (dental surgeon or layperson) and target audience (professional audience or lay audience).
- **Reliability:** evaluated based on the DISCERN--adapted criteria (25), consisting of six items with binary score, as shown in Figure 1.
- **Usefulness:** analyzed by a scoring system (20), as shown in Figure 2.

Binary evaluation 0 (no) / 1 (yes)
1. Are the objectives clear and were achieved?
2. Is the disclosed information balanced and bias-free?
3. Were additional sources provided for the patient?
4. Does it describe how the treatment is?
5. Does it describe the benefit of treatment?
6. Is it clear there may be more than one possible treatment?
Scoring: 0-2 (slightly reliable) / 3-4 - moderately reliable / 5-6 - very reliable

Figure 1 - DISCERN-adapted reliability criteria.

Evaluation: 0 (no information/ misleading information) / 1 (superficial information) / 2 (proper information)
1. Definition: what are porcelain veneers?
2. Indication
3. Contraindication
4. Procedure risks
5. No reversible treatment / wear
Scoring: 0-3 (slightly useful) / 4-6 (moderately useful) / 7-10 (very useful)

Figure 2 - Usefulness criteria adapted from Hassona et al. (2016).

Calibration of researchers

Two independent researchers analyzed 10 videos at two distinct moments, with a seven-day break between evaluations. The agreement was verified

by the Kappa coefficient, and any differences were resolved by consensus.

Statistical analysis

Data were analyzed using IBM SPSS 22 software and Kappa test for agreement between the two researchers, Kolmogorov-Smirnov test for data normality, Mann-Whitney test for comparisons between groups, and chi-square testing for associations between categorical variables. The significance level was set at 5% (α = 0.05).

RESULTS

Of the 100 most-watched videos, 32 were excluded from the study: one for being in Spanish, six for lasting more than 20 minutes, and 25 for not specifically addressing the proposed theme. Thus, the final sample consisted of 68 videos.

The analysis of the selected videos showed an average duration of 6.10 minutes (0.22–17.65 min) and a total of 27,172,525 views (10.871–8.083,054 views), with an average of 254.31 views/day. Most of the videos, 80.9% (n = 55), were produced by dentists, while 19.1% (n = 13) by laypeople. Regarding the target audience, 27.9% (n = 19) of the videos were for health professionals, and 72.1% (n = 49) for the lay audience.

Analyses of the reliability and usefulness of the videos were performed after the calibration of researchers, with an agreement level higher than 95% (p <0.001). Reliability ranged from 0 to 6 points, and most of the videos (n = 44/64.7%) were classified as moderately reliable, while usefulness ranged from 0 to 10, with most (n = 46/67.6%) classified as slightly useful.

Comparison between reliability and video source did not reveal a significant difference (p = 0.922). However, the videos created by laypeople were classified as being more useful than those produced by dentists (p = 0.002) (Table 1). In addition, the analysis between the target audiences showed significant differences in reliability (p = 0.041) and usefulness (p = 0.004), with higher scores in the videos intended for laypeople (Table 2).

Regarding reliability and video source, 21.8% (n = 12) of dentist videos were classified as slightly reliable, while 30.8% (n = 4) of layperson videos received the same classification (p = 0.227). No dentist video was classified as very useful, while 30.8% (n = 4) of layperson videos were classified as such (p <0.001). Usefulness was also significantly higher in the videos intended for the lay audience (p = 0.012) (Table 1).

Video performance analysis was carried out after the calibration of researchers, with an agreement level higher than 95% (p <0.001). Video analysis based on DISCERN-adapted criteria showed that 95.6% (n = 65) presented clarity and achievement in objectives, but 82% (n = 56) did not offer additional sources to users. Only about half (n = 34) addressed the treatment and its benefits, and 66.2% (n = 45) did not clarify the existence of other treatment options (Table 3).

In the usefulness index, 70.6% (n = 48) of the videos did not explain what porcelain veneers are, 42.6% (n = 29) did not explain their indications, 94.1% (n = 64) omitted contraindications, 85.3% (n = 58) and 83.2% (n = 57) did not describe the risks associated with the procedure, and 35.3% (n = 24) did not mention that the treatment is irreversible (Table 3).

Table 1 - Analysis of reliability and usefulness indexes by video source

	Dentist (n=55/80.9%)		Layperson (n=13/19.1%)		All (n=68/100%)		p
Reliability index							**0.922**
Slightly reliable	12	21.8%	4	30.8%	16	23.5%	
Moderately reliable	38	69.1%	6	46.1%	44	64.7%	
Very reliable	5	9.1%	3	23.1%	8	11.8%	
Usefulness index							**0.002**
Slightly useful	42	76.4%	4	30.8%	46	67.6%	
Moderately useful	13	23.6%	5	38.4%	18	26.5%	
Very useful	0	0%	4	30.8%	4	5.9%	

Table 2 - Analysis of reliability and usefulness indexes by audience

	Professional (n=19/27.9%)		Layperson (n=49/72.1%)		All (n=68/100%)		p
Reliability index							0.041
Slightly reliable	6	31.6%	10	20.4%	16	23.5%	
Moderately reliable	12	63.1%	32	65.3%	44	64.7%	
Very reliable	1	5.3%	7	14.3%	8	11.8%	
Usefulness index							0.004
Slightly useful	18	94.7%	28	57.1%	46	67.6%	
Moderately useful	1	5.3%	17	34.7%	18	26.5%	
Very useful	0	0.0%	4	8.2%	4	5.9%	

Table 3 - Video performance regarding reliability and usefulness

Reliability	0 (No)		1 (Yes)	
1. Are the objectives clear and achieved?	3	4.4%	65	96.6%
2. Is the information balanced and free from bias?	18	26.5%	50	73.5%
3. Are additional sources provided for the patient?	56	82.3%	12	17.6%
4. Does it describe how the treatment is performed?	34/32*	50/47.1%*	34/36*	50.0/52.9%*
5. Does it describe the benefits of the treatment?	34	50.0%	34	50.0%
6. Is it clear that more than one treatment option may be possible?	45	66.2%	23	33.8%
Usefulness	**0 (Absent/misleading)**		**1 (Superficial information)**		**2 (Adequate information)**	
1. Definition: What are porcelain veneers?	48	70.6%	10/11*	14.7/16.2%	10/9*	14.7/13.2%
2. Indication	29	42.6%	14	20.6%	25	36.8%
3. Contraindication	64	94.1%	3	4.4%	1	1.5%
4. Procedure risks	58/57*	85.3/83.2%*	2/3*	2.9/4.4%*	8	11.8%
5. Irreversibility/tooth wear	24	35.3%	10	14.7%	34	50.0%

**Both results were inferred when there was divergence between the researchers.*

DISCUSSION

The Youtube™ platform has been consolidated as an important source of health information, including dentistry. Previous studies have highlighted the great heterogeneity in the quality of available information, especially in relation to aesthetic procedures such as porcelain veneers (4,6,9,26). This study, when analyzing the most-watched videos about the subject, revealed that the majority are intended for a lay audience, highlighting the great demand for information about aesthetic dental treatments. Nevertheless, the analysis also found that many of these videos had incomplete and inaccurate information, with 66% of them not mentioning the existence of therapeutic alternatives, and 35% not warning that the procedure is irreversible.

The literature already discusses the importance of considering less invasive alternatives before opting for irreversible treatments such as porcelain veneers. Haywood and Sword (2021) suggest that whitening treatments should be prioritized before veneers, which may be an invasive and irreversible option. Similarly, Christensen et al. (2006) state that direct compound resin veneers are a more conservative alternative. In the context of the analyzed videos, the absence of information about other treatment options, such as resin veneers, can lead viewers to a distorted view of the available options. In addition, the lack of information about the treatment being irreversible, with 35% of the videos omitting the dental wear required, can result in an inadequate understanding of the risks associated with the procedure.

The analysis of the video origin revealed that 80.9% of the videos were created by dentists; however, surprisingly, the videos produced by laypeople were classified as more useful. This can

be explained by the fact that many videos produced by dentists focus only on technique without providing information about the alternatives or treatment risks. On the other hand, layperson videos tend to explore personal experiences and provide clarification about what veneers are, their indications, contraindications, and the risks involved, which may have contributed to their highest usefulness index score.

Analysis of the video content based on the clarity and range criteria, using the usefulness index, also showed that a large portion of the videos did not address important points about treatment with porcelain veneers. For example, 70.6% of the videos did not define what porcelain veneers are in a proper manner, 42.6% did not explain their indications, and 94.1% omitted information about contraindications. The omission of this crucial information can lead to misinformation among viewers, compromising decision-making about the treatment. This lack of complete and accurate information is a significant concern, as it can directly impact patients' choices of procedures that may not be the most suitable for their conditions.

In addition, the Youtube™ algorithm that determines the order of videos in search results, based on interactions and engagement, can influence the visibility of the most informative videos. Although the study has analyzed the 100 most-watched videos, there is a possibility that high-quality content has not been included due to the metadata-based classification system and user interactions. This reinforces the need to consider the limitations imposed by algorithms in promoting high-quality content.

Finally, the limitations of this study include the fact that the analysis was performed only with YouTube™ videos. With the growth of other platforms such as Instagram and TikTok™, which operate with different algorithms and parameters, it is essential to expand research to these emerging media in order to evaluate the quality of information patients are consuming. The lack of scientific studies on these latest platforms is an important gap that should be addressed in future studies.

CONCLUSION

In conclusion, Youtube™ presents itself as a widely used platform for disseminating information about dental treatments, but with limitations in terms of content quality and reliability. Most of the analyzed videos did not provide essential information, such as treatment alternatives, contraindications, and the risks involved, presenting generally moderate reliability but low utility. These findings highlight the need for greater responsibility on the part of dental professionals and laypeople when sharing health-related information.

The authors have no conflict of interest to declare.

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CASE REPORT

IT LOOKS LIKE, BUT IT IS NOT: ORAL PARACOCCIDIOIDOMYCOSIS AS A DIFFERENTIAL DIAGNOSIS OF ORAL CANCER

PARECE, MAS NÃO É: PARACOCCIDIOIDOMICOSE ORAL COMO DIAGNÓSTICO DIFERENCIAL DO CÂNCER ORAL

Katilene Aparecida dos Santos Leite[1], Renata Tucci[2], Rebeca de Souza Azevedo[2], Juliana de Souza do Nascimento[3]

ABSTRACT

South American blastomycosis, also known as paracoccidioidomycosis, is a systemic mycosis caused by the fungus *Paracoccidioides brasiliensis* that grows in the soil feeding on decomposing organic matter and it is considered the most important fungal infection in Latin America, with Brazil being an endemic center. The infection initially involves the lungs through inhalation of the fungal spores with possible spread to other regions of the body, including the mouth. In the oral cavity, lesions usually manifest with a granular, erythematous, and ulcerated appearance. Other diseases can have similar characteristics, such as squamous cell carcinoma. The objective of this study is to report a clinical case of a patient with paracoccidioidomycosis that mimicked the clinical features of squamous cell carcinoma. A 57-year-old male patient presented with a lesion in the lower labial mucosa region extending to the gingiva and floor of the mouth. The lesion exhibited a moriform, ulcerated appearance with ill-defined borders. The diagnostic hypotheses were paracoccidioidomycosis and squamous cell carcinoma. Histopathological examination showed pseudoepitheliomatous hyperplasia and multinucleated giant cells with *Paracoccidioides brasiliensis* yeasts inside, which is consistent with the definitive diagnosis of paracoccidioidomycosis. It is concluded that paracoccidioidomycosis and squamous cell carcinoma have similar clinical and microscopic characteristics, which may lead to a mistaken clinical diagnosis. Thus, the definitive diagnosis can only be established after confirmation of the presence of the fungus.

