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Resumen

Objetivo: evaluar los protocolos y guías prácticas publicadas sobre retención en ortodoncia.

Metodología: se llevó a cabo una búsqueda, análisis, crítica e interpretación de datos secundarios sobre recidiva y retención en ortodoncia. Para la elaboración de dicha investigación se contó con 9 libros de Ortodoncia, algunos de ellos brindados por la biblioteca CRAI Dulce Chacón de la universidad europea. También, se realizó una búsqueda bibliográfica de 33 artículos científicos encontrados en diferentes bases de datos como Medline Complete, Cochrane Library, SciELO y PubMed, utilizando como palabras claves: *orthodontic relapse, orthodontic retention, protocol orthodontic retention, practices orthodontic retention, orthodontic retainers, Hawley and vacuum-formed retainers, orthodontic relapse and retention.*

Resultados: el tipo de retención más utilizado en la arcada superior parece ser una combinación de retenedores fijos y removibles. En la arcada inferior, el retenedor fijo adherido a todos los dientes anteriores es el tipo de retención más utilizado. La duración del periodo de retención de la arcada superior oscila entre los 2 - 5 años, y en la arcada inferior la duración de la retención suele ser permanente. La frecuencia de los controles de la fase de retención suele ser de 3 a 4 citas durante el primer año, y posterior a este, mínimo una vez al año.

Conclusiones: Los resultados de este estudio ofrecen a los ortodoncistas tener una guía práctica de retención basada en evidencia científica.

Abstract

Objective: evaluate the protocols and practical guides published on retention in orthodontics.

Methodology: a search, analysis, critique and interpretation of secondary data was carried out. For the making of this research, 9 books on Orthodontics were used, some of them provided by the CRAI Dulce Chacón Library of the European University. Also, a bibliographic search of 33 scientific articles found in different databases such as Medline Complete, Cochrane Library, SciELO and PubMed was carried out, using as keywords: *orthodontic relapse, orthodontic retention, protocol orthodontic retention, practices orthodontic retention, orthodontic retainers, Hawley and vacuum-formed retainers, orthodontic relapse and retention.*

Results: the type of retention most used in the upper arch seems to be a combination of fixed and removable retainers. In the lower arch, the fixed retainer attached to all anterior teeth is the most widely used type of retention. The duration of the retention period in the upper arch ranges from two to five years, and in the lower arch the retention period is usually permanent. The frequency of the retention phase controls is usually three to four appointments during the first year, and after this, at least once a year.

Conclusions: the results of this study offer orthodontists a practical retention guide based on scientific evidence.

Índice

Introducción

1. **Concepto de retención**

2. **Concepto de recidiva**

3. **Frecuencia de la recidiva**

4. **Localizaciones más frecuentes de recidiva**

5. **Factores etiológicos de la recidiva**
   - **4.1** Persistencia de hábitos deletéreos
   - **4.2** Oclusión inadecuada
   - **4.3** Torque inadecuado
   - **4.4** Modificación de la anchura y forma de arcada
   - **4.5** Reorganización de los tejidos periodontales y gingivales
   - **4.6** Aumentos de la dimensión vertical
   - **4.7** Terceros molares
   - **4.8** Cambios ocasionados por el crecimiento y la edad

6. **Prevención recidiva**
   - **6.1** Principios de retención básicos
   - **6.2** Tratamientos quirúrgicos preventivos
     - **6.2.1** Fibrotomía supracrestal circunferencial
     - **6.2.2** Gingivoplastia
     - **6.2.3** Frenectomía
     - **6.2.4** Stripping

7. **Planificación de la retención**
   - **7.1** Corrección y sobrecorrección
   - **7.2** Maloclusiones no recidivantes
   - **7.3** Maloclusiones recidivantes
   - **7.4** Maloclusiones que requieren un período variable de retención

8. **Duración de la retención**

9. **Calendario de revisiones**

10. **Colaboración del paciente**

11. **Tipos de retenedores**
    - **11.1** Retenedores removibles
      - **11.1.1** Hawley
      - **11.1.2** Essix o formados al vacío
      - **11.1.3** Posicionador
      - **11.1.4** Retenedor elástico
      - **11.1.5** Aparatos funcionales
    - **11.2** Retenedores fijos
      - **11.2.1** Barra lingual
      - **11.2.2** Retenedor fijo a la medida del paciente

1. Concepto retención

La retención se define como la inmovilización de los dientes en su nueva posición. (1) (2) (3) (4) (5) La retención se inicia en el momento en que se han alcanzados los objetivos del tratamiento y se decide interrumpir la acción de los aparatos activos. (6) (7)

En un tratamiento de ortodoncia el paciente puede llegar a pensar que el tratamiento ha terminado cuando le retiran los aparatos, pero este debe ser informado que todavía queda una fase importante, la fase de retención. (6) Esta es importante, ya que, una vez que desaparezcan los estímulos mecánicos sobre las estructuras que circundan a las piezas dentarias, los dientes deberán ser considerados potencialmente inestables y deberán de ser retenidos en el sitio logrado por el tratamiento de ortodoncia. (8)

Por lo tanto, será importante hacerle saber al paciente que la recaída no es previsible, pero es muy probable (7) (9) (10) (11), y que pondrán someterse a un tratamiento de ortodoncia sólo si están dispuestos y tienen la capacidad de seguir la retención prescrita. (10)

2. Concepto recidiva

La recidiva se define como la recaída de los tejidos de soporte de los dientes, que ocasionará que estos vuelvan o retrocedan hacia la maloclusión original. (1) (3) (8) (9) (11) (12)

La palabra recidiva proviene del latín *recidivus*, que significa lo que nace o se renueva, y que medicamente se describe como la reaparición de enfermedades después de

haber conseguido salud. En el caso de la recidiva en ortodoncia, la maloclusión no es una enfermedad como tal, sino más bien se describe como un alejamiento o desplazamiento de la dentición hacia posiciones no óptimas. En otro sentido, se podría describir la recidiva como la vuelta de uno o varios dientes hacia su posición original, la cual debe ser diferenciada de la evolución del desarrollo o envejecimiento de la dentición. (6)

Es importante saber que los dientes carecen de capacidad celular de adaptación, por lo que buscarán un equilibrio a través de cambios posicionales. Mershon afirma que "podemos mover los dientes hacia donde creemos que deban estar, pero la naturaleza los desplazará al sitio donde mejor se adapte al equilibrio de la dentición". (6)

3. Frecuencia de la recidiva

La recidiva en ortodoncia es muy frecuente (11) (13), siendo muy habitual que los pacientes requieran o deseen iniciar de nuevo el tratamiento. El porcentaje de recidiva de un tratamiento de ortodoncia suele ser mayor los dos primeros años después del tratamiento con la aparatología fija, se conoce que el movimiento dental comenzará aproximadamente a las dos horas después de haber realizado la remoción, calculándose que el 50% de la recidiva se alcanza a las 12 horas. Aun así, la recidiva suele disminuir con el paso de los años, siendo este mucho menor a partir del cuarto año postratamiento. (13) (14)

Otros autores confirman que, sólo el 67% de los pacientes mantienen los resultados del tratamiento a los 10 años postretención (15), mientras que otros autores opinan que la mayoría de los pacientes tienen una alineación insatisfactoria a los 10 años

posterior del tratamiento de ortodoncia. (16) Concluyendo que, solo el 10-30% de los pacientes mantienen una alineación correcta 20 años después de la remoción de los retenedores, siendo en la mayoría de los casos mayor la recidiva en la arcada inferior en comparación con la arcada superior. (11) (15) (16) (17)

En los casos de recidiva se suele ver con mayor frecuencia apiñamientos, diastemas, alteración de la sobremordida tanto a nivel vertical como horizontal e inestabilidad de la corrección de la clase II y III de Angle. (15)

4. Localizaciones más frecuentes de recidiva

Generalmente, la recidiva tiende a enfocarse en su mayoría a nivel de los incisivos inferiores, (3) (15) siendo estos la primera evidencia de la inestabilidad posterior a un tratamiento de ortodoncia. La inestabilidad del sector anteroinferior suele deberse a la irregularidad de la alineación de los incisivos inferiores, produciéndose así, en la mayoría de los casos apiñamiento de este sector. (15)

El método más utilizado para medir la irregularidad de los incisivos es el índice de irregularidad de Little, (12) (17) el cual se realiza llevando a cabo una medición lineal del desplazamiento de los puntos de contacto de los incisivos mandibulares (15), para ello, se marcan los puntos más mesiales y distales del borde incisal de los incisivos, al igual que, los puntos más mesiales de los caninos. Luego, las distancias entre estos puntos se miden y se suman. (11)

Este índice se clasifica en cero, cuando el paciente presenta un perfecto alineamiento, leve cuando la irregularidad oscila entre 1 y 3 milímetros, moderado con una irregularidad entre 4 a 6 milímetros y severo cuando es mayor de 6mm. (15)

Para la medición de este índice se suele utilizar calibradores específicos, principalmente de 0.1 mm de precisión. Estos deberán ser colocados paralelos al plano oclusal, midiendo solo el apiñamiento lineal (horizontal) de los puntos de contacto anatómicos. (17)

Este índice permite cuantificar la severidad del apiñamiento anteroinferior antes del tratamiento de ortodoncia, al finalizar el tratamiento y años después de este. (17)

5. Factores etiológicos de la recidiva

La etiología de la recidiva es compleja, y a pesar de que haya muchos factores involucrados, muchos de ellos no han podido ser demostrados. (6) En esta investigación se recogerán los principales factores implicados en la etiología de la recidiva.

5.1 Persistencia de hábitos deletéreos

Uno de los factores etiológicos es el no haber eliminado la etiología de la maloclusión, como por ejemplo la persistencia de hábitos deletéreos. Es importante erradicar hábitos anómalos como, chuparse el dedo o el labio, la respiración bucal, la interposición lingual, entre otros. Aun así, el problema es que pocas veces este factor causal es identificado por el ortodoncista. (6) (18)

Es importante conocer que las presiones generadas por los tejidos blandos pueden generar recidivas de los tratamientos de ortodoncia, por lo que será necesario crear un área de equilibrio entre los tejidos blandos (lengua, labios y mejillas) y los dientes, ya que, se han visto casos de alteraciones a nivel de la forma de arcada o inclinaciones a nivel de los incisivos. (1) (9) (19)

5.2 Oclusión inadecuada

Otro de los factores etiológicos de la recidiva es no haber conseguido una correcta oclusión con el tratamiento de ortodoncia, por ejemplo: dejando contactos proximales incorrectos, inadecuada intercuspidación dental, falta de cierre de diastemas, entre otros. (6)

De igual manera, será importante llevar a cabo una adecuada corrección y sobrecorreción de la relación anteroposterior y de la sobremordida, un adecuado paralelismo de las raíces en la zona de extracciones en los casos en donde éstas han sido parte del plan de tratamiento, al igual que, debemos comprobar que coincida la línea media superior e inferior y que las angulaciones mesio-distales de las coronas sean correctas. (6)

5.3 Torque inadecuado

Los cambios en la inclinación de los incisivos en sus bases óseas aumentan el riesgo de recidiva, sobre todo en el caso de los incisivos inferiores si no son posicionados de manera vertical con respecto al hueso basal. (1) (18)

5.4 Modificación de la anchura y forma de arcada

La expansión del arco inferior para la solución de apiñamientos leves y moderados se ha cuestionado por su poca estabilidad, ya que, los dientes tienden a regresar a su posición inicial. Por lo que, se recomienda no aumentar en exceso el perímetro de los arcos y seguir la forma de arco del paciente. (1) (9)

5.5 Reorganización de los tejidos periodontales y gingivales

Posterior al tratamiento con aparatología fija, puede ocurrir una recaída como resultado de las tensiones ejercidas por las fibras periodontales que tienden a tirar a los dientes hacia sus posiciones originales. (9) (10) (20)

Durante el tratamiento de ortodoncia, es normal que se produzca un ensanchamiento del espacio del ligamento periodontal, al igual que una rotura de los haces de fibras colágeno que rodean al diente, estos cambios son necesarios para que se pueda producir la movilización dental. (10)

Los elementos y materiales utilizados en un tratamiento de ortodoncia ejercen fuerzas que producen movimientos y, cuando se retiran, los tejidos quedan inestables o alterados, haciendo que el ligamento periodontal como la red de fibras colágenas y elásticas de la encía deban remodelarse en la nueva posición. (3) (5)

En ese momento cada diente es capaz de responder individualmente a las fuerzas de masticación, y lo que se espera es que en un plazo aproximado de 3 a 4 meses se reorganice el ligamento periodontal. Esta reorganización del ligamento periodontal es muy importante para la estabilización del tratamiento, reduciendo así el riesgo de recidiva. (10)

La remodelación de las fibras colágenas y elásticas es mucho más lenta que la del ligamento periodontal, por lo general, la red de fibras colágenas de la encía se

reorganiza aproximadamente en un plazo de 4 a 6 meses y las fibras elásticas supracrestales se remodelan aún con mayor lentitud, pudiendo presentarse alteraciones en las posiciones dentales hasta un año después de haber removido el aparato. (19) (21)

5.6 Aumentos de la dimensión vertical

También se puede llegar a observar recidivas en los casos de mordidas profundas, ya que, al intentar aumentar la dimensión vertical la mandíbula rotará hacia abajo y hacia atrás, en estos casos la mandíbula tenderá a recidivar en sentido contrario y aumentará el riesgo de apiñamiento y protrusión de los incisivos anteroinferiores. (1)

5.7 Terceros molares

Otro factor etiológico que juega un papel muy controvertido es la presencia de los terceros molares después del tratamiento de ortodoncia, ya que se le contribuyen como factor de riesgo para el desarrollo de maloclusión o recidiva. (22)

Zawawi K y Melis M, en 2014, se plantearon como objetivo evaluar el papel de los terceros molares en el desarrollo de apiñamiento o recidiva después del tratamiento de ortodoncia en el sector anterior, proponiendo como hipótesis que el componente mesial de las fuerzas de erupción de los molares puede crear una migración mesial de los dientes que culmina en el área de los incisivos, ocasionando la pérdida de espacio disponible. (22)

5.8 Cambios ocasionados por el crecimiento y la edad

Otro aspecto por considerar son los cambios ocasionados por el crecimiento, los cuales pueden modificar el resultado final del tratamiento. (1) (19) (20) (23) Los

pacientes en fase de crecimiento deben ser tratados con precaución y medidas de retención, ya que se pueden presentar alteraciones esqueléticas y dentales que obliguen a repetir el tratamiento. (1) (19)

Debemos tener mucha precaución con los pacientes en crecimiento, ya que, la principal causa de apiñamiento de los incisivos inferiores al final de la adolescencia es el crecimiento tardío de la mandíbula, la cual la mayoría de las veces se acompañará de la inclinación lingual de los incisivos como respuesta al patrón de crecimiento. (21)

También, es importante tomar en cuenta que puede haber movimientos dentales no deseados ocasionados por los cambios en la edad. Por lo que, los retenedores no solo están indicados para resistir a la tendencia de los dientes a regresar a sus posiciones de pretratamiento, sino también para resistir los cambios de edad no deseados a largo plazo. (10)

6. Prevención de la recidiva

Antes de llevar a cabo la fase de retención, el ortodoncista debe guiarse de una serie de principios básicos de retención. Al igual que, debe tomar en cuenta que existen diversos tipos de tratamientos quirúrgicos preventivos, los cuales, en conjunto con los principios básicos de retención, pueden ayudar a reducir el riesgo de recidiva del tratamiento efectuado.

6.1 Principios de retención básicos

Los principios de retención básicos son:

1) Los dientes que se han movido tienden a volver a su posición inicial.

2) La eliminación de la causa de la maloclusión evitará la recaída.

3) La maloclusión se debería sobrecorregir.
4) La oclusión es un factor importante para mantener los dientes en sus posiciones corregidas, esta deberá ser estudiada y analizada en oclusión estática como funcional.
5) Se debe esperar que el hueso y los tejidos adyacentes se reorganicen en su nueva posición.
6) Los incisivos inferiores deberán ser posicionados de manera perpendicular al plano mandibular, teniendo así, mayor probabilidad de mantenerse en su posición.
7) Las correcciones que han sido realizadas cuando el paciente estaba aún en fase de crecimiento tendrán menor riesgo o probabilidad de recidiva.
8) Cuando mayor haya sido el movimiento dental, menor será el riesgo de recidiva.
9) La forma de arcada inferior no se debe alterar ni modificar. (6) (18)

6.2 Tratamientos quirúrgicos preventivos

Los tratamientos quirúrgicos preventivos son:

6.2.1 Fibrotomía supracrestal circunferencial

Un enfoque alternativo es utilizar un procedimiento quirúrgico simple llamado fibrotomía supracrestal circunferencial, que consiste en seccionar las fibras supracrestales, permitiendo así que se regeneren en la nueva posición establecida, haciendo que la recaída por la elasticidad gingival se reduzca significativamente. (9) (24) (25)

El protocolo para la realización de la fibrotomía supracrestal se basa en un corte entrando interdentalmente en el espacio del ligamento periodontal. Este procedimiento debe realizarse al final del tratamiento de ortodoncia, unas semanas antes de retirar el aparato, ya que la cicatrización de los tejidos tardará entre 7 a 10 días. (8) (26) Este procedimiento está contraindicado en los casos con inflamación gingival o cuando el biotipo gingival sea muy fino. (1)

6.2.2 Gingivoplastia

Otro procedimiento quirúrgico utilizado para disminuir la recidiva es la gingivoplastia, la cual se puede realizar en las zonas donde se han llevado a cabo exodoncias, con el propósito de disminuir el tejido gingival acumulado por el cierre mecánico. (1)

6.2.3 Frenectomía

También tenemos una opción quirúrgica en los casos de diastemas interincisales causados por inserciones bajas de los frenillos vestibulares, en donde se llevará a cabo lo que se conoce como la Frenectomía, la cual consiste en la eliminación completa del frenillo, incluyendo su unión al hueso subyacente. Este procedimiento se puede llevar a cabo con un bisturí convencional, electrobisturí o mediante el uso de láseres. Es recomendado llevar a cabo este procedimiento, ya que, si no se elimina el frenillo, este tiende a traccionar el tejido gingival y a volver a abrir el diastema. (1) (27)

6.2.4 Stripping

Y, por último, tenemos la reaproximación o también conocido como stripping, que consiste en la reducción del esmalte interproximal de los incisivos inferiores para

modificar los puntos de contactos por áreas de contacto grandes y planas, permitiendo así mejorar la estabilidad de estos. (1) (9)

7. Planificación de la retención

Antes de la remoción de la aparatología fija se debe comprobar ciertos aspectos como son: la corrección y sobre corrección, al igual que, se deberá evaluar las maloclusiones que estuvieron presentes en el paciente antes de la colocación de los Brackets, con el propósito de pautar la duración de la retención según sea caso.

7.1 Corrección y sobrecorrección

La sobrecorreción significa terminar el tratamiento de modo que se facilite el movimiento de los dientes en dirección opuesta a la que significaría la reaparición de la maloclusión. Esto suele llevarse a cabo en las maloclusiones clase II, en los casos de sobremordida y mordida abierta, ha sido también recomendada en el tratamiento de las rotaciones, pero no existen pruebas que indiquen una mejor estabilidad de estas. (1) (6) (18) (25)

7.2 Maloclusiones no recidivantes

Los casos en los que no requeriremos retención son:

- Casos de mordida cruzada anterior, donde la causa era funcional y se ha podido establecer una sobremordida adecuada.
- Casos de mordida cruzada posterior, en donde se ha conseguido establecer una adecuada interdigitación.

- Casos en donde los caninos se encuentran altos y se ha realizado la extracción de ellos. (1) (6)

7.3 Maloclusiones recidivantes

También debemos conocer los casos que requerirán retención permanente o semipermanente, en los cuales encontramos:

- Casos en los que se haya realizado expansiones de las arcadas dentales.
- Casos en los que se ha creado una mordida dual que quiera mantenerse.
- Casos en donde han estado presente rotaciones dentales muy severas.
- Casos con diastema central entre incisivos centrales superiores.
- Casos donde el plan de tratamiento involucraba la realización de exodoncias. (1) (6)
- Casos en donde se han realizado extrusiones dentales.
- Casos de anomalías hereditarias con mordida cruzada anterior. (25) (28)

7.4 Maloclusiones que requieren un periodo variable de retención

Los casos que requerirán un periodo variable de retención serán:

- Clase Molar II, ya que, pueden no requerir retención de la arcada inferior.
- Clase Molar II, división 2º.
- Clase Molar III, las cuales han sido corregidas de manera quirúrgica y de ello, dependerá la duración de la retención.
- Casos de mordida profunda, en donde se requerirá la retención del plano vertical, pero la duración de la retención estará relacionada con el crecimiento remanente del paciente.

