Original Article

Efficacy of 0.3% Cannabidiol (CBD) Oral Paste for The Treatment of Recurrent Aphthous Ulcers

Fuengboon Talkijkul[1], Kanokporn Bhalang[1], Chalapinyo Umpreecha[2]

[1]Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand

[2]Dental Department, Thanyaburi Hospital, Pathumthani, Thailand

Abstract

Cannabidiol (CBD) at 0.1% has been reported to be suitable as an alternative management for Recurrent Aphthous Ulcers (RAU) due to its analgesics and anti-inflammatory effects. This study aimed to examine 0.3 % CBD when compared to 0.1% CBD, 0.1% Triamcinolone Acetonide (TA) oral paste and pure oral paste in the treatment of RAU. For safety investigations, 100 healthy participants were examined for allergic reaction to 0.3% CBD oral paste compared to pure oral paste, then 50 healthy participants were evaluated for local and systemic effects of 0.3% CBD oral paste in which blood tests were performed before drug application and seven days after. After that, RAU patients from the Oral Medicine Clinic, Faculty of Dentistry, Chulalongkorn University were treated with 0.3% CBD, 0.1% CBD, 0.1% TA, and pure oral paste. Each patient received the assigned medication and applied it to the ulcer three times daily for seven days. Ulcer size was assessed using a photograph analyzed with computer software on Days 0 (baseline), 2, 5, and 7. Pain levels were recorded daily. Patient satisfaction was evaluated at the final visit, and quality of life assessment using Oral Health Impact Profile–14 (OHIP-14) was performed at baseline and the last visit. No participants had any allergic reaction to 0.3% CBD in oral paste. There was no significant increase in blood tests values after seven days of topical application of the medicine. However, the level of creatinine was significantly decreased ($p < 0.05$). The 0.3% CBD group showed a significant reduction in pseudomembranous ulcer size and erythematous border on Day 2 compared to pure oral paste. However, the reduction was not significantly different from 0.1% CBD at all monitoring points. Pain levels decreased daily with 0.3% CBD, but the reduction was not significantly different from pure oral paste, 0.1% CBD or 0.1% TA. No significant differences in OHIP-14 scores were observed among the four groups. 0.3% CBD demonstrated early anti-inflammatory and analgesic effects when used to treat RAU. However, those effects were not significantly different from 0.1% CBD.

Keywords: Cannabidiol, Cannabis, Cannabinoid, CBD, Recurrent aphthous ulcers

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Correspondence to:

Kanokporn Bhalang, Department of Oral Medicine, Faculty of Dentistry, Chulalongkorn University, 34 Henri Dunant Road, Pathumwan, Bangkok, 10330 Thailand. Tel.: 086-789-7587 Email: cudent70@gmail.com

Introduction

Recurrent Aphthous Ulcer (RAU) is the most common type of oral ulcers and is considered a chronic inflammatory condition.[1,2] The ulcers usually appear as painful, round or oval sores with an erythematous border.

They can occur as a single ulcer or as multiple ulcers and often last for about two weeks.[3,4] RAU can strongly affect quality of life, because it causes pain and discomfort when patients speak, eat, or swallow.[1] The prevalence is about 20% of the general population and may be up to 40% in children; the rate also differs between races.[1,2] The etiology of RAU is still not well understood. Many factors may be involved, such as genetics, infections, immune problems, nutritional deficiency, stress, smoking, trauma, and certain drugs. RAU can also be part of systemic diseases such as Behçet's disease, Crohn's disease, ulcerative colitis, HIV, or cyclic neutropenia.[3,5]

Current treatment of RAU focuses on reducing pain and inflammation and improving ulcer healing. Common treatments include topical corticosteroids, analgesics, and antiseptic mouthwash.[1,5] Topical corticosteroids are the most effective and are used as the first choice, but they may cause side effects such as fungal infection, contact allergy, or pigmented mucosa.[6] Therefore, treatments with fewer side effects are needed.