Keywords: Paracoccidioidomycosis; Blastomycosis; Squamous cell carcinoma; Oral cancer; Differential diagnosis; Microscopy.

RESUMO

A blastomicose sul-americana, também conhecida como paracoccidioidomicose, é uma micose sistêmica causada pelo fungo *Paracoccidioides brasiliensis,* que cresce no solo, nutrindo-se de restos de matéria orgânica em decomposição. É considerada a infecção fúngica mais importante da América Latina, sendo o Brasil um centro endêmico. A infecção envolve inicialmente os pulmões, por meio da inalação do fungo, com possível disseminação para outras regiões do corpo, incluindo a boca. Clinicamente, na mucosa oral, as lesões geralmente se manifestam com aspecto granular, eritematoso e ulcerado. Outras doenças podem apresentar características semelhantes, como o carcinoma de células escamosas. O objetivo deste trabalho é relatar um caso de paracoccidioidomicose que mimetiza as características do carcinoma de células escamosas. Trata-se de um paciente de 57 anos, do sexo masculino, com lesão na região da mucosa labial inferior, estendendo-se para gengiva e assoalho bucal, e apresentando aspecto clínico moriforme, ulcerado e sem limites precisos. As hipóteses diagnósticas foram de paracoccidioidomicose e de carcinoma de células escamosas orais. O exame histopatológico exibiu epitélio pseudoepiteliomatoso e células gigantes multinucleadas com leveduras de *Paracoccidioides brasiliensis* em seu interior, sendo compatível com o diagnóstico definitivo de paracoccidioidomicose. Conclui-se que o paracoccidioidomicose e o carcinoma de células escamosas apresentam características clínicas e microscópicas semelhantes, o que pode acarretar um diagnóstico clínico equivocado. Dessa forma, o diagnóstico definitivo é feito por meio da confirmação da presença do fungo.

Palavras-chave: Paracoccidioidomicose; Blastomicose; Carcinoma de células escamosas; Câncer bucal; Diagnóstico diferencial; Microscopia.

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How to cite this article: Leite KAS, Tucci R, Azevedo RS, Nascimento JS. It looks like, but it is not: oral paracoccidioidomycosis as a differential diagnosis of oral cancer. Nav Dent J. 2025;52(1):15-20.

Received: 09/26/2024
Accepted: 01/07/2025

DOI: https://doi.org/10.22491/1983-7550-52-1-3

INTRODUCTION

South American blastomycosis, also known as paracoccidioidomycosis (PCM), is a systemic mycosis caused by the dimorphic fungus *Paracoccidioides brasiliensis*. It is estimated that 10 million people in Latin America are infected with PCM, and Brazil is an endemic center of this disease, with a higher concentration in the South, Southeast, and Central-West regions (1). However, due to the lack of disease notification, even though it has recently been included in the National List of Compulsory Notifiable Diseases, the number of PCM cases may be underestimated. Moreover, this condition is considered the third leading cause of death from chronic infectious diseases in the country (2).

People are infected by inhaling the fungus in its yeast form, which is found in the soil. Rural workers or residents of the region can have contact with the fungus directly or indirectly (2). Most PCM cases affect men with chronic tobacco and alcohol use between 30 and 50 years of age, who have poor nutrition and hygiene, as well as socioeconomic vulnerability (3). The lungs are generally the primary site of involvement, with symptoms including cough, dyspnea, and weight loss. Nevertheless, dissemination may occur to various regions of the body, such as lymph nodes, skin, mucous membranes, and adrenal glands (3,4).

In most cases, PCM is diagnosed by the dental surgeon or otolaryngologist, as the head and neck region is an important area of disease manifestation (1). In the oral cavity, lesions usually manifest with a granular, erythematous, and ulcerated appearance. The most affected sites are the lips, buccal mucosa, floor of the mouth, tongue, and pharynx (3). It is important to note that other diseases may have clinical and even microscopic characteristics similar to those of this infection, and differential diagnosis between these conditions is essential. This study aims to report a case of PCM that mimics the characteristics of squamous cell carcinoma (SCC).

CASE REPORT

This research was submitted to and approved by the Research Ethics Committee under CAEE 69783923.0.0000.5578.

A 57-year-old pheoderma Black man attended the School Clinic of Faculdade Independente do Nordeste (Fainor), located in the city of Vitória da Conquista (Bahia), to evaluate an extensive lesion in the lower lip mucosa region. During the anamnesis, he reported being a farmer and a chronic smoker for about 30 years, smoking 20 cigarettes a day. He denied the presence of previous systemic diseases and alcoholism.

During the clinical examination, the presence of a vegetating lesion with granulomatous and ulcerated surface was observed, with hemorrhagic areas, characterized as moriform stomatitis. The lesion stretched throughout the lower lip mucosa, and the same clinical pattern was present in the anterior gingival region and floor of the mouth, without delimited margins (Figure 1a). Hardened and bloody edges (Figure 1b) were observed on palpation. The patient did not report any pain. Based on clinical presentation, two main diagnostic hypotheses were proposed: SCC and PCM.

The area with hardened and irregular edge, along with the ulcerated region, was chosen for incisional biopsy, considering that there would be more morphologically altered cells in connective tissue and in the tissue deployment area. The intraoperative and the postoperative period passed without complications. The patient received a prescription of 500 mg of sodium dipyrone to be taken every six hours for three days, and all postoperative instructions were delivered both verbally and in written form.

The surgical specimen was sent to the Oral Pathology Laboratory of the Nova Friburgo Health Institute at Universidade Federal Fluminense (ISNF/UFF), in the state of Rio de Janeiro. Partial loss of epithelial integrity and pseudoepitheliomatous hyperplasia were observed microscopically in some areas. In connective tissue, a granulomatous appearance was noted, with the presence of epithelioid macrophages and multinucleated giant cells with *Paracoccidioides brasiliensis* inside, which led to the final diagnosis of PCM (Figure 2a and B).

Prescribed treatment was the use of 200mg itraconazole once daily for nine months. However, the patient reported that, on his own, he suspended the use of the medicine after completing six months of treatment and that he no longer had medical follow-up.

The patient returned to FAINOR School Clinic to undergo intraoral physical examination again. The loss of the lower right lateral incisor was observed, probably caused by periodontal disease. In addition, clinical evaluation of the labial mucosa, gingiva, and floor of the mouth revealed complete remission of PCM.

Figure 1 - Clinical features of the oral lesion. (A) Vegetative lesion with a superficial appearance of moriform stomatitis, with loss of epithelial continuity in the lower labial mucosa region (arrow). (B) A more pronounced pattern is seen in the intraoral region, but with erythematous color and diffuse appearance in the inserted gingiva extending to lingual region, which appears hemorrhagic upon palpitation.

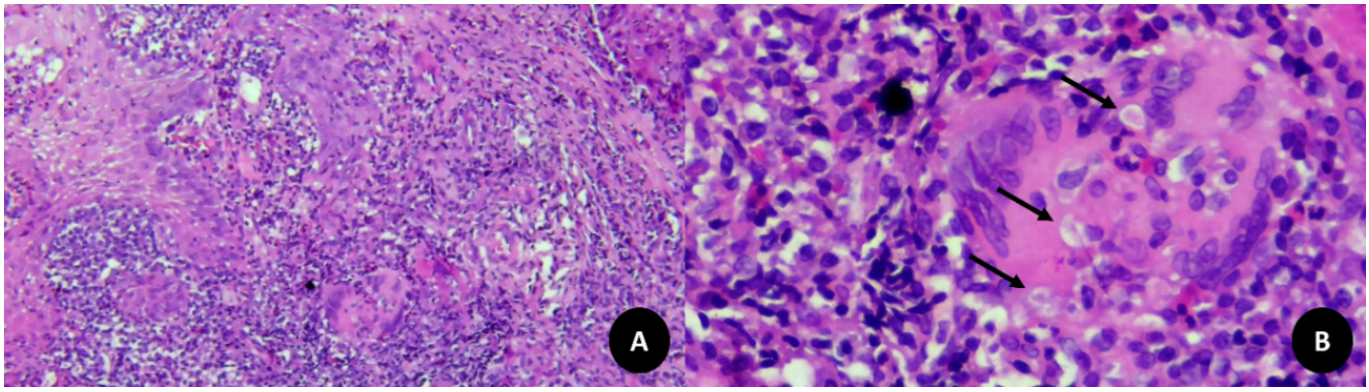

Figure 2 - Microscopic characteristics. A) Pseudoepitheliomatous invasion and intense inflammatory subepithelial infiltrate with the presence of multinucleated giant cells and dispersed epithelioid macrophages in connective tissue (hematoxylin and eosin staining, X50). (B) In the magnified image, the presence of yeast of Paracoccidioides brasiliensis (arrow) was observed inside a multinucleated giant cell (hematoxylin and eosin staining, X400).

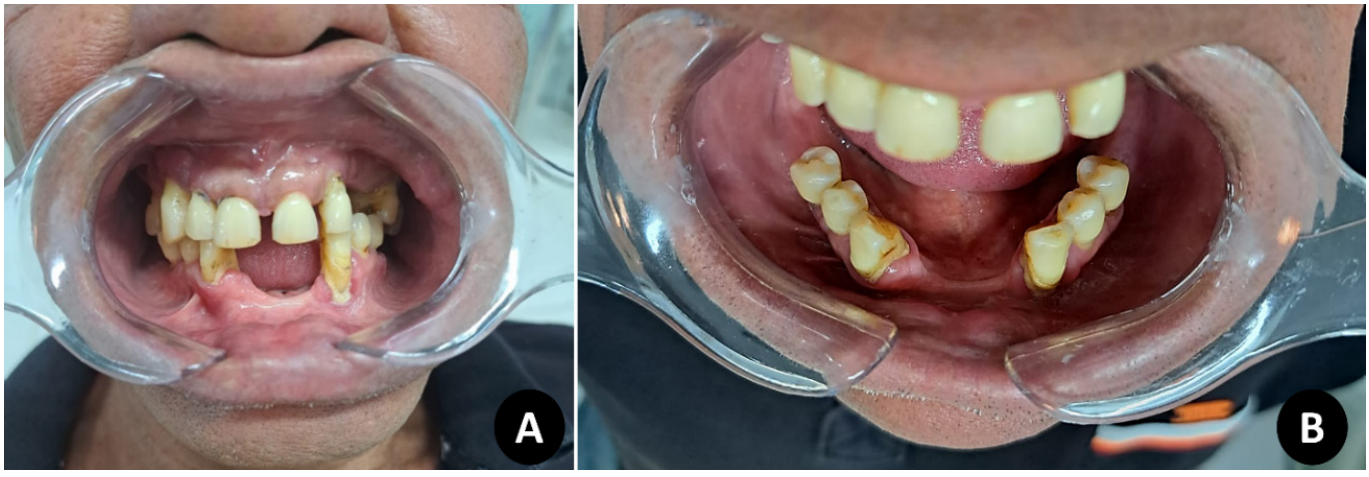

Figure 3 - Clinical characteristics after treatment for PCM. (A) and (B) Intact and normocolored mucous membranes after antifungal treatment prescribed by the infectologist. It is noteworthy that the patient did not complete the nine months of treatment with itraconazole.