- Casos de erupción ectópica dental, los cuales suelen requerir periodos prolongados de retención. (6)
- Casos en donde se han corregido de manera temprana las rotaciones dentales.
- Mordidas profundas leves que han sido corregidas por medio de la intrusión de los incisivos. (1)

8. Duración de la retención

Existe mucha controversia con respecto al tiempo de uso de los aparatos de retención. La mayoría de los odontólogos consideran que cuanto mayor sea el período de retención mejor será el resultado del tratamiento, aun así, reconocen que existen características individuales entre los pacientes, las cuales deberán ser tomadas en cuenta desde el inicio del tratamiento (29). Para el odontólogo será un desafío determinar exactamente cuánto tiempo de retención requerirá el paciente, por eso la mayoría de los odontólogos preferirán la retención permanente por ser la opción más segura. (3) (7) (9) (16) (30)

Otros autores plantean que el uso de estos variará según el tiempo de tratamiento, si el tratamiento de ortodoncia duró pocos meses, el odontólogo puede decidir que el paciente use estos aparatos todo el tiempo hasta que la oclusión sea estable, pautando la disminución del uso de este por etapas. En el caso de que el tratamiento de ortodoncia haya durado varios años es probable que el odontólogo recomiende el uso permanente del retenedor. (31)

Actualmente, la pauta más extendida es el uso a tiempo completo del retenedor removible durante el primer año, seguido por el uso nocturno durante el segundo año.

(32) (33). Aun así, otros autores recomiendan que el paciente use a tiempo completo el aparato de retención removible durante los primeros 3 - 4 meses, y posterior al cuarto mes, les recomiendan seguir utilizando los retenedores a tiempo parcial durante al menos 12 meses, permitiendo así la organización de las fibras gingivales. (21) (34) Se debe tomar en cuenta que si el paciente aún está en crecimiento deberá utilizar la retención a tiempo parcial hasta la finalización de este. (19) (21)

De igual manera, la duración de la retención dependerá del diagnóstico de la primera consulta, de la edad del paciente y del aparato de retención seleccionado. Si el aparato seleccionado es de tipo removible se deberá ir reduciendo de manera progresiva las horas de uso diario, iniciando por su uso las 24 horas y terminando por su uso una vez por semana. (7) (25) (28)

9. Calendario de revisiones

En el momento que el paciente acepte el consentimiento de retención, se le planteará llevar a cabo un calendario de revisiones de este. Se le aconsejará la revisión de los aparatos de retención al mes, a los 3 meses, a los 6 meses y al año (1) (2) (3) (16) (21) (30) (34). Además, se le recomendará el cambio de las placas o retenedores removibles cada dos años, y en el caso de la retención de tipo fija, se valorará su remoción a los cinco años. (1) (21)

10. Colaboración del paciente

En ortodoncia, la colaboración del paciente es mucho más exigente que en otras áreas que involucran el cuidado de la salud. Los pacientes no colaboradores suelen ser aquellos que tienen una actitud desafiante o pobre hacia el tratamiento de ortodoncia. Esta actitud por parte del paciente podría provocar el fracaso del tratamiento realizado. (35)

Los pacientes deben estar completamente conscientes del compromiso que requiere llevar retenedores, sobre todo si el tipo de retención es removible, ya que, su éxito dependerá en gran parte del cumplimiento por el paciente. (9) (35)

De igual manera, es importante conocer que la fácil y rápida adaptación a los retenedores, la adecuada relación con los tejidos adyacentes y la comodidad al usarlos garantiza la colaboración del paciente en esta importante fase de retención. (36)

Otros de los factores que intervienen en la colaboración del paciente son el estado socioeconómicos y demográficos, el nivel educativo, la relación médico-paciente, la información suministrada sobre el tratamiento, el tipo de retención y la orientación de los padres. (35)

Estudios concluyen que, a los pacientes que se le prescriben retenedores formados al vacío, colaboran mucho más en el tratamiento que los pacientes que se le prescriben retenedores Hawley. (35) (37) Aun así, a los dos años se ha observado un mayor cumplimiento en los pacientes con retenedores Hawley. (37)

Esto puede deberse a que los retenedores formados al vacío cubren las superficies oclusales, las cuales tienden a desgastarse debido al estrés de las actividades

funcionales y parafuncionales. Otra de las razones es la susceptibilidad a fracturas que tiene el retenedor formado al vacío debido al material del cual están hechos. (37)

Por lo que se concluye que, al decidir el tipo de retención es importante tomar en cuenta la colaboración del paciente, pues de ello dependerá el éxito del tratamiento.

11. Tipos de retenedores

Retenedores removibles
Hawley
Essix o formados al vacío
Posicionador
Retenedor elástico
Aparatos funcionales

Retenedores fijos
Barra lingual
Retención fija a la medida del paciente

Tabla 1. Tipos de aparato de retención

Como ya se ha ido mencionado anteriormente disponemos de diversos tipos de retención, estos pueden ser removibles o fijos y deben cumplir con algunos aspectos, por ejemplo, ser higiénicos, deben estar diseñados para ir en dirección opuesta a la recidiva, deben ser fáciles de usar y no deben interferir con la recuperación de los tejidos de soporte ni con la oclusión. (1)

En este trabajo nos enfocaremos en dar a conocer los aparatos de retención más utilizados para prevenir o reducir la recidiva después de un tratamiento de Ortodoncia.

11.1 Retenedores removibles

Empezaremos dando a conocer los retenedores de tipo removibles, los cuales pueden ser un medio de retención muy eficaz para contrarrestar la inestabilidad entre las arcadas, y también suelen ser usado en los pacientes con problemas a nivel del crecimiento. (21)

11.1.1 Hawley

Descripción

Es uno de los retenedores removible más utilizado (3) (4) (5) (34) (32) (38), se compone de una base de acrílico con ganchos de retención Adams en los molares y también consta de un arco vestibular, con ansas en la zona de los caninos. (1) (6) (8) (11)

Este arco vestibular va a mantener la zona de los dientes anteriores en su lugar, sujetándolos en la superficie vestibular a nivel del tercio medio de su corona. El alambre utilizado es acero inoxidable redondo de 0.028¨ o 0.030¨ de diámetro. (4) (8)

Las ansas ubicadas en los caninos van a permitir el ajuste de la posición anteroposterior del alambre y permitirán de igual manera, corregir pequeñas recidivas, es muy importante que estas se encuentren separas de la encía de los caninos. (4) (8)

El cuerpo del retenedor puede ser elaborado con metacrilato de metilo líquido y en polvo (acrílico), en resinas acrílicas fotocuradas o en materiales termoplásticos. El grosor ideal debe ser de aproximadamente 1,5 mm a 2 mm en la arcada superior y en el caso que se decida utilizar también en la arcada inferior su grosor ideal será entre 2 mm a 2,5 mm, sin restarle espacio a la lengua. Lo ideal es que el acrílico cubra los

cíngulos de los dientes anteriores consiguiendo así una mayor retención del aparato. (4) (8)

Es importante conocer que este retenedor gracias a que cubre el paladar en el caso de la arcada superior, nos permite proporcionar automáticamente un plano de mordida potencial para controlar la sobremordida y si en el caso hubiese la necesidad de controlar la profundidad de la mordida se podrá incorporar un plano de mordida a nivel lingual de los incisivos superiores. (21)

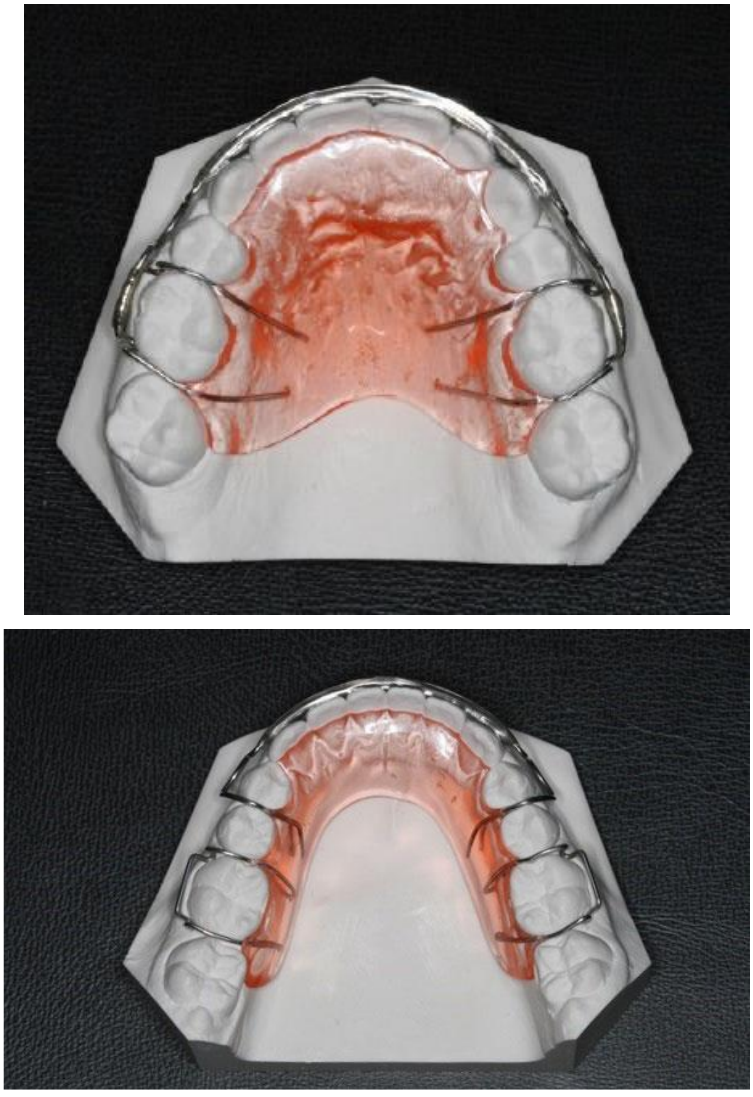

Imagen 1. Retenedor Hawley (9)

Ventajas

Las ventajas que nos ofrece este tipo de retenedor removible es que son higiénicos, permiten el uso del hilo dental sin impedimentos, no aumentan el riesgo de padecer de caries dental ni de enfermedad periodontal, nos pueden servir de guía para la erupción de segundos y terceros molares, nos permiten agregar elementos para corregir recidivas, como por ejemplo resortes o también se les puede agregar planos o bloques de mordida para la corrección de ésta. (4) (8) También son preferidos por los pacientes por su gran resistencia y durabilidad. (4) (38)

Inconvenientes

De igual manera, este tipo de retenedor presenta ciertos inconvenientes y es que no son estéticos, pueden dificultar el habla del paciente, pueden llegar a absorber malos olores, que la retención depende completamente del paciente tanto su uso como su limpieza, y, por último, pero no menos importante, el saber que los alambres que pasan por las superficies oclusales pueden interferir en la oclusión pudiendo causar una mordida abierta en el sector posterior. (8)

11.1.2 Retenedores transparentes, Essix o formados al vacío

Descripción

Otro de los retenedores más utilizados actualmente (2) (3) (5) (7) (8) (32) (34) (38), son los conocidos como retenedores transparentes, Essix® o formados al vacío, los cuales son elaborados a partir de unas placas plásticas o de acetato. Se clasifican en función de su extensión:

A: la placa solo abarca el sector anterior de canino a canino.

C+: la placa abarca la arcada completa. (8)

Essix A

Materiales

El grosor más utilizado para la elaboración de la placa Essix de tipo A es de 0,030¨. (8)

Ventajas y desventajas

Son retenedores muy estéticos, ya que reflejan la luz y mantienen el brillo natural de los dientes. Su gran desventaja es que no abarca la arcada completa por lo tanto no permite la retención del sector posterior. (8)

Essix C+

Materiales

Los Essix de tipo C+ solo están disponibles en grosor de 0.040¨. (8)

Ventajas y desventajas

Son considerados menos estéticos que los Essix tipo A, ya que no reflejan la luz de la misma manera, pero aun así tienen una gran ventaja que es su resistencia. Además, también se diferencian de los tipos A porque involucrarán o comprenden la arcada dentaria completa de molar a molar, lo cual los hace muy útiles para mantener las expansiones palatinas realizadas. (8)

Imagen 2. Retenedor Essix o formado al vacío (9)

Ventajas

Las ventajas que nos ofrece este tipo de retenedor es que es altamente estético, son fáciles de realizar y económicos, pueden ser también utilizados como férula de blanqueamiento y como gran ventaja nos permiten realizar ligeros movimientos dentales (de 2mm a 3mm) por medio de botones de resinas sobre el diente afectado realizando una ventana en el lado opuesto. (4) (5) (8) (11) (32)

Inconvenientes

Dado que el material utilizado es transparente y delgado la mayoría de los pacientes lo prefiere, aun así, posee algunas limitaciones para su utilización, por ejemplo, el espesor del material sobre las caras oclusales puede llegar a ser un problema si en ambas arcadas se utiliza este tipo de retención, debido a que no conseguiremos adecuados puntos de contacto oclusal y los dientes no estarán en contacto. Lo ideal en este caso es que se utilice este retenedor en la arcada superior y un retenedor fijo a nivel de la arcada inferior. (11) (21) (32)

Otra de las limitaciones es que este retenedor no controla la profundidad de la mordida como lo hace un retenedor de tipo Hawley, además, con el paso del tiempo se va desgastando y cambiando de color hasta llegar al punto de que es necesario sustituirlo. (11) (21)

11.1.3 Posicionador

Descripción

Es un retenedor removible que no ha sido utilizado con tanta frecuencia, fue descrito por primera vez por Kesling en 1945, se trata de un aparato bimaxilar, elaborados de silicona semidura, que puede ser utilizado como un aparato de retención y/o puede incorporar pequeños detalles de terminación, suele ser usado en las noches y se recomienda que por el día se utilice por lo menos 2 a 4 horas. (1) (6) (28)

Imagen 3. Posicionador (28)

Ventajas

Los posicionadores aprovechan la movilidad dental incrementada inmediatamente después del tratamiento de ortodoncia con aparatos fijos, para poder llevar a cabo

correcciones muy finas de malposiciones dentales. Este posicionador se confecciona realizando un set-up de los dientes por medio de un encerado ideal. (28)

Inconvenientes

Este retenedor presenta notables inconvenientes como lo son su volumen, que no tienen la misma eficacia a nivel de los incisivos como los otros retenedores mencionados anteriormente, además tiene el gran inconveniente de alterar la mordida. Aun así, son muy útiles en pacientes con tendencia a la recidiva de Clase III y otra gran ventaja viene siendo que mantiene las relaciones oclusales. (21)

11.1.4 Retenedor elástico

Descripción

Otro tipo de retenedor utilizado con menor frecuencia, es el retenedor elástico, también conocido como spring retainers, este se elabora a nivel de los incisivos, por medio de dos bloqueas de acrílico, uno en vestibular y el otro en lingual, unidos por un alambre con capacidad elástica. (6) De igual manera, este retenedor puede ser diseñado para cubrir toda la arcada dentaria y no solo el sector anterior, a este se le conoce como retenedor de Lewis. (21)

El retenedor elástico además de cumplir su función de retención también puede ser utilizado para corregir pequeñas recidivas del sector anterior. (8) (28) Para su elaboración también debemos de realizar un set-up en el modelo de escayola del paciente, en donde para la corrección de los dientes rotados aplicaremos cera sobre la cara del diente que se quiere rotar, mientras que en el lado opuesto se desgastará

el modelo, siendo aconsejable realizar un stripping o reaproximación en el diente que se quiera rotar. (1)

Imagen 4. Retenedor elástico (21)

Ventajas e inconvenientes

Las ventajas y desventajas de este tipo de retenedor son muy parecidas a las del retenedor Hawley, excluyendo la ventaja de adicionar elementos accesorios para la corrección de la mordida. (8)

1.1.1 Aparatos funcionales

También es importante mencionar los aparatos funcionales utilizados en el tratamiento de ortodoncia, ya que estos de igual manera serán utilizados como aparatos

removibles de retención, debido al gran potencial de crecimiento que presentan estos pacientes, pudiendo así alterar los resultados logrados. (1)

1.2 Retenedores fijos

Indicaciones

En el momento en el que el odontólogo dude de la estabilidad de la alineación obtenida, puede optar por los conocidos aparatos de retención fijos, los cuales serán utilizados cuando necesitemos mantener el cierre de diastemas, conservar los espacios logrados para la colocación de puentes y, sobre todo, para el mantener los incisivos retenidos durante el final del crecimiento. (6) (16) (21)

Otros casos en donde la retención fija puede ser privilegiada, será en los que el soporte periodontal esté reducido, al igual que, en los casos de pacientes con labio leporino y paladar hendido, con evidencias de cicatrices que pueden predisponer a una recidiva del tratamiento. (9)

1.2.1 Barra lingual

Descripción

Uno de los retenedores fijos recomendado para retener los incisivos en la posición lograda con la ortodoncia y reducir el riesgo de recidiva, es la barra lingual fija (21), la cual se caracteriza por ser un retenedor prefabricado (28), anclado únicamente a los caninos, aunque también puede ser cementado en los primeros premolares, esta se encontrará apoyada en las superficies linguales planas de los incisivos inferiores por encima de los cíngulos, impidiendo lingualización de los incisivos. (21)

El alambre utilizado deberá ser lo bastante grueso para aguantar la distorsión de todo el sector a retener, permitiendo así conseguir la estabilidad del sector anterior durante muchos años (21). Este retenedor se compone de dos bases metálicas, que como ya se dijo anteriormente, suelen ser cementadas en los caninos y un arco con un alambre de 0,036¨. (8)

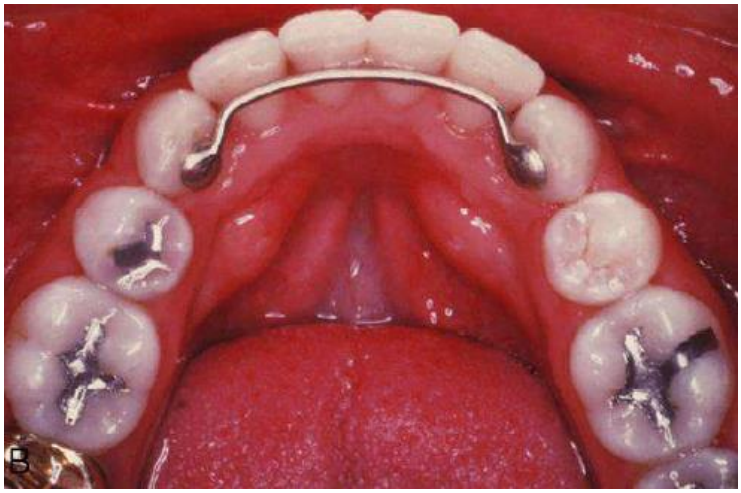

Imagen 5. Barra lingual (21)

Cementación

Para llegar a cabo el cementado de este tipo de retenedor, será fundamental realizar una profilaxis de las caras linguales del sector anteroinferior, posterior al aislamiento colocaremos adhesivo tanto a nivel de las superficies linguales de los incisivos anteroinferiores como a nivel de las bases de la barra, donde además en ésta aplicaremos la resina que nos permitirá unir la barra a los dientes, para su estabilización fijaremos la barra a los dientes por medio de ligaduras metálicas y fotopolimerizamos. También podemos agregar un poco de resina en las superficies linguales de los incisivos con el propósito de conseguir mayor retención y estabilidad. (8)

1.2.2 Retención fija a la medida del paciente

Descripción

También tenemos otra opción de retención fija, la cual se realiza a la medida del paciente. (8) La principal indicación para esta variante es la rotación muy acentuada de un diente, por lo que será aconsejable el uso de un alambre no tan rígido, optando por alambres más flexibles, por ejemplo, se podría utilizar un alambre de acero trenzado de mediano calibre. (21)

Imagen 6. Retención fija a la medida del paciente (21)

Elaboración y cementación

Para llevar a cabo el procedimiento de cementado, se tomará una impresión de la arcada inferior en alginato y se vaciará para la elaboración de un modelo de trabajo, en dicho modelo iremos adaptando el alambre trenzado sobre las superficies linguales de los incisivos y caninos, aunque también existe la posibilidad de hacerlo directamente sobre el paciente sin la necesidad de llevar a cabo un modelo de trabajo. Posteriormente, será llevado a boca para su cementación, la cual se realizará de la misma manera que el alambre prefabricado. (8)

Como ya se mencionó anteriormente, este tipo de retención también es recomendado para el cierre de diastemas de los incisivos centrales superiores, incluso si ya se ha realizado la Frenectomía, puesto a que tiende de igual manera a abrirse un diastema pequeño entre los incisivos. El alambre recomendado para estos casos será de tipo flexible, permitiéndole a los dientes una ligera movilidad independiente durante su función. (21)

Los retenedores superiores fijos no son utilizados con tanta frecuencia, debido a que tienen mayor riesgo de fractura por el contacto incisal, por lo que será fundamental evaluar el resalte y la sobremordida del paciente. (21)

Otra de las indicaciones para el uso de este retenedor fijo, es como mantenedor de espacio de un póntico o implante, para esta retención se necesitará un alambre grueso, el cual irá adherido a las superficies intracoronales de los dientes adyacentes a la brecha edéntula, posicionándolo de tal manera que no interfiera con la oclusión. (21)

Ventajas e inconvenientes de la retención fija

La dos grandes ventajas que presentan este tipo de retención que los hace muy aceptados por los pacientes, es que son independientes de la colaboración del paciente y que son altamente estéticos, pero sin embargo presenta muchos inconvenientes, ya que necesitarán un cuidado y mantenimiento constante, debido a la facilidad de acumular cálculo dental sobre todo si el paciente no mantiene una buena higiene oral. (1) (8) (16) (39)

Es muy importante que el paciente sea consciente de la importancia en el mantenimiento del aparato, ya que corre el riesgo de recidiva de la maloclusión inicial o la alteración de las posiciones conseguidas con el tratamiento de ortodoncia. Hay muchos informes en donde se han visto movimientos no deseados, debido a fallos en la adhesión de algunos o varios dientes, por lo que será fundamental el mantenimiento constante del retenedor. (9)

Interlandí plantea que el retenedor fijo mandibular no es el retenedor ideal, debido a los inconvenientes expuestos anteriormente y además nos señala que este tipo de retención no nos permite controlar el alineamiento de premolares y molares. Otro de los inconvenientes que nos plantea Interlandí es que el retenedor fijo dificulta el uso del hilo dental, por lo que concluye de que en algún momento este deberá ser retirado. (8)

Objetivos

Principal:

Evaluar los protocolos y guías prácticas publicadas sobre la retención en ortodoncia.

