

Comparison of Fixed and Removable Retainers on Oral Health: An Original Research

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ABSTRACT

Aim: The purpose of this study is to compare the oral and periodontal health of the teeth retained with the use of removable and fixed retainers.

Methodology: Thirty cases receiving comprehensive orthodontic treatment in between 10 to 20 years were randomly selected and divided into 2 groups of 15 each. One group was given removable retainers and other was given fixed retainers. The periodontal status of the patients was assessed with bleeding on probing index, Plaque index and Calculus index.

Results: The mean plaque index in case of removable retainers at 1st, 3rd and 6th month were 0.5, 1.0 and 1.7 where as in case of fixed retainers that were 1.8, 3.0 and 4.5. The mean dental calculus index in case of removable retainers at 1st, 3rd and 6th month were 0.0, 0.1 and 0.1 where as in case of fixed retainers that were 0.1, 0.9 and 1.8.

Conclusion: Removable retainers are superior in oral hygiene maintenance, yet the use of fixed retainers cannot be denied

Keywords: Retainers, fixed, removable, oral health, periodontal status

INTRODUCTION

Appliances which are used in orthodontics practice are broadly classified as removable and fixed appliance by which retention can be achieved. Removable appliances used are Hawley's appliance and Essix retainers. However, the most commonly used removal appliance is Hawley's appliance.¹ Hawley's appliance is made of acrylic palatal portion and labial bow is made of stainless steel wire 0.020 to 0.036 inch, whereas Essix retainer typically consist of a 0.030 inch plastic and all surfaces of the teeth are covered completely. Intra-arch instability is anticipated and prolonged retention is intended by the fixed retainers which are used normally.² It was first proposed by Zachrisson³, where he introduced individual tooth adjustment, multi-stranded wire bonded on the lingual surface of each tooth for retention for the longer period. There are various types of fixed retainers. The most commonly used are the

mandibular canine to canine (3-3) bonded retainer bar (0.030 or 0.032 inch) and the thin wire is 0.0215 inch, flexible retainer and spiral wire retainer.^{4,5}

Segner et al (2000) performed a retrospective study which assessed the reliability of bonded retainers. Among his results, he reports that these retainers were not responsible for causing caries and that the majority of retainer breakages or losses occurred in the first 3 to 6 months. More importantly he concluded that bonded retainers were highly competent and dependable in maintaining tooth alignment. This study has the largest sample size of contributing to a fair level of evidence. However because of the lack of a control group it is not possible to establish whether due to the bonded retainers preventing tooth movement or because of absence of attempted movement by the teeth themselves.⁶

Artun et al (1997) carried out a study comparing 4 types of retainers. Subjects were divided into 4 groups, 3 groups receiving each a different version of bonded retainer while the 4th group received a removable retainer and served as the control group. His paper reported that the 4 types of retainers were equally capable of maintaining incisor positioning. This study is considered to be a randomized-controlled trial, and with such a strong design it has the highest level of evidence. However there is at the same time the lack of a *true* control group that would have ideally received no means of retention at all.⁷

Edwards (1988) investigated a less prescribed means of retention which involves a surgical process where a B.P. blade is inserted into the gingival sulcus severing the epithelial attachment surrounding the teeth as well as the transeptal fibers. The study divided subjects into 2 groups, one in which circumferential supracrestal fiberotomy procedure and removable retainer worn at night was given, and another where only a removable retainer was worn which served as a control. Although the randomization process was done inappropriately (alternating assignment of subjects to the 2 groups) thereby granting the study only a fair level of evidence, the study reports that the circumferential supracrestal fiberotomy procedure was more efficient than a removable retainer alone especially in preventing purely rotational relapse.⁸

Little et al reported that long term retention is recommended and the better choice is bonded retainer for prevention of recurrence of crowding in the mandibular anterior segment.^{9,10} Watt et al investigated the effect of mandibular canine to canine lingual retainers bonded to 2 to 6 teeth for incisor mobility. With a total of 60 participants, divided into 3 equal groups (2 groups with mandibular bonded retainers and one control group with removable retainers), the study results revealed that tooth mobility decreased with the number of teeth bonded to the retainer.¹¹

Stormann et al in prospective randomized study compared 2 types of fixed mandibular retainers. In total 103 patients had either canine to canine (bonded to 6 teeth) or canine and canine (bonded to 2 teeth). Using Little's irregularity index to measure relapse over a period of 24 months, it was found that canine to canine bonded retainer had a greater degree of stability whereas the canine and canine removable retainer had been associated with frequent relapse as the incisors were not bonded.¹²

AIM OF THE STUDY

The purpose of this study is to compare the oral and periodontal health of the teeth retained with the use of removable and fixed retainers.

METHODOLOGY

This cross-sectional study was conducted in our institutional setting for a period of 1 year i.e. from Jan 2020 to Jan 2021. Thirty patients (age range: 10-20 years) were given all-inclusive orthodontic treatment for mandibular anterior teeth based on certain criteria.