DISCUSSION

PCM is a systemic mycosis caused by the dimorphic fungus *Paracoccidioides brasiliensis*, which preferably affects the rural population due to occupational exposure and the inhalation of conidia present in the soil (5). States with an agricultural lifestyle such as Rio Grande do Sul, Minas Gerais, Paraná, Espírito Santo, and São Paulo record more cases of oral PCM (2). The disease is predominant in men (5,6) due to greater occupational exposure in agriculture and the influence of estrogen, which provides women with hormonal protection by inhibiting the transition from the fungus to its pathogenic form (9,10).

In addition, the most affected patients are adults, between 30 and 50 years of age, chronic smokers and/or alcohol users, residing in rural areas, with precarious hygiene and a low socioeconomic status (10-12). These characteristics are present in the case reported, because the patient is older, chronic smoker, and lives in adverse conditions in rural area.

The main sites affected by PCM are the lungs, lymph nodes, and skin. Nevertheless, there is a high incidence in the oral cavity regions in South America, especially in Brazil, Mexico, and Venezuela, with rates ranging from 29.3% to 66.0% (9,.13-15). The most commonly affected places in the oral cavity include the gingiva/alveolar ridge, palate, lips, and buccal mucosa (13).

Clinically, the chronic manifestation of PCM in the oral cavity is characterized by one or multiple surface lesions that vary from granulomatous to ulcerated, often presenting hemorrhagic petechiae, known as moriform stomatitis (13). These lesions are frequently painful (9), although the analyzed patient has denied this symptom. Other systemic signs, such as a non-productive cough, fever, hemoptysis, dysphagia, and dyspnea may arise concomitantly (5), but were not reported by the patient. Studies suggest that the use of plant-based materials, such as toothpicks, may be a source of infection (9-10). In addition, according to Brazão-Silva et al. (9), inflammatory mediators from pre-existing periodontal disease may favor the installation of *Paracoccidioides brasiliensis*, although further studies are needed to prove this relationship.

Differential diagnoses of PCM include SCC, syphilis, histoplasmosis, leishmaniasis, tuberculosis, and lymphoma (9,10). Among malignant neoplasms, SCC is the most common and can affect the same regions or adjacent tissues affected by the PCM. Azevedo et al. (16) reported a case of coexistence of PCM and SCC, highlighting similarities in clinical characteristics, sex, age, and social behaviors of the patients. This justifies the inclusion of SCC as a diagnostic hypothesis in this case, since the patient was a middle-aged male chronic smoker.

PCM diagnosis is based on the clinical characteristics of the lesion, microscopic analysis of tissue samples, and chest radiography (2). However, not all these exams are promptly available to the requesting professional. Techniques such as incisional biopsy and oral exfoliative cytopathology can be easily performed by the stomatologist (2). In the Unified Health System, incisional biopsy in the oral cavity is performed in patients referenced to the Dental Specialty Centers (17).

Microscopically, the oral PCM has pseudoepitheliomatous hyperplasia, which can mimic the true carcinomatous invasion observed in SCC. The main histopathological feature of PCM is the presence of *Paracoccidioides brasiliensis* inside multinucleated giant cells, often linked to the mother cell, giving the characteristic aspect known as “Mickey Mouse ears” or “steering wheel” (18). Special staining methods such as Grocott-Gomori’s methenamine silver (GMS) and Periodic Acid-Schiff (PAS) can facilitate fungus visualization (3,16,18). Nevertheless, in the case reported, hematoxylin and eosin (HE) staining was sufficient to identify the microorganism.

According to Shikanai-Yasuda et al. (2017) (19), itraconazole at the 200mg/day dose for nine to 12 months is the recommended treatment for the moderate clinical manifestations of PCM, as performed in the case studied. At advanced stages or in immunosuppressed patients, amphotericin B can be used. Other azole antifungals derived from sulfonamide and amphotericin B are effective for different clinical forms of the disease (20-22). Photodynamic therapy (PDT) can be used as a complementary treatment, assisting in the healing and decontamination of the region (20-22).

Relapses are common, especially when the patient discontinues treatment, which is a possibility in the case reported, given that the patient reported abandoning medical follow-up and the use of medication. Furthermore, the disease may manifest decades after the initial infection (23). The prognosis is favorable with early diagnosis and proper treatment. Nonetheless, in cases of late diagnosis or inadequate treatment, the prognosis becomes unfavorable and may evolve to severe impairment of vital organs and death (5).

CONCLUSION

PCM and SCC share similar clinical and microscopic characteristics, which may result in misdiagnoses. Considering that the oral cavity is a region often affected by PCM, it is essential that health professionals, especially in endemic areas, recognize the clinical profile of the disease and include it among diagnostic hypotheses. Biopsy plays a crucial role in confirming the final diagnosis. The prognosis is directly related to the severity of the disease, the time to establish the diagnosis, and the adequacy of the prescribed treatment. It is noteworthy that the treatment for PCM is prolonged and demands continuous follow-up by infectologists and stomatologists, both during and after its completion, to minimize the risk of relapse and complications.

The authors have no conflict of interest to declare.

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LITERATURE REVIEW

ORAL MANIFESTATIONS OF SYPHILIS: ESSENTIAL ASPECTS FOR THE DENTIST

MANIFESTAÇÕES ORAIS DA SÍFILIS: ASPECTOS ESSENCIAIS PARA O CIRURGIÃO-DENTISTA

Gabriel Bassan Marinho Maciel[1], Taline Laura Guse[2]

ABSTRACT

Syphilis, or lues, is a chronic infectious disease caused by the spirochete *Treponema pallidum* and transmitted through sexual, via blood or placental contact. Untreated syphilis spreads to many organs and compromises the cardiovascular and nervous systems, which can result in death. The aim of this study was to describe the main aspects of syphilis for the dentist, in order to facilitate its early identification and management. To this end, literature searches were carried out on the Pubmed, Embase, Lilacs and Cochrane databases. In total, 6,265 references were found and, after reading the titles and abstracts, 40 articles were selected for full-text reading. Syphilis traditionally progresses in three stages. Primary syphilis is marked by chancre, most commonly affecting the lip. Oral manifestations are more frequent in secondary syphilis, and consist of white mucous patches, condyloma lata, maculopapular lesions or split papules. In tertiary syphilis, gummas may be present, which can cause perforations in the palate or lesions in the tongue, such as interstitial glossitis and luetic glossitis. Congenital syphilis, in turn, significantly affects children's dentition. The dentist plays an essential role in the early identification of syphilis and the consequent referral o specialized care.

Keywords: Syphilis; Treponema pallidum; Hutchinson teeth; Pathology, Oral; Sexually Transmitted Diseases.

RESUMO

A sífilis, ou lues, é uma doença crônica infecciosa causada pela espiroqueta *Treponema pallidum,* sendo transmitida por contato sexual, hematológico ou placentário. A sífilis não tratada se dissemina em muitos órgãos e compromete o sistema cardiovascular e nervoso, podendo levar o paciente ao óbito. O objetivo deste trabalho foi descrever os principais aspectos da sífilis para o cirurgião-dentista, com o intuito de facilitar sua identificação precoce e conduta. Para tal, foram realizadas buscas na literatura nas bases de dados Pubmed, Embase, Lilacs e Cochrane. Ao final, 6.265 referências foram encontradas e, após a avaliação dos títulos e resumos, 40 artigos foram selecionados para a leitura completa. A sífilis progride tradicionalmente em três estágios. A sífilis primária é marcada pelo cancro, que quando acomete a mucosa oral é mais comum em lábios. As manifestações orais são mais frequentes na sífilis secundária e consistem em placas mucosas brancas, condiloma lata, lesões maculopapulares ou pápulas fendidas. Na sífilis terciária há presença de goma, a qual pode causar perfurações no palato ou alterações na língua, tais como glossite intersticial e glossite luética. A sífilis congênita, por sua vez, afeta significativamente a dentição das crianças. O cirurgião-dentista possui papel essencial na identificação precoce da sífilis e consequente encaminhamento do paciente para atendimento especializado.

Palavras-chave: Sífilis; Treponema pallidum; Dentes de Hutchinson; Patologia Bucal; Infecções Sexualmente Transmissíveis.

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How to cite this article: Maciel GBM, Guse TL. Oral manifestations of syphilis: essential aspects for the dentist. Nav Dent J. 2025;52(1):21-26.

Received: 05/16/2024
Accepted: 02/17/2025

DOI: https://doi.org/10.22491/1983-7550-52-1-4

INTRODUCTION

"He who knows syphilis knows medicine". This famous quote by Sir William Osler demonstrates the complexity of diagnosing syphilis in the 19th century, a process that is still challenging in the healthcare field (1). Syphilis, also known as lues, is a chronic infectious disease caused by the spirochete *Treponema pallidum* (2), a bacterium whose only host is the human species (3). It is transmitted mainly through sexual (4), blood, or placental contact (5). The disease represents a major public health issue due to its ability to affect several organs, resulting in dermatological, rheumatological, neurological, and ocular manifestations (6). Besides, syphilis can cause serious complications during pregnancy and facilitate the transmission of Human Immunodeficiency Virus (HIV) (7,8).

Treponema pallidum has been affecting humans for centuries (9). With the emergence of HIV and consequent behavioral changes in society, the incidence of syphilis decreased in the second half of the 20th century. Nevertheless, with the evolution of the management of Acquired Immunodeficiency Syndrome (AIDS) and the resulting false sense of security that sexually transmitted diseases are easily curable, combined with the lack of knowledge of such infections (5), the incidence of syphilis has increased in developed countries since 2000 (10). The World Health Organization (WHO) estimates that, in 2020, there were 7.1 million new cases of syphilis worldwide (11). The disease is widely disseminated in areas with extreme poverty (12) and its prevalence is significantly higher in the group of men who have sex with men (MSM), especially those who are HIV positive (11).

Syphilis is treated with antibiotics, and penicillin is the drug of choice (7). If left untreated, the natural course of the disease traditionally involves three stages, in which there are a variety of oral manifestations (13) that resemble other oral lesions. In addition, syphilic oral lesions are typically asymptomatic (14), making early diagnosis difficult. In view of the recent increase in the incidence of *Treponema pallidum* infection, this narrative review aims to compile the essential aspects of syphilis for the dentist.

MATERIAL AND METHODS

The search strategy combined the MeSH terms "Syphilis," "Syphilis Latent," "Syphilis Congenital" and "Mouth" with their respective entry terms "Syphilis Latent Stage", "Latent Stage Syphilis", "Congenital Syphilis", "Hutchinson's Teeth", "Teeth Hutchinson's", "Oral Cavity", and "Cavity Oral," as well as the free-text terms "Treponema pallidum", "lues", and "diagnosis". The Boolean operators used were "OR" and "AND," and the strategy was applied to the Pubmed, Embase, Lilacs, and Cochrane databases. The inclusion criteria were publications related to the topic, full-text articles available for free through the CAPES Journal Portal, and publications from the last 15 years, in Portuguese, English or Spanish languages. Exclusion criteria were as follows: animal studies, duplicate articles, book chapters, dissertations, and theses. The initial search resulted in 6,265 references, and, after applying the inclusion and exclusion criteria, 40 articles were included in the literature review, as indicated in the flowchart below (Figure 1).