Secundarios:

- Identificar el tipo de retención dental más utilizado en la arcada superior e inferior.
- Determinar la duración del período de retención dental.
- Evaluar la frecuencia de controles de la fase de retención dental.
- Comparar el grado de aceptación y efectividad de los retenedores removibles.

Materiales y métodos

Estrategia de búsqueda

1) Consulta de libros en la biblioteca CRAI Dulce Chacón de la Universidad Europea de Madrid. Se buscaron libros que englobaran los temas de recidiva y retención en Ortodoncia. Otros libros consultados fueron recopilados de internet.
2) Búsqueda digital:
   - Básica (palabras claves): *orthodontic relapse, orthodontic retention, protocol orthodontic retention, practices orthodontic retention, orthodontic retainers, Hawley and vacuum-formed retainers, orthodontic relapse and retention.*
   - Avanzada: uso de operador boléano (AND).
   - Base de datos: **Medline complete** (https://web-b-ebscohost-com.ezproxy.universidadeuropea.es/ehost/search/basic?vid=0&sid=3c0503de-1bb2-4f83-bb00-720bfdc6eaaf%40sessionmgr101) y **Cochrane Library** (https://www.cochranelibrary.com/).
   - Motores de búsqueda: **Pubmed** (https://pubmed.ncbi.nlm.nih.gov/) y **SciELO** (https://scielo.org/es/).
   - Revistas digitales: **The angle orthodontist** (www.angle.org) y **American Journal of Orthodontics and Dentofacial Orthopedics** (www.ajodo.org).
3) Búsqueda manual: se revisaron manualmente las referencias de los artículos seleccionados, para asegurarse que no se omitiera ningún artículo de interés.

Tabla. 2 búsqueda digital y resultados

	Tipo de búsqueda	Palabras llaves	Resultados
Medline Complete	Básica	Orthodontic relapse	1.269
	Básica	Orthodontics retention	2.237
	Básica	Protocol orthodontic retention	121
	Básica	Practices orthodontics retention	217
	Básica	Orthodontic retainers	1.537
	Avanzada	Hawley and vacuum-formed retainers	33
	Avanzada	Orthodontic relapse and retention	338
Cochrane Library	Básica	Orthodontic relapse	78
	Básica	Orthodontics retention	237
	Básica	Orthodontic retainers	222
	Avanzada	Hawley and vacuum-formed retainers	22
Pubmed	Básica	Orthodontic relapse	9
	Básica	Orthodontics retention	4
Scielo	Básica	Orthodontic relapse	26
	Básica	Orthodontics retention	46
	Básica	Orthodontic retainers	14
	Avanzada	Orthodontic relapse and retention	9
	Básica	Orthodontic relapse	498
	Básica	Orthodontics retention	911

The angle orthodontist	Básica	Protocol orthodontic retention	380
	Básica	Orthodontic retainers	598
	Avanzada	Orthodontic relapse and retention	298
American Journal of Orthodontics and Dentofacial Orthopedics	Básica	Protocol orthodontic retention	1.020
	Avanzada	Orthodontic relapse and retention	1.876
	Avanzada	Hawley and vacuum-formed retainers	56

Criterios de inclusión

Para la recopilación de información se llevó a cabo dos tipos de búsqueda bibliográfica diferentes.

La primera búsqueda recogió los antecedentes y estado actual del tema, es decir, todo lo referente a recidiva en ortodoncia, su definición, factores etiológicos, prevención, entre otros. Para dicha búsqueda se abarcó los siguientes criterios:

- Artículos de revisión.
- Artículos de gran impacto.
- Artículos de los últimos 20 años.
- Artículos de texto completo.
- Artículos en inglés.
- Ensayos clínicos prospectivos.
- Libros documentales.

La segunda búsqueda estuvo motivada a responder los objetivos propuestos. Para ello, se abarcó alguno de los siguientes criterios:

- Encuestas a ortodoncistas sobre la fase de retención.
- Ensayos clínicos dirigidos a pacientes para conocer las experiencias y/o efectividad de la fase de retención.

Criterios de exclusión

- Estudios con menos de 30 participantes.
- Estudios en animales**.**
- Estudios que no especificaban el método estadístico.
- Documentos de tesis.
- Contenido no relevante para el trabajo de investigación.

Recogida de datos y análisis estadístico de los resultados

Se analizaron dieciséis artículos, los cuales fueron recopilados en dos tablas para evaluar los protocolos y guías prácticas sobre la retención en ortodoncia. Diez de los artículos fueron recopilados en la **tabla 3**, y se basaron en encuestas a ortodoncistas de diferentes partes del mundo, lo cual permitió evaluar sus protocolos de retención. Los seis artículos restantes, fueron recopilados en la **tabla 4**, y se basaron en ensayos clínicos realizados en pacientes, lo que permitió conocer las experiencias de los pacientes, al igual que, la efectividad de los diferentes protocolos de retención.

Tabla 3. Encuestas a ortodoncistas sobre la fase de retención

Estudio	Muestra	Experiencia laboral	Objetivos	Materiales y métodos	Resultados	Conclusiones
Mushriq, 2020	175 H: 58,4% M: 41,6% **Origen:** Irak	46%: > 10 años 24%: <10 años	Protocolos de retención comunes.	23 preguntas **Método estadístico:** chi-cuadrado	- **Arcada superior:** combinación VFR y fijo. **Arcada inferior:** fijo. - **Uso (removible):** 3 - 6 meses: TC. Posterior: dejar de usar.	Los resultados permiten comparar prácticas.
Rahman, 2016	32 H: 37,5% M: 62,5% **Origen:** Malasia	87,5%: > 6 años.	Tipos de retenedores más utilizados.	25 preguntas **Método estadístico:** SPSS	- **Retenedor removible preferido:** VFR. - **Retenedor fijo:** mandibular más utilizado. - **Uso (removible):** 3 - 9 meses: TC.	Período de retención de 6 años o más.
Patcas, 2014	562 H: 69% M: 31% **Origen:** Suiza	Promedio: 22 años	Protocolos de retención en Suiza.	21 preguntas **Método estadístico:** SPSS	- **Arcada superior e inferior:** fijo. - **Duración:** permanente. - **Controles:** Primer control: primeros 3 meses.	Los retenedores fijos son muy usados en Suiza.
Popović, 2020	92 H: 23,9% M: 76,1% **Origen:** Croacia	No registrado	Protocolos de retención en Croacia.	14 preguntas **Método estadístico:** SPSS	- **Arcada superior:** VFR. **Arcada inferior:** combinación fijo y removible. - **Período de retención:** 3-5 años. - **Controles:** 4 citas primer año y 3 citas a partir de entonces.	La retención se reduce con el aumento de la edad y la experiencia.
Al-Jewair, 2016	167 H: 69% M: 31% **Origen:** Arabia Saudita	46%: 6 -15 años	Protocolos de retención en Arabia Saudita.	**Método estadístico:** SPSS y chi-cuadrado. **Significancia:** 5%	- **Arcada superior:** HR. **Arcada inferior:** fijo. - **Uso (removible):** permanente. - **Retenedor removible:** casos con exodoncias. - **Primer control:** uno o dos meses después de la remoción.	HR en el maxilar y fijo en la mandíbula.
Valiathan, 2010	658 H: 86,7% M:13,3% **Origen:** Estados Unidos	Promedio: 15 años	Protocolos de retención en Estados Unidos.	**Análisis de los datos:** frecuencias, porcentajes y pruebas de chi-cuadrado.	- **Arcada superior:** HR. **Arcada inferior:** fijo**.** - **Uso (removible):** TC 9 meses y luego TP. - **Primer control:** 1º - 2º mes. **Segundo control:** 3º - 5º mes. **Tercer y cuarto control:** 6 º - 11º mes.	HR en el maxilar y fijo en la mandíbula.
Vandevska, 2013	150 H: 69,3% M: 30,7% **Origen:** Noruega	58%: > de 20 años. 41%: < de 20 años.	Protocolos de retención en Noruega.	14 preguntas. **Método estadístico:** SPSS y chi-cuadrado**.**	- **Arcada superior:** combinación fijo y removible. **Arcada inferior:** fijo. - **Duración retención**: Maxilar: 2-5 años. Mandíbula: > 5 años. **- Retenedores removibles:** más citas de seguimiento.	Se desean pautas de retención comunes.
Renkema, 2009	254 **Origen:** Holanda	No registrado	Protocolos de retención en Países Bajos.	**Método estadístico:** SPSS, chi-cuadrado y Fisher.	- **Arcada superior e inferior**: fijo. - **Retenedor removible:** casos de expansión y/o exodoncias. - **Uso (removible):** TC 6 meses. **Uso (fijo):** permanente. - **Controles (removible):** Primer año: 2 - 4 controles.	Necesidad de desarrollar una guía de retención.
Lai C, 2014	145 **Origen:** Suiza	42%: > 20 años. 58%: < 20 años.	Protocolos de retención en Suiza.	21 preguntas. **Método estadístico:** SPSS, chi-cuadrado y Fisher.	**- Arcada superior e inferior:** fijo. - **Retenedor fijo y removible:** casos de expansión maxilar o exodoncias. **- Uso (removible):** mínimo 16 h/día. **Uso (fijo):** permanente. - **Controles primer año:** Fijo: 2 controles. Removible: 3 controles	Se desea una guía práctica de retención.
Andriekute, 2017	81 H: 13,6% M: 86,4% **Origen:** Lituania	46,9%: < 10 años. 53,1%: > 10 años.	Protocolos de retención en Lituania.	28 preguntas. **Método estadístico:** SPSS y chi-cuadrado. **Significancia:** <0,05.	**- Retenedor fijo y removible:** casos de expansión maxilar. - **Retenedor removible preferido:** HR. - **Retenedor fijo preferido:** adherido a los seis dientes anteriores. - **Controles:** Primer año: 3 citas. Posterior: 1 vez al año.	Se desean pautas de retención basadas en evidencia.

Nota: H: hombre; M: mujer; SPSS: Statistical Package for the Social Sciences; HR: retenedor Hawley; VFR: retenedor formado al vacío; TC: tiempo completo; TP: tiempo parcial.

Tabla 4. Ensayos clínicos a pacientes sobre la fase de retención

Estudio	Muestra	Objetivo	Materiales y métodos	Resultados	Conclusiones
Saleh, 2017	94 H: 46% M: 54%	Aceptabilidad del HR y VFR durante 6 meses.	**HR:** 41 **VFR:** 45 Cuestionario a la semana **(T1)**, a los 3 meses **(T2)** y a los 6 meses **(T3)**.	No hubo diferencias en el ajuste y capacidad para morder. **Diferencias: VFR:** Hablar (P < 0,05), apariencia (P < 0,001) e irritación gingival (P < 0,001). **HR:** durabilidad (P < 0,001).	Iguales en la adaptación y capacidad para morder.
Chagas, 2020	70 H: 34% M: 66%	Nivel de satisfacción del HR y VFR.	**Uso:** 1 mes (24h/día) cada uno. Después un cuestionario.	**VFR:** mejor para tragar. **HR:** mejor en la higiene y durabilidad. 52,86%: prefirieron HR.	Satisfacción general: no hubo diferencia.
Ramazanzadeh, 2018	90 H: 36% M: 63%	Efectividad VFR y HR.	**Grupo 1:** HR (4 meses TC, luego TP). **Grupo 2:** VFR (4 meses TC, luego TP). **Grupo 3:** VFR (1 semana TC, luego TP). Evaluación al 4º y 8º mes.	**Ancho IC e IM:** no diferencias. **LAS**: menor grupo HR (< 0.05). **IR:** menor en los 2 grupos VFR (p < 0.05). **Apiñamiento:** menor en el grupo 2 en la mandíbula (p < 0,05).	Ambos regímenes del VFR fueron más efectivos.
Demir, 2012	42 H: 29% M: 71%	Comparar VFR y HR.	**VFR:** 22 **HR:** 20 **Tiempo medio de retención:** 1 año. **Seguimiento:** 2 años. **4 etapas:** radiografías y modelos. **Calibradores Vernier:** precisión:0,1mm.	**IR:** aumentó en los dos grupos. **Ancho IC:** no hubo diferencias. **LAI:** tendió a volver a su posición original. **VFR:** más eficiente para retener el sector anteroinferior.	Ambos retenedores tuvieron éxito (p> 0,05).
Shawesh, 2010	67 **Grupo 1:** H: 41% M: 59% **Grupo 2:** H: 24% M: 76%	2 regímenes HR: -TP 1 año. -TC 6 meses, luego 6 meses TP.	Modelos de estudio: **(T1):** final del tratamiento. **(T2):** un año después de la remoción. Uso de calibradores digitales.	**T1 - T2:** ligero aumento en el IR. **T2:** ligero aumento (0,5 mm) del apiñamiento anterior.	No se encontraron diferencias entre los dos regímenes.
Tynelius, 2015	49 H: 33% M:67%	Comparar tres estrategias 5 años después de la retención.	**Grupo 1:** VFR (paladar y dientes anteriores), fijo inferior. **Grupo 2:** VFR maxilar, stripping anteroinferior. **Grupo 3:** posicionador prefabricado. **Uso: 1er año: Grupo 1 y 2:** TC 2 días, luego TP 12 meses. **Grupo 3:** TP 12 meses. **2do año:** TP. Los modelos se midieron en 4 etapas.	- **Maxilar:** **Ancho IC:** diferencia significativa entre los grupos 1 y 2. - **Mandíbula:** **IR:** diferencia significativa entre los grupos 1 y 2.	Los 3 métodos lograron resultados favorables.

Nota: H: hombre; M: mujer; HR: retenedor Hawley; VFR: retenedor formado al vacío; TC: tiempo completo; TP: tiempo parcial; IC: intercanino; IM: intermolar; LAS: longitud de arcada superior; LAI: longitud de arcada inferior; IR: índice de irregularidad.

Discusión

La fase de retención tiene como propósito mantener las posiciones logradas con el tratamiento de ortodoncia, al igual que, minimizar la posibilidad de recidiva. (5) (7) (11) (40) La recidiva en ortodoncia se entiende como la recaída de los tejidos de soporte de los dientes, ocasionado que estos vuelvan o retrocedan hacia la maloclusión original. (11)

Desafortunadamente, el predecir la aparición de recidiva es complicado, ya que, cualquier maloclusión puede estar propensa a inestabilidad, por lo que, será muy importante mantener la alineación lograda. (11) Hoy en día, no existe un acuerdo sobre el tipo de retenedor, la duración y los controles de esta fase, por lo que la elección del protocolo de retención se basa principalmente en las preferencias personales y criterios no científicos. (20) (34) (40)

Aun así, como se puede observar en la tabla 3, varios autores de diferentes países han realizado encuestas y ensayos clínicos sobre protocolos de retención y tendencias utilizadas, las cuales, revelan preferencias y diferencias entre los ortodoncistas, siendo estas muy útiles para la elaboración de un protocolo de retención universal. (20) (40)

Por esta razón, el objetivo de este estudio **fue evaluar los protocolos y guías prácticas publicadas sobre la retención en ortodoncia**, con el propósito de obtener respuestas sobre el tipo de retenedor más utilizado, la duración de esta fase y sus controles.

Tipo de retención dental más utilizado en la arcada superior

Los resultados sobre el tipo de retenedor más utilizado en la arcada superior fueron muy divergentes, puesto que algunos ortodoncistas, sobre todo de Malasia y Croacia, consideran que el retenedor formado al vacío es el retenedor más utilizado para la arcada superior (7) (25). De la misma manera, los ortodoncistas de Arabia Saudita y EE. UU, consideran que el retenedor Hawley es el más utilizado (2) (34).

Otros ortodoncistas consideran que el tipo de retención ideal para la arcada superior es una combinación de retenedores fijos y removibles (3) (16) (20) (41), sobre todo en los casos donde se ha expandido la arcada superior o en los casos donde se han realizado exodoncias. (3) (16)

Solo hubo dos estudios en donde los ortodoncistas respondieron que preferían el uso de retenedores fijos en la arcada superior (16) (42), excepto cuando la arcada superior se expandió durante el tratamiento o cuando se realizaron exodoncias, en cuyo caso se colocó un retenedor removible tipo Hawley en la arcada superior. (42)

Tipo de retención dental más utilizado en la arcada inferior

Los resultados sobre el tipo de retenedor más utilizado en la arcada inferior fueron más semejantes, puesto que la mayoría de los ortodoncistas prefirieron el uso de un retenedor fijo para la arcada inferior (2) (3) (16) (20) (34) (41), preferiblemente adherido a todos los dientes anteriores. (20) (16) (41)

Aun así, podemos observar en la tabla 3, que hubo dos estudios en donde la mayoría de los doctores prefirieron la combinación de retenedores removibles y fijos para la arcada inferior (3) (25), siendo el retenedor Hawley el preferido como retenedor removible. (3)

Solo hubo un estudio en donde se prefirió el retenedor removible formado al vacío como el ideal para la arcada inferior, seguido del retenedor Hawley. (7)

Duración del período de retención dental

Los resultados sobre la duración del período de retención fueron variados, aun así, mayoría de los ortodoncistas prefirió el uso del retenedor removible a tiempo completo los primeros 3 - 9 meses de la fase de retención (7) (16) (20) (25) (34) (42), mientras que otros prefirieron el uso permanente del retenedor removible (2) (16).