Cannabis has been used for pain relief for thousands of years and is now studied as a treatment for several diseases especially in the conditions that would not respond to conventional treatment.[7,8] The main active compounds in cannabis are cannabinoids, which include delta-9-tetrahydrocannabinol (THC) and Cannabidiol (CBD).[9] CBD is not psychoactive[10] and has several effective properties, such as pain relief, anti-seizure, anti-nausea, and especially anti-inflammatory effects.[11] CBD has dose-related side effects and is considered well tolerated. The most seen adverse effects of CBD are drowsiness and sedations. Other adverse effects such as cardiovascular and reproductive effects have been reported at very high doses exceeding 200mg/kg/day which are higher than therapeutic doses. Currently, clinically significant cardiovascular and reproductive effects are rarely seen. Contraindications of CBD include a known allergy to cannabidiol or sesame oil, individuals with history of substance abuse or alcohol dependence and patients with depression, mood disorders and suicidal tendencies.[12]

0.1 % CBD can be used as alternative treatment for RAU13. It was demonstrated that 0.1% CBD oral paste reduced ulcer size and promoted ulcer healing but was less effective than 0.1% Triamcinolone Acetonide (TA). Thus, this study increased CBD concentration to 0.3%. Allergic reactions were examined, as well as local and systemic effects from using topical 0.3% CBD oral paste and compared the efficacy of 0.3% CBD, 0.1% CBD, 0.1% TA and pure oral paste when used for the treatment of RAU.

Materials and methods

Study design

This study was performed in three steps: starting by investigating allergic reactions of 0.3% CBD on the upper backs of participants, followed by examining the local and systemic effects of 0.3% CBD on normal oral mucosa, and finishing with studying the efficacy of CBD oral paste for the treatment of RAU. This study was carried out from December 2024 to May 2025.

0.3% CBD oral paste effect on subjects' upper back

One hundred healthy participants (50 males and 50 females) according to the data from Bhalang K *et al.,* 2013[14] were recruited to be investigated for allergic reaction to 0.3% CBD oral paste. The medicine was filled in two Finn chambers and pure oral paste in the other two chambers. The chambers were applied to the upper backs of participants. After 48 hours, the chambers were removed. Fifteen minutes later, allergic reactions were investigated based on the International Contact Dermatitis Research Group (ICDRG). The ICDRG score was used again 24 hours later[15].

Local and systemic effect of 0.3% CBD oral paste on normal oral mucosa

Fifty Participants (25 males and 25 females) according to the data from Bhalang K *et al.,* 2013[14] were evaluated for local and systemic side effects of 0.3% CBD oral paste when used on normal oral mucosa. Participants were instructed to apply 1 cm diameter of 0.3% CBD oral paste three times/day after meal for seven days on their lower labial mucosa. Blood tests were performed before and after seven days of drug application. Blood screenings are composed of blood urea nitrogen (BUN), creatinine, aspartate aminotransaminase (AST), alanine aminotransaminase (ALT), total bilirubin, alkaline phosphatase (ALP), total protein, and albumin.[16,17]

Efficacy of CBD oral paste for the treatment of RAU

A total of 60 participants from the calculation by G*power program were randomly assigned into four groups to receive one of the following treatments: pure oral paste, 0.1% TA oral paste, 0.1% CBD oral paste, or 0.3% CBD oral paste. The medication was applied to the ulcer three times per day after meals for seven consecutive days. If a participant presented with more than one ulcer, only the most accessible ulcer was evaluated. When an ulcer had completely healed, participants were not required to continue with the medication but were still asked to attend all scheduled follow-up visits. On the final day of the study, participants were asked to rate their satisfaction and report any adverse effects experienced during treatment.

Inclusion and exclusion criteria

To study allergic reaction, the local and systemic effects of CBD, healthy participants were eligible if they were 18–65 years old, willing to join the study, and provided written informed consent. To study the efficacy of CBD oral paste in treating RAU, participants with RAU were required to have a history of RAU occurring at least twice a year on non-keratinized oral mucosa. At the time of enrollment, participants were present with 1–3 aphthous ulcers of less than 48 hours duration, measuring 2–10 mm in diameter, and located in areas easily accessible for evaluation and treatment, such as the labial mucosa, buccal mucosa, or floor of the mouth.