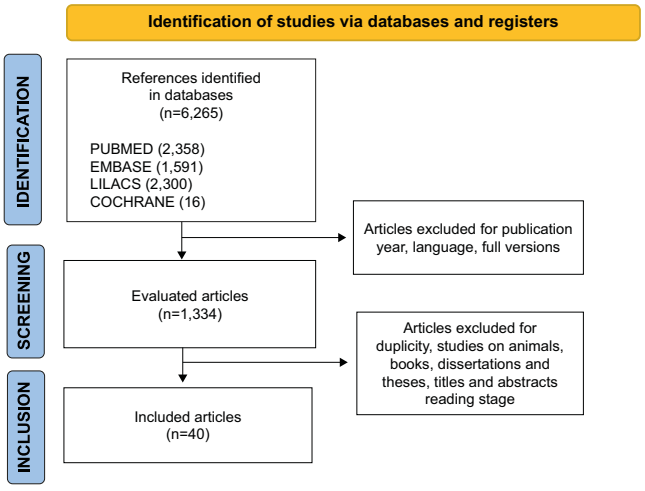

Figure 1 - Flowchart of studies included in the review.

LITERATURE REVIEW

Historical context

Syphilis has been recognized throughout history by different terms: "lues", which means plague in Latin (15), "French disease" (16), and "Neapolitan disease" (17). The first description of syphilis was made by military surgeon Marcello Cumano, at the Battle of Fornovo in 1495, in Italy (9). However, the term "syphilis" has its origins in the book "*Syphilis sive morbus gallicus*" (1), by Girolamo Fracastoro, published in 1530, in which the author describes the disease characteristics (15). The poem tells the story of a shepherd named "Syphilus", the first victim of the disease (16).

It is also believed that the etymology of the term "syphilis" may come from the Greek expression "friend of pigs" (16). The origin of the disease, however, is controversial. While one hypothesis proposes that the bacteria came from the Americas

to Europe aboard Christopher Columbus' ships in 1493, another theory suggests that it was brought with slaves on the sea route between the Iberian Peninsula and Africa (9).

Pathogenesis syphilis

The pathological basis of syphilis is vasculitis (18), and its causative agent is the Gram-negative bacterium *Treponema pallidum* subspecies *pallidum*, a spiral-shaped, mobile, slow-growing bacterium (4,9,18), whose dimensions vary from 0.10 to 0.18 µm in diameter and 6 to 20 µm in length (9). Its virulence factors are not yet fully understood (18). Infection occurs when the bacteria penetrate the mucous membranes directly through fissures in the skin caused by sexual intercourse, or via the placenta and bloodstream, such as direct blood transfusions or sharing needles during injectable drug use (7). Once in the epithelium, these microorganisms multiply and spread throughout the body via the lymphatic and blood vessels (19).

Treponema pallidum is recognized as a stealth pathogen, given that it has low surface antigenicity that allows it to evade the body's adaptive immune responses, thus facilitating its local replication and early dissemination (20). Syphilis has a long incubation period, and it takes approximately three weeks from inoculation until the appearance of the primary lesion (7). Based on the symptoms and time of evolution, syphilis is divided into three stages and a latency period, with distinct clinical and pathological manifestations (21,22), which are represented in Figure 2.

PRIMARY	SECONDARY	TERTIARY	CONGENITAL
■ Lip ■ Gengivae ■ Tonsils ■ Tongue ■ Palate	■ Lip ■ Tongue ■ Palate ■ Buccal mucosa	■ Tongue ■ Palate	■ Tongue ■ Palate ■ Teeth
■ Ulcer (chacre) ■ Single or multiple ■ Lymphadenopathy	■ White mucous patches ■ Condylomata lata ■ Maculopapular lesions ■ Split papules	■ Gumma ■ Interstitial glossitis ■ Luetic glossitis	■ Hutchinson's incisor ■ Mulberry molars ■ High-arched palate ■ Gumma

Figure 2 - Most-affected sites and main oral manifestations of syphilis according to the stage.

Primary syphilis

The classic feature of primary syphilis is the presence of an asymptomatic chancre at the site of inoculation between 3 and 90 days after exposure (4,23), together with associated reactive lymphadenomegaly (24). In the area of initial contact with the bacteria, an isolated papule appears and erodes rapidly, forming a hardened chancre with adjacent erythema (4,13). It is more prevalent in the anogenital region, followed by the oral mucosa (25), where it can affect any area as long as it is inoculated, and it is more frequent on the lips (4.22). In women, the lower lip is more affected, while in men it occurs more on the upper lip, probably due to different sexual practices (24).

Secondary syphilis

In secondary or disseminated syphilis, *Treponema pallidum* affects multiple organs (26) and usually causes systemic symptoms, such as malaise, weight loss, headache, fever, myalgia, and arthralgia. Moreover, the disease is highly transmissible (13). The disseminated stage occurs approximately 4 to 10 weeks after the initial infection and its classic manifestation is the presence of multiple foci of infection in the form of painless macular rashes, 1 to 2 cm in size, reddish or coppery in color, affecting the palms of the hands or soles of the feet (7). It is at this stage that syphilis is usually identified, particularly in women or MSM (7). Symptoms usually appear from the fourth week of the initial infection and may manifest even before the complete resolution of the primary stage (24). Fever, hepatitis, and nephritis may be associated (27).

Head and neck manifestations are more frequent in secondary syphilis, in which 22% of cases show an affected oral mucosa (5). Clinically, the secondary stage manifests in many ways in the oral cavity, including multiple white or reddish mucous patches, usually covered by a fibrinous pseudomembrane (24), condylomata lata (papillary lesions), and split papules (4). The tongue is affected in up to 30% of cases and may show white-pink mucous patches, with or without a so-called serpentine or snail-like

trail (22). If left untreated at this stage, the lesions disappear spontaneously and the latent period of syphilis begins, which can last for several years and may last a lifetime if it does not progress to tertiary syphilis (24). During this period, there are no clinical manifestations, and the infection can only be detected through serological tests (7). In secondary syphilis, the visual system may be affected, and the most frequent alteration is partial or total inflammation of the uveal tract (20,28).

Tertiary syphilis

After the latent phase, approximately 15% to 30% of cases progress to tertiary syphilis (27), which usually involves the central nervous system (tabes dorsalis, general paresis, Argyll Robertson pupils, dementia) and cardiovascular system (ascending aortic aneurysm, left ventricular hypertrophy, congestive heart failure) and can lead to death (20,24). Foci of granulomatous inflammation (gumma) can be found in the skin, mucous membranes, soft tissues, bones, and internal organs (7,27).

In the oral cavity, gumma is most prevalent on the hard palate, and can cause perforation and communication with the nasal cavity; on the tongue, there is an increase in size and formation of a lobulated pattern (interstitial glossitis) or atrophic papillae with deep infection (luetic glossitis) are observed (24).

Congenital syphilis

Syphilis can be vertically transmitted from an infected mother to her fetus, either by transplacental transmission in any trimester or by contact with a maternal lesion during childbirth (29,30). Estimates show that congenital syphilis affects one million pregnant women per year worldwide (31), and usually it manifests three months after childbirth or in the first two years thereafter (30). The most relevant clinical findings for the dentist are the Hutchinson's triad, which consists of Hutchinson's teeth, ocular interstitial keratitis, and deafness associated with the eighth pair of cranial nerves (24). In relation to permanent dentition, *Treponema pallidum* induces an inflammatory reaction that inhibits the ameloblasts of the tooth germ, causing defects in the incisors (screwdriver incisal edge) and molars (mulberry, Fournier or Moon molars), which present globular projections on their occlusal surface (24,32). In congenital syphilis, there is disturbance in the child's growth and skin fissures on the lips are observed, as well as vesiculobullous lesions, maculopapular skin rashes, fever, jaundice, anemia, hepatosplenomegaly, and rhinitis (24).

Diagnosis

The definitive diagnosis of syphilis is based mainly on serological findings. Laboratory tests are of high importance in asymptomatic cases (23). Non-treponemal screening tests, such as Venereal Disease Research Laboratory (VDRL) and Rapid Plasma Reagin (RPR) are accessible, rapid, but nonspecific. Test positivity tends to decrease in the latent stage of syphilis and is not useful for differentiating reinfection from previous infections (22). If the screening tests are positive, highly specific treponemal tests such as Treponema pallidum Hemagglutination Assay (TPHA) and Fluorescent treponemal antibody absorption (FTA-Abs) are performed. Currently, the Dual Path Platform (DPP®) HIV-Syphilis rapid test is available, based on immunochromatography (33), which identifies antibodies to *Treponema pallidum* in a simple and rapid manner, and is a versatile option for diagnosis in situations without the infrastructure to perform conventional tests (34).

Since highly specific tests for syphilis are permanently positive, they are not appropriate for the diagnosis of a second infection. In these cases, the bacteria need to be detected in biopsy tissue or exudate (23). Syphilis has no specific histological characteristics (35). Histopathological examination usually reveals epithelial hyperplasia (with or without ulceration) and spongiosis with associated exocytosis. However, vasculitis is rarely observed, and spirochetes are not observed (36), since *Treponema pallidum* is not stained by routine tissue preparation (18). Dark-field microscopy is used for this purpose, and the DNA of microorganisms can be detected with nucleic acid amplification tests (20). For the diagnosis of congenital syphilis, not all signs of Hutchinson's triad are always present, and other clinical signs such as frontal bossing, atretic maxilla and high-arched palate are necessary (24).

Given the high prevalence of syphilis, the dentist must be trained to recognize its oral manifestations and favor early identification. A wide variety of clinical conditions can be perceived as syphilis, and include pyogenic granuloma, traumatic ulcerations, atypical aphthous ulcerations, geographic tongue, deep fungal infections, tuberculosis, Crohn's disease, pyostomatitis vegetans, erosive oral lichen planus, drug-related ulcerations, granulomatosis with polyangiitis, and cancer (22). Particularly in situations of simultaneous HIV infection, the natural course of syphilis changes, leading the patient to

early symptomatic neurosyphilis and several unusual presentations, such as vascular involvement (37).

The dentist must perform a detailed anamnesis that addresses the patient's recent sexual history, as well as the presence of systemic symptoms suggestive of syphilis. Early diagnosis is especially important in pregnant women due to the potential sequelae in the newborn. In the face of a suspected case, the professional must reinforce to the patient the importance of adopting preventive practices to interrupt the infectious chain, such as the use of condoms, recommend testing and treatment of the partner, besides referring the patient to specialized medical care to confirm the diagnosis and administer the appropriate treatment.

