

What's new for the clinician – summaries of recently published papers (April 2024)

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1. Photobiomodulation therapy (PBMT) in recurrent herpes labialis management: a randomised controlled trial

Herpes labialis is an infection with herpes simplex virus type 1 (HSV-1) with initial episodes presenting as asymptomatic or symptomatic small blisters or sores on the skin near the site of infection. When the initial infection heals, the virus spreads to sensory nerve cells, where it remains dormant until reactivation occurs. Recurrent herpes labialis (RHL) is a viral disease caused by the reactivation of herpes simplex virus type 1 (HSV-1) which lies dormant in the sensory neurons after the initial infection.¹ HSV-1 reactivation occurs due to various factors such as physical or emotional stress, hormonal imbalances, bacterial infections and suppression of immunity.¹

The disease progression in recurrent herpes simplex labialis (HSL) typically incorporates multiple stages. During the precursor stage, perceptions of pain, tingling or burning may transpire in the affected area, followed by the development of vesicles. Rupturing of the vesicle leads to soft scab formation which is subsequently replaced by a hard scab. Periodically, the scab abates and falls off, allowing the lesion to completely heal without scarring. Throughout this healing process, symptoms such as pain and discomfort ensue, and complete healing may require seven to 10 days. According to the World Health Organization (WHO), about 3.7 billion individuals under the age of 50 are affected by HSV-1, which accounts for 67% of the global population.¹

Acyclovir and its derivatives are considered the standard antiviral drugs for treating herpes simplex virus infections. Skin lesions can be treated topically with cream or ointment form of the medication. The goal of topical treatment for herpes labialis lesions is to shorten healing time. However, acyclovir ointment has been reported to have moderate effectiveness, and repeated use is necessary to achieve the desired therapeutic effect.

Photobiomodulation therapy (PBMT), or what was previously known as low-level laser or cold laser therapy, has been considered as one of the treatment options for RHL. In RHL, PBMT is thought to reduce the pain intensity and increase the interval between recurrent episodes without side effects or drug interactions, which is particularly useful in elderly or immunocompromised patients. Gaizeh Al-Hallak et al (2024)¹ reported on a trial that sought to compare acyclovir cream and photobiomodulation therapy in the management of recurrent herpes labialis (pain index and clinical recovery index).

METHODOLOGY

This was a randomised double-blind controlled clinical trial. According to the sample size calculation, 18 patients per

group were necessary to provide truly significant results (considering the standard α error of 0.05 and a power of 0.95). Assuming a 10% noncompliance rate for follow-up evaluation, the sample size was increased to 20 patients. The study included 40 patients with recurrent herpes labialis who attended the Department of Oral Medicine at Damascus University. Patients were informed of the study's purpose and provided written consent before participating. The exclusion criteria for the study included were pregnant and lactating, individuals with diabetes, immunocompromised patients, those allergic to acyclovir, patients who had taken antiviral, anti-inflammatory or antibiotic medications within the month prior to treatment, smokers and those with lesions that had progressed to the crust stage. The inclusions were individuals in good health, were at least 18 years old, had a history of recurrent herpes labial and had at least one lesion in the vesicular stage.

The patients were randomly divided into two groups (20 patients in each group). The first group (control group) was treated with acyclovir (5%) five times a day for five days. A passive (placebo) laser application with the same irradiation time and number of sessions was used for the second group. The second group (PBMT group) was treated with a diode laser with parameters (wavelength 650nm, power 100mW and fluence 4.7J/cm²), continuous wave (CW) for 120s. The output was according to the display of the device. The treatment was conducted using the contact mode, yet the protective film was not utilised to avoid laser scattering. Instead, the probe was disinfected with alcohol after every use. The laser was applied using a circular probe on the first day and 48h after the first application. In addition, the patients received a placebo cream and applied it five times a day for five days; it was placed in similar containers as the acyclovir cream.

The lesions were diagnosed and treated by an oral medicine specialist, while the results were evaluated and recorded by another specialist who was unfamiliar with the type of treatment used.

The patient's pain levels were monitored and recorded at five time points.

- T0: Before taking any action in the first session.
- T1: After applying the laser (activated or placebo) in the first session.
- T2: The second session (after 48h) before applying the laser (activated or placebo).
- T3: The second session after applying the laser (activated or placebo).
- T4: Third session after 7 days.