Exclusion criteria for studying allergic reactions were pregnancy and lactation. Exclusion criteria in the study of local and systemic effects of CBD included pregnancy and lactation; concurrent bacteria, fungal, or viral infections; known allergies to CBD or oral paste used in the study. For RAU subjects, the exclusion criteria included pregnancy and lactation; concurrent bacterial, fungal, or viral infections; known allergies to CBD or oral paste used in the study: and ulcers associated with systemic diseases such as Behçet's syndrome, Crohn's disease, ulcerative colitis, anemia, or traumatic ulcers. Patients with diabetes mellitus, which may delay wound healing, were also excluded. In addition, those receiving systemic steroids, oral retinoids, or other immunomodulatory drugs within one week prior to the study, or taking non-steroidal anti-inflammatory drugs, acetaminophen, or other oral topical medications within 48 hours, were excluded. Further exclusion criteria included recent dental surgery within the past two weeks and the presence of orthodontic braces that could contact the ulcer site.

CBD Preparation

CBD oral pastes at concentrations of 0.1% and 0.3% were confirmed to pass cellular and animal safety tests. The shelf life of the CBD oral paste was approximately two years. All formulations were manufactured and supplied by Leapdelab Co., Ltd.

Measurements

- **Ulcer size**

Ulcer size was assessed at baseline (before treatment) and on Days 2, 5, and 7. The measurement included both the pseudomembranous area and the erythematous border. Ulcers, including the erythematous border, were photographed with a DSLR camera equipped with a ring flash (settings: f22, 1/200, ISO 100). An object of known size was included in each photograph for calibration, and the images were analyzed using computer software (Image-Pro Plus, version 4.5), as shown in Figure 1.

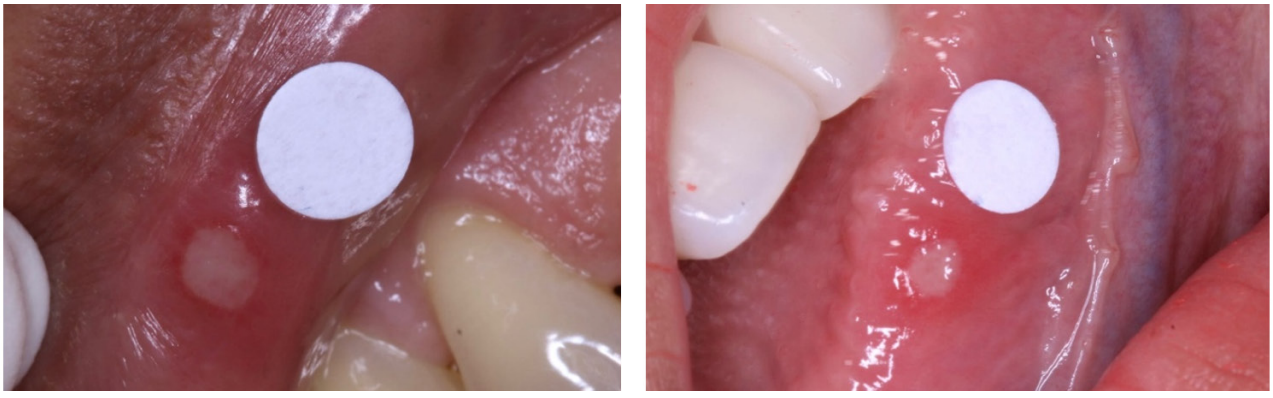

Figure 1 *Aphthous ulcer with an object of known size*

- **Pain level**

Pain level was evaluated using a visual analog scale (VAS). The VAS consisted of a 10-cm horizontal line anchored with "no pain" at one end and "worst pain" at the other. Participants recorded their pain daily from day 0 to day 7, before treatment on Day 0 and 30 minutes after applying the medication following dinner for the remaining days.