Treatment

Once detected, syphilis is treated based on the stage, usually with a single dose of long-acting penicillin, which should be maintained above the minimum inhibitory concentration for at least 10 days, since *Treponema pallidum* divides more slowly than most bacteria (20). Alternative therapies are used in patients with allergy to penicillin (38) and include the use of doxycycline, tetracycline, or ceftriaxone (7). The administration schedule and its duration vary according to the stage of the disease and the degree of involvement of the central nervous system (22). At the beginning of treatment, there is a risk of the Jarisch-Herxheimer reaction, a transient immune response that causes fever, chills, headache, myalgia, and exacerbation of existing skin lesions (39). This reaction is more frequent in the early stage of syphilis. It is associated with an elevated VDRL titer and should not be confused with a drug reaction to penicillin (40). In turn, the management of infants and children with congenital syphilis is based on the mother's history and her relationship with the infection and treatment, which includes risk factors for reinfection and a complete physical examination of the child (30), which highlights the importance of prenatal monitoring of pregnant women.

CONCLUSION

Syphilis is a systemic infection caused by the bacterium *Treponema pallidum,* which presents a wide variety of oral manifestations that can occur at any stage of the disease, which makes its identification challenging. Since the incidence of syphilis continues to grow, future research should focus on improving preventive strategies and increasing access to rapid testing in higher-risk populations. The dentist is essential in the process of early diagnosis of syphilis. Through a detailed anamnesis, based on knowledge of numerous clinically similar diseases and serological tests, the professional is able to quickly refer the patient to specialized care.

The authors have no conflict of interest to declare.

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LITERATURE REVIEW

DECISION-MAKING FACTORS IN THE MANAGEMENT OF MAXILLARY LATERAL INCISOR AGENESIS: SYSTEMATIC REVIEW

FATORES DE TOMADA DE DECISÃO NO MANEJO DA AGENESIA DOS INCISIVOS LATERAIS SUPERIORES: REVISÃO SISTEMÁTICA

Assali Ahlam[1], El haddaoui Rajae[1], Youssef Oualalou[1], Zaoui Fatima[1]

ABSTRACT

Deciding whether to close or open the space of missing maxillary lateral incisors remains a clinical challenge. This systematic review aims to study the decisive factors in decision-making in patients with agenesis of the maxillary lateral incisors. Following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines, this research was conducted using the PubMed, ScienceDirect, and Cochrane Library databases by selecting publications published from January 1, 2010 to September 30, 2024. The study protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO CRD42024532098), in accordance with Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines. The study was assessed using the Joanna Briggs Institute (JBI) tools base on each study's design. Our searches retrieved 56 bibliographical references. After removing duplicates, studying the titles and abstracts, and reading the articles in full, eight studies were included in this review. Therapeutic decision-making is primarily based on periodontal parameters, with studies suggesting that space closure is preferable when both treatment options are viable.

Keywords: Agenesis; Lateral incisor; Treatment choice.

RESUMO

Fechar ou abrir o espaço de incisivos laterais superiores ausentes continua sendo um grande desafio para os dentistas. O objetivo desta revisão sistemática foi estudar os fatores decisivos no processo de tomada de decisão em pacientes com agenesia dos incisivos laterais superiores. Seguindo as diretrizes PRISMA, a pesquisa foi realizada nas seguintes bases de dados (PubMed, ScienceDirect, Cochrane Library), selecionando publicações publicadas de 1º de janeiro de 2010 a 30 de setembro de 2024. O protocolo foi registrado no registro prospectivo internacional de revisões sistemáticas (PROSPERO) em conformidade com as diretrizes PRISMA (PROSPERO CRD42024532098). De acordo com o desenho de cada estudo, a avaliação foi realizada utilizando as ferramentas do Joanna Briggs Institute (JBI) para os estudos incluídos. Foram identificadas 56 referências bibliográficas. Após a remoção de duplicatas, análise dos títulos e resumos e posterior leitura dos textos completos, oito artigos foram incluídos neste trabalho. A tomada de decisão terapêutica baseia-se principalmente em parâmetros periodontais e estudos demonstram que o fechamento de espaços é preferível quando ambas as opções de tratamento são viáveis.

Palavras-chave: Agenesia; Incisivo lateral; Escolha de tratamento.

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How to cite this article: Ahlam A, Rajae EH, Oualalou Y, Fatima Z. Decision-making factors in the management of maxillary lateral incisors agenesis: systematic review. Nav Dent J. 2025;52(1):27-33.

Received: 09/14/2024
Accepted: 12/02/2025

DOI: https://doi.org/10.22491/1983-7550-52-1-5

INTRODUCTION

A tooth is considered congenitally missing when it has not erupted into the oral cavity, has not been accidentally lost or extracted, and is not visible on radiographic examinations (1). The prevalence of congenitally missing maxillary lateral incisors varies across studies (2,3). Swarnalatha et al. (4) recently reported a prevalence rate of 3.77% in a sample of orthodontic adolescent population, in which 62.16% had bilateral lateral incisor agenesis and women showed a higher percentage of upper lateral incisor hypodontia (2.8%) than men (0.9%).

Variation in the prevalence and pattern of agenesis may relate to differences in race and ethnicity between populations, environment, or sampling techniques (1,4). There are two possible options to manage congenital agenesis of maxillary lateral incisors: an orthodontic treatment to close the space by using a reshaped canine or an orthodontic treatment that opens a space and places cantilever resin-bonded fixed dental prostheses or restores an implant-supported fixed prosthesis (1,5). The decision on the most appropriate treatment modality should consider the type of malocclusion, the relation of the anterior teeth, the availability of space, and the condition of the adjacent tooth (6).

Regardless of the option, orthodontists mainly target a satisfactory functional and aesthetic outcome and long-term stability. This process involves many challenges and requires a careful assessment prior to a decision (1). This study aims to investigate the key factors that influence treatment planning for patients with agenesis of the maxillary lateral incisors to optimize both short- and long-term outcomes.

MATERIAL AND METHOD

Registration of protocol

The protocol of this study was registered with the international prospective register of systematic reviews in accordance with Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines (PROSPERO CRD42024532098).

Research strategy

This systematic review was carried out in the PubMed, Cochrane Library, and ScienceDirect databases, selecting publications published from January 1, 2010 to September 30, 2024, according to the following keywords: (maxillary lateral incisor OR upper lateral incisor OR lateral incisor) AND (congenitally missing OR agenesis) AND orthodontics AND treatment choice. The research question was established using the Population, Intervention, Comparison, and Outcomes format (Figure 1).

Population	Patients with maxillary permanent lateral incisor agenesis (uni/bilateral)
Intervention	Treatment of maxillary lateral incisor agenesis
Comparison	Occlusal, periodontal, or aesthetic outcome of the two treatments
Outcomes	Factors affecting decision-making for patients with maxillary lateral incisor agenesis

Figure 1 - Population, Intervention, Comparison and Outcomes question.

Inclusion and exclusion criteria

The inclusion and exclusion criteria to choose the articles for analysis are summarized in Figure 2.

Inclusion criteria	Exclusion criteria
• Articles published from January 1, 2010, to September 30, 2024; • Full text availability; • Written in French or English; • Cohort, case-control, comparative, prospective, longitudinal, retrospective or cross-sectional studies, original articles, and randomized control trials; • Clinical studies about missing maxillary lateral incisors involving both methods (space opening and closure) in permanent dentition; • Studies regardless of gender or race.	• Case reports; • Literature reviews; • Expert opinions; • Editorials; • Letters; • Case series; • Agenesis of maxillary lateral temporary incisors; • Studies treating a maxillary lateral incisor missing because of a trauma or caries.

Figure 2 - Inclusion and exclusion criteria.

Data extraction method

A.A and E.R, two independent reviewers, performed a qualitative synthesis by discussing their conclusions stemming from their evaluation of the titles and abstracts of the chosen studies. Zotero was used to detect duplicates

(www.zotero.org). After their removal, other studies were removed based on an initial review of titles and abstracts. Articles that failed to meet the inclusion criteria of this study were excluded. Then, the texts of the remaining articles were read in full to ensure their eligibility. The reference list of the included articles in this review is shown in the references.

Then, A.A and E.R independently extracted data from the selected studies by a data-extraction sheet that contained the following information: authors' name, year of publication, study design, aim of the study, treatment modalities, participants, parameters evaluated, and results. Moreover, two other researchers, Y.O and Z.F, reevaluated the collected data. The selection process is shown in the flowchart below (Figure 3).

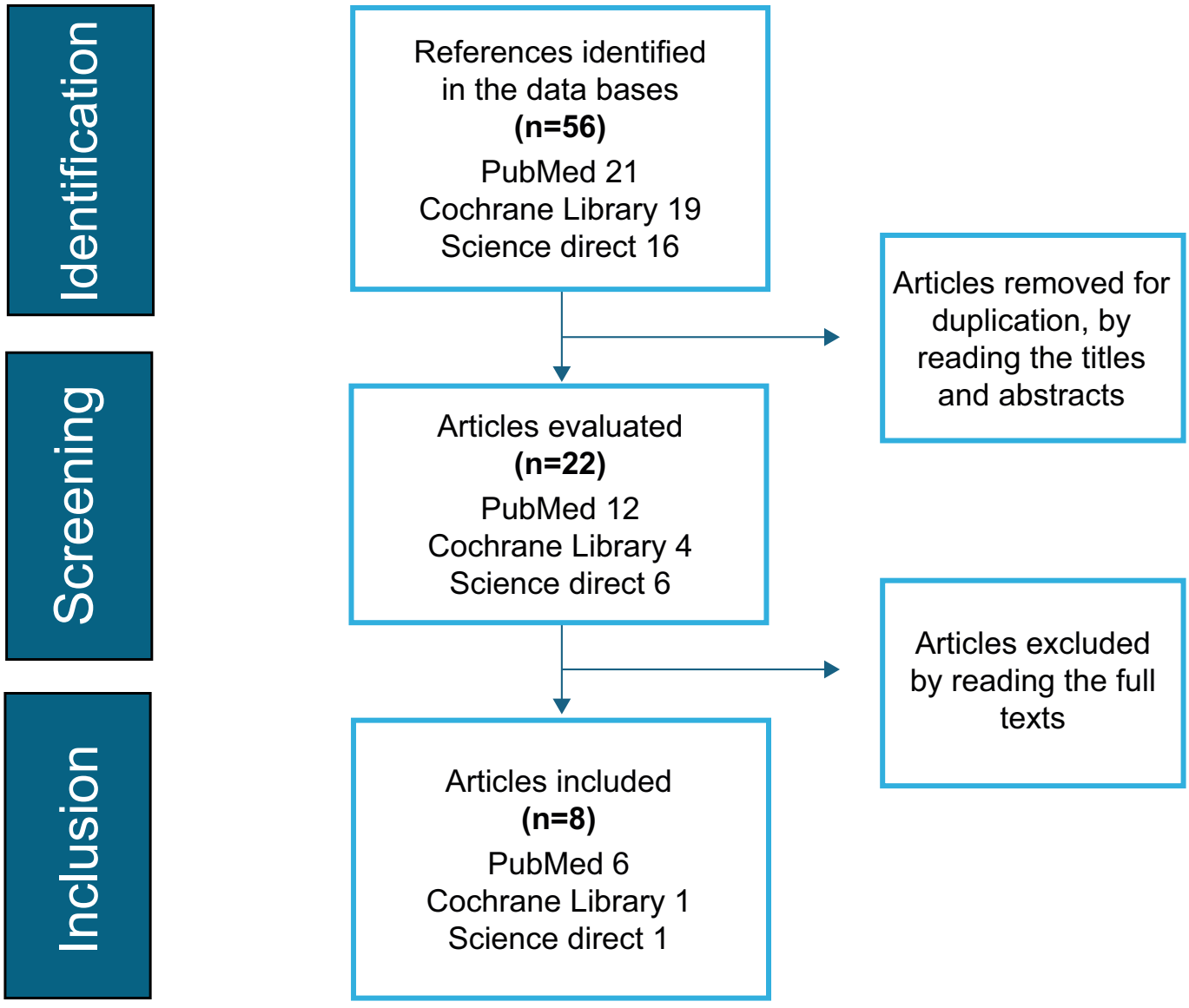

Figure 3 - Flowchart of the article inclusion process.