The level of pain was measured through the visual analogue scale (VAS), which ranged from 0 representing no pain to 10

representing the worst pain ever. The day the patient noticed the complete disappearance of the pain was also recorded, as well as the day when the crust spontaneously fell off the lesion, which is considered a sign of clinical healing.

RESULTS

Forty participants were divided into two groups. The PBMT group consisted of 5 males (25%) and 15 females (75%) with a mean age of 25.80 ± 6.56 years, and the control group was treated with acyclovir consisted of 1 male (5%) and 19 females (95%) with a mean age of 27.70 ± 9.35 years. There were no significant differences between the two study groups for either sex ($p = 0.077$) or age ($p = 0.820$).

Before starting treatment (T0), the average pain level according to VAS was 4.6 ± 2.70 in the PBMT group and 4.05 ± 2.42 in the control group, with no significant difference between the two groups ($p = 0.555$).

At T3, there was a statistically significant difference in pain levels between the two study groups in the second session after laser application ($p = 0.035$). The pain level in the control group was significantly higher than that in the PBMT group. The differences were not significant between the two groups at the evaluation times T0, T1, T2 and T4.

The results also showed there was a significant difference between the two study groups on the day of pain relief ($p = 0.008$), as it was found the pain in the PBMT group disappeared faster than that in the control group. The difference was not significant on the day the crust fell off ($p = 0.067$).

CONCLUSION

The researchers concluded that photobiomodulation therapy could replace conventional medicine treatment of recurrent herpes.

IMPLICATIONS FOR PRACTICE

PBMT showed better clinical outcomes than acyclovir. However, this therapy shows the greatest potential for efficacy among immunosuppressed patients who suffer from frequent recurrence, severe life-threatening infection and virus resistance to traditional medicines.

REFERENCE

1. Gaizeh Al-Hallak MA, Calhoun K, Hsaijan JA, et al. Efficacy of photobiomodulation therapy in recurrent herpes labialis management: a randomized controlled trial. *Clin Oral Invest* 28, 157 (2024). <https://0-doi-org.innopac.wits.ac.za/10.1007/s00784-024-05541-5>

2. Comparison of efficacy of thermoplastic retainer with round and rectangular bonded lingual wire retainer in the mandible two years after orthodontic treatment: a randomised controlled trial

Following orthodontic treatment, retention is key for maintaining teeth in their corrected positions. Irrespective of the patient's age, underlying malocclusion or type of mechanotherapy used, retention is necessary to preserve the final alignment and occlusion.¹ Without retention, there is a natural tendency for teeth to relapse back towards the original malocclusion. The main goals of the retention phase following orthodontic tooth movement are to:

Allow for reorganisation of the gingival and periodontal tissues. Forces from the gingival and periodontal fibres

around the teeth tend to pull the teeth back towards their original positions.

Minimise changes due to growth and ageing. In late adolescence, continued growth in the patterns that contributed to the initial malocclusion can affect the stability of the orthodontic outcome. In addition, long-term studies have shown that very slow growth continues throughout adult life.¹ These age changes in the form of ongoing dentofacial growth and changes in the surrounding soft tissues can contribute to the deterioration of occlusal relationships and tooth alignment.

Maintain teeth in unstable positions. The teeth may be in an inherently unstable position after treatment sometimes necessary due to compromise or aesthetics.

Permit neuromuscular adaptation to the corrected tooth position. Continuous soft tissue pressures may more readily produce a relapse tendency.

Teeth are retained with removable or fixed retainers and fixed retention has been identified nowadays as the most popular choice in the mandible among orthodontists.¹ Removable retainers can be removed by the patient, which affords the advantage of being easier to fully clean around the teeth to maintain proper oral hygiene. Part-time or full-time wear may be prescribed; however, it has been shown that, in many cases, removable retainers need only be worn at night to maintain dental stability.¹ Typically, removable retainers are made by softening a clear thermoplastic polymer sheet through heat and then moulding it over working models of the teeth by either vacuum or pressure thermoforming. The thin and transparent design makes them a discreet retainer option that is well accepted by patients from a comfort and aesthetic perspective. Excellent compliance is essential with removable retainers and, if consistent wear is overlooked, relapse can occur.