Los ortodoncistas americanos posterior a la primera fase de retención, les recomendaron a sus pacientes, el uso parcial de sus retenedores removibles de manera permanente, es decir, 8 horas al día (34), en el caso de los ortodoncistas malasios no les indicaron a sus pacientes que dejaran de usar el retenedor en un momento específico (7), a diferencia de los ortodoncistas iraquíes que si les indicaron a sus pacientes que dejaran de usar los retenedores posterior a la primera fase de retención. (20)

Otros de los ortodoncistas encuestados, consideran que la duración del periodo de retención de la arcada superior oscila entre los 2 y 5 años (25) (41), a diferencia de la retención de la arcada inferior que se prefirió de tipo permanente, lo cual se debe a que el retenedor más utilizado en la arcada inferior es el retenedor fijo. (16) (41) (42)

Controles de la fase de retención dental

Los resultados sobre la frecuencia de los controles de la fase de retención fueron más semejantes, puesto que la mayoría de los ortodoncistas pautaron una media de 3 a 4 citas durante el primer año (3) (16) (25) (42); posterior al primer año, la mayoría de los

ortodoncistas les recomendaron a sus pacientes acudir a control, como mínimo una vez al año (25) (41).

La mayoría de los ortodoncistas pautaron el primer control de la retención durante los dos primeros meses después de la remoción de la aparatología fija (2) (34) (16), la segunda cita dentro del tercer - quinto mes, y la tercera y cuarta cita entre el sexto - undécimo mes del primer año de retención. (34)

Dos de los estudios recopilados, nos indican que los retenedores removibles suelen tener un control más estricto que los retenedores fijos, pautando como mínimo dos controles del retenedor fijo y tres controles del retenedor removible durante el primer año de la fase de retención. (16) (41)

En conclusión, según la mayoría de los ortodoncistas encuestas existe la necesidad de crear una guía práctica de retención posterior al tratamiento de ortodoncia. (3) (16) (41) (42)

Comparativa del grado de aceptación entre el retenedor Hawley y el formado al vacío

Dos de los estudios recopilados llevan a cabo una comparativa de la aceptación por parte del paciente del retenedor Hawley y del retenedor formado al vacío. Los resultados de dichos estudios fueron muy variados, ya que, en uno se compara la aceptabilidad por 6 meses y sus resultados indican que no hubo diferencias significativas entre ambos retenedores en la capacidad de morder, el ajuste del aparato y la higiene. (38) En el estudio en el que todos los participantes utilizaron los dos tipos de retenedores por un mes, sus resultados indican que no hubo diferencias

significativas entre ambos retenedores en la adaptación, el habla, la comodidad, la estética, la satisfacción y el ajuste. (4)

Aun así, se puede observar en la tabla 4, que en el primer ensayo se encontraron niveles de aceptación más altos en el grupo que utilizó el retenedor formado al vacío, excepto en la durabilidad, que fue significativamente mayor en el grupo que utilizó el retenedor Hawley, esto se debió al gran índice de fracturas del retenedor formado al vacío. (38)

En cambio, en el estudio donde los pacientes utilizaron durante un mes cada uno de los retenedores, los resultados mostraron que el retenedor formado al vacío era mucho más eficaz en la capacidad para tragar, y que el retenedor Hawley era más eficaz en cuanto a la higiene y la durabilidad. En dicho estudio, el 57,86% de los pacientes prefirieron el retenedor Hawley y el 47,14% el retenedor formado al vacío. (4)

Comparativa del grado de efectividad de los retenedores removibles más utilizados en la arcada superior

Se recopiló varios estudios que compararon la efectividad entre el retenedor Hawley y el retenedor formado al vacío, donde se midieron el índice de irregularidad de Little, la longitud de la arcada y el ancho intercanino. En dichos estudios, no se encontraron diferencias estadísticamente significativas con respecto al ancho intercanino entre ambos retenedores. (5) (11) En la variable longitud de arcada, se observó que esta fue significativamente menor en la arcada superior del grupo Hawley del primer estudio, (11) en el cambio, en el segundo estudio la longitud de arcada mandibular aumentó durante el tratamiento y tendió a volver a su posición original después de la

fase de retención en ambos grupos, sin embargo, estos cambios fueron significativamente mayor en el grupo Hawley. (5)

Aun así, como se puede observar en la tabla 4, ambos estudios mostraron que, al medir el índice de irregularidad del sector anterior, este fue significativamente menor en el grupo del retenedor formado al vacío. Por lo que ambos estudios concluyen que, el retenedor formado al vacío es más efectivo para mantener la alineación de los incisivos (5) (11), siendo ideal el uso de dicho retenedor durante mínimo 4 meses a tiempo completo y luego solo por las noches. (11)

Otro estudio recopilado comparó dos regímenes diferentes de retención del aparato Hawley, en donde uno de estos fue su uso nocturno durante un año y el otro su uso completo por 6 meses, seguido de 6 meses de uso nocturno. Los resultados mostraron aumentos relativamente pequeños del índice de irregularidad, al igual que, una cantidad relativamente pequeña de apiñamiento dental del sector anterior para ambos grupos, dicho estudio concluye que, no se encontraron diferencias estadísticamente significativas entre los dos regímenes de retención. (19)

Por último, un estudio realizado en 2014 llevó a cabo una comparación entre tres estrategias de retención diferentes, una de estas fue el uso del retenedor removible formado al vacío en la arcada superior cubriendo el paladar y los dientes anteriores en conjunto con un retenedor fijo mandibular, otra estrategia fue el retenedor formado al vacío combinado con stripping del sector anteroinferior y la última estrategia fue un posicionador prefabricado para ambas arcadas. (23)

Los dos primeros grupos utilizaron el retenedor removible durante mínimo 22 horas diarias por dos días, y luego por la noche durante 12 meses; el grupo del posicionador

prefabricado, se le recomendó su uso diario de 30 minutos y durante toda la noche por 12 meses. A partir del segundo año, a todos los grupos se les recomendó usar el retenedor cada dos noches. Los resultados de dicho estudio concluyen que, después de 5 años o más sin retención, las tres estrategias de retención lograron resultados clínicos igualmente favorables. (23)

Conclusiones

1. El tipo de retención más utilizado en la arcada superior parece ser una combinación de retenedores fijos y removibles. En la arcada inferior, el retenedor fijo adherido a todos los dientes anteriores es el tipo de retención más utilizado.
2. Se suele elegir un retenedor removible en los casos donde se ha expandido la arcada superior o cuando se han realizado exodoncias.
3. La duración del periodo de retención de la arcada superior oscila entre los 2 - 5 años, y en la arcada inferior la duración de la retención suele ser permanente.
4. Se recomienda el uso del retenedor removible a tiempo completo los primeros 3 - 9 meses de la fase de retención.
5. La frecuencia de los controles de la fase de retención suele ser de 3 a 4 citas durante el primer año, y posterior a este, mínimo una vez al año.
6. El retenedor Hawley se caracteriza por ser más duradero que el retenedor formado al vacío.
7. El retenedor formado al vacío es más efectivo para mantener la alineación de los incisivos.

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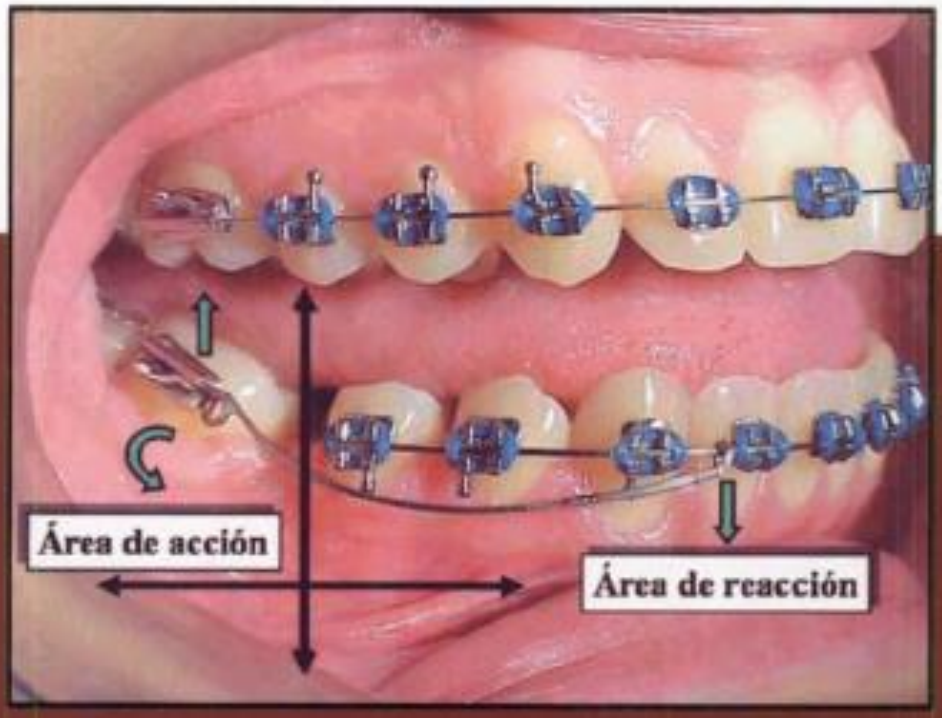

Gonzalo Alonso Uribe Restrepo

Retention practices and factors affecting retainer choice among orthodontists in Saudi Arabia

Thikriat S. Al-Jewair, BDS, MSc, Mohammad A. Hamidaddin, BDS, Hamdan M. Alotaibi, BDS, Nasser D. Alqahtani, BDS, MS, Sahar F. Albarakati, BDS, MS, Eman A. Alkofide, MS, DSc, Khalid A. Al-Moammar, MORTH RCSed, PhD.

ABSTRACT

الأهداف: التعرف على بروتوكلات التثبيت التي يمارسها أطباء تقويم الأسنان في المملكة العربية السعودية والعوامل التي تؤثر في اختيار المثبت.

الطريقة: أجريت هذه الدراسة المستعرضة خلال الفترة من فبراير ومارس 2015 في كلية طب الأسنان، جامعة الدمام، الدمام، المملكة العربية السعودية. ارسل استطلاع الكتروني تم اختباره مسبقاً (34 عنصر) إلى جميع أعضاء جمعية تقويم الأسنان السعودية البالغ عددهم 1200 عضو. اشتمل الاستبيان على البيانات الديموغرافيه، وممارسات العلاج المستخدمه في التقويم، وبروتوكولات التثبيت وبعد التثبيت.

النتائج: استلمنا 167 (13.9%) رد خلال فترة الدراسة. واظهرت النتائج الاستخدام السائد للهولي في قوس الفك العلوي (61.3%) والمثبت اللساني في قوس الفك السفلي، كما أوصى مايقارب 90.3% بارتداء المثبت القابل للإزالة. وبشكل عام، يميل أطباء تقويم الأسنان الذين أجروا عدد أقل من عمليات خلع الأسنان إلى استخدام المثبت الدائم، أما الذين أجروا عمليات خلع أكثر يستخدمون المثبت المتحرك p=0.018. كما استخدم تخفيض المينا المتلاصق من قبل 28% كإجراء مساعد لدعم التثبيت، واستخدم مايقارب 64% مرحلة مابعد التثبيت لارتداء المثبت. كما أن المشاركون الذين استخدموا المثبت المتحرك أكثر شيوعاً لاستخدامه مدى الحياة.

الخاتمة: يعد استخدام كلا من هولي في قوس الفك العلوي والمثبت اللساني في قوس الفك السفلي أكثر البروتوكولات استخداما. كان التثبيت مدى الحياة الخيار الأكثر شيوعاً للمشاركين الذين استخدموا المثبت القابل للإزالة وخصوصاً عند خلع الأسنان.

Objectives: To identify the retention protocols practiced by orthodontists in Saudi Arabia, and the factors affecting retainer choice.

Methods: This cross-sectional study took place between February and March of 2015 at the College of Dentistry, University of Dammam, Dammam, Saudi Arabia. A previously tested electronic survey of 34 items was sent to all 1,200 orthodontic members of the Saudi Orthodontic Society. The questionnaire elicited data on the subjects' demographics, orthodontic treatment practices, retention, and post-retention protocols.

Results: One hundred and sixty-seven (13.9%) responses were received during the study period. The results showed predominant use of Hawley in the maxillary arch (61.3%), and fixed lingual in the mandibular arch (58.5%). Approximately 90.3% recommended full-time maxillary removable retainer wear. Overall, orthodontists who performed fewer extractions tended to use fixed retainers, and those who performed more extractions used removable retainers (p=0.018). Interproximal enamel reduction was used by 28% of the respondents as an adjunct procedure to enhance retention. Approximately 64% practiced a post-retention phase of retainer wear. Participants who used removable retainers most commonly prescribed lifetime retention.

Conclusion: Hawley in the maxilla, and fixed lingual in the mandible were the most common retention protocols prescribed. Lifetime retention was the most common choice for participants who used removable retainers, especially when extractions were carried out.

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From the Department of Orthodontics (Al-Jewair), State University of New York at Buffalo, Buffalo, USA, the College of Dentistry (Hamidaddin), New York University, New York, New York, the Department of Orthodontics (Alotaibi), King Abdulaziz Airbase Hospital, Dammam, and the Division of Orthodontics (Alqahtani, Albarakati, Alkofide, Al-Moammar), Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Thikriat S. Al-Jewair, Department of Orthodontics, State University of New York at Buffalo, Buffalo,New York, United States of America. E-mail: taljewair@gmail.com

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Progress in Orthodontics

RESEARCH Open Access

A survey of protocols and trends in orthodontic retention

Alvyda Andriekute, Arunas Vasiliauskas* and Antanas Sidlauskas

Abstract

Background: The objectives of this study were to evaluate retention procedures and protocols which are used by the orthodontists in Lithuania and to identify commonly used types of dental retainers.

Methods: One hundred seven questionnaires in total with 28 multiple-choice questions were sent to all members of the Lithuanian Orthodontic Society. The questionnaire was organized into eight sections representing specific information about socio-demographic status of the respondents, selection of a retention system, details of commonly used fixed and removable retainers, the duration of the retention period, supervision of the retainers, instructions for patients, and necessity of common retention guidelines.

Results: The overall response rate was 75.7%. All of the respondents prescribed retainers after the orthodontic therapy. More than 40% of the respondents combined fixed and removable retainers in different clinical situations, but the first-choice option after an expansion of the maxillary dental arch was the removable retainer (54.3%); meanwhile, a fixed retainer was used after a correction of any rotations of the mandibular anterior teeth (49.4%). The Hawley retainer was preferred by 90.1% of the respondents for a maxillary dental arch, and 74.1% of them preferred it for a mandibular dental arch. The most preferable fixed retainer was the retainer bonded to all six anterior teeth (in the upper dental arch—by 71.6%; in the lower one—by 80.2%). There was no consensus on the duration of a retention period. Most of the orthodontists checked up retainers three times during the first year (fixed ones—by 42.0%; removable ones—by 30.0%) and once per year after the 1-year retention period (fixed ones—by 44.4%; removable ones—by 40.7%). All orthodontists gave instructions for taking care of an orthodontic retainer. It was observed that the orthodontists with less than 10 years of experience used a protocol based on the skills learned during their postgraduate studies, while orthodontists with more than 10 years of experience used retention procedures based on their orthodontic work practice ($p < 0.05$).

Conclusions: A combination of fixed and removable retainers was the most often used in an orthodontic retention. Evidence-based guidelines are desired for a common retention protocol.

Keywords: Retention, Hawley retainer, Fixed retainer

Background

There is no doubt that teeth after an active orthodontic treatment have a tendency to move into the previous position, and a relapse can occur at any age [1]. The supragingival and transseptal fibers are most commonly associated with a relapse; occlusal factors, soft tissue pressures, and further growth are also some influencing factors [2]. A relapse affects patients' time and finances and can cause esthetic discomfort because unfavorable changes often appear in the front teeth. This situation negatively affects both the patient and the doctor. Orthodontic retainers which are made to be worn after dental braces in order to maintain teeth in their correct position are used to minimize any relapse.

Nevertheless, there is no agreement among the orthodontists concerning the need for any retention, choosing the type of a retainer, or determining how long retainers should be worn after an orthodontic treatment. A large number of variations in retention strategies, different materials for retention, or individual patient factors can lead to challenges of choosing retention protocols.

* Correspondence: arunas@vasiliauskas.ot.lt
Clinic of Orthodontics, Lithuanian University of Health Sciences, Lukšos-Daumanto st. 6, LT-5016 Kaunas, Lithuania

Original Article

Level of satisfaction in the use of the wraparound Hawley and thermoplastic maxillary retainers

Adenilson Silva Chagas[a]; Karina Maria Salvatore Freitas[b]; Rodrigo Hermont Cançado[c]; Fabricio Pinelli Valarelli[c]; Luiz Filiphe Gonçalves Canuto[d]; Renata Cristina Gobbi de Oliveira[c]; Ricardo Cesar Gobbi de Oliveira[c]

ABSTRACT

Objective: To compare the level of satisfaction in the use of wraparound Hawley and thermoplastic maxillary retainers.

Materials and Methods: The study sample included 70 orthodontic patients (24 males and 46 females), who were in the retention stage (mean age = 20.80 years). All patients wore the two types of maxillary retainer for 1 month each, along with a 3×3 fixed mandibular retainer. After the use of each retainer, the patients responded to a questionnaire evaluating the level of satisfaction with their use of the maxillary retainer. Intergroup comparison was performed by independent *t* tests. Chi-square test was used to evaluate preference for the type of retainer by gender.

Results: The thermoplastic retainer was better for swallowing and the wraparound Hawley appliance was better for hygiene and durability. The other factors evaluated (adaptation, speech, comfort, esthetics, satisfaction, and fitting) did not show significant differences between the retainers. There was also no significant difference in preference for the appliances.

Conclusions: Regarding the overall satisfaction and the preference, there was no difference between the wraparound Hawley and thermoplastic retainers. The wraparound Hawley appliance was better in hygiene and resistance than the thermoplastic retainer; and the thermoplastic appliance was better than the wraparound Hawley for swallowing fluids and saliva. (*Angle Orthod.* 2020;90:63–68.)

