

The Role of Sodium Lauryl Sulfate as a Causative Agent of Recurrent Aphthous Ulceration

تأثير مادة صوديوم لوريل سولفيت كمادة مسببة لزيادة ظهور حالات التقرح في الفم

Karar Abdulzahra Mahdi, Asst. Lec. M.Sc. in Dentistry, Department of Oral Surgery- College of Dentistry / University of Babylon.

E-mail: aalfahham@yahoo.com

الخلاصة

خلفية البحث : صوديوم لوريل سلفات هو منظف يعتبر كعامل رئيسي لتقليل الشد السطحي، ويستخدم في معاجين الأسنان، ومن الممكن أن يؤثر في وظيفية العزل الموجودة في الغشاء المخاطي الفموي مما يؤدي الى زيادة دخول العوامل الخارجية.

الهدف : إن هدف هذه الدراسة هو لمقارنة تأثير معجون الأسنان المحتوي على صوديوم لوريل سلفات مع معجون الأسنان الخالي منه على المرضى الذين يعانون من التقرحات الفموية المتكررة.

المنهجية : أجريت هذه الدراسة في العيادة الخاصة للمدة من 2015/1/10 إلى 2015/6/1، اشترك في هذه الدراسة 33 متطوعاً (20 انثى ، 13 ذكراً ، متوسط العمر : 22 عام وتتراوح اعمارهم بين 15_35 سنة). جميع المشتركين يعانون من تقرحات فموية متكررة. تم اختبار نوعين من معاجين الاسنان الاول يحتوي على مادة صوديوم لوريل سلفات والآخر لا يحتوي على هذه المادة . المشاركون تم توزيعهم بشكل عشوائي على كلا المعجونين ليستخدموه لمدة 8 اسابيع ومن ثم تم تغيير نوع المعجون الى 8 اسابيع أخرى. تم الطلب من المشتركين لتسجيل شدة الألم المصاحب للتقرحات على مقياس (vas) والذي يتكون من 100 تدرج حسب شدة الألم .بالإضافة إلى ذلك طلب منهم تسجيل عدد التقرحات التي تظهر في الفم، تم استعمال اختبار t لتحديد الفروق الإحصائية .

النتائج : عدد التقرحات وشدة الألم المصاحب لها كان أكثر في المجموعة التي استخدمت معجون الأسنان المحتوي على صوديوم لوريل سلفات. **الاستنتاج :** نستنتج من هذه الدراسة ان استخدام معجون الأسنان الذي لا يحتوي على مادة صوديوم لوريل سلفات من الممكن أن يقلل من نسبة حدوث حالات التقرح الفموي المتكررة.

التوصيات : أوصت الدراسة بضرورة تعزيز استخدام معجون الأسنان الذي لا يحتوي على مادة صوديوم لوريل سلفات وذلك للتقليل من نسبة حدوث حالات التقرح الفموي المتكررة.

Abstract

Background: Sodium lauryl sulfate (SLS) is a detergent that has been used as the major surfactant in most dentifrices and could affect the barrier function of oral mucosa causing enhanced penetration of exogenous antigens.

Objective: The aim of this clinical trial was to compare the effects of an SLS-free dentifrice and an SLS-containing dentifrice in patients suffering from recurrent aphthous ulcers .

Method: This study was achieved in private clinic from 10/1/2015 to 1/6/2015, in this study, 33 volunteers (20 women, 13 men; mean age, 22 years; range, 15-35 years) were included, all have a history of recurrent aphthous ulceration. Two different dentifrices were used in the study. One contained SLS, and the other was SLS free. The patients were randomly allocated to one of the test toothpastes for 8 weeks, Then the patients changed to the other toothpaste for another 8 weeks period. The patients were asked to record on 100 mm visual analogue scales (VAS) the soreness arising from the ulcerated area, as well as the total number of ulcers, t-test was used to determine the statistical difference.

Results: The number of ulcers and baseline soreness scores were significantly less in the group of patients using SLS free tooth paste

Conclusions: This study concluded that using SLS free toothpaste can decrease the number of recurrent aphthous ulcers and the soreness that result from these ulcers regardless of the gender of the patients.

Recommendations: It was recommended to enhance the use of SLS free tooth paste to minimize the number of recurrent aphthous ulcers and the soreness.

Keywords: recurrent aphthous ulceration, Sodium lauryl sulfate.

