

UNIVERSITI TEKNOLOGI MARA

**EFFECTIVENESS OF
THERMOPLASTIC RETAINER
CLEANSING AGENTS AND
PATIENT-REPORTED
EXPERIENCES AND
OUTCOMES:
A RANDOMISED
CONTROLLED TRIAL**

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ABSTRACT

The thermoplastic retainer is a popular form of orthodontic retainer. Owing to repeated use, the thermoplastic retainer may harbour harmful bacteria if not cleaned effectively. Orthodontists frequently recommend cleansing agent according to their experience and preference as there is insufficient evidence on effective cleansing agent. Cleaning recommendations vary from brushing thermoplastic retainer with tap water only to using antimicrobial cleansing agent after brushing. Studies have shown that the presence of an orthodontic appliance intra-orally predisposes to an increase in saliva bacterial count with varying effects on an individual's saliva parameters. This research seeks to compare the effectiveness of thermoplastic retainer cleansing agents, to investigate the unstimulated saliva parameters and to evaluate the patients' perception on the different cleansing agents. This research was based on the data obtained at baseline (T_0), 6 months post-retention (T_1) and 12 months post-retention (T_2). This randomised controlled trial was conducted at the UiTM Postgraduate Orthodontic Clinic and 30 adult patients (20 females, 10 male; mean \pm SD age, 23.8 ± 6 years) were randomly allocated using block randomisation into intervention and control groups. The two interventions were brushing with toothpaste (Group A), brushing with tap water followed by soaking in a commercial cleansing tablet, Retainer Brite (Group B) and brushing with tap water as control (Group C). All patients were provided with a dental kit, a pre-recorded video demonstrating the thermoplastic retainer cleaning protocol and general retainer wear instructions. During retainer fit, saliva sample was collected for salivary microbial count and saliva parameter assessment was done as baseline (T_0) records. Plaque sample from the retainer, saliva sample and saliva parameter were collected at 6 months (T_1) and 12 months post-retention (T_2). Plaque samples and saliva samples were cultivated on selective microbial agar for oral streptococci detection. A newly developed assessment form comprised of 6 items on freshness, cleanliness, taste, smell, ability to clean and time allocation was recorded using the Likert Scale. Oral streptococci count were analysed using Kruskal-Wallis Test. For the upper plaque sample, no statistically significant difference was found at T_1 ($p=0.245$) and statistically significant difference reported at T_2 ($p=0.03$). However, for the lower plaque sample, no statistically significant differences were observed at both T_1 ($p=0.716$) and T_2 ($p=0.285$) respectively. Similarly, no statistically significant difference for the saliva sample at T_0 ($p=0.459$), T_1 ($p=0.359$) and T_2 ($p=0.204$), respectively. Saliva parameters were analysed using repeated measure analysis of variance. A statistically significant difference was reported for the hydration value between T_0 and T_1 ($p=0.035$) only. No statistically significant difference was observed for saliva quantity, saliva viscosity and saliva pH between all-time points. Fisher's exact test was done for the assessment form and no statistically significant differences were found for any of the 6 items assessed. In conclusion, our study revealed that brushing with toothpaste (Group A), brushing with tap water followed by soaking in a commercial cleansing tablet, Retainer Brite (Group B) and brushing with tap water as control (Group C) were equally effective clinically as the oral streptococci count were all within the low category. The unstimulated saliva hydration value was reduced between baseline to 6 months post-retention only due to the different sample collection time. Meanwhile, saliva pH, quantity and viscosity did not change during the 1 year of retention. The findings suggest that the cleansing agents had good acceptance in terms of patients' perception on freshness, cleanliness, smell, taste, time allocation and compliance.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Retention is the phase of orthodontic treatment that aims to maintain the teeth in their corrected positions after fixed appliances have been removed (Moyers, 1973). Without the retention phase, teeth tend to return to their original position. This unfavourable movement from the corrected position is termed as relapse (Riedel et al., 1969). The causes of relapse are believed to be associated with the recoil of the fibres that hold the teeth, pressure from the tongue, cheeks and lips, continued growth and the way teeth contact (Littlewood et al., 2016). Almost all patients after the completion of orthodontic treatment will need long-term retention to prevent relapse (Littlewood et al., 2016). Retainers can either be removable or fixed. The use of orthodontic retainers can greatly increase the effect to oral health, particularly if oral hygiene is not satisfactory.

Removable orthodontic retainer such as the thermoplastic retainer is increasingly being used due to its clinical effectiveness, cost-effectiveness and increased patient preference (Hichens et al., 2007; Rowland et al., 2007). Effective cleaning of the retainer is one of the key elements in preserving the integrity of the retainer. Retainers that are not effectively cleaned may draw in plaque build-up and accumulate bacteria in the mouth (Tiro, 2018). In turn, this may result in dental caries, gingival inflammation and periodontal disease (Jaderberg et al., 2012).

Thermoplastic retainers can be cleaned either mechanically, chemically or a combination of both. At present, orthodontists recommend a variety of cleaning methods. However, the scientific evidence for each cleaning agent is insufficient (Chang et al., 2014). Several studies have attempted to investigate the effectiveness of different cleansing agents on thermoplastic retainer (Akgün et al., 2019; Alagu et al., 2012; Albanna et al., 2017; Chang et al., 2014; Shpack et al., 2014). However, the findings from these studies were conflicting. In a 2014 study by Chang *et al.*, it was suggested that the same fluoridated toothpaste used for brushing teeth can be used for cleaning retainers. They found that brushing thermoplastic retainers with toothpaste was more effective than using tap water alone. In 2017, Albanna *et al.* revealed that brushing