KEY WORDS: Orthodontics; Orthodontic retainers; Retention

INTRODUCTION

Retention is the phase of orthodontic treatment that aims to maintain the teeth in the correct position after active treatment and to counteract relapse, which is the natural tendency of the teeth to return to their initial positions, and the normal posttreatment changes that can also occur as part of a physiologic process of the development of the occlusion.[1,2] To prevent relapse and these physiological changes, some type of orthodontic retainer is often used. Several forms of retention are mentioned in the literature but, according to systematic reviews, there are no data that scientifically support the clinical choice of one retainer type over another.[3–5]

The Hawley retainer was originally described by Hawley[6] in 1919 and is one of the most commonly used retainers after orthodontic treatment. Transparent thermoplastic appliances were recommended for use as temporary retainers, finishing appliances,[7] and even permanent retention.[8] They are easy to manufacture, inexpensive, cosmetic, and comfortable and, therefore, have a high level of patient acceptance.[8] Hawley and thermoplastic retainers are both commonly used after orthodontic treatment. Since the degree of relapse that may occur after fixed appliance therapy will probably not be affected by the choice of retainer, whether thermoplastic or Hawley,[9,10] it would be interesting to

[a] Graduate Student, Department of Orthodontics, UNINGA University Center, Maringá, Brazil.
[b] Professor, Department of Orthodontics. Bauru Dental School, Bauru; and UNINGA University Center, Maringá, Brazil.
[c] Professor, Department of Orthodontics. UNINGA University Center, Maringá, Brazil.
[d] Professor, Department of Orthodontics. UNINASSAU, Recife, Brazil.
Corresponding author: Dr Karina Maria Salvatore de Freitas, Department of Orthodontics, UNINGÁ University Center, Rod. PR 317, 6114, Maringá-PR, 87035-510, Brazil
(e-mail: kmsf@uol.com.br)

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Comparison of retention characteristics of Essix and Hawley retainers

Abdullah Demir[a]
Hasan Babacan[b]
Ruhi Nalcacı[c]
Tolga Topcuoglu[d]

[a]Department of Orthodontics, Faculty of Dentistry, Selcuk University, Konya, Turkey
[b]Department of Orthodontics, Faculty of Dentistry, Cumhuriyet University, Sivas, Turkey
[c]Department of Orthodontics, Faculty of Dentistry, Suleyman Demirel University, Isparta, Turkey
[d]Department of Orthodontics, Faculty of Dentistry, Gaziantep University, Gaziantep, Turkey

Objective: We aimed to compare the retention characteristics of Essix and Hawley retainers. **Methods:** Adolescents undergoing fixed appliance treatment at 2 centers were recruited for this study. Twenty-two patients (16 women and 6 men) wore Essix retainers (Essix group) while 20 (14 women and 6 men) wore Hawley retainers (Hawley group). The mean retention time was 1 year, and the mean follow-up recall time for both groups was 2 years. Two qualified dental examiners evaluated the blind patient data. Maxillary and mandibular dental casts and lateral cephalograms were analyzed at 4 stages: pretreatment (T1), post-treatment (T2), post-retention (T3), and follow-up (T4). **Results:** The results revealed that Essix appliances were more efficient in retaining the anterior teeth in the mandible during a 1-year retention period. The irregularity index increased in both arches in both groups after a 2-year post-retention period. The mandibular arch lengths increased during treatment and tended to return to their original value after retention in both groups; however, these changes were statistically significant only in the Hawley group. Cephalometric variables did not show any significant differences. **Conclusions:** The retention characteristics of both Essix and Hawley retainers are similar.
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Key words: Retention, Relapse, Orthodontic treatment

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Corresponding author: Hasan Babacan.
Associate Professor, Department of Orthodontics, Faculty of Dentistry, Cumhuriyet University, Dis Hekimligi Fak. Ortodonti AD, 58140 Sivas, Turkey.
Tel +90-346-2191010 **e-mail** babacanhasan@yahoo.com

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A survey on retention practice among orthodontists in Malaysia

Norma Ab Rahman
Tze Fui Low
Nur Shaheera Idris

Orthodontic Unit, School of Dental Sciences, Universiti Sains Malaysia, Malaysia

Objective: The aim of this study was to evaluate retention practices commonly employed by orthodontists. The objectives were to identify the types of retainer frequently used and to investigate the variations in retention practice. **Methods:** A total of 97 orthodontists were randomly selected, and a questionnaire consisting of 25 multiple-choice questions sent to them by mail. Upon receiving of the completed questionnaires, the data were statistically analyzed. **Results:** A total of 32 responses were received; among these, 59.4% of orthodontists' practiced is in a government setting and 40.6% were in private practice. A vacuum-formed retainer was the most commonly used removable retainer for both maxillary (46.9%) and mandibular (46.9%) arches, followed by a Hawley retainer (maxilla, 43.8%; mandible, 37.5%), and a fixed retainer (maxilla, 3.1%; mandible, 9.4%). Of the responding orthodontists, 78.1% prescribed full-time wear (more than 20 h per day) for a duration of 3–9 months for a maxillary arch, compared to 71.9% for the mandibular arch. Only 18.8% of the orthodontists prescribed part-time wear of the retainer for the maxillary arch, compared to 21.9% for the mandibular arch. The majority of orthodontists did not instruct their patients to stop wearing removable retainers (71.9%) or fixed retainers (66.8%) at any specific time and they preferred their patients to continue wearing retainers. **Conclusions:** Vacuum-formed retainers are the most commonly used retainers among orthodontists. The majority of orthodontists prescribed full-time wear for more than 20 h per day with a duration of 3–9 months and preferred indefinite use of the retainer.
[Korean J Orthod 2016;46(1):36-41]

Key words: Hawley retainer, Retention practice, Vacuum-formed retainer

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Corresponding author: Norma Ab Rahman.
Lecturer, Orthodontic Unit, School of Dental Sciences, Universiti Sains Malaysia, Healthy Campus, 16150 Kubang Kerian, Kelantan, Malaysia.
Tel +60-199818248 **e-mail** normaabrahman@gmail.com

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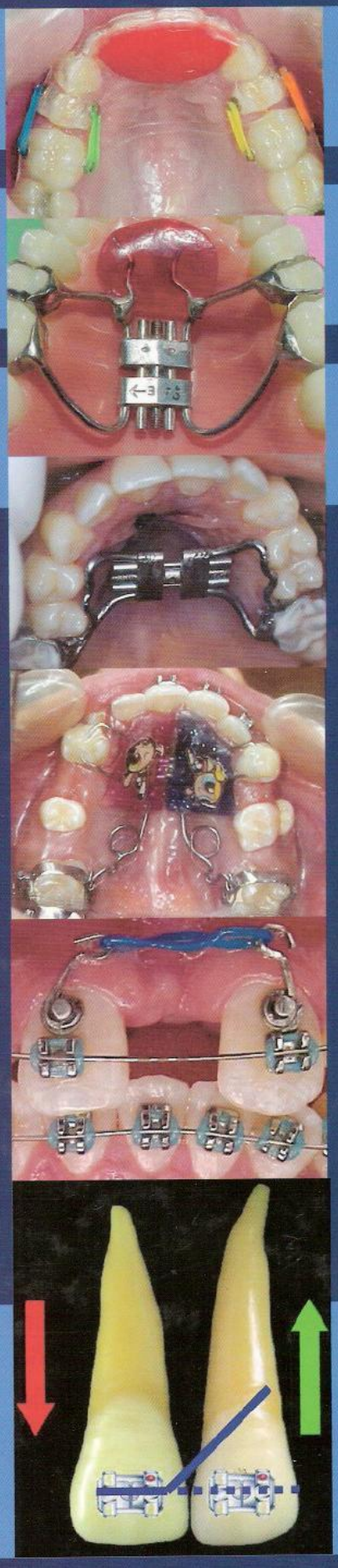
1.001 Tips en Ortodoncia y sus Secretos

Esequiel E. Rodríguez Yañez
Rogelio Casasa Araujo
Adriana C. Natera M.



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Retention and relapse in clinical practice

SJ Littlewood,*† S Kandasamy,‡§¶ G Huang‖

*St Luke's Hospital, Little Horton Lane, Bradford, BD5 0NA, United Kingdom.
†Leeds Dental Institute, University of Leeds, United Kingdom.
‡School of Dentistry, The University of Western Australia.
§Centre for Advanced Dental Education, Saint Louis University, MO, USA.
¶West Australian Orthodontics, Midland, WA, Australia.
‖Professor and Chair, University of Washington, Department of Orthodontics, Seattle, Washington, USA.

ABSTRACT

Maintaining teeth in their corrected positions following orthodontic treatment can be extremely challenging. Teeth have a tendency to move back towards the original malocclusion as a result of periodontal, gingival, occlusal and growth related factors. However, tooth movement can also occur as a result of normal age changes. Because orthodontics is unable to predict which patients are at risk of relapse, those which will remain stable and the extent of relapse that will occur in the long-term, clinicians need to treat all patients as if they have a high potential to relapse. To reduce this risk, long term retention is advocated. This can be a significant commitment for patients, and so retention and the potential for relapse must form a key part of the informed consent process prior to orthodontic treatment.It is vital that patients are made fully aware of their responsibilities in committing to wear retainers as prescribed in order to reduce the chance of relapse. If patients are unable or unwilling to comply as prescribed, they must be prepared to accept that there will be tooth positional changes following treatment. There is currently insufficient high quality evidence regarding the best type of retention or retention regimen, and so each clinician's approach will be affected by their personal, clinical experience and expertise, and guided by their patients' expectations and circumstances.

Keywords: Fixed retainers, incisor crowding, relapse, removable retainers, retainers, retention, stability.

Abbreviations and acronyms: IPR = Interproximal reduction; SDB = Sleep disordered breathing.

INTRODUCTION

Maintaining teeth in their corrected positions after treatment is often the most challenging part of an orthodontic treatment plan. Relapse following orthodontic treatment is traditionally thought of as a move back towards the original malocclusion. However, a return towards the initial malocclusion does not always occur, and relapse could be considered as any unfavourable change in tooth position after orthodontic treatment away from a corrected malocclusion. These changes may also be the result of normal age-related effects.

Clinicians involved in orthodontic treatment need to have a thorough understanding of the aetiology of relapse and be familiar with different methods of reducing this relapse. This includes familiarity with the advantages and disadvantages of various retainers, as well as the ability to advise patients on how to wear retainers effectively.

The present article will provide a contemporary overview of retention and relapse in orthodontics, and will discuss the responsibilities of the patient and the clinician in reducing relapse following treatment.

HISTORICAL PERSPECTIVE

In 1934, Oppenheim stated "Retention is one of the most difficult problems in orthodontia; in fact, it is the problem."[1] Eighty years later, clinicians continue to struggle with the same issue. Over the decades, many theories have been proposed regarding retention. For example, Kingsley felt that occlusion was the key to stability.[2] An alternative theory was that the apical base had to be respected.[3] Similarly, was the idea that the mandibular incisors had to be placed over basal bone in order to promote stability.[4–6] Finally, Rogers proposed that proper function and balance of the musculature was related to stability.[7] These theories, as well as others, will be discussed in more detail below. In reality, orthodontic relapse is complicated and highly variable, and better data to provide evidence-based recommendations to our patients, is needed.

Retention in orthodontics

C. D. Johnston*[1] and S. J. Littlewood[2]

VERIFIABLE CPD PAPER

IN BRIEF

- Describes the factors that influence stability following orthodontic treatment.
- Explains the rationale and evidence for orthodontic retention and the various types of orthodontic retainers.
- Outlines how general dental practitioners can support their patients wearing orthodontic retainers.

PRACTICE

Retention is necessary following orthodontic treatment to prevent relapse of the final occlusal outcome. Relapse can occur as a result of forces from the periodontal fibres around the teeth which tend to pull the teeth back towards their pre-treatment positions, and also from deflecting occlusal contacts if the final occlusion is less than ideal. Age changes, in the form of ongoing dentofacial growth, as well as changes in the surrounding soft tissues, can also affect the stability of the orthodontic outcome. It is therefore essential that orthodontists, patients and their general dental practitioners understand the importance of wearing retainers after orthodontic treatment. This article will update the reader on the different types of removable and fixed retainers, including their indications, duration of wear, and how they should be managed in order to minimise any unwanted effects on oral health and orthodontic outcomes. The key roles that the general dental practitioner can play in supporting their patients wearing orthodontic retainers are also emphasised.

INTRODUCTION

Orthodontic retention is the final stage of orthodontic treatment and aims to maintain the teeth in their corrected positions after the completion of orthodontic tooth movement. Teeth have a tendency to return towards their initial positions due to tension in periodontal fibres, particularly those around the necks of the teeth (inter-dental and dento-gingival fibres). The quality of the final occlusion will also affect the stability of the orthodontic outcome, with unwanted displacing occlusal contacts potentially leading to unfavourable changes in tooth position. Sound orthodontic treatment planning and the achievement of appropriate occlusal and soft tissue treatment goals can help to minimise orthodontic relapse. Nevertheless, some degree of relapse is almost inevitable unless a suitable retention protocol is put in place following removal of active appliances. Unfortunately, patient compliance often decreases as orthodontic treatment progresses[1] and poor compliance with retention appliances can often undermine the improvements achieved during treatment. An experimental study has shown significant deterioration in corrected tooth rotations, lower incisor alignment and overjet in only four weeks when retention appliances were not used following orthodontic movement.[2]

Unwanted tooth movements after treatment can also occur as a result of normal age changes, even in patients who have not had orthodontic treatment. This deterioration in the alignment of their teeth is due to changes in the soft tissue pressures and skeletal structures around the dentition. These soft tissue changes and minor ongoing growth can be regarded as a part of the normal ageing process and are unpredictable. Retainers are therefore indicated not only to resist the tendency of teeth to return to their pre-treatment positions following orthodontic tooth movement, but also to resist unwanted long-term age changes.

In most orthodontic cases, retainers are therefore an essential part of orthodontic treatment. There is no evidence to suggest that the retention regimen for adults should differ from that used for adolescent patients, providing the periodontal supporting tissues are normal. Post-retention outcomes in adults have been shown to be at least as stable as those in adolescents in relation to midline alignment, overjet, overbite, molar relationship and incisor alignment.[3,4] There are a small number of occlusal problems for which retention is not required. For example, after correction of posterior and anterior crossbites, the incisor overbite and posterior intercuspation may be adequate for maintaining the correction, and as a result no retention is necessary.[5]

The general dental practitioner (GDP) has an important role to play in reinforcing the importance of good retainer wear for patients who have completed orthodontic treatment. By supporting the advice given by the orthodontist, the GDP can help ensure that their patients achieve maximum gain from their treatment. The GDP also has a key role in helping the patient to maintain good dental health while wearing retainers (Fig. 1). If retainers are to be worn on a long-term basis then the patient will benefit from

- Informing potential orthodontic patients that wearing retainers after orthodontics is an essential part of orthodontic treatment.
- Reinforcing the need for patients to wear their retainers as advised and how to look after them.
- At dental 'check-up' appointments, ensuring that patients are adhering to their retention regime.
- Adjustment, repair or replacement of removable retainers and ensuring that they still fit well. (Responsibility for the replacement or repair may depend on whether the patient remains under care of the orthodontist who completed the treatment).
- For patients wearing bonded retainers, checking that retainers are still intact, bonded and that the patient is maintaining good oral hygiene around them. Fractured or de-bonded retainers should be repaired (with appropriate advice if required).

Fig. 1 Roles of the general dental practitioner in orthodontic retention

[1]Consultant Orthodontist and Senior Lecturer, Centre for Dentistry, Queen's University Belfast & Belfast Health and Social Care Trust, Grosvenor Road, Belfast, BT12 6BP; [2]Consultant in Orthodontics, St Luke's Hospital, Little Horton Lane, Bradford, BD5 0NA.
*Correspondence to: Chris Johnston
Email: c.d.johnston@qub.ac.uk

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The retention characteristics of Hawley and vacuum-formed retainers with different retention protocols

Baratali Ramazanzadeh [1], Farzaneh Ahrari [2], Zahra-Sadat Hosseini [3]

[1] Professor of Orthodontics, Dental Research Center, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran
[2] Assistant Professor of Orthodontics, Dental Research Center, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran
[3] Assistant Professor, Department of Orthodontics, School of Dentistry, Golestan University of Medical Sciences, Gorgan, Iran

Correspondence:
Dental Research Center, School of Dentistry
Mashhad University of Medical Sciences
Mashhad, Iran
Farzaneh.Ahrari@gmail.com

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Abstract

Background: This study aimed to compare the effectiveness of two different protocols of wearing vacuum-formed retainers (VFRs) with the standard protocol of wearing Hawley retainer in maintaining the results of orthodontic treatment.

Material and Methods: This single-blind randomized clinical trial consisted of 90 patients who finished orthodontic treatment at the Department of Orthodontics of Mashhad Dental School, and required removable retainers. The participants were randomly divided into 3 groups and received the following treatments. Group 1: Hawley retainers (4 months full-time and then night-only); group 2: VFR_4M (4 months full-time and then night-only); group 3: VFR_1W (1 week full-time and then night-only). The study models were prepared after debond and at 4 and 8 months later, and intercanine width, intermolar width, arch length and the Little's irregularity index were compared between groups.

Results: No significant differences were found in intercanine and intermolar widths between groups (P>05). Upper arch length was significantly lower in Hawley group than the two VFR groups (p<0.05), but lower arch length values were comparable. Upper irregularity index was significantly lower in two VFR groups compared to Hawley group (p<0.05), whereas in the lower jaw, only VFR_4M group showed significantly lower crowding than Hawley group (p<0.05).

Conclusion: Both retention regimens of VFRs were more effective than Hawley retainer in maintaining arch length and tooth alignment in the upper arch. For better incisor alignment in the lower jaw, the patients should be advocated to wear VFR 4 months full-time and then at night instead of wearing Hawley retainer.

Key words: *Essix, Hawley retainer, orthodontic treatment, retention, vacuum-formed retainer.*

ORIGINAL ARTICLE CE AJO-DO

Relapse revisited—again

Kenneth C. Dyer,[a] James L. Vaden,[b] and Edward F. Harris[c]
Chattanooga, Cookeville, and Memphis, Tenn

Introduction: Long-term changes in the dentitions of orthodontic patients have been studied. However, most studies in the literature report findings after only a few years posttreatment. In this study, we examined records an average of 24 years after active treatment. The purpose was to answer 2 questions: (1) does irregularity increase with time after treatment, and (2) how much relapse can be expected if a conservatively treated sample is recalled 2.5 decades after active treatment? **Methods:** The sample consisted of dental casts of 52 women who were treated in the mid-1970s to the early 1980s with 0.022 × 0.028-in standard edgewise appliances. Each was given a maxillary Hawley retainer and either a mandibular Hawley or a banded canine-to-canine retainer at debanding. Retention lasted 24 to 32 months. The same practitioner treated all the patients. The sample is one of convenience; specifically, inclusion depended only on each patient's willingness to return for a recall examination. Records were collected at 3 examinations for each patient: start of treatment, end of the active phase of treatment, and long-term retention recall. The long-term maxillary and mandibular casts were measured and occluded in maximum intercuspation. Variables were measured, including incisor overjet and overbite, buccal segment relationship of the first molars and canines, and incisor irregularity in each arch. Variables were measured on the casts with digital readout sliding calipers precise to 0.001 mm. **Results:** Mandibular incisor irregularity at recall was less than 3.5 mm in 77% of the patients examined. Correction of the maxillary incisor irregularity remained relatively stable over the time interval studied. Buccal segment Class II correction remained stable at the recall examination. **Conclusions:** Orthodontic treatment can yield reasonably good long-term stability in both occlusal correction and tooth alignment. (Am J Orthod Dentofacial Orthop 2012;142:221-7)

Instability of tooth alignment and occlusal relationships occurs to some extent in practically every patient.[1] Relapse is defined as the tendency of teeth to return toward their pretreatment positions. It is a complex problem that appears to be multifaceted. Factors that can be linked to relapse include unfavorable skeletal growth patterns, improper treatment plans, uncooperative patients, muscular functions and habits, changes in arch forms, occlusion, and transseptal fibers.

In this study, we explored the stability of orthodontic tooth alignment and Class II dentition occlusal correction. Dental casts (52 subjects) were made at the start of treatment (T1), after the active phase of treatment (T2), and at an average of 24 years after treatment (T3). All subjects whose records were in the study were treated by 1 clinician (J.L.V.). The purpose of the study was to use dental casts to evaluate the long-term changes (>20 years) in the dental arches. Changes in the dentition over this interval of about 2.5 decades include any dental relapse that occurred along with aging changes that impacted the dentition.

Most orthodontic patients are treated in their adolescence. This fact alone leaves ample opportunity for subsequent growth of the maxillary and mandibular complexes to effect movement of the teeth into different positions.[2-4] If a patient continues to grow after treatment, there might be lingually directed pressure on the mandibular incisors with the forward displacement of the mandible.[5] Perera[6] reported a relationship between mandibular growth and mandibular anterior crowding in untreated subjects (n = 29). Perera indicated that forward rotational growth in the mandible is closely related to mandibular incisor crowding that commonly occurs after the adolescent years. However, Shields et al[7] determined that horizontal and vertical growth showed no statistical association with posttreatment mandibular anterior irregularity.

Although orthodontic patients tend to exhibit decreases in tooth alignment in the long term, arch length decreases and incisor crowding increases in the dental arches of patients who have had no orthodontic

[a]Private practice, Chattanooga, Tenn.
[b]Private practice, Cookeville, Tenn; professor, Department of Orthodontics, Health Science Center, University of Tennessee, Memphis.
[c]Professor, Department of Orthodontics, Health Science Center, University of Tennessee, Memphis.
The authors report no commercial, proprietary, or financial interest in the products or companies described in this article.
Reprint requests to: James L. Vaden, 308 E First St, Cookeville, TN 38501; e-mail, jlvaden@frontiernet.net.
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Original Article

Orthodontic treatment stability predictors: *A retrospective longitudinal study*

Paloma González-Gil de Bernabé[a]; José María Montiel-Company[b]; Vanessa Paredes-Gallardo[b]; Jose Luis Gandía-Franco[c]; Carlos Bellot-Arcís[d]

ABSTRACT

Objective: To examine medium- to long-term orthodontic treatment stability and its possible association with certain variables.