Fixed retainers are bonded to the teeth and are in place permanently which reduces the demands on patient compliance. However, as they cannot be removed for cleaning, they are more prone to plaque and calculus accumulation and may hinder a patient's oral care practices. Often wires are bounded from canine to canine (round or rectangular wires) to maintain the anterior teeth in position.

Ugrin and Špalj (2024)¹ reported on a trial that sought to compare therapeutic and post-therapeutic changes in dentition, the success of maintaining the condition achieved by orthodontic treatment after two years using three types of retention appliances (thermoform removal retainer, rectangular fixed, round wire fixed retainer), and to determine the impact of orthodontic appliances on gingival health. The null hypothesis was that removable and fixed retainers are equally successful in maintaining the results achieved by orthodontic therapy and have similar effects on gingival health.

METHODOLOGY

This was a randomised controlled trial with three parallel groups. With a hypothetical difference in incisor irregularity of 2mm between the two retention protocols and a standard deviation of 3 in each group, a minimum sample size of 36 subjects in each group, ie a total of 108, was calculated. The number was increased to allow for a drop-out rate

of 40%. Therefore, 152 patients aged 11-18 years before starting orthodontic treatment were recruited.

The criteria for inclusion were patients with permanent dentition without hypodontia and tooth loss prior to orthodontic treatment, with a healthy periodontium in the lower front, dental class I or mild class II and III. Exclusion criteria were extraction cases or orthognathic surgery cases. Comprehensive treatment with a multibracket fixed appliance (MBT 0.022) was performed on all patients.

After removing the fixed orthodontic appliances, the subjects were divided into three groups. All three groups had thermoplastic vacuum-formed removable retainers in the maxilla made of thermoplastic foil with a thickness of 1mm but the retention protocols were different for the mandible. In the first group, a rectangular passive steel wire measuring 0.673×0.268 mm (0.027×0.011 inches) composed of eight flattened and braided wires was placed in the lower jaw. The second group received a round steel wire in the lower jaw with a diameter of 0.406mm (0.016 inches) composed of 6 thinner twisted wires. All retainers were adapted to the plaster models and attached with an adhesive technique to the lower canines and incisors lingually, for each tooth separately. All wires were adapted and bonded using flowable composite and adhesive. The third group was the control group, without wires, and the subjects received a vacuum-formed retainer for the mandible.

The same oral hygiene regime was given to all patients which included brushing of the teeth, flossing of the interdental spaces and avoiding interdental brushes to prevent retainer debonding. The duration of orthodontic therapy was recorded. The irregularity of the position of the lower incisors and intercanine width before therapy, after removal of the fixed orthodontic appliance and after two years of retention, and the frequency of wire detachment/breakage/loss of retainer, were monitored. Subjects who showed a debonding were not excluded but the retainer was rebonded. Also, a new retainer was made for those who broke/lost the removable retainer. All measurements were made on the plaster models using a digital calipers just after completion of orthodontic therapy and after two years. The Little's Irregularity Index was used to measure the irregularity of the position of the lower incisors, and it measures the distance between the contact points of each mandibular incisor. It represents the sum of all distances. Intercanine width was recorded as the distance between the tips of the lower canines. Plaque Control Record (PCR) was used for the assessment of biofilm accumulation, Calculus Surface Index (CSI) for calculus accumulation and Bleeding on Probing (BOP) for the extent of gingivitis. PCR, CSI and BOP indices were assessed with a periodontal probe after 6 months and 2 years in retention in 4 places (mesial, distal, buccal and lingual) and the value per subject expressed in the proportion of affected measurement sites (0-100%).

RESULTS

In two years of retention, 61% of patients responded to check-ups. Those who came to the final check-up were matched according to the initial Little's index by retention groups to obtain an equal number of patients per group with a uniform degree of initial crowding. Thus, out of 100 patients, the sample for analysis consisted of 66 patients aged 11-18 years (median 14; interquartile range 14-16; 68% women). Therapies lasted 12-34 months (median

20.5; interquartile range 16.5-25.3; average 21.4 ± 5.4). The Little's incisor irregularity range at the beginning of therapy was 0.4-11.2mm (median 3.2; interquartile range 1.4-4.9mm; average 3.5 ± 2.4). The intercanine width at the beginning of the therapy was 20.4-30mm (median 26.1; interquartile range 24.6-27.4; average 26.1 ± 2.0).