INTRODUCTION

Recurrent aphthous ulcers (RAU) are characterized by the development of recurring, painful ulcerations of oral mucosa and is of unknown cause. Minor recurrent aphthous stomatitis, the most common type, affects about 80% of RAU adult and child patients, and is characterized by round or oval shallow ulcers usually less than 5 mm in diameter with a white pseudomembrane surrounded by a thin erythematous margin. Minor aphthous occurs on the non-keratinized mobile surfaces such as the labial and buccal mucosa and floor of the mouth and is uncommon on the palate, gingiva, or dorsum of the tongue. These ulcers heal within 7-14 days with no scar formation⁽¹⁾.

Sodium lauryl sulfate (SLS) is a detergent that has been used as the major surfactant in most dentifrices for more than 2 decades. It solubilises flavor oils and lipid-soluble anti-bacterial agents such as triclosan in dentifrice, and it has an anti-microbial effect⁽²⁾.

It is well established that SLS is an irritant to skin at high concentrations and that its repeated application results in a dose-dependent contact dermatitis .and also enhance the penetration of molecules through the oral mucosa⁽³⁾.

SLS, though, plays an important role in toothpastes which is a personal hygiene product used by individuals, its concentration is usually not indicated on the product. There is no guideline for the use of SLS in toothpaste. Studies on SLS have linked the substance to irritation of the skin, eyes, respiratory system if inhaled, organ toxicity and neurotoxicity. Others are endocrine disruption, eco toxicology and biochemical or cellular changes and possible mutation and cancer. SLS is a skin irritant that could damage the oral mucosa and skin⁽⁴⁾.

The SLS in dentifrice could affect the barrier function of oral mucosa causing enhanced penetration of exogenous antigens. This raises the possibility that SLS could play a role in the etiology of recurrent aphthous ulcers and it was thus of interest to study the possibility that SLS could exacerbate ulcer pattern in RAU patients⁽⁵⁾.

Little previous studies^(5,7) confirmed the role of SLS as a contributing factor for the increased incidence of recurrent aphthous ulcers , while one recent study concluded that SLS-free dentifrice had no significant effect on ulcer pattern in the RAU study group⁽⁶⁾.

Objectives of the Study

The aim of this clinical trial was to compare the effects of an SLS-free dentifrice and an SLS-containing dentifrice in patients suffering from recurrent aphthous ulcers.

PATIENTS AND METHODS

This study was achieved in private clinic from 10/1/2015 to 1/6/2015, in this study . In this study, 33 volunteers (20 women, 13 men; mean age, 22 years: range, 15-35 years) were included, all have a history of recurrent aphthous ulceration . They were all healthy individuals with no systemic drug consumption and showed healthy gingival conditions. Blood screening was carried out, and no abnormalities in the findings were found in any of the test subjects.

Two different dentifrices were used in the study. One contained SLS, and the other was SLS free. The patients were randomly allocated to one of the test toothpastes for 8 weeks, Then the patients changed to the other toothpaste for another 8 weeks period. Both pastes were coded to ensure a double-blind design.

The patients were asked to record on 100 mm visual analogue scales (VAS) the discomfort arising from the ulcerated area. The boundaries of the scale were marked _no pain' and _worst possible pain'. Recordings were made at baseline (every week).the total number of ulcers was recorded for each patient at the end of each 8 week period.

Statistical Analysis:

The analysis of data was performed by using a Megast at (Version 9.4 2005) computer program . Results were expressed as mean ± standard deviation S.D. Independent unpaired student t-test was used to analyze the differences between groups.

RESULTS:

Table (1) : Effect of SLS on the number of ulcers and soreness scores among the patient group .

RAU* Indicators	SLS tooth paste N= 33	SLS-free tooth paste N= 33	P- value
baseline soreness scores (mm) as recorded on 100 mm VAS (mean± SD)	59.42± 5.8	43.81±3.6	P <0.05
number of ulcers at baseline (mean± SD)	3.8±0.5	2.2±0.12	P <0.05

*RAU : Recurrent aphthous ulcers .

The results of the study according to the number of ulcers and soreness scores are shown in Table 1. The number of ulcers and baseline soreness scores were significantly less in the group of patients using SLS free tooth paste (P <0.05).

Table (2): Effect of gender on the number of ulcers and soreness scores among the patient group

RAU* Indicators	Male n=13	Female n=20	P- value
Baseline soreness scores (mm) as recorded on 100 mm VAS (mean± SD)	52.67 ± 2.5	54.43 ±4.1	NS
number of ulcers at baseline (mean± SD)	3.66 ±1.6	3.73 ±0.98	NS

* RAU : Recurrent aphthous ulcers .