Materials and Methods: In a retrospective longitudinal study of 70 postretention patients, the Peer Assessment Rating (PAR) index was measured at the start (T1) and end (T2) of treatment and between 4 and 10 years afterwards (T3). The stability was considered absolute when the T2 and T3 values were identical and relative when the difference was within the ±5 range.

Results: Among the 70 patients, 65.8% were female and 34.2% were male. Their mean age was 14.5 years. The mean treatment length was 2.4 years. The mean retention phase was 3.3 years. The mean pre- and posttreatment PAR scores were 29.8 (T1) and 6.3 (T2). The mean T1–T2 difference was 23.6. The mean T2–T3 difference was −0.39.

Conclusions: Within the study, 7.1% presented absolute stability and 68.6% presented relative stability. Lower anterior segment alignment and overbite were the most unstable occlusal features and tended to worsen. Fixed retainer (odds ratio [OR] 0.31; 95% confidence interval [CI] 0.10–0.98) as a protective factor and years without retention (OR 1.32; 95% CI 1.03–1.68) as a risk factor are predictor variables of instability in the case of lower anterior segment alignment. The PAR value at the end of treatment (OR 1.29; 95% CI 1.08–1.54) and extractions (OR 4.76; 95% CI 1.05–21.6) before treatment are predictors for midline instability. (*Angle Orthod.* 2017;87:223–229)

KEY WORDS: Long-term stability; Relapse; Treatment outcome; Orthodontic retainer and retention; Follow-up study

INTRODUCTION

The long-term stability of orthodontic treatment remains one of the main challenges for orthodontists. Studies to analyze the stability of treatments during the initial posttreatment years have drawn attention to an improvement in occlusal contact during the first year due to settling.[1] Al Yami et al.[2] stated that the maximum movement takes place during the first two posttreatment years, while Greco et al.[3] observed a decrease in movement 4 years after the treatment had ended.

The frequency of relapse varies by follow-up time. In the long term, relapse values of 30% have been reported.[4] Other researchers[5] state that between 30% and 50% of cases maintain an acceptable alignment after 10 years, but barely 10% do so after 20 years. This result reflects how unstable orthodontic treatment is as well as ignorance related to the reasons for this instability and reinforces the need to inform patients about long-term expectations for the treatment. It should be remembered that the patients' satisfaction in the follow-up stage is associated only with their occlusal status at that moment, not with the initial malocclusion or with their occlusion when the treatment ended.[6]

The methods for assessing stability have traditionally measured independent occlusal features in study

[a] Assistant Professor, Department of Stomatology, Faculty of Medicine and Dentistry, University of Valencia, Spain.

[b] Postdoctoral Assistant Professor, Department of Stomatology, Faculty of Medicine and Dentistry, University of Valencia, Spain.

[c] Associate Professor, Department of Stomatology, Faculty of Medicine and Dentistry, University of Valencia, Spain.

[d] Adjunct Professor, Department of Stomatology, Faculty of Medicine and Dentistry, University of Valencia, Spain.

Corresponding author: Dr Carlos Bellot-Arcís, Departmento de Estomatología, Unidad Docente de Ortodoncia, Universitat de València, C/ Gascó Oliag 1, 46010 Valencia (Spain)
(e-mail: carlos.bellot@uv.es)

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La contención natural como solución a la recidiva ortodóncica

Dr. Alberto Albaladejo
Profesor asociado de la Universidad de Salamanca
Dra. Ana María Leonés
Licenciada en Medicina y Cirugía por la Universidad de Granada. Residente de Pediatría en el Hospital Virgen de las Nieves
Granada

Resumen
El objetivo de este artículo es evaluar los aspectos importantes en la estabilidad a largo plazo del tratamiento de ortodoncia. Se resalta la importancia de retener los dientes desplazados ortodóncicamente para evitar las recidivas por parte del ligamento periodontal, así como la de posicionar los dientes dentro de la línea de fuerzas cero. Combinando el tratamiento activo con una reeducación miofuncional basada en un diagnóstico etiológico, se obtiene un equilibrio en la cavidad bucal capaz de evitar las recidivas provocadas por la musculatura. La férula termoplástica portada durante la noche es la mejor tolerada de todos los sistemas de contención removible y la indicada para evitar la recidiva causada por las fibras periodontales.

Palabras clave
Fuerzas musculares, reeducación miofuncinal, fibras periodontales, férula termoplástica.

Introducción
Retener es una palabra que deriva de tener, que significa "asir o mantener asido y ocupado" (1), según su etimología latina, y es sinónimo, entre otros, de inmovilizar, estancar, atar, impedir, interceptar y dificultar (2). De esta manera, la retención es la parte del tratamiento ortodóncico en el cual se está fijando una oclusión que se ha logrado establecer tras una acción correctiva, impidiendo la reaparición de las característica oclusales que motivaron la corrección (3).

Diferencias entre deriva centrípeta y recidiva
Resulta bastante frecuente confundir tanto por parte del dentista como por el paciente, el fenómeno de la deriva centrípeta con la recidiva postortodóncica.

La recidiva es un retroceso hacia la posición inicial, cualquiera que sea la dirección, tras la remoción del aparato ortodóncico debido a un equilibrio muscular no adaptado a la forma de las arcadas, o a la acción de las fibras periodontales. Sin embargo, la deriva centrípeta es aquella que se caracteriza por un desplazamiento lento y progresivo de todos los dientes hacia el centro de la arcada dentaria, a la imagen de la deriva mesial de los primeros molares que constituyen la primera manifestación de este fenómeno (4), el cual se produce como consecuencia de una evolución del equilibrio labiolingual que empieza con la dentición mixta y dura toda la vida. Esta migración mesial de los dientes no se puede eliminar, debido a que se produce una aposición ósea más importante sobre la pared mesial de los alvéolos que sobre la pared distal. La evolución del equilibrio muscular mencionado podría explicarse por una disminución de la presión lingual y por una aplicación a un nivel más bajo de la presión labial.

Varios estudios realizados sobre sujetos no tratados ortodóncicamente (5-7), muestran un fenómeno en el transcurso de la vida, en la que la mayoría de las arcadas tienen una tendencia a disminuir y, por lo tanto, las malposiciones producidas son más frecuentes.

Bien entendidos los conceptos de recidiva y deriva centrípeta, este último podría ser aplicado de la misma manera tanto en aquellos pacientes que no han portado un aparato de ortodoncia como en aquellos que han sido tratados con aparatología activa. Naturalmente, son factores que hacen más importante el aumento de la duración del periodo de observación. En el caso de los sujetos no tratados ortodóncicamente, no pueden, por principio, recidivar. Por consecuencia, todos los desplazamientos observados en estos pacientes se explican por la deriva centrípeta, por lesiones periodontales o por la acción de las muelas del juicio carentes de espacio suficiente para su erupción y que provocan un apiñamiento anterior y un desplazamiento del resto de las piezas.

Post-orthodontic retention effectiveness of two types of fixed retainers in patients aged between 12 and 35: a systematic literature review

Gómez M[1], Herrera Luz E[2], Suárez A[3], Sánchez G[4]

Abstract:

Objective: To identify the effectiveness of two types of fixed post-orthodontic retainers in patients aged between 12 and 35 through a systematic literature review.

Method: A systematic literature search was performed using the followings electronic databases: Cochrane, Pubmed, Science Direct, Isi Web Science, Scielo. Keywords: *Tooth crowding, Posttreatment, Retainer, Malocclusion, Recurrence, Orthodontic stability, Relapse*. The articles were analyzed by title, abstract and full text. The ones that fulfilled the eligibility criteria were chosen. The methodological quality of the articles selected was evaluated using the MINCIR checklist. The articles were classified using the SIGN list, where the articles were evaluated according to study design. ***Results****:* In the initial electronic search, 6,632 articles were identified, 15 of which fulfilled the inclusion criteria. After being analyzed, only four articles were considered to include all the quality and inclusion criteria. ***Conclusions:*** There is not enough scientific evidence in the publications analyzed to determine which of the two types of evaluated retainers is the most effective in post-orthodontic retention.

Keywords: Tooth crowding, posttreatment, retainer, malocclusion, recurrence, orthodontic stability, relapse.

[1] Orthodontist, Universidad Javeriana, Graduate

[2] Orthodontist, New York University, Professor, Universidad Javeriana

[3] Epidemiology Specialist, Universidad El Bosque, Professor, Universidad Javeriana

[4] Orthodontist, Universidad Javeriana, Professor, Universidad Javeriana

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Caroline S. Lai[1]
Johannes M. Grossen[1]
Anne-Marie Renkema[2]
Ewald Bronkhorst[3]
Piotr S. Fudalej[1]
Christos Katsaros[1]

[1] Department of Orthodontics and Dentofacial Orthopedics, University of Bern, Bern, Switzerland
[2] Departments of Orthodontics and Craniofacial Biology, Radboud University Medical Centre, Nijmegen, The Netherlands
[3] Community and Restorative Dentistry, Radboud University Medical Centre, Nijmegen, The Netherlands

CORRESPONDENCE
Dr. J. M. Grossen
Department of Orthodontics and Dentofacial Orthopedics
University of Bern
Freiburgstrasse 7
CH-3010 Bern
Switzerland
E-mail: johannes.grossen@zmk.unibe.ch

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Orthodontic retention procedures in Switzerland

A survey

KEYWORDS
relapse,
retention,
stability,
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SUMMARY

Objective: To survey retention procedures used in orthodontic practices in Switzerland.

Material and methods: A questionnaire previously developed by Renkema et al. (2009) was sent to 223 Swiss orthodontists. The questionnaire comprised six parts, mainly containing multiple-choice questions. Information as to background education of the individual orthodontist, retention in general, frequency of different types of removable or bonded retainers that were used, retention protocol, and the type and size of the wire used for bonded retainers was assessed.

Results: The overall response rate was 65 percent. Most orthodontists placed a bonded retainer in the upper and lower arch, except when the upper arch was expanded during treatment or when extractions were performed in the upper arch, in which case they placed a combination of fixed and removable retainers. Opinions varied with regard to how many hours the removable retainers should be worn and the duration of the retention phase. As far as bonded retainers were concerned, 87 percent of the orthodontists preferred life-long retention. Ninety-three percent of the orthodontists considered that the development of a guideline on retention procedures would be useful.

Conclusions: The choice of retention procedures is mostly based on orthodontist's personal preference. A further research into the long-term effectiveness of individual retention protocols is needed.

Introduction

Teeth have a tendency to return to their initial positions once active orthodontic treatment has been completed. This phenomenon is known as relapse. A search for the mechanisms of relapse identified a range of putative causative factors such as continuing craniofacial growth, forces acting on the dentition from the orofacial musculature, stretching of periodontal tissues, and inadequate occlusal contacts, the nature and modality by which the correction was achieved, and others (Blake & Bibby 1998). These factors likely act in concert in order to bring about relapse, which occurs to some extent in the vast majority of patients (Littlewood et al. 2006, Joondeph 2011).

To counteract relapse, orthodontic retention is used for varied times in practically every patient. Recent surveys about retention procedures (Wong & Freer 2004, Renkema et al. 2009, Singh et al. 2009, Valiathan & Hughes 2010, Pratt et al. 2011, Vandevska-Radunovic et al. 2013) demonstrated some similarities among orthodontists practicing in various countries, such as a frequent use of fixed wire retainers in the mandibular dental arch or a growing popularity of removable vacuum-formed retainers. Many differences in retention protocols regarding the choice of the retainer type and duration of retention were, however, also noted. For example, removable vacuum-formed retainers were most often used for retention of the maxillary

Correlation between mandibular incisor crown morphologic index and postretention stability

Marcos Roberto de Freitas,[a] Renata Cristina Faria Ribeiro de Castro,[b] Guilherme Janson,[c] Karina Maria Salvatore Freitas,[b] and José Fernando Castanha Henriques[a]

Bauru, São Paulo, Brazil

Introduction: Considering postretention stability as a result of successful orthodontic treatment, we aimed to verify the influence of mandibular-incisor-crown morphology in the relapse of mandibular anterior crowding. **Methods:** The sample comprised 56 white subjects of both sexes with Class I and Class II malocclusions at pretreatment, treated with extraction of 4 first premolars and edgewise mechanics. No patient underwent interproximal stripping during or after treatment. Mean pretreatment age was 13.23 years. Mean treatment time was 2.11 years, and mean posttreatment evaluation time was 5.12 years. Mandibular anterior crowding was measured with the Little irregularity index, and the mesiodistal and buccolingual proportion of the mandibular incisor crowns was measured with the Peck and Peck index. The measurements were obtained from dental casts at the pretreatment, posttreatment, and postretention stages. The Pearson correlation coefficient was calculated to determine the correlation between mandibular-incisor-crown morphology and the amount of postretention-crowding relapse. **Results:** The mandibular-incisor-crown morphologic index was not significantly correlated with the amount of mandibular-anterior-crowding relapse. **Conclusions:** Mandibular-incisor-crown morphology is not correlated with the amount of mandibular-anterior-crowding relapse. (Am J Orthod Dentofacial Orthop 2006;129:559-61)

The key to success in an orthodontic practice is the detailed evaluation of treatment outcomes.[1] Long-term stability is an important objective in orthodontics.[1] Much research has been devoted to preventing posttreatment relapse of mandibular anterior crowding. A topic that has been widely studied with varying results and conclusions has been the association of enlarged teeth and incisor crowding. In studies in which statistically significant differences in incisor dimensions were found between crowded and uncrowded dentitions, the mean difference in mesiodistal (MD) width was approximately 0.25 mm per incisor.[2,3] Other similar studies found no significant correlation between tooth dimensions and crowding.[4-6] Peck and Peck[7,8] suggested that the determining factors in mandibular anterior crowding were not only tooth width, but also tooth shape. They found statistically significant differences in MD and buccolingual (BL) dimensions of mandibular incisors between perfectly aligned and control groups of untreated females. Combining these measures into an index (MD/BL × 100), they formulated ideal index ranges required for the mandibular incisors to be well aligned and recommended MD reduction to adapt them to this range and prevent future crowding, although no incisors were narrowed and assessed later.[7,8]

It seems that incisor MD width and shape are related to crowding.[2,3,7-9] However, most studies used untreated samples or pretreatment models of treated samples and did not evaluate the posttreatment and postretention stages. Investigations focusing on the postretention stage found only weak or no significant associations between the Little irregularity index and incisor shape.[4-6] Thus, the validity of the MD/BL ratio in predicting the relapse of orthodontically treated patients is at least questionable. Our study aimed to verify the correlation between mandibular-incisor-crown morphology and the relapse of mandibular anterior crowding to further investigate this assumption.

MATERIAL AND METHODS

The sample comprised orthodontic records from 56 white patients treated in the orthodontic clinic at Bauru Dental School, University of São Paulo, with fixed appliances and edgewise mechanics, and the 4 first premolars extracted. There were 27 females and 29 males with Angle Class I (28 patients) and Class II (28 patients)

From the Department of Orthodontics, Bauru Dental School, University of São Paulo, Bauru, São Paulo, Brazil.
[a]Full professor.
[b]Graduate student.
[c]Associate professor.
Reprint requests to: Dr Karina Maria Salvatore Freitas, Department of Orthodontics, Bauru Dental School, University of São Paulo, Alameda Octávio Pinheiro Brisolla 9-75, Bauru-SP-17012-901, Brazil; e-mail, bst00111@uol.com.br.
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Hawley retainers full- or part-time? A randomized clinical trial

M. Shawesh*, B. Bhatti**, T. Usmani** and N. Mandall*
*School of Dentistry, University of Manchester and **Heaton Mersey Specialist Orthodontic Practice, Manchester, UK

SUMMARY The aim of this trial was to compare two different orthodontic retention regimens: is night-only wear of upper and lower Hawley retainers for 1 year as effective as 6 months full-time followed by 6 months night-only wear? Sixty-seven consecutive patients attending for orthodontic debond were randomly allocated to wear upper and lower Hawley retainers either for 1 year night-only (group 1) or for 6 months full-time followed by 6 months night-only (group 2). In group 1, 41.2 per cent were males and 58.8 per cent were females and their mean age was 15.6 years [standard deviation (SD) 1.6 years]. In group 2, 24.2 per cent were males and 75.8 per cent were females and their mean age was 15.8 years (SD 1.2 years). Study models were taken at the start (T0) and end (T1) of treatment and 1 year post-debond (T2). Digital callipers were used to measure upper and lower labial segment irregularity using Little's index and upper and lower labial segment crowding. To evaluate differences between groups 1 and 2 *t*-tests were used.

There were no statistically significant differences between the two retention regimens at T2 for labial segment irregularity or crowding ($P > 0.05$). Since both retention regimens were equally effective during the 1 year retention period, it would seem clinically acceptable to ask patients to wear their retainers at night only.

Introduction

The aim of this randomized clinical trial was to determine whether there is any difference between two orthodontic retention regimens: whether night-only wear of an upper and lower Hawley retainer for 1 year is as effective as 6 months full-time wear followed by 6 months night-only wear.

Most orthodontic clinicians will carry out supervised retention for at least 1 year after active treatment has ceased. The scientific rationale for this is that Reitan (1959, 1967) suggested that the gingival fibre network typically took 4–6 months to remodel and periodontal fibres took at least 262 days to re-organize, thus necessitating a means of maintaining teeth in their new post-treatment position. Use of retainers, theoretically, prevents the tendency of teeth to return to their pre-treatment positions not only from the influence of periodontal and gingival fibres but also from occlusal and soft tissue forces and continued dentofacial growth.

Southard *et al.* (1992) investigated the potential role of periodontal transseptal fibres, which were thought to be the prime force in exerting compression between mandibular contact points. They showed, using a digital tension transducer to record the interproximal force, that elastic supracrestal fibres continued to exert significant forces between mandibular contact points, possibly contributing to post-treatment changes in tooth position.

There is a wide variation in the retention regimen used by orthodontists, varying from immediate night-only wear of retainers to a period of 3–6 months full-time wear followed by night-only wear.

There are limited prospective studies that investigate this question and the problem of lack of scientific evidence has been highlighted in a systematic review (Littlewood *et al.*, 2006). However, Destang and Kerr (2003) investigated maxillary retention in two parallel groups to determine whether a longer retention period would decrease the relapse potential and increase stability. Twenty patients were allocated to a 6 month retention regimen using an upper Hawley retainer for 3 months full-time and 3 months night-only. The second group of 18 patients followed a 1 year retention regimen, with the same retainer, wearing it for 6 months full time followed by 6 months night-only. They found that the second group who experienced an overall retention regimen for 1 year showed less post-retention irregularity relapse of the maxillary anterior teeth compared with the group who had only worn a retainer for 6 months. They concluded that retention for 1 year, rather than 6 months, was clinically more beneficial.

There are numerous studies of possible variables that may influence orthodontic retention and relapse; these include: continued post-treatment facial growth and development (Björk and Skieller, 1972; Lopez-Gavito *et al.*, 1985; Little *et al.*, 1990; Wieslander, 1993), proclination of the lower labial segment and expansion of the intercanine width during orthodontic treatment (Mills, 1968; Little *et al.*, 1981; Felton, 1987), arch length deficiency (Richardson, 1996), tooth fibre discrepancy and a triangular shape of the lower incisors (Peck and Peck, 1972), and the mesial drift theory (Richardson, 1979) and the third molar theory. However, several published studies suggest that the latter plays a very minor role in long-term changes to the dental arch (Richardson, 1989; Ades *et al.*, 1990; Harradine *et al.*, 1998).