- **Participant satisfaction**

On the final day, participants rated their satisfaction with the medication on a scale of 0 (not satisfied) to 10 (most satisfied). They were also asked to report any adverse reactions related to the medication.

- **Oral health–related quality of life (OHQoL)**

Oral health–related quality of life was evaluated using the Oral Health Impact Profile–14 (OHIP-14) questionnaire. This instrument includes 14 questions across seven domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Participants rated each item on a 5-point scale ranging from 0 (never) to 4 (very often). The total possible score ranged from 0 to 56, with higher scores indicating poorer OHQoL. The questionnaire was administered on the first and last visit.[18,19]

Statistical analysis

All data were analyzed using IBM SPSS Statistics version 28, with a significance level set at 5%. Patient information, baseline variables and clinical findings of RAU were summarized using descriptive statistics. Mean differences within each group of blood test parameters were analyzed by using paired t-test for normally distributed data or Wilcoxon signed-rank test with non-normal distribution. For comparison of mean differences in ulcer size, pain level, satisfaction scores, and quality of life (QoL) improvement among the four groups, one-way ANOVA with Bonferroni post hoc test was used for normally distributed data, while the Kruskal–Wallis H test with Bonferroni correction was applied for non-normally distributed data. Changes in QoL between the first and last visits were analyzed using a paired sample t-test.

Ethical consideration

This clinical study was approved by the Ethics Committee of the Faculty of Dentistry, Chulalongkorn University (certification number: HREC-DCU 2024-098). All participants were informed about the purpose and procedures of the study before signing a written informed consent form. They were allowed to withdraw at any time without consequence.

Results

0.3% CBD oral paste effect on subjects' upper back

None of the participants had a positive allergic reaction to the 0.3% CBD oral paste when applied on their upper backs.

Local and systemic effect of 0.3% CBD oral paste on normal oral mucosa

As shown in Table 1, there was no significant increase in blood tests values after seven days of topical application of the medicine and no adverse reaction of using 0.3% CBD. However, there were significantly lower levels of creatinine, ($p<0.05$).

Table 1 *Blood test parameters before and after using 0.3% CBD for 7 days*

	Before (mean (SD))	After (mean (SD))	*P*
BUN	13.22 (3.91)	12.96 (3.30)	0.706[a]
Creatinine	0.84 (0.22)	0.81 (0.20)	0.039[a]
Total protein	7.37 (0.59)	7.38 (0.49)	0.483[a]
Albumin	4.55 (0.30)	4.51 (0.32)	0.086[b]
Total bilirubin	0.46 (0.18)	0.48 (0.19)	0.314[b]
AST	22.84 (6.59)	22.69 (5.95)	0.583[a]
ALT	23.06 (13.27)	23.54 (14.23)	0.478[a]
ALP	67.64 (17.68)	67.86 (19.30)	0.779[a]

[a]*p-values from paired-samples t-test*

[b]*p-values from Wilcoxon signed-rank test*

Efficacy of CBD oral paste for the treatment of RAU

Demographic data and ulcer histories

Sixty participants (15 in each group of 0.3% CBD group, 0.1% CBD group, TA group, and pure oral paste group) were included in the analysis. There were no significant differences observed among the four groups regarding demographic data and ulcer history. 0.3% The CBD group had a higher ratio of men to women when compared to other groups, but the difference was not statistically significant, as shown in Table 2.