Methodological and risk of bias assessments

Risk of bias was independently evaluated by two researchers: A.A and E.R. In case of any conflict of opinions, reviewers Y.O and Z.F were to reexamine the results of the evaluation. According to the design of each study, evaluations followed the Joanna Briggs Institute (JBI) tools for the included studies (retrospective, case-control, and cross-sectional studies) (7).

RESULTS

Study selection

This review found 56 studies. After eliminating duplicates, 47 remained in its final corpus. The analysis of their titles and abstracts retained 22 articles. Further studies were excluded after full-text reading due to methodological concerns

or unclear reporting. Thus, this systematic review included eight articles. The flowchart above illustrates this study selection process (Figure 1). Table 1 summarizes the included articles.

Table 1 - Results of studies included in the review

Authors	Study design	Aim of study	Treatment modalities	Participants	Evaluated parameters	Results
Jamilian A. et al (2015) (8)	Retrospective study	To compare the aesthetic, periodontal, and functional outcomes.	- SC - SO + implant	Study group: 10 patients SC (19y ± 2.1) and 10 SO+implant (20years ± 1.4).	- Aesthetic, periodontal, and functional outcomes.	- Well-accepted aesthetic results for the two modalities. - Infraocclusion in implant patients. - Better periodontal health with SC.
Hvaring C. et al (2016) (9)	Retrospective study	To compare soft tissue morphology and crowns.	- SC - SO + implant - SO + fixed prothesis	- 50 patients - Mean age, 25.6 years).	- Mucosal discoloration - Crown morphology - The color and papilla index.	- Mucosal discoloration only occurred in implants - Higher papilla index for orthodontic SC.
Josefsson et al (2019) (10)	Cross-sectional study	To evaluate the best treatment option.	- SC - SO + implant	44 patients: 22 SC, 22 SO + implant Mean age: 24.6-33.7 years.	- Aesthetics - Periodontal Status - Occlusal morphology.	- No significant aesthetic differences between the groups. - Gingival color was better in the SC group. - Gingival recession was more common in implant group
Barber et al (2014) (11)	Case control	To establish whether patients preferred aesthetic outcomes .	- SC - SO	- 102 patients (14-16 years)	Aesthetics	Most examiners chose SO.
Shneider et al (2016) (12)	Case control	To determine how dentists, orthodontists, and laypersons judge the aesthetic outcome.	- SC - SO + implant	- 9 patients: 3 SC, 3SO + implant, 3 Control group	Aesthetics	Dentists ranked SO and SC as equally aesthetic, laypersons chose SC.
De Marchi et al (2014) (13)	Case control	To evaluate the smile attractiveness.	-SC - SO + implant	- 68 patients: 26 SC, 20 SO, 22 control group	aesthetics	- Patients with SC were significantly more satisfied.
Qadri et al (2016) (14)	Cross sectional study	To investigate the opinions of laypersons.	- SC - SO	- 21 patients: 11 SC, 10 SO	Aesthetics	Aesthetics after SC is statistically more pleasant than SO.
Kafantaris et al (2020) (15)	Retrospective study	To investigate the factors affecting decision-making.	- SC - SO	- 46 patients (31 women > 17 years et 11 men > 18 years).	- Soft tissue response - Aesthetic outcome - TMJ response - Periodontal and peri-implant status	- Decision-making is directly dependent on patients' age, individual characteristics, and participating specialists in the treating team.

SO: Space opening – SC: Space closure – TMJ: Temporomandibular joint.

Study characteristics and risk of bias assessment

The included studies consisted of retrospective, case–control studies, and cross-sectional studies. These eight studies shared a common objective: to study parameters related to the management of maxillary lateral incisor agenesis. They compared aesthetic, periodontal, and functional outcomes.

Following the Joanna Briggs Institute critical appraisal checklist, this review classified the risk of bias of its chosen studies as high when they obtained up to 49% of "yes" responses; as moderate, if from 50 to 69%; and as low, if over 70%. A "✓" means yes, an "X" denotes no, and a "?" indicates unclear. Therefore, this review categorized five studies as under moderate risk and three, as having low risk (Tables 2, 3 and 4).

Table 2 - The Joanna Briggs Institute critical appraisal for retrospective studies

Checklist questions	1	2	3	4	5	6	7	8	9	10	% yes	Risk
Jamilian A. et al. (2015) (8)	✓	✓	✓	X	✓	X	X	X	✓	✓	60%	Moderate
Hvaring C. et al. (2016) (9)	✓	X	✓	✓	✓	X	X	✓	✓	✓	70%	Low
Kafantaris et al. (2020) (15)	✓	✓	✓	X	✓	X	X	X	X	✓	50%	Moderate

Table 3 - The Joanna Briggs Institute critical appraisal for case control studies

Checklist questions	1	2	3	4	5	6	7	8	% yes	Risk
Quadri et al. (2016) (14)	X	✓	✓	✓	X	?	✓	✓	64%	Moderate
Barber et al. (2014) (11)	✓	✓	✓	X	✓	X	✓	✓	75%	Low
Shneider et al. (2016) (12)	✓	✓	X	✓	✓	X	X	✓	63%	Moderate

Table 4 - The Joanna Briggs Institute critical appraisal for cross sectional studies

Checklist questions	1	2	3	4	5	6	7	8	9	10	% yes	Risk
De Marchi et al. (2014) (13)	✓	✓	✓	X	✓	X	X	X	✓	✓	60%	Moderate
Josefsson et al. (2019) (10)	✓	✓	X	✓	✓	X	✓	✓	✓	✓	80%	Low

DISCUSSION

The management of congenitally missing permanent maxillary lateral incisors involves either space closure or opening. Practitioners' decision-making should consider the canine dimensions, facial profile, and the gingival height. Most studies evaluated periodontal parameters and assessed results by comparing the two techniques. According to Rosa et al. (2015) (16), orthodontic space closure in cases with lateral incisor agenesis offers no long-term risks for periodontal tissues and the temporo-mandibular joint. Previous findings agree with Šikšnelytė et al. (2021) (6) and Jamilian et al. (2015) (8).

According to Josefsson et al. (2019) (10), the space closure group showed better gingival coloration and the implant group presented gingival recession. Nevertheless, these groups showed no significant aesthetic differences. The authors concluded that space closure is advantageous if both options are feasible. These results agree with the systematic reviews of Kilidiaris et al. (2016) (17), Silveira et al. (2016) (18), and Al Qahtani (2021) (19), which reported that space closure is preferable over space opening and prosthodontic rehabilitation whenever possible.

The use of dental implants in growing individuals remains a topic of ongoing debate in the literature. Some studies have reported changes in the relative position of the implant in the vertical and sagittal direction. Jamilian et al. (2015) (8) have reported that all implants had infraocclusions greater than 1 mm five years after treatment. These findings resemble those in Bernard (20) and Jemt (21), who showed that the surrounding alveolar bone and the adjacent teeth continue developing vertically 19 years after implantation, causing its infraocclusion. According to Oesterle and Croning (22), facial growth ceases at age 17 in girls, whereas it may still continue up to age 25 in men. Thus, placing implants before the end of facial growth may increase the infraocclusion of the implant crown.

Ciarlantini and Melsen (2017) (23) have suggested mini-screws with pontics, suggesting that this approach enables the development of the alveolar process. Michelogiannakis et al. (2020) (24) reported that mini-screws could stimulate the bone crest in toothless sites, reporting a development in the vertical direction of the alveolar bone. So, mini-screws with pontics might represent a useful temporary substitution for congenitally missing permanent maxillary lateral incisors in space openings in growing patients.

Lacarbonara et al. (2021) (25) evaluated mini-implants for 10 years, reporting no signs of infraocclusion, good status of the peri-implant tissue, and satisfactory marginal bone resorption. The authors concluded mini-implants may configure a good solution for severe bone atrophy.

Implant replacement may have additional drawbacks. For example, Hvaring et al. (2016) (9) reported mucosal blue discoloration in implant patients and Dueled et al. (2009) (26) found that volunteers' labial gingiva had turned blue in more than 50% of single-implant crowns in follow ups over four years.

The current clinic recommendations suggest fixed resin-bonded partial dentures as the gold

standard (due to their more pleasant aesthetics and lesser invasiveness). Kafantaris et. al. (2020) (15) reported that such bilaterally attached or cantilevered dentures offer better results than implants regarding soft tissue response, aesthetics, and function. According to Antonarakis et al. (2014) (27) conducted a comparative financial evaluation of many treatment modalities for congenitally missing lateral incisors. The least cost-effective treatment refers to full-coverage fixed partial dentures.

This review has some limitations. First, it only chose articles that were published in French and English, potentially leaving out significant data from other languages. Another limitation refers to the significant variability in study quality as some showed methodological inconsistency. Furthermore, this review focused on available evidence, which may fail to fully represent real-world clinical decision-making. Finally, study heterogeneity prohibited a meta-analysis or quantitative synthesis, hindering the meaningful combination of data.

CONCLUSION

According to the analyzed studies, therapeutic decision-making mainly stems from periodontal parameters, preferring space closure when both therapeutics are possible. In case of space opening, studies deem resin-bonded fixed partial dentures as more aesthetic and less invasive, showing more satisfactory functional and periodontal results than implantations. Treatment must involve a multidisciplinary approach to achieve optimal occlusion and a natural smile with long-term stability. However, further studies with larger sample sizes and standardized approaches must be carried out to strengthen therapeutic recommendations and improve management strategies.

No competing interests have been declared.

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LITERATURE REVIEW

ORTHOPEDIC MAXILLARY PROTRACTION IN GROWING PATIENTS WITH BILATERAL CLEFT LIP AND PALATE: AN INTEGRATIVE REVIEW OF THE LITERATURE

PROTRAÇÃO MAXILAR ORTOPÉDICA EM PACIENTES EM CRESCIMENTO COM FISSURA BILATERAL: REVISÃO INTEGRATIVA DA LITERATURA

El Honsali Yasmina[1], El haddaoui Rajae[1], Halimi Abdelali[1], Zaoui Fatima[1]

ABSTRACT

The therapeutic management of patients with cleft lip and palate is challenging, and complete bilateral clefts are the most difficult to treat. These patients have a growth deficit related to early reconstructive procedures. This study aimed to review the literature on maxillary protraction protocols and their effects in growing patients with bilateral cleft lip and palate. The PubMed, ScienceDirect, Cochrane Library, and Virtual Health Library, and Scopus databases were searched using keywords "maxillary protraction", "bilateral cleft", and "orthodontic" combined with the Boolean operator "AND". In total, three protocols for protraction in patients with bilateral cleft lip and palate are reported: face mask protraction with dental anchorage, face mask protraction with skeletal anchorage, and intermaxillary traction with skeletal anchorage. The results suggest that dental and skeletal anchorage protraction therapies effectively treat patients with maxillary hypoplasia, although the specific effects vary according to treatment protocol, type of anchorage, and factors related to cleft severity and surgical history. Orthopedic protraction of the maxilla has positive aesthetic, skeletal, and functional effects. Early treatment and the use of skeletal anchorages enhance these effects. Large studies are needed to determine the best protocol for optimal results.