The results also revealed that there was no statistical difference between male and female in the number of ulcers and baseline soreness scores (table 2) .

DISCUSSION

This study has examined the effect of an SLS-containing dentifrice on the frequency of RAU and the soreness result from ulcerations. The results showed a significant reduction in numbers of ulcers as well as soreness when the patients used and SLS-free toothpaste for 2 months.

The reasons for these results are not fully understood, but it may be due to denaturation of mucosal mucin by Sodium lauryl sulfate. Mucins are principal organic constituents of mucus, the visco-elastic material that covers all mucosal surfaces, and evidence suggests that mucins play an integral role in non-immune protection of the mucosal surfaces⁽⁸⁾. The oral mucosa may then be more vulnerable to exogenous irritating agents and allergens, and in RAU patients the incidence of ulcers may increase.

Furthermore, it is possible that SLS could make the mucosa more permeable to other compounds and agents and that this may play a role in the pathogenicity of RAU⁽³⁾. It was found that SLS in mouth rinses can cause desquamation of oral epithelium and a burning sensation in humans⁽⁴⁾.

These results are agreed with a previous study⁽⁶⁾ that showed a significantly higher frequency of aphthous ulcers was demonstrated when the patients brushed with an SLS- than

with detergent-free placebo paste. While another study by Healy *et al* showed that none of the ulcer parameters measured was significantly affected by the use of the SLS-free dentifrice as compared with the SLS dentifrice⁽⁷⁾. A recent article reported that the recovery period and pain in oral aphthous ulcers can be decreased substantially by using toothpastes not containing SLS⁽⁹⁾.

The reason of these different results may be due to the difference in the concentration of the sodium lauryl sulfate in the toothpastes and the time the toothpaste stay in contact with oral mucosa between each sample.

CONCLUSIONS

This study concluded that using Sodium lauryl sulfate free toothpaste can decrease the number of recurrent aphthous ulcers and the soreness that result from these ulcers regardless the gender of the patients.

RECOMMENDATIONS

It was recommended to enhance the use of SLS free tooth baste to minimize the number of recurrent aphthous ulcers and the soreness .

REFERENCES:

1. Akintoye S. O. and Greenberg M. S.(2014) .Recurrent aphthousstomatitis. *Dent Clinic North Am*,58(2):281 –297.
2. Piret J, Desormeaux A, and Bergeron MG. (2002). Sodium lauryl sulfate, a microbicide effective against enveloped and nonenvelopedviruses.. *Curr Drug Targets* 3 (1): 17–30. doi:10.2174/1389450023348037. PMID 11899262.
3. Marrakchi S andMaibach HI (2006). Sodium lauryl sulfate-induced irritation in the human face: regional and age-related differences. *SkinPharmacolPhysiol*19 (3): 177–80. doi:10.1159/000093112. PMID 16679819.
4. Gimba C.E, Abechi S.E and Elizabeth O. (2014) . Investigations of Sodium Lauryl Sulphate and Saccharin Concentrations inBrands of Toothpaste. *Res. J. Chem. Sci*, 4(6), 58-61.
5. Herlofson B.B. and Barkvoll P.(1994) . Sodium lauryl sulfate and recurrent aphthous ulcers A preliminary study. *ActaOdontolScand*: 52: 257-259. Oslo. ISSN 0001-6357.
6. Bonitsis NG, Altenburg A, Krause L, Stache T, Zouboulis CC. (2009) Current concepts in the treatment of Adamantadies-Behets disease. *Drugs Future*, 34: 749-763.
7. Healy CM, Paterson M., Joyston-Bechal, S., Williams DM and MH Thornhill. (1999) .The effect of a sodium lauryl sulfate-free dentifrice on patients with recurrent oral ulceration, *Oral Diseases*, 5(1) : 39–43 .
8. Frankel. E S and Rebeck K. (2015). Salivary mucins protect surfaces from colonization by carcinogenic bacteria. *Appl. Environ. Microbial*,81: 11 .
9. Unal M, Yalcin BM, and Ozturk O. (2014). A Patient Having Recurrent Aphtous Stomatitis after Three Years of Smoking Cessation; A Case Report and Review of Literature. *J Addict Res Ther*, 5: 1000202. doi:10.4172/2155-6105.1000202 .