Table 2 Demographic data and ulcer histories information

	0.3% CBD (n=15)	0.1% CBD (n=15)	TA (n=15)	Placebo (n=15)	*p*
Sex					
Male, n (%)	7 (11.7)	1 (1.7)	2 (3.3)	3 (5.0)	0.071[a]
Female, n (%)	8 (13.3)	14 (23.3)	13 (21.7)	12 (20.0)	
Age (years), mean (SD)	39.20 (15.42)	34.60 (10.89)	36.13 (10.78)	32.33 (9.92)	0.720[b]
Duration of the ulcer (hours), mean (SD)	42.53 (10.72)	41.60 (11.54)	34.07 (13.64)	33.40 (12.63)	0.074[b]
Ulcer size of day 0 from photograph (mm2), mean (SD)	10.66 (7.13)	14.17 (10.00)	18.56 (13.69)	21.13 (25.06)	0.303[b]
VAS of day 0 (mm), mean (SD)	64.40 (20.26)	56.27 (16.75)	53.27 (19.01)	51.53 (27.65)	0.462[b]
OHIP-14 score at the first visit (scores), mean (SD)	29.20 (8.31)	25.73 (7.51)	25.53 (9.17)	30.40 (13.42)	0.433[c]

Ulcer size reduction

In the 0.3% CBD group, both pseudomembranous ulcer and erythematous border sizes decreased on day two but increased on Day five before reducing again by Day 7. In contrast, the pure oral paste group showed substantial increases in both ulcer and border size on Days 2 and 5, followed by a reduction on Day 7. Meanwhile, TA consistently reduced pseudomembranous ulcers and erythematous border sizes beginning on Day 2, as shown in Table 3.

On Day 2, statistical analysis revealed that the 0.3% CBD significantly reduced pseudomembranous ulcers and erythematous border sizes more than placebo ($p = 0.016$). Reductions with the 0.3% CBD were larger than those observed with the 0.1% CBD, although the differences were not statistically significant.

Table 3 Adjusted percentage ulcer size when compared with baseline (100%)

	0.3% CBD (n=15), mean (SD)	0.1% CBD (n=15), mean (SD)	TA (n=15), mean (SD)	Pure oral paste (n=15), mean (SD)	*p*
Pseudomembranous ulcer size					
Day 0	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	
Day 2	86.01 (66.34)	102.47 (55.77)	77.51 (54.70)	167.51 (81.23)	0.007[a]
Day 5	159.98 (331.11)	91.95 (161.19)	25.31 (46.78)	176.43 (168.09)	0.018[a]
Day 7	105.55 (203.88)	70.36 (183.00)	2.39 (6.49)	146.73 (184.68)	0.008[a]
Erythematous border size					
Day 0	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	
Day 2	99.25 (79.97)	101.63 (45.98)	69.87 (37.32)	136.24 (55.42)	0.024[b]
Day 5	131.6 (211.48)	100.19 (86.78)	34.77 (33.15)	133.40 (91.96)	0.007[a]
Day 7	100.40 (144.04)	68.25 (93.36)	11.77 (22.29)	112.71 (121.21)	0.006[a]

[a]*p-Values from Kruskal-Wallis test*

[b]*p-Values from one-way ANOVA*

Pain reduction

Pain scores from ulcers (VAS) were converted into percentages relative to baseline (Day 0 = 100%). No significant differences in pain levels among the four treatment groups were observed, as shown in Table 4. Daily comparisons showed that pain reduction began on Day 1 in the 0.3% CBD, 0.1% CBD, and 0.1% TA groups. In contrast, the pure oral paste group experienced worsening pain on Days 1 and 2, followed by gradual improvement from Day three onward.

Table 4 *Comparison of adjusted percentage VAS in each day when compared with baseline (100%)*

	0.3% CBD (n=15), mean (SD)	0.1% CBD (n=15), mean (SD)	TA (n=15), mean (SD)	Pure oral paste (n=15), mean (SD)	p^a
Day 0	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	100.00 (0.00)	
Day 1	89.75 (15.37)	81.62 (2374)	90.44 (26.62)	108.31 (65.27)	0.727
Day 2	76.67 (33.13)	71.58 (31.27)	66.91 (29.95)	109.77 (82.41)	0.504
Day 3	64.74 (39.47)	54.78 (32.86)	37.37 (31.64)	90.48 (91.94)	0.234
Day 4	45.31 (39.99)	34.56 (33.90)	15.54 (27.25)	74.84 (107.29)	0.055
Day 5	31.14 (43.73)	21.33 (34.68)	12.78 (26.09)	56.52 (104.61)	0.251
Day 6	24.81 (45.27)	14.74 (32.28)	7.30 (14.94)	50.32 (116.78)	0.589
Day 7	18.33 (41.14)	8.91 (26.44)	2.24 (6.30)	41.40 (113.97)	0.299