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Research Article

Retention Protocols and Factors Affecting Retainer Choice among Iraqi Orthodontists

Mushriq F. Abid, Ali M. Al-Attar, and Akram F. Alhuwaizi

Orthodontic Department, College of Dentistry-Baghdad University-Iraq, Baghdad, Iraq

Correspondence should be addressed to Mushriq F. Abid; mushriq.abid@codental.uobaghdad.edu.iq

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Background. To identify the most common retention protocols practiced by Iraqi orthodontists using a specially designed e-survey. Furthermore, this study aimed to assess the effect of sociodemographic factors on the participant's choice. *Methods*. Two hundred and twenty-five questionnaires with 23 multiple choice questions were sent to members of the Iraqi Orthodontic Society. The questionnaire was organized into four sections representing information about sociodemographic status of the orthodontists, factors affecting the selection of the retention system, commonly used retainers in the upper arch and lower arch, and duration of the retention system. The chi-square test was used to test the significant association between different variable and sociodemographic factors. *Results*. The response rate was 87.5%. The majority of the respondents considered the original malocclusion (80.2%) and clinical experience (49.7%) as the main factors for choosing the retention protocol. In the maxillary arch, a combination of vacuum-formed retainer and fixed retainer (35%) was mostly applied; in the mandibular arch, a fixed retainer was mainly used (46.7%). Most of the respondents recommended initial full-time wearing of a removable appliance (78.2%), especially in the first 3–6 months (47.2%). According to the respondents, bonding a fixed retainer to all anterior teeth was most common (79.7%), fabricated, and adapted directly inside the patient's mouth (75.1%). More than half used flowable composite (54.8%) and recommend leaving the retainer forever (53.8%). Most of the variables showed a statistically significant association between the sociodemographic factors and type, duration, and fabrication of the retainer used. *Conclusions*. A combination of removable and fixed retainers was commonly used in orthodontics retention, and sociodemographic factors significantly affected retainer choice.

1. Introduction

Prevention of relapse and maintenance of the orthodontic treatment require the use of retention protocols and appliances [1]. Relapse can occur at any age, and it is most commonly caused by occlusal forces, soft tissue pressure, and continuous growth, which could be influencing factors [2]. Surprisingly, to date, there has been no universal agreement about which retention protocol should be recommended including the need for retention, the type of retainer needed, and retention duration. However, several systematic and Cochrane reviews concluded that there is insufficient evidence to make recommendations on orthodontic retention regimen [3, 4].

Many types of orthodontic retainers are used after orthodontic treatment including removable acrylic retainers, vacuum-formed retainers (VFRs), and bonded retainers. It seems that the choice for a orthodontic retainer type is still debatable due to a large number of variations in retention materials, strategies, and individual patient factors. Orthodontists in the US mainly prefer the use of Hawley or VFR in the maxillary arch and the bonded retainer in the lower arch [5]. In Norway, they use a combination of bonded and removable retainers in the upper arch, while bonded retainers are used in the lower arch [6]. In Ireland, orthodontists recommend full-time wear of VFR in the maxillary and mandibular arches followed by part-time wear [7]. There are several disadvantages of different types of retainers, for example, a bonded retainer could cause plaque

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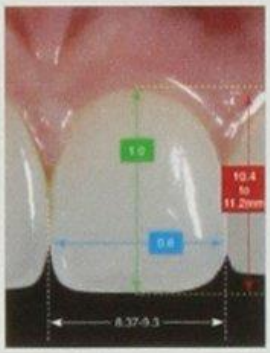

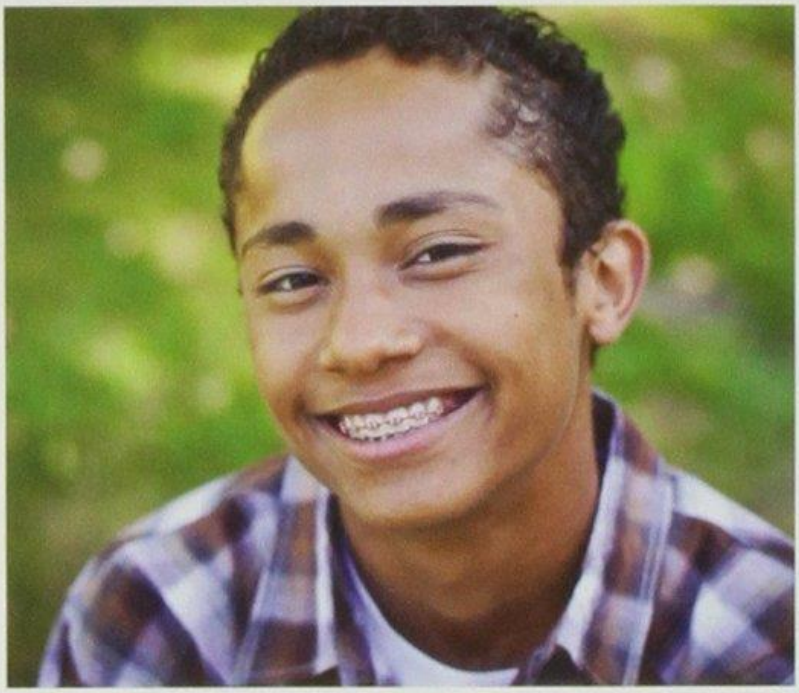

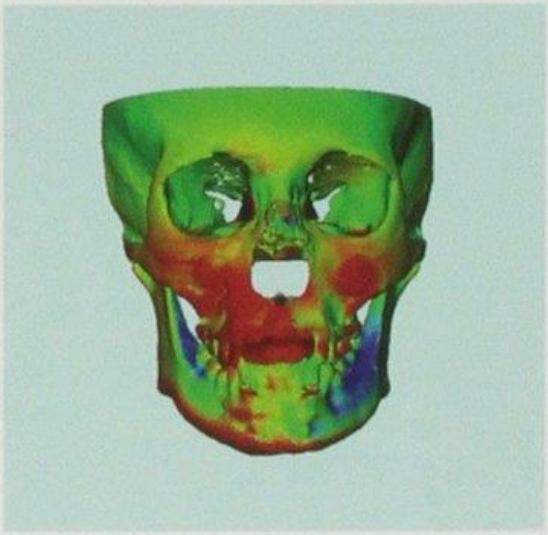

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Review Article

The Role of Mandibular Third Molars on Lower Anterior Teeth Crowding and Relapse after Orthodontic Treatment: A Systematic Review

Khalid H. Zawawi[1] and Marcello Melis[2]

[1] *Department of Orthodontics, Faculty of Dentistry, King Abdulaziz University, P.O. Box 80209, Jeddah 21589, Saudi Arabia*
[2] *Craniofacial Pain Center, Tufts University School of Dental Medicine, One Kneeland Street, Boston, MA 02111, USA*

Correspondence should be addressed to Khalid H. Zawawi; kzawawi@kau.edu.sa

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Aims. To evaluate the role of third molars in the development of crowding or relapse after orthodontic treatment in the anterior segment of the dental arch. *Methods.* PubMed search of the literature was performed selecting all the articles relevant to the topic and limiting the studies to controlled trials on humans and written in English language. Systematic review was conducted according to the PRISMA (preferred reporting items for systematic reviews and meta-analyses) statement. *Results.* A total of 12 clinical studies were included in the review. A high risk of bias was found in most of the articles, either because the relative items assessed were inadequate or because they were unclearly described. The third molars were not correlated with more severe anterior tooth crowding in most of the studies. However, four of them described a different outcome. *Conclusion.* Definitive conclusions on the role of the third molars in the development of anterior tooth crowding cannot be drawn. A high risk of bias was found in most of the trials, and the outcomes were not consistent. However, most of the studies do not support a cause-and-effect relationship; therefore, third molar extraction to prevent anterior tooth crowding or postorthodontic relapse is not justified.

1. Introduction

In orthodontics, the most controversial role of the third molars is whether they can contribute to the development of malocclusion or relapse after orthodontic treatment, particularly in the anterior segment of the dental arch. While this subject has been discussed and presented in the literature, it is an issue that remains unresolved. It has been hypothesized that, while erupting, the tooth could transmit an anterior component of force down the dental arch concentrating in the areas of canines and incisors, which results in tooth rotation and misplacement [1, 2]. Based on such theory, Niedzielska suggested that, when a sufficient space is available for the eruption of the third molars, the tooth assumes a normal position in the dental arch and does not cause displacement of the other teeth; conversely, when the space is deficient, third molars may aggravate dental crowding [2]. However, several studies did not confirm these conclusions. Sidlauskas and Trakiniene [3] studied a group of ninety-one subjects with a mean age of 21 years. Registration of crowding was based on the mesiodistal width measurements of the teeth in relation to the length of the corresponding segment of the lower dental arch. No statistically significant differences were reported in terms of lower dental arch crowding between the groups with erupted, unerupted, and agenesis of third molars. They concluded that there is no evidence to implicate third molars as etiologic factors in the late lower dental arch crowding [3]. In addition, Karasawa et al. [4] evaluated three hundred subjects with a mean age of 20.4 years on the presence or absence of wisdom teeth and mandibular incisor crowding. They also found no statistically significant association between the presence of upper and/or lower third molars and anterior mandibular teeth crowding. Their conclusions stated that evidence on the role of third molars as etiologic factor in the late lower arch crowding is lacking, similarly to the ones of the previous study [4].

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Randomized controlled trial

Five-year postretention outcomes of three retention methods—a randomized controlled trial

Gudrun Edman Tynelius, Sofia Petrén, Lars Bondemark and Eva Lilja-Karlander

Department of Orthodontics, Faculty of Odontology, Malmö University, Sweden

Correspondence to: Gudrun Edman Tynelius, Harvigslund Stubbarp 112, S-274 91 Skurup, Sweden.
E mail: gudrunedmantynelius@gmail.com

Summary

Objective: Comparison of three different retention strategies 5 years or more postretention.
Design, Setting, and Participants: Randomized, prospective, single-centre controlled trial. Forty-nine patients (33 girls and 16 boys) were randomly assigned to one of three retention methods during 2 years by picking a ballot shortly before start of retention treatment. Inclusion criteria were no previous orthodontics, permanent dentition, normal skeletal sagittal, vertical, and transversal relationships, Class I dental relationship, space deficiencies, treatment plan with extractions of four premolars followed by fixed straight-wire appliance. Maxillary and mandibular Little's irregularity index (LII), intercanine and intermolar width, arch length, and overbite/overjet were recorded in a blinded manner, altogether 10 measurements on each patient. Significant differences in means within groups assessed by *t*-test and between groups by one-way analysis of variance.
Interventions: Retention methods: removable vacuum-formed retainer (VFR) covering the palate and the maxillary anterior teeth from canine-to-canine and bonded canine-to-canine retainer in the lower arch (group V-CTC); maxillary VFR combined with stripping of the lower anterior teeth (group V-S); and prefabricated positioner (group P).
Results: Maxillary mean LII ranged from 1.8 to 2.6 mm, mean intercanine width 33.6–35.3 mm with a significant difference between groups V-S and P, mean intermolar width 46.8–47.4 mm and mean arch length 21.8–22.8 mm. Mandibular mean LII ranged from 2.0 to 3.4 mm with a significant difference between groups V-S and P, mean intercanine width from 25.4 to 26.6 mm, mean intermolar width from 40.8 to 40.9 mm and mean arch length from 16.9 to 17.3 mm. Mean overbite ranged from 1.8 to 2.7 mm and mean overjet from 3.7 to 4.1 mm.
Limitations: A single centre study could be less generalizable.
Conclusions: The three retention methods disclosed equally favourable clinical results.
Trial registration: This trial was not registered.
Protocol: The protocol was not published before trial commencement.

Introduction

A major challenge in orthodontic treatment is to inhibit relapse and ensure long-term stability of outcome. Growth, initial crowding, and patient compliance have traditionally been regarded as the main determinants of orthodontic treatment stability (1). As long as the maxilla and mandible are still growing, the position of the teeth and thus the result of retention treatment may be affected. Most current knowledge about long-term stability is based on retrospective studies (2–5). A recent review by the Cochrane group concluded that to date there is insufficient evidence to single out any particular retention strategy as the preferred method (6): it was recommended that future studies should include true randomization, reporting of dropouts, adequate sample size calculation, and a minimum follow-up period of 3 months.

There are a number of recent studies of the short-term effects of different retention strategies. Two randomized controlled trials (RCTs) comparing two appliances have shown equal short-term

SYSTEMATIC REVIEW

Orthodontic treatment stability and periodontal condition with circumferential supracrestal fiberotomy: a systematic review

Estabilidad del tratamiento de ortodoncia y de la condición periodontal con la fibrotomía supracrestal circunferencial: revisión sistemática

Sandra Patricia Castaño Duque[1], Ingrid Isabel Mora Díaz[2], Sergio Iván Losada Amaya[3], Lina María Álvarez Gómez[4], Lina Marcela Rengifo Mosquera[5], Ángela Zerpa Romandini[6], Isaac Wasserman Milhem[7]

1 DDS, School of Dentistry, Universidad de Antioquia. Specialist in Orthodontics; Specialist in Clinical Epidemiology; Specialist in Higher Education, Universidad El Bosque. Coordinator, Specialization in Orthodontics, Universidad El Bosque, Bogotá, Colombia. Assistant Professor, Universidad El Bosque.

2 DDS, School of Dentistry, Universidad El Bosque. Specialist in Periodontics and Oral Medicine, Universidad El Bosque, Bogotá, Colombia. Specialist in Clinical Epidemiology, Universidad de la Frontera, Chile. Associate Professor, Universidad El Bosque.

3 DDS, School of Dentistry, Pontificia Universidad Javeriana. Specialist in Periodontics and Oral Medicine, Universidad El Bosque. Master's Degree in Epidemiology, Universidad El Bosque, Bogotá, Colombia. Associate Professor, Universidad El Bosque.

4 DDS, School of Dentistry, Universidad Santiago de Cali. Specialist in Orthodontics, Universidad El Bosque. Bogotá, Colombia.

5 DDS, School of Dentistry, Universidad Santiago de Cali, Valle del Cauca. Specialist in Orthodontics, Universidad El Bosque. Bogotá, Colombia.

6 DDS, School of Dentistry, Universidad Gran Mariscal de Ayacucho, Venezuela. Specialist in Periodontics and Oral Medicine, Universidad El Bosque. Bogotá, Colombia.

7 DDS, School of Dentistry, Universidad Nacional de Colombia. Bogotá, Colombia. Certificate in Orthodontics, New York University, USA.

Keywords: malocclusion, periodontal disease, orthodontics retainers, recurrence, systematic review

ABSTRACT

Introduction: stability is one of the main goals of orthodontic treatment, and circumferential supracrestal fiberotomy is an alternative to prevent relapse in cases of tooth rotation, crowding and inclined teeth. However, there are no studies demonstrating the effectiveness of this treatment and its effects on the periodontal condition. The aim of this systematic review (SR) was to evaluate the effectiveness of circumferential supracrestal fiberotomy (CSF) as an adjuvant in the stability of orthodontic treatment during retention and its effects on the periodontal condition once it has been performed. ***Methods:*** the search for topic-related studies was conducted on the PubMed and EMBASE databases until October 2018. The studies were considered eligible if they covered the use of CSF during the retention period and reported the periodontal condition in a follow-up period longer than or equal to 1 year. For bias-risk assessment in the chosen studies, the Newcastle-Ottawa Scale was applied to observational studies, and the Cochrane Collaboration tool for Randomized Clinical Trials (RCTs) and Controlled Clinical Trials (CCTs). ***Results:*** the search strategy yielded 85 potential eligible articles, of which 5 were included in the SR. Four of the five studies reported a lower irregularity rate in patients who had CSF when compared to a control group. No changes in plaque index, gingival index, insertion levels, probe depth and keratinized gingiva amount were reported. ***Conclusions:*** fiberotomy is an effective method to prevent relapse of previously rotated teeth and does not cause periodontal alterations. However, it is important to note that the studies' methodological quality was low.

Palabras clave: maloclusión, enfermedades periodontales, recurrencia, revisión sistemática

RESUMEN

Introducción: la estabilidad es uno de los principales objetivos del tratamiento de ortodoncia, y la fibrotomía supracrestal circunferencial es una de las alternativas para prevenir la recidiva en casos de rotaciones dentales, apiñamiento y dientes con inclinación; sin embargo, no se tienen estudios que demuestren la efectividad de este tratamiento, así como sus efectos en la condición periodontal. El objetivo de esta revisión sistemática (RS) consistió en evaluar la efectividad de la fibrotomía supracrestal circunferencial (FSC) como procedimiento coadyuvante en la estabilidad del tratamiento de ortodoncia durante la retención, así como los efectos en la condición periodontal posterior a su realización. ***Métodos:*** la búsqueda de estudios relacionados con el tema se realizó mediante las bases de datos PubMed y EMBASE hasta octubre de 2018. Los estudios fueron considerados elegibles si abarcaban el uso de la FSC durante el periodo de retención y si reportaban la condición periodontal con un tiempo de seguimiento mayor o igual a un año. Para la evaluación del riesgo de sesgos en los estudios elegidos, se aplicó la escala Newcastle-Ottawa en los estudios observacionales y la herramienta de colaboración Cochrane para los ensayos clínicos aleatorizados (ECA) y ensayos clínicos controlados (ECC). ***Resultados:*** la estrategia de búsqueda arrojó 85 posibles artículos elegibles, de los cuales 5 fueron incluidos en la RS. Cuatro de los cinco estudios reportaron un índice de irregularidad menor en los pacientes que tuvieron FSC cuando se compararon con un grupo control. Con respecto a la condición periodontal, no se reportaron cambios en índice de placa, índice gingival, niveles de inserción, profundidad al sondaje y cantidad de encía queratinizada. ***Conclusiones:*** la fibrotomía es un método eficaz para evitar la recidiva de dientes previamente rotados y no genera alteraciones a nivel periodontal. Sin embargo, es importante tener en cuenta que la calidad metodológica de los estudios no fue alta.

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Original Scientific Paper

ORTHODONTIST CLINICAL EXPERIENCE AND CLINICAL SITUATION SIGNIFICANTLY INFLUENCE THE RETENTION PROTOCOL – A SURVEY FROM CROATIA

Zoran Popović[1], Magda Trinajstić Zrinski[2] and Stjepan Špalj[2]

[1]Private Dental Practice, Rijeka, Croatia;
[2]Department of Orthodontics, University of Rijeka Faculty of Dental Medicine, Rijeka, Croatia

SUMMARY – The aim was to assess the views and practice of Croatian orthodontists concerning retention protocols. A total of 150 questionnaire copies were distributed, of which 92 were validly completed. The survey included sociodemographic characteristics, practices of informing patients about retention options, commonly used appliances, and reasons for choosing a particular type of retention and treatment duration. Orthodontists informed patients about retention mostly verbally, the retention period was 3-5 years, the choice of method depended on the malocclusion (76%), and the protocol was influenced by clinical experience of the orthodontist (39%). The most commonly used appliance in the maxilla was the vacuum-formed retainer (52%), whereas a combination of fixed and removable retainers was most common in the mandible (34%). Modus of acquiring knowledge, biological reasons (malocclusion type, oral health, treatment outcome, and growth) and the patient's wishes were not a predictor of retention duration or recall frequency. With an increase in orthodontic experience, the duration of retention decreased and orthodontists were more likely to change the duration of retention ($p=0.001$), as well as the type of retention appliance ($p<0.001$). In conclusion, retention protocols among Croatian orthodontists were influenced mostly by their clinical experience and clinical situation.

Key words: *Croatia; Clinical protocols; Orthodontic appliances; Orthodontic retainers; Orthodontics, corrective – methods; Surveys and questionnaires*

Introduction

Orthodontic therapy comprises two phases described as active treatment and retention. Retention protocols depend on the presenting malocclusion type, patient age, treatment duration and outcome, but also on the clinician's education and clinical experience. For decades, the retention phase has been the most controversial phase of clinical orthodontics as there are no precise or widely accepted rules on the type, modus and duration. Due to the etiologic uncertainty of a malocclusion, an individual approach to patients is often necessary[1]. Neuromuscular balance, elasticity of the gingiva and periodontal ligament, occlusion stability, therapeutic factors and growth are known factors that affect relapse of a treated malocclusion[2].

Depending on the anomaly, there is a reported pattern and frequency of relapse. Rotated teeth are very susceptible to relapse post-treatment change and, surprisingly, their movement does not depend on available space. Even in extraction treatment, tooth rotational relapse can occur. In cases of class II sagittal relationship correction, an increase in overjet may occur, whereas in class III cases, late mandibular growth may cause reappearance of a mesio-occlusion.