Keywords: Maxillary protraction; Orthodontic; Cleft lip; Growing patients.

RESUMO

O manejo terapêutico de pacientes com fissura labiopalatina é desafiador, e fissuras bilaterais completas são as mais difíceis de tratar. Esses pacientes apresentam déficit de crescimento relacionado a procedimentos reconstrutivos precoces. O objetivo deste estudo é revisar a literatura sobre protocolos de protração maxilar e seus efeitos em pacientes em crescimento com fissura labiopalatina bilateral. As bases de dados utilizadas foram PubMed, Science Direct, Cochrane Library e Virtual Health Library (VHL), Scopus, usando as seguintes palavras-chave "protração maxilar", "fenda bilateral" e "ortodôntico" com o operador booleano "AND". Três protocolos para protração em pacientes com fissura labiopalatina bilateral são relatados: protração com máscara facial com ancoragem dentária, protração com máscara facial com ancoragem esquelética e tração intermaxilar com ancoragem esquelética. Os resultados sugerem que tanto as terapias de protração de ancoragem dentária quanto esquelética são eficazes em pacientes com hipoplasia maxilar, embora os efeitos específicos variem de acordo com o protocolo de tratamento, o tipo de ancoragem e fatores relacionados à gravidade da fissura e histórico cirúrgico. A protração ortopédica da maxila tem efeitos estéticos, esqueléticos e funcionais positivos. O tratamento precoce e o uso de uma ancoragem esquelética aumentam esses efeitos. Grandes estudos são necessários para determinar o melhor protocolo para resultados ideais.

Palavras-chave: Protração maxilar; Ortodontia; Fissura de lábio; Pacientes em crescimento.

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How to cite this article: Yasmina EL, Rajae EH, Abdelali H, Fatima Z. Orthopedic maxillary protraction in growing patients with bilateral cleft and palate: integrative literature review. Nav Dent J. 2025;52(1):34-41.

Received: 01/07/2025
Accepted: 04/02/2025

DOI: https://doi.org/10.22491/1983-7550-52-1-6

INTRODUCTION

Cleft lip and palate represent one of the most common congenital malformations (1). The annual prevalence of infants born with cleft lip with or without cleft palate is 10 per 10,000 (2). Patients with cleft lip and palate have typical facial features such as maxillary hypoplasia, skeletal Class III pattern, and abnormalities in the number and position of their teeth (3). The psychological consequences of this malformation are very serious because they affect the facial region. The therapeutic management of cleft patients is demanding, and complete bilateral clefts are the most difficult to treat (4), due to intrinsic growth deficits that affect facial morphology later in life, and extrinsic growth deficits related to early reconstructive surgery (5).

According to Tellez-Conti et al. (6), orthopedic treatment at an early age is recommended to compensate for growth deficits in the middle third of the face, to avoid the scarring effects of surgery, and to achieve a better facial, skeletal, and dental relationship at the end of the growth period. Although orthopedic maxillary protraction has received wide attention and has been shown to effectively treat patients with normal and unilateral cleft lip and palate (UCLP), few studies have focused on its effect on bilateral cleft patients (7). This review aimed to investigate the protocols for maxillary orthopedic protraction and the extent of dentoskeletal and soft tissue change in growing patients with bilateral cleft lip and palate (BCLP).

MATERIAL AND METHOD

A non-systematic electronic search was performed on PubMed, ScienceDirect, Cochrane Library, Virtual Health Library, and Scopus using the following English descriptors: “maxillary protraction”, “bilateral cleft”, “orthodontic”, and the Boolean operator “AND”. Inclusion and exclusion criteria are listed in Figure 1. The initial search retrieved 212 articles and, after applying the inclusion and exclusion criteria, eight articles were selected for this literature review. The flowchart for article selection, in accordance with PRISMA guidelines is shown in Figure 2 (8). Searches were conducted November 10, 2024. The reference lists of all included articles were searched for additional studies.

Inclusion criteria	Exclusion criteria
• (BCLP) treated with orthopedic maxillary protraction alone or combined with other treatments; • Languages: English and French; • Clinical studies.	• Patients with syndromic cleft lip and palate; • Normal or cleft patients not treated by maxillary protraction; • Duplicates; • Literature review, books, thesis, abstracts, and letters to the editor.

Figure 1 - Inclusion and exclusion criteria.

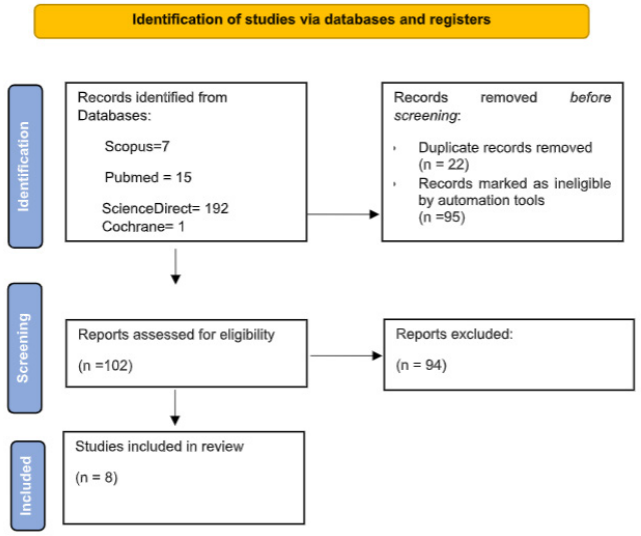

Figure 2 - Article selection flow chart.

RESULTS

Characteristics of the included articles

This review extracted information on the anchorage type, authors, year of publication, study design, studied sample, device used and orthopedic protraction protocol, age at initial treatment, the duration of treatment, and the outcomes from its chosen articles (Table 1). The publication years of the studies ranged from 1993 to 2022, seven of the analyzed articles were retrospective studies, and one study was a clinical trial.

The total sample evaluated by all articles totaled 210 patients, 82 of whom had bilateral cleft lip and palate; 113, unilateral cleft lip and palate; 15, no clefts. Patients’ ages varied from four to 12 years.

Regarding anchorage type and traction method, four studies (9-12) used a face mask for traction in conjunction with dental anchorage (either a quad helix, palate expander, or transpalatal arch). These dental anchorages also used for maxillary expansion. Overall, three studies (13-15) used a face mask in conjunction with infrazygomatic mini-plates for skeletal anchorage. Another study (16) used intermaxillary traction with elastics on infrazygomatic miniplates as skeletal anchorage.

Table 1 - Selected articles

Anchorage type	Author, year	Study design	Sample	Orthopedic protraction appliance	Orthopedic protraction protocol (Wearing time, amount of force, the traction force direction)	Age of protraction	Duration of treatment	Outcomes
Dental Anchored Face Mask Therapy	Mutluol et al. 2022 (9)	Retrospective study	-30 patients; -15 non cleft; -15 BCLP.	Petit face mask + hyrax expander	- 24 hours per day (excluding meals); - 500 g of force on each side; - Forward and 30°-45° downward to the maxillary occlusal plane	BCLP: 10.8 years Non-cleft patients: 11.4 years	BCLP 6 months Non-cleft patients: 6 months	Rapid maxillary expansion, combined with face mask, induced improvement in both groups: - Soft tissue: decreased profile concavity - Hard tissue: maxillary protrusion, mandibular retraction, - Increased upper incisor proclination more important in BCLP group
	Kobayashi et al. 2015 (10)	Retrospective study	- 7 BCLP	Delaire type face mask + palatal arch	- 8-12 hours per day - 150-250 g of force on each side; - 10° downward from the occlusal plane.	- 4-5 years	- 6-12 months	Maxillary growth at 10 years was good after the use of maxillary protraction appliance for postoperative retardation of maxillary growth cases. A treatment protocol based on presurgical orthopedics, gingivoperiosteoplasty, Furlow's palatoplasty, and maxillary protraction may be an option, but long-term growth is unknow
	Tindlund and Rygh 1993 (11)	Retrospective study	- 87 patients; - 63 UCLP; - 24 BCLP.	Delaire-type face mask + Quadhelix	- 11 hours per day; - 350 g of force on each side; - Forward and 15° downward to the maxillary occlusal plane.	- 6 years - 11 months	- 12-15 months	The effect of protraction on soft tissue: the convexity of the soft tissue profile(SS-NS-SM angle) increased significantly in both groups (especially the BCLP group).
	Tindlund and Rygh 1993 (12)	Retrospective study	- 87 patients; - 63 UCLP; - 24 BCLP.	Delaire-type face mask + Quadhelix	- 11 hours per day; - 350 g of force on each side; - Forward and 15° downward to the maxillary occlusal plane.	- 6 years 11 months	- 12-15 months	Effects in hard tissue are: For BCLP group - 90% dentoalveolar; - 10% skeletal For UCLP group - 55% dentoalveolar - 45% Skeletal -Advancement of point A BCLP < UCLP -Counterclockwise rotation of the palatal plane in both groups; - Clockwise rotation of the occlusal plane significantly greater in the BCLP group

(Continues...)

(Continuation)

Anchorage type	Author, year	Study design	Sample	Orthopedic protraction appliance	Orthopedic protraction protocol (Wearing time, amount of force, the traction force direction)	Age of protraction	Duration of treatment	Outcomes
Mini-Plates-Anchored Face Mask Therapy	Kim JE et. al. 2020 (13)	Retrospective study	- 24 patients; - 11 BCLP; - 13 UCLP.	Petit-type face mask + infrazygomatic miniplates	- 12-4 hours per day; - 500 g of force on each side; - ND.	- 12 years	- 57 months	The amount of maxillary protraction with the face mask and infrazygomatic miniplates was significantly correlated with the improvements in airway spaces
	Woon On et al. 2018 (14)	Retrospective study	- 21 patients; - 16 UCLP; - 5 BCLP.	Petit-type face mask + infrazygomatic miniplates	- 12-14 hours per day; - 500 g of force on each side; - Forward and 30° downward to the maxillary occlusal plane.	- 11 years	- 57 months	Long-term use of face mask and infrazygomatic miniplates is effective on maxillary protraction in adolescent cleft patients without clockwise rotation of the mandible. Dental inclination change in the maxillary and mandibular incisors was minimized during long-term use.
	Ahn HW et al. 2012 (15)	Retrospective study	- 30 patients; - 15 UCLP; - 15 BCLP.	Petit-type face mask + infrazygomatic miniplates	- 12-14 hours per day - More than 500 g of force on each side; - Forward and 30° downward to the maxillary occlusal plane.	- 11 years	- 24 months	The effect of protraction on hard tissue: - Point A advance BCLP < UCLP; - Minimal counterclockwise rotation of the palatal plane in two groups; - No difference in the degree of vestibuloversion of the maxillary incisors or on the linguoversion of the mandibular incisors between the two groups. - No difference was observed regarding clockwise rotation of the mandible.
Mini-Plates-Anchored Intermaxillary elastics traction therapy	Jahanbin A et al. 2016 (16)	Clinical Trial	- 11 patients Group 1 (3 UCLP; 3 BCLP); Group 2 (3 UCLP; 2 BCLP)	Group 1: Intermaxillary elastics traction to infrazygomatic miniplates + w-arch expander Group 2: Mini-Plate-Anchored face mask Therapy + w-arch expander.	Group 1: - 12-14 hours per day; - 500 g of force on each side; - Forward and 15° downward to the maxillary occlusal plane; Group 2: - 24 hours. - The elastic force until 250 g per side; - CL III elastics.	Group 1: 10 years; Group 2: 8 years.	Group 1: - 7 months; Group 2: - 5 months.	Bone-anchored intermaxillary elastics had similar effects to the miniplate-anchored face mask on maxillary protraction. Also, both of the applied methods showed similar results on the lip and chin soft tissue contour. No significant difference was found between the two treatment groups regarding the type of cleft.