[a]*p-Values from Kruskal-Wallis test*

Participant satisfaction

The analysis of satisfaction among the four medications showed that participants using TA reported the highest satisfaction, with a mean score of 8.60 followed by 0.3% CBD group with a mean score of 8.47.

Quality of life

Paired-sample t-tests showed that all four treatments significantly reduced OHIP-14 scores from baseline to the final visit ($p < 0.001$). The greatest mean reduction in OHIP-14 score was observed in the 0.3% CBD group, followed by the 0.1% CBD group, the TA group, and pure oral paste group. Since the data were normally distributed, a one-way ANOVA was performed to compare changes across the four groups. However, the differences among the groups were not statistically significant ($p = 0.863$).

Discussion

Recurrent aphthous ulcer (RAU) is the most common ulcerative lesion in the oral cavity[1,2] and often impacts patients' quality of life. Although it is highly prevalent, the exact etiology remains unclear.[3] Topical corticosteroids are considered the first-line therapy; however, their long-term use may cause adverse effects, particularly immuno-suppression, which can increase the risk of fungal infection.[6] CBD, a major component of cannabis[10], has been applied in various therapeutic settings due to its analgesic and anti-inflammatory properties.[11] These characteristics suggest that CBD-based formulations could serve as an alternative treatment for RAU.

In this study, the effect of using 0.3% CBD was evaluated in terms of allergic reaction, including local and systemic effects. There was no allergic reaction to CBD on subjects' skin. Blood tests showed no greater level of blood parameters (AST, ALT, ALP, Total protein, Total bilirubin, Albumin, BUN, Creatinine) after applying CBD oral paste on oral mucosa except creatinine level which was significantly lower. However, the change was small and remained within the normal range, no clinical symptoms were found. Therefore, this finding is unlikely to be clinically significant.

This is in accordance with the data from Leise. J.M. *et al.,* 2023[20] which found that the creatinine level had decreased with the increasing level of CBD supplementation in horses. Pan. H. *et al.,* 2009[21] revealed similar results in mice. To the authors' knowledge, there was no evidence showing that CBD has any effect on kidney function in humans.

The efficacy of 0.3% CBD was evaluated in terms of ulcer size reduction, pain relieving, patient satisfaction, and oral-health-related quality of life. The results showed that 0.3% CBD did not produce the expected outcomes.

While it reduced pseudomembranous ulcer size and erythematous borders in the early stage, both increased the sizes again in the later stage. Only on Day 2 that 0.3% CBD significantly reduced pseudomembranous ulcer size compared to pure oral paste.

Regarding the pain, the 0.3% CBD demonstrated moderate analgesic effects. Pain scores decreased daily in the 0.3% CBD group, though the reduction was not significantly different from the pure oral paste group. A larger number of participants might result in a more significant effect from this group. Furthermore, the subjective nature of pain evaluation and self-limited disease in RAU could also affect the results.

Oral health-related quality of life was assessed using the OHIP-14 questionnaire. Scores improved significantly from baseline to the final visit in all four treatment groups. However, there were no significant differences among the groups, possibly because RAU is usually a self-limiting condition and placebo effects may also contribute. Thus 0.3% CBD can help improve quality of life after RAU occurrence, even if its effects are not superior to other treatments.