With the therapy, incisor irregularity was corrected in the range 0-11.2mm (average 3.1 ± 2.4 mm) and mandibular intercanine width 3.3-4.7mm (average 0.7 ± 1.4 mm). There were no significant differences between the groups formed for retention. Therapeutic change of intercanine width linearly inversely moderately correlated with therapeutic change of Little's ($r = -0.362$; $p = 0.003$). As the intercanine width increased, the irregularity of the incisors decreased. In the retention phase, a round wire debonded/broke more often than a rectangular wire (incidence 41 vs 36% of cases, average 0.5 vs 0.4 times). In comparison, a removable retainer was lost/broken in 27% of cases (0.3 times) but without statistically significant differences between groups.

The post-therapy change in the irregularity of the mandibular incisors was in the range of 0-4.2mm. Relapse was more common when there was no bonded retainer (incidence 68.2%; severity 0.7 ± 1.0 mm) than with a round (36.4% ; 0.5 ± 1.2 mm) or rectangular retention wire (13.6% ; 0.1 ± 0.1 mm; $p = 0.001$ for incidence and $p = 0.049$ for severity). The amount of change was significant in the group with a round retainer ($p = 0.012$; $r = -0.538$) and without a bonded retainer with a larger effect size for the latter ($p = 0.001$; $r = -0.729$). The difference was significant between the group without a bonded retainer and with a rectangular one with a large effect size ($p < 0.001$; $r = -0.581$).

All subjects in the rectangular retainer group who did not have retainer failure had no relapse, while 38% of those who had rebonded retainer had some relapse ($p = 0.036$; $V = 0.526$) with an average severity of 0.1 ± 0.2 mm. The difference was not significant in the round retainer group (56% of cases with relapse in the rebonded group (average severity 1.1 ± 1.8) vs 23% in the non-failure group (average severity 0.1 ± 0.3) or removable retainer group (50% of cases with broken retainer (average severity 0.3 ± 0.3) vs 75% without broken retainer (average severity 0.9 ± 1.1)). The incidence of relapse when failure occurred did not differ significantly between retainer groups.

The post-treatment change in mandibular intercanine width was in the range of -0.7-2.2mm. The intercanine width decreased more often and more intensively without a bonded retainer (incidence 68.2%; severity 0.5 ± 0.7 mm) and with round more often and more intensively (45.5% ; 0.5 ± 0.7 mm) than with rectangular (27.3% ; 0.1 ± 0.3 mm; Figs 5, 6 and 7). The difference was not significant for severity, but it was for incidence ($p = 0.025$). The amount of change was significant in the group with round retainer ($p = 0.006$; $r = -0.587$) and without bonded retainer ($p = 0.002$; $r = -0.657$). The difference is significant between the group without a bonded retainer and with a rectangular one with a moderate effect size ($p = 0.004$; $r = -0.430$).

There were no significant differences between the groups in the accumulation of biofilm, calculus or the extent of gingivitis 6 months and 2 years after completion of orthodontic therapy. Calculus accumulation significantly increased during retention (between 6 months and 2 years) in all three groups, but

statistically significantly only in the group with a rectangular retainer ($p=0.009$) and without a bonded retainer with the latter having a larger effect size ($p=0.003$). The groups did not significantly differ from each other in terms of increased calculus accumulation. Biofilm accumulation and the extent of gingivitis did not change significantly.

CONCLUSION

The researchers concluded that a rectangular wire bonded on each tooth from canine to canine in the mandible was the more effective retention procedure after orthodontic treatment when compared to bonded round wire and vacuum-formed removable retainer. The impact of all retention appliances on gingival health was similar.

IMPLICATIONS FOR PRACTICE

Evidence based data showing superiority for clinical outcomes that favours using a rectangular retainer which is bonded from canine to canine in the mandible compared to two other options is presented in this trial.

REFERENCE

1. Kanizaj Ugrin S, Špalj S. Comparison of efficacy of thermoplastic retainer with round and rectangular bonded lingual wire retainer in the mandible two years after orthodontic treatment: a randomised controlled trial. Clin Oral Invest 28, 183 (2024). <https://doi-org.innopac.wits.ac.za/10.1007/s00784-024-05572-y>

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