**ND: no detail*

The treatment period varied from six to 24 months and wearing time, from 11 to 24 hours (excluding meal times). Moreover, the vector force was directed forward and 10-45 degrees downward to the maxillary occlusal plane. The amount of force ranged from 150 to 350 g per side for patients aged under six years and 500 g per side for older ones.

Overall, three studies compared treatment between patients with unilateral or bilateral cleft lip and palate (11,12,15), one study compared

treatment between patients with bilateral or no cleft (9), and one study evaluated the protraction protocol in a group of children with bilateral clefts and compared their growth with a group of normal untreated children (10). The remaining three studies evaluated protraction in patients with bilateral or unilateral clefts, without comparing these two types of cleft (13,14,16).

The authors used several cephalometric analyses to assess treatment outcomes. To interpret the results, they compared similar measurements:

- (ua.is-n.ss) or (U1-NA): assessment of the upper incisor proclination;
- (L1- NB) or (la.ii-nsm) or IMPA: assessment of the lower incisor proclination;
- (GOGNSN) or (ML-NSL): assessment of mandibular divergence.

Results of the chosen studies

Results suggest that dental and skeletal anchorage protraction therapies successfully treat patients with BCLP and maxillary hypoplasia, although the specific effects may vary depending on the treatment protocol and treatment duration. Table 2 presents the studies that reported identical skeletal cephalometric measurements (SNA, SNB, ANB, and GoGn-SN) before and after orthopedic protraction.

Hard tissue effects: maxillary advancement constitutes a relevant outcome in most studies: SNA=+2.19° (9), SNA=+0.45° (15), SNA=+0.1°(12) (SNA-SNA difference measured before and after protraction). The UCLP group showed a greater point A advance than the BCLP group (12,15). Rotation of the occlusal plane: some studies observed rotation, particularly clockwise rotation of the occlusal plane in cases of dental anchorage (9,12).

Table 2 - Quantitative analysis of included studies

	Sample BCLP	SNA (T2 - T1)	SNB (T2 - T1)	ANB (T2 - T1)	GOGNSN (T2 - T1)
Quadhelix+ Delaire face mask (12)	24	+0.1	−1.8	+1.8	+0.7
Miniplates + Petit face mask (15)	15	+0.45	−0.82	+1.27	+0.46
Expander (dental anchorage) + Petit face mask (9)	15	+2.19	−0.52	+2.33	+0.81

Soft tissue effects: face mask therapies (with miniplates or dental anchorage) significantly changed soft tissue, decreasing profile concavity (SS-N-SM=+2.5°) and significantly increasing gnathion, subnasale, and upper lip thickness (9,11).

Dental effects: dentoalveolar Class III compensation occurred, particularly in dental anchorage and longer treatment protocols (9,12,13). Functional effect: the amount of maxillary protraction with the face mask and miniplates was significantly related to the improvements in this airway on the oropharyngeal and nasopharyngeal airway spaces. Maxillary advancement: point A advancement to the vertical reference plane is positively correlated with increases in superior posterior airway space, middle airway space, and upper nasopharynx (13).

DISCUSSION

The reviewed studies provided a comprehensive overview of orthopedic traction protocols for patients with BCLP, their efficacy, their impact on skeletal structures and soft tissues, and their long-term outcomes. Variability in outcomes is influenced by multiple factors such as anchorage type, protraction method and protocol, bilateral cleft type characteristics, and alveolar bone graft.

Regardless of the type of anchorage, advancement of point A is a common outcome across all studies. To enable quantitative comparisons, only three studies (9,12,15) showed identical skeletal cephalometric measurements (SNA, SNB, ANB, GOGNSN) before and after orthopedic protraction. Quantitative Analysis (Table 2) showed a greater point A advance in the study that treated patients with dental anchorage protraction and palatal disjunction (9), better controlling the vertical direction in the study in which patients with BCLP received miniplates (15), making them an interesting therapeutic option in hyperdivergent cases. It also found better control of the incisal axes and rotation of the palatal and occlusal planes with skeletal anchorage (14, 16).

These results agree with Baek et al. 2010, which confirms that skeletal anchorage better controls secondary effects such as labial inclination of the maxillary incisors, extrusion of the maxillary molars, and clockwise rotation of the mandibular plane (17).

Faco et al. 2019, found that face mask bone anchorage therapy in patients with UCLP showed a significant orthopedic maxillary

protraction, improved Class III skeletal pattern, a counterclockwise rotation of the palatal plane, and improved molar relations (18). Han et al. have also shown better esthetic results and stability with miniplate anchorage (19). Therefore, the use of a skeletal anchorage would be an advantage, except that miniplates can only be placed after the age of 10 years. The reduced height of the maxillary alveolar bone and the eruption of the mandibular canines would complicate surgery before this age (20). The potentiation of the effect of protraction by disjunction is a result to be interpreted with caution as it contradicts the meta-analysis of Zhang et al. 2015, which states that the result of maxillary orthopedic protraction is similar with or without rapid palatal disjunction (21).

The facial profile changed from a concave to more orthognathic profile for all samples in the selected studies. This finding agrees with Shamlan et al. 2015, who investigated the canonical correlation between hard and soft tissues in facial profiles and found that 84% of the soft tissue variation stems from hard tissue variation (22).

According to these results, maxillary protraction with skeletal anchorage has skeletal and aesthetic effects in the treatment of patients with BCLP and long-term functional effects, increasing pharyngeal airspace (13). This result agrees with Steegman et al. 2023 (23), who confirm that 1.5 years of treatment with skeletal anchorage significantly increased total airway volume and nasopharynx ($P<0.01$).

The included studies in this review used face mask traction (Delaire or Petit) or intermaxillary elastics traction. According to Jahanbin et al. 2016, intermaxillary traction on miniplates can offer an alternative to maxillary protraction in patients with unilateral and bilateral cleft lip and palate (16) as it is easier for patients to cooperate in the absence of an extraoral appliance, as in Tiwari et al. 2024 (24).

Overall, three studies investigated the effects of orthopedic maxillary protraction on hard and soft tissues considering cleft type (11,12,15). They reported greater maxillary advancement in patients with unilateral clefts both under the conventional tooth-anchored masks and skeletal-anchored masks, despite the difference in effects (skeletal for the UCLP and mainly dentoalveolar for the BCLP). Tindlund and Rygh (11) showed that the changes in the soft tissue profile were more or less the same. Before we can say that protraction works better in unilateral than in bilateral clefts, we must consider the surgical history and severity of the cleft.

Each study used a specific surgical protocol. However, the protocol was the same in UCLP and BCLP (11,15). According to Naqvi et al. (25), surgery avoids directly damaging bone but the fibrous scar tissue formed near bone growth sites may prevent normal downward and forward maxillary remodeling and development. As patients with BCLP generally have more scar tissue than those with UCLP, the amount of scar tissue and their tension may explain the difference in maxillary advancement between them. Further studies are needed to assess the influence of cleft scar tissue on maxillary protraction outcomes.

These studies ignored the severity of the cleft at the start of treatment or cervical vertebral maturation, an indicator of patients' growth potential. The GOSLON Yardstick index is the most widely used to assess the efficacy of treatment and treatment outcomes (26). According to Harila et al. (27), this useful method can assess the relation between dental arches and treatment prognosis in cleft patients. They found that patients with BLCP have the poorest prognosis because the initial size of their cleft is usually the largest and most severe. Therefore, such poor outcome confirms that the initial severity of the cleft affects the prognosis of the occlusion and the required orthodontic treatment and methods.

Tellez-Conti et al. (28) found a difference in craniofacial growth and development in patients with cleft lip and palate. Patients with unilateral cleft had predominantly Class III malocclusions, whereas patients with bilateral cleft had Class II malocclusions at an early age. During the prepubertal period, these values became progressively negative until the end of the growth period, implying Class III. Therefore, early orthopedic treatment is strongly recommended to compensate for growth deficits in the midface and to avoid the scarring effects of surgical procedures (28,29). It is advisable to re-examine patients with bilateral clefts in the prepubertal period as this is when Class III malocclusion tends to develop.

According to Ahn et al. 2020 (30), the severity of the cleft and whether alveolar bone grafting is performed can influence the position of the maxillary center of resistance. Studies show that combining protraction and grafting can correct alveolar clefts well, but the timing of grafting remains controversial (9,10,31,32).

In our review, Kobayashi et al. 2015 (10) performed alveolar bone grafting after orthopedic protraction in most patients to correct residual alveolar bone insufficiency. This is consistent with the timing suggested by Meazzini et al. (31), who state that in growing patients with wide unilateral or bilateral

clefts, preoperative orthopedic protraction could be an effective method to reduce alveolar and cleft width, minimizing the risk of post-graft fistulae and reducing the need for additional surgery. However, Yang et al. 2012 (32) found, in their three-dimensional finite element analysis, that it would be more advantageous to perform maxillary protraction with a skeletally anchored face mask and after alveolar bone grafting, regardless of cleft type.

Despite the relevance of its results, this study has several limitations: a small number of included studies, limited sample size of patients with bilateral clefts, protocol heterogeneity, and the compared groups prohibited a meta-analysis. Future research should focus on prospective randomized controlled trials to better assess the efficacy of treatment methods and their long-term results.

CONCLUSION

Several maxillary protraction protocols can treat growing patients with bilateral clefts. They generally produce positive skeletal, aesthetic, and functional results. The studies in this review reported a decrease in profile concavity, Class III dentoalveolar compensation (particularly with dental anchorage), and longer treatment protocols. The UCLP group showed greater A-point advancement than the BCLP group. The use of a skeletal anchorage is possible from the age of 10 years, providing better vertical control and minimizing dentoalveolar effects.

The following factors can optimize protraction results:

- Early restorative surgery: perform conservative surgical procedures close to the suture areas to minimize the negative impact on maxillary growth.
- Age of orthodontic treatment: start treatment at an early age to compensate for growth deficits due to scar tissue tension.
- Follow-up is important during the pre-pubertal period.
- Anchorage: Use of skeletal anchorage in patients over 10 years of age.

No competing interests have been declared.

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