Umpreecha *et al.*[13] reported that the 0.1% CBD oral paste significantly reduced the ulcer size, erythematous border, and pain compared with a placebo at all monitoring points. Similarly, Qi *et al.*[22] demonstrated that the CBD oral spray reduced inflammation, relieved pain, and promoted wound healing. Coelho *et al.*[23] also found that CBD improved pain and inflammation in cats with chronic gingivostomatitis without adverse effects. This study found that higher concentration (0.3%) was not as effective as the lower concentration (0.1%), which contrasts to the findings of Chrepa *et al.*[24], who showed a dose-dependent effect of CBD on pain relief. Unfortunately, the trend of ulcer size and pain reduction when the concentration of CBD increased was not found. These results may be due to a plateau effect, in which increasing concentration does not provide more benefits and topical CBD may have limited tissue penetration in the oral mucosa, thus a higher concentration may not increase the effects. Furthermore, it was found that patients in the 0.3% CBD group had more lesions on the ventral tongue than other groups (data not shown). Since the tongue has movable functions during talking and eating, this could also affect wound healing. A higher ratio of men in the 0.3% CBD group could also result in higher pain tolerance in this group as well.[25]

This study has three main limitations. First, the number of participants in each group was small, which may limit the reliability of the findings. Second, although photographic analysis is more accurate than dental probe measurements, the ulcer sites located in less accessible areas such as the buccal mucosa and the floor of the mouth may reduce accuracy due to variations in retraction force or angulation. To minimize this bias, standardized retraction and angulation should be applied as consistently as possible.

Conclusion

The 0.3% CBD oral paste demonstrated analgesic effect by lowering pain levels with no allergic reaction or adverse local and systemic effects; however, although it can reduce the ulcer size initially, it was also associated with an increase in pseudomembranous ulcer size and erythematous border during the later stages. While the 0.3% CBD may represent a potential alternative for patients with RAU who want to avoid steroid therapy, further research with a larger number of participants is required to validate its efficacy. Future research should also be conducted to confirm the benefits of CBD for patients with renal problems. Exploring CBD for its potential application in other oral lesions should also be considered.

References

1. Ofluoglu D, Ergun S, Warnakulasuriya S, Namdar-Pekiner F, Tanyeri H. An evaluation of the efficacy of a topical gel with Triester Glycerol Oxide (TGO) in the treatment of minor recurrent aphthous stomatitis in a Turkish cohort: A randomized, double-blind, placebo-controlled clinical trial. ***Med Oral Patol Oral Cir Bucal*** 2017; 22(2):e159-e66.

2. Yang Z, Li M, Xiao L, Yi Z, Zhao M, Ma S. Hyaluronic acid versus dexamethasone for the treatment of recurrent aphthous stomatitis in children: efficacy and safety analysis. ***Braz J Med Biol Res*** 2020;53(8):e9886.

3. Preeti L, Magesh K, Rajkumar K, Karthik R. Recurrent aphthous stomatitis. ***J Oral Maxillofac Pathol*** 2011;15(3):252-6.