Inclusion criteria were: a) Patients undergoing fixed orthodontic treatment, b) Patients with removable/fixed retainers, c) Patients between age of 10 and 20 years. The modified plaque index, according to Quigley and Hein (modified according to Turesky) was, registered for buccal and lingual tooth surfaces according to the following scale:

No plaque – 0,

Spots of plaque at the cervical margin– 2,

Gingival third of tooth surface covered with plaque– 3,

Two thirds of tooth surface covered with plaque– 4,

More than two-thirds of tooth surface covered with plaque– 5.

To measure the amount of dental calculus, a calibrated periodontal probe was applied at three location of the buccal and lingual sides of each lower incisor and canine, a mesial location, at the tooth center and distal location.

RESULTS

Among the 30 cases given retainers, 15 were given removable and 15 were given fixed retainers. 11 males got removable retainers and 4 males got fixed retainers, 7 females got removable retainers and 8 females got fixed retainer. It has been observed that 6 months visit has higher indices reading and 1-month follow-up has the lowest indices reading.

For male and female population on ANOVA test, plaque index was significant and dental calculus index were not significant. The mean plaque index in case of removable retainers at 1st, 3rd and 6th month were 0.5, 1.0 and 1.7 where as in case of fixed retainers that were 1.8, 3.0 and 4.5. The mean dental calculus index in case of removable retainers at 1st, 3rd and 6th month were 0.0, 0.1 and 0.1 where as in case of fixed retainers that were 0.1, 0.9 and 1.8. (Table1)

Table 1- Mean plaque index and dental calculus index after different time

Index	Removable retainer	Fixed retainer
<i>Plaque index</i>	0.5	1.8
1 month	1.0	3.0
3 months	1.7	4.5
6 months		
<i>Dental calculus index</i>	0.0	0.1
1 month	0.1	0.9
3 months	0.1	1.7
6 months		

DISCUSSION

Orthodontic treatment does not end when appliances have been removed and concerned about the stability after completion of active orthodontic treatment and lifetime retention is necessary to maintain satisfactory alignment.¹² Many literatures have shown that relapse after completion orthodontic treatment is unpredictable.¹³⁻¹⁵ In a study of 428 retention patients showed that 20% of patients were not wearing their retainers after 2 years, but 45% were wearing them every night and 80% at least 1 night per week.¹⁶

Silness and Loe's plaque index system is similar to their gingival index system in that it is used to clearly distinguish between the severity and location of soft debris aggregate.¹⁷ In another study, it was found that there was slightly more plaque and calculus present in the fixed retention group. However, this did not result gingival inflammation than in the removable retainer group.¹⁸ Another study has shown significant difference between the fixed retainers and removable retainers group, whereas other studies have shown that there is no

statistical significant difference among different indices recorded from removable and fixed retainers on follow up visit although the recording of indices were high.¹⁹

Significant differences in the gingival conditions exist between the patients who wear removable or fixed retainers. Retention is usually necessary following the orthodontic treatment to overcome the elastic recoil of the periodontal supporting fibers and to allow remodeling of the alveolar bone. In the present study, plaque and calculus accumulation are more in the fixed retainer than the removable retainer.

A recent study published in 2018 by Jinhas concluded that the lingual fixed retainers and Hawley retainers have the longest survival followed by combination retainers and vacuum-formed retainers.²⁰ A systematic review conducted by Mai et al.in 2014 has concluded that there are no differences with respect to changes in intercanine and intermolar width between VFRs and Hawley retainer after active orthodontic treatment. However, currently, the evidence is insufficient for VFR being more effective than Hawley retainers and high-quality RCTs are necessary.²¹ A recent RCT conducted by O'Rourke et al.in 2016 has compared the effectiveness of bonded and VFRs in 82 subjects for 18 months post-debond. They have found that bonded retainers have a better ability to hold the mandibular incisor alignment in the first 6 months after treatment than do VFRs.²² Another RCT conducted by Ramazanzadeh et al.in 2018 had compared the effectiveness of wearing the Hawley retainer for 4 months full-time and then night time, VFRs for 4 months full-time and then night time, and VFR for 1 week full-time and then night time. They have reported both regimens of VFR to be more effective than the Hawley retainer in maintaining arch length and tooth alignment in the upper arch. VFRs for 4 months are advocated for better incisor alignment in the lower arch compared to the Hawley retainer.²³

In present study it was found that, the mean plaque index in case of removable retainers at 1st, 3rd and 6th month were 0.5, 1.0 and 1.7 where as in case of fixed retainers that were 1.8, 3.0 and 4.5. The mean dental calculus index in case of removable retainers at 1st, 3rd and 6th month were 0.0, 0.1 and 0.1 where as in case of fixed retainers that were 0.1, 0.9 and 1.8. At one month follow up the indices were recorded least than the 3 months and 6 months and it was the highest at the 6 months follow-up.

CONCLUSION

The oral hygiene status of the group with fixed retainers was compromised and removable retainers was better. All the oral hygiene indices showed higher in the fixed retainers groups. Removable retainers are superior in oral hygiene maintenance, yet the use of fixed retainers cannot be denied.

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