4. Slebioda Z, Szponar E, Kowalska A. Etiopathogenesis of recurrent aphthous stomatitis and the role of immunologic aspects: literature review. ***Arch Immunol Ther Exp (Warsz)*** 2014;62(3):205-15.
5. Tarakji B, Gazal G, Al-Maweri SA, Azzeghaiby SN, Alaizari N. Guideline for the diagnosis and treatment of recurrent aphthous stomatitis for dental practitioners. ***J Int Oral Health*** 2015;7(5):74-80.
6. Coondoo A, Phiske M, Verma S, Lahiri K. Side-effects of topical steroids: A long overdue revisit. ***Indian Dermatol Online J*** 2014;5(4):416-25.
7. MacCallum CA, Russo EB. Practical considerations in medical cannabis administration and dosing. ***Eur J Intern Med*** 2018;49:12-9.
8. Breijyeh Z, Jubeh B, Bufo SA, Karaman R, Scrano L. Cannabis: A Toxin-Producing Plant with Potential Therapeutic Uses. ***Toxins (Basel)*** 2021;13(2)117.
9. Alcohol and Drug Foundation (ADF). Cannabinoids - Alcohol and Drug Foundation 2022 [updated June 6, 2025. Available from: https://adf.org.au/drug-facts/cannabinoids/.
10. Chayasirisobhon S. Mechanisms of Action and Pharmacokinetics of Cannabis. ***Perm J*** 2020;25:1-3.
11. Lucas CJ, Galettis P, Schneider J. The pharmacokinetics and the pharmacodynamics of cannabinoids. ***Br J Clin Pharmacol*** 2018;84(11):2477-82.
12. Meissner H, Cascella M. Cannabidiol (CBD) in Clinical Care. StatPearls. Treasure Island (FL)2025.
13. Umpreecha C, Bhalang K, Charnvanich D, Luckanagul J. Efficacy and safety of topical 0.1% cannabidiol for managing recurrent aphthous ulcers: a randomized controlled trial. ***BMC Complement Med Ther*** 2023;23(1):57.
14. Bhalang K, Thunyakitpisal P, Rungsirisatean N. Acemannan, a polysaccharide extracted from Aloe vera, is effective in the treatment of recurrent aphthous ulceration. L Altern Complement Med. 2013;19(5):429-34.
15. Johansen JD, Aalto-Korte K, Agner T, Andersen KE, Bircher A, Bruze M, *et al.* European Society of Contact Dermatitis guideline for diagnostic patch testing - recommendations on best practice. ***Contact Dermatitis*** 2015;73(4):195-221.
16. Bergamaschi MM, Queiroz RH, Zuardi AW, Crippa JA. Safety and side effects of cannabidiol, a Cannabis sativa constituent. ***Curr Drug Saf*** 2011;6(4):237-49.
17. Lopez HL, Cesareo KR, Raub B, Kedia AW, Sandrock JE, Kerksick CM, Ziegenfuss TN. Effects of Hemp Extract on Markers of Wellness, Stress Resilience, Recovery and Clinical Biomarkers of Safety in Overweight, But Otherwise Healthy Subjects. ***J Diet Suppl*** 2020;17(5):561-86.
18. Kurklu-Gurleyen E, Ogut-Erisen M, Cakir O, Uysal O, Ak G. Quality of life in patients with recurrent aphthous stomatitis treated with a mucoadhesive patch containing citrus essential oil. ***Patient Prefer Adherence*** 2016;10:967-73.
19. McGrath C, Rogers SN. Overview of Instruments Used to Assess Quality of Life in Dentistry. In: Preedy VR, Watson RR, editors. Handbook of Disease Burdens and Quality of Life Measures. New York, NY: Springer New York; 2010. p. 145-59.
20. Leise JM, Leatherwood JL, Paris BL, Walter KW, George JM, Martinez RE, *et al.* Evaluation of an Oral Supplemental Cannabidiol Product for Acceptability and Performance in Mature Horses. ***Animals*** 2023;13(2):245.
21. Pan H, Mukhopadhyay P, Rajesh M, Patel V, Mukhopadhyay B, Gao B, *et al.* Cannabidiol attenuates cisplatin-induced nephrotoxicity by decreasing oxidative/nitrosative stress, inflammation, and cell death. ***J Pharmacol Exp Ther*** 2009;328(3):708-14.
22. Qi X, Lin W, Wu Y, Li Q, Zhou X, Li H, et al. CBD Promotes Oral Ulcer Healing via Inhibiting CMPK2-Mediated Inflammasome. ***J Dent Res*** 2022;101(2):206-15.
23. Coelho JC, Duarte N, Bento da Silva A, Bronze MDR, Mestrinho LA. Placebo-Controlled Trial of Daily Oral Cannabidiol as Adjunctive Treatment for Cats with Chronic Gingivostomatitis. ***Animals (Basel)*** 2023;13(17)2716.
24. Chrepa V, Villasenor S, Mauney A, Kotsakis G, Macpherson L. Cannabidiol as an Alternative Analgesic for Acute Dental Pain. ***J Dent Res*** 2024;103(3):235-42.
25. Bartley EJ, Fillingim RB. Sex differences in pain: a brief review of clinical and experimental findings. ***Br J Anaesth*** 2013;111(1):52-8.