During the finishing phase of orthodontic treatment, overcorrection of the malocclusion and circumferential supracrestal fiberotomy are the mechanisms

Correspondence to: *Magda Trinajstić Zrinski, DMD, PhD*, Krešimirova 40, HR-51000 Rijeka, Croatia
E-mail: magda.zrinski@fdmri.uniri.hr
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Original article

Extractions, retention and stability: the search for orthodontic truth

Sheldon Peck[1,2]

[1]Department of Orthodontics, University of North Carolina, Chapel Hill, NC, USA

[2]Historian, The Edward H. Angle Society of Orthodontists

Correspondence to: Sheldon Peck, 180 Beacon Street, Boston, MA 02116, USA. E-mail: peckslam@gmail.com

Adapted from the 2016 E. Sheldon Friel Memorial Lecture, presented 13 June 2016 at the 92nd Congress of the European Orthodontic Society, Stockholm, Sweden.

Summary

Background and objectives: From the beginnings of modern orthodontics, questions have been raised about the extraction of healthy permanent teeth in order to correct malocclusions. A hundred years ago, orthodontic tooth extraction was debated with almost religious intensity by experts on either side of the issue. Sheldon Friel and his mentor Edward H. Angle both had much to say about this controversy. Today, after significant progress in orthodontic practice, similar arguments are being voiced between nonextraction expansionists and those who see the need for tooth extractions in some orthodontic patients. Furthermore, varying concepts of mechanical retention of treatment results have evolved over the years which have been misinterpreted as enhancing natural orthodontic stability.

Materials and methods: In this essay, representing the Ernest Sheldon Friel Memorial Lecture presented in 2016 at the 92nd Congress of the European Orthodontic Society, a full spectrum of evidence from biology, anthropology and history is critically discussed in the search for truth among highly contested orthodontic variables: extraction versus nonextraction, fixed retention versus limited retention, and rationalized stability versus biological homeostasis.

Conclusions and implications: Conscientious clinicians should try to develop individualized treatment plans for their patients, and not be influenced by treatment 'philosophies' with untested claims in clinical orthodontics.

Orthodontics is a relatively young sphere of studied biomedical interest. The first writings about therapeutic tooth movement in 18th-century Europe largely concerned the regulation of teeth, or straightening of crooked teeth. In fact, 'orthodontosie,' the art of making teeth straight—the neologism from which 'orthodontics' is derived—was suggested in 1841 by French surgeon-dentist, Pierre-Joachim Lefoulon (1). Then and earlier, there was no focus on dental occlusion, the way upper and lower teeth meshed together. Cosmetic straightness was the first and only goal of any treatments that would reposition the teeth (2).

In 1899, Edward H. Angle is generally credited with introducing the concepts of occlusion and malocclusion as essential elements of orthodontic thinking (3). No longer could dentists entering the nascent field of treating malalignments of the teeth neglect consideration of abnormal variations in the bite. Whether orthodontic treatment was initiated to correct an irregularity of the teeth such as dental crowding, or a malocclusion such as underdevelopment of the lower jaw, a critical decision was to determine if dental arch space needed to be made by the extraction of selected permanent teeth, a clinical practice that was popular at that time, but coming under scrutiny. For many years, Angle intensely studied this extraction-nonextraction conundrum in orthodontic treatment.

Frederick Noyes, first a dentist-histologist and then an Angle-trained orthodontist, taught Angle School students that bone growth is produced in response to mechanical stimuli such as orthodontic forces (4). Angle embraced this 'bone-growing' rationalization as the

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Review Article

Dentistry Section

Frenectomy: A Review with the Reports of Surgical Techniques

DEVISHREE, SHEELA KUMAR GUJJARI, SHUBHASHINI P.V.

ABSTRACT

The frenum is a mucous membrane fold that attaches the lip and the cheek to the alveolar mucosa, the gingiva, and the underlying periosteum. The frena may jeopardize the gingival health when they are attached too closely to the gingival margin, either due to an interference in the plaque control or due to a muscle pull. In addition to this, the maxillary frenum may present aesthetic problems or compromise the orthodontic result in the midline diastema cases, thus causing a recurrence after the treatment. The management of such an aberrant frenum is accomplished by performing a frenectomy.

The present article is a compilation of a brief overview about the frenum, with a focus on the indications, contraindications, advantages and the disadvantages of various frenectomy techniques, like Miller's technique, V-Y plasty, Z-plasty and frenectomy by using electrocautery. A series of clinical cases of frenectomy which were approached by various techniques have also been reported.

Key Words: Frenum, Frenectomy, Mucogingival techniques

INTRODUCTION

Aesthetic concerns have led to an increasing importance in seeking dental treatment, with the purpose of achieving perfect smile. The continuing presence of a diastema between the maxillary central incisors in adults, has often been considered as an aesthetic problem. The presence of an aberrant frenum being one of the aetiological factors for the persistence of a midline diastema, the focus on the frenum has become essential [1].

The frena may also jeopardize the gingival health by causing a gingival recession when they are attached too closely to the gingival margin, either because of an interference with the proper placement of a toothbrush or through the opening of the gingival crevice because of a muscle pull [2].

The Muscular Anatomy of the Frenum

A frenum is a mucous membrane fold which contains muscle and connective tissue fibres that attach the lip and the cheek to the alveolar mucosa, the gingiva and the underlying periosteum [2].

Knox and Young histologically studied the frenulum, and they have reported both elastic and muscle fibres (Orbicularis oris - horizontal bands and oblique fibres). However, Henry, Levin and Tsaknis have found considerably dense collagenous tissue and elastic fibres but no muscle fibres in the frenulum [2].

Aetiology

The maxillary labial frenum develops as a post-eruptive remnant of the ectolabial bands which connect the tubercle of the upper lip to the palatine papilla. When the 2 central incisors erupt widely separated, no bone is deposited inferior to the frenum. A V-shaped bony cleft between the two central incisors and an abnormal frenum attachment results. The mandibular frenum is considered as aberrant when it is associated with a decreased vestibular depth and an inadequate width of the attached gingiva [1,2].

Diagnosis

The abnormal frena are detected visually by applying tension over the frenum to see the movement of the papillary tip or the blanch which is produced due to ischaemia in the region. The frenum is characterized as pathogenic when it is unusually wide or when there is no apparent zone of the attached gingiva along the midline or the interdental papilla shifts when the frenum is extended.

Classification

The labial frenal attachments have been classified as mucosal, gingival, papillary and papilla penetrating, by Placek et al (1974) [3].

1. Mucosal – when the frenal fibres are attached up to the mucogingival junction.
2. Gingival – when the fibres are inserted within the attached gingiva.
3. Papillary – when the fibres are extending into the interdental papilla.
4. Papilla penetrating – when the frenal fibres cross the alveolar process and extend up to the palatine papilla.

Indications

The frenum is characterized as pathogenic and is indicated for removal when

- An aberrant frenal attachment is present, which causes a midline diastema.
- A flattened papilla with the frenum closely attached to the gingival margin is present, which causes a gingival recession and a hindrance in maintaining the oral hygiene.
- An aberrant frenum with an inadequately attached gingiva and a shallow vestibule is seen.

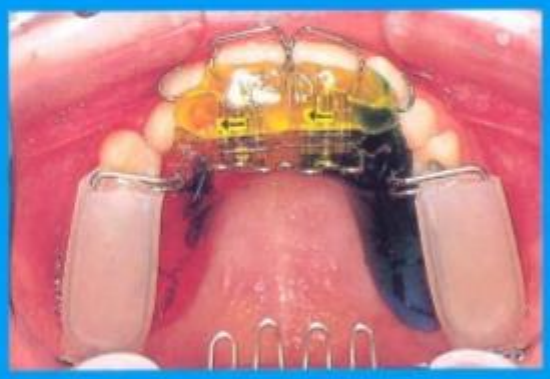
Treatment

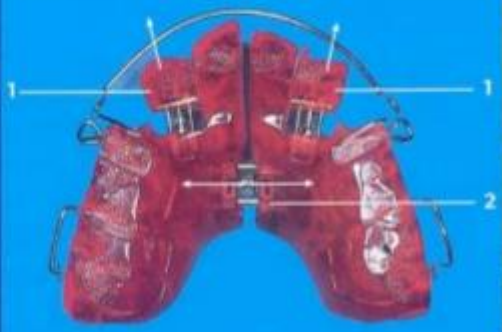
The aberrant frena can be treated by *frenectomy* or by *frenotomy* procedures. *Frenectomy* is the complete removal of the frenum,

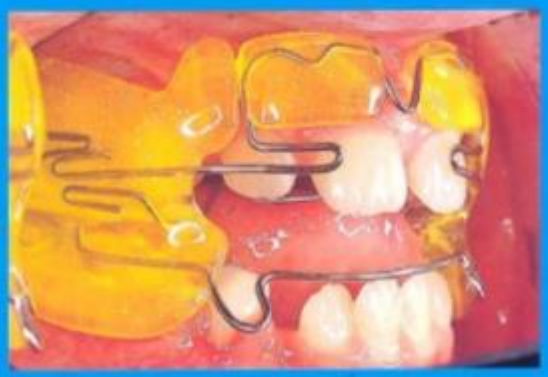
Ulrike Grohmann

Aparatología en Ortopedia Funcional

Atlas Gráfico







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REVIEW ARTICLE

Orthodontic Retainers: A Contemporary Overview

Ahmed M Alassiry

Abstract

Aim: The aim of this article is to provide an insight into the various modalities of retention and types of appliance used in achieving this objective.

Background: Maintaining the orthodontically treated teeth in their corrected position is a challenging and ominous task since the inception of this specialty. Orthodontic retainers play a pivotal role in preventing posttreatment tooth movement, thereby maintaining the esthetic, function, and stability of the stomatognathic system.

Results: An extensive study of literature suggests that there are significant variations in the results describing the effectiveness, cost factors, survival times, oral hygiene status, and regimen of various orthodontic retention appliances. In terms of patient's satisfaction and speech articulation, vacuum-formed retainers (VFRs) are better than Hawley retainers. Occlusal contacts are better achieved with Hawley retainers than VFRs.

Conclusion: Currently, there is insufficient high-quality evidence in favor of a particular retention appliance/regime or protocol. There is a need for further evidence-based high-quality studies/randomize controlled trial studies (RCTs) to evaluate different orthodontic retention appliances and regime after the orthodontic treatment.

Clinical significance: Irrespective of the appliance, the patients should be prepared for a long-term or indefinite retention phase following orthodontic treatment to prevent relapse.

Keywords: Orthodontic retainers, Relapse, Removable retainers, Retention, Vacuum formed retainers.

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Introduction

"It's not over until it's over" and this dictum holds completely true for an orthodontic treatment. Even after completing an orthodontic treatment successfully, the daunting task of keeping the teeth in their rightful position persists. The onus of this responsibility lies on both the orthodontist and the patient. On the one hand, it is the job the orthodontist to provide with well-fitting, comfortable retainers with proper instructions and motivation for the patient to wear it regularly. On the other hand, the patient is incumbent to wear the retainer as directed by the orthodontist. But, easy said than done, the retention stage remains the most difficult part of the orthodontic treatment. Many reputed personalities in orthodontics like Angle, Case, Tweed, and Hawley have highlighted the concerns in retention and attributed it to professional negligence.[1] Such is the problem of retention that once Tweed and his orthodontist friend quipped that "I would gladly pay someone half my fee if he relieves me of the responsibility of successfully carrying my patients through their retention periods."[2]

Many appliances are used for the posttreatment retention phase. In the Angle era, banded fixed appliances were used as retainers.[3] In 1919, removable retainers were introduced by Hawley.[4] With the advent of the acid-etch technique, Kneirim for the first time in 1973 described the use of fixed bonded retainers.[5] In the present scenario, many retention appliances are being advocated to prevent relapse and offer long-term stability. The aim of this article is to appraise the orthodontic retainers by providing an extensive review of literature.

Discussion

The origin of this problem lies in the treatment itself. Ideally, after achieving proper alignment and occlusion, it takes around a year for the surrounding periodontium to reorganize and adapt itself.[6] Most of the studies have reported that the maximum quantum of relapse occurs in the first 2 years posttreatment.[7,8] This relapse can be attributed to the following factors:

- Continuous skeletal maturation or aging process
- Inherited characteristics/genetics
- Recoil of the periodontal ligament and gingival fibers
- Soft-tissue maturation
- Occlusal factors
- Limits of the dentition
- Presence of third molars
- Maxillary and mandibular expansion

The road to an eternal, perpetual straight smile begins and ends with an orthodontic retainer. Retainers are defined as orthodontic appliances used to prevent relapse/return following correction, of features of the original malocclusion. They can be classified as shown in Table 1.

Removable Retainers

These categories of retainers can be removed and reinserted by the patient. Hawley retainers are the most common and popular, century-old appliance designed by Charles Hawley in the year 1919.[9]

Department of Preventive Dental Sciences, Faculty of Dentistry, Najran University, Kingdom of Saudi Arabia

Corresponding Author: Ahmed M Alassiry, Department of Preventive Dental Sciences, Faculty of Dentistry, Najran University, Kingdom of Saudi Arabia, Phone: +966 504135127, e-mail: ahmedassiry@hotmail.com

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CLEAR ALIGNER TECHNIQUE

Sandra Tai, BDS, MS

QUINTESSENCE PUBLISHING

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Article

The Behavior of Two Types of Upper Removable Retainers—Our Clinical Experience

Luminita Ligia Vaida [1], Eugen Silviu Bud [2,*], Liliana Gabriela Halitchi [3,*], Simona Cavalu [4], Bianca Ioana Todor [1], Bianca Maria Negrutiu [1], Abel Emanuel Moca [1] and Florian Dorel Bodog [5]

1 Department of Dentistry, Faculty of Medicine and Pharmacy, University of Oradea, 1 Universitatii Str., 410087 Oradea, Romania; ligia_vaida@yahoo.com (L.L.V.); biancaioana.todor@gmail.com (B.I.T.); biancastanis@yahoo.com (B.M.N.); abelmoca@yahoo.com (A.E.M.)

2 Department of Orthodontics, University of Medicine and Pharmacy Science and Technology G.E Palade, 38 Gh. Marinescu Str., 540139 Targu Mures, Romania

3 Department of Clinical Disciplines, Faculty of Dentistry, Apollonia University of Iasi, 2 Muzicii Str., 700399 Iasi, Romania

4 Department of Preclinical Sciences, Faculty of Medicine and Pharmacy, University of Oradea, 1 Universitatii Str., 410087 Oradea, Romania; simona.cavalu@gmail.com

5 Department of Surgery, Faculty of Medicine and Pharmacy, University of Oradea, 1 Universitatii Str., 410087 Oradea, Romania; fbodog@gmail.com

* Correspondence: eugen.bud@gmail.com (E.S.B.); gabriella_halitchi@yahoo.com (L.G.H.)

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Abstract: The Hawley retainer (HR) and the vacuum-formed retainer (VFR) are the most common removable retainers in orthodontic treatments. The aim of this retrospective study was to comparatively analyze the behavior of two types of removable retainers—HRs and VFRs—in terms of retainer damage, loss, and the rate of installation of mild or severe relapse that required recourse to certain therapeutic interventions. The study was performed on 618 orthodontic patients aged 11–17 years, average age 13.98 ± 1.51, out of which 57% were patients having VFRs and the remaining 43% having HRs in the upper arch. We performed an analysis of the two groups of patients—HRs group and VFRs group—at 6 months (T1) and at 12 months (T2) after the application of the retainer. The results showed that 6% of all the retainers were damaged, mostly at T2 (54.1%). Seven percent of all the retainers were lost, mostly at T1 (58.1%). Of all the patients, 9.1% presented mild relapse, mostly at T1 (58.9%), while 2.6% presented severe relapse. The VFRs were significantly more frequently associated with the occurrence of damage than the HRs ($p < 0.001$). Severe relapse was more frequently associated with the HRs rather than with VFRs ($p < 0.05$).

Keywords: Hawley retainer; vacuum-formed retainer; relapse; orthodontic treatment; children and adolescents

1. Introduction

The aim of the orthodontic treatment is not only to improve oral functioning and health but also to enhance dento-facial esthetics, self-esteem, and oral health-related quality of life [1]. Retention is a sine-qua-non condition of orthodontic treatment and its aim is to maintain the teeth in the correct position obtained at the end of the active phase of the orthodontic treatment. The omission of the retention phase has as consequence the relapse, the tendency for the initial malocclusion to reappear [2,3]. Relapse may occur due to imbalances in the gingival fibers, periodontal tissues, occlusion, or facial soft tissues [4,5]. Unwanted changes may also occur after the removal of the orthodontic fixed appliance (at the end of the active phase of orthodontic treatment) in growing patients, due to unfavorable growth trends. Unfortunately, no prediction can be made regarding the risk of relapse in the event of giving

Randomized Controlled Trial > World J Orthod. Fall 2007;8(3):300-6.

Part-time versus full-time retainer wear following fixed appliance therapy: a randomized prospective controlled trial

Daljit S Gill [1], Farhad B Naini, Allan Jones, Christopher J Tredwin

Affiliations + expand

PMID: 17902334

Abstract

Aim: To compare part-time and full-time Essix-type retainer wear regimens following fixed appliance treatment, with respect to dental alignment and occlusal changes.

Methods: In this prospective study, 60 patients were randomly allocated to either full-time or part-time Essix retainer wear following fixed appliance therapy. Study casts were taken before treatment, at debonding, and 6 months following debonding. Little's irregularity index, the intercanine width, intermolar width, overjet, and overbite were measured blindly on both the maxillary and mandibular casts.

Results: Both groups showed pretreatment equivalence for start age, duration of fixed appliance treatment, Little's index, intercanine width, intermolar width, overjet, and overbite. The number of patients completing the trial was 29 (1 dropout) in the part-time group and 28 in the full-time group (2 dropouts). There was a significant reduction in both the maxillary and mandibular Little's index and mandibular intermolar width in both groups during active treatment. There was a significant reduction in overjet and overbite in only the part-time retention group during fixed appliance treatment. Between debonding and 6 months after debonding, there was no significant change in any of the intra- or intergroup study cast measurements.

Conclusions: Night-time-only Essix retainer wear may be an acceptable retention regimen following the use of fixed appliances.

ORIGINAL ARTICLE

Results of a survey-based study to identify common retention practices in the United States

Manish Valiathan[a] **and Eric Hughes**[b]
Cleveland, Ohio, and Tuscaloosa, Ala

Introduction: The purpose of this descriptive study was to use a carefully constructed, pilot-tested survey instrument to identify the most common orthodontic retainers and retention protocols prescribed in the United States as reported by active members of the American Association of Orthodontists. **Methods:** We randomly selected 2000 active members, stratified by region of practice, for the study. Information gathered included, but was not limited to, the types of retainers prescribed in the maxillary and mandibular arches, duration of full-time and part-time wear, use of fixed retainers, appliances fabricated in office vs commercial laboratories, the number of debonds per year, and retention appointment schedules. The survey consisted of 20 questions. Data were gathered on a categorical scale and analyzed. **Results:** We received 658 responses (32.9%) during a 12-week period. Maxillary Hawley retainers (58.2%) and mandibular fixed lingual retainers (40.2%) were the most commonly used. Most orthodontists prescribed less than 9 months of full-time wear of removable retainers and thereafter advised part-time, but lifetime wear. Most orthodontists (75.9%) did not instruct patients to have the fixed lingual retainers removed at a specific time. More orthodontists who prescribed Hawley retainers recommended longer full-time wear compared with clear thermoplastic retainers. The timing of scheduled retention appointments varied among clinicians and depended on the number of years in practice, the volume of patients debonded, and the type of prescribed retainer. The only regional difference associated with retainer design was the Northeast region, where mandibular fixed lingual retainers were used less frequently. Female orthodontists did not use mandibular fixed lingual retainers as often as their male counterparts. **Conclusions:** Maxillary Hawley and mandibular fixed lingual retainers are most commonly used. This study is the first to describe retention protocols and the scheduling of retention appointments in the United States. (Am J Orthod Dentofacial Orthop 2010;137:170-7)

Retention of a patient's corrected malocclusion is a vital component of successful orthodontic treatment.[1] The degree of stability of each corrected malocclusion is unpredictable, and much effort is often required to maintain the final orthodontic position of the teeth. Teeth tend to move back to their pretreatment positions if they are not retained.[1,2] Several retainer designs have evolved over time, with various retention protocols to minimize relapse. A few studies examined the relative effectiveness of these appliances.[3-6] Because of the lack of scientific evidence, it appears that current recommendations are based largely on personal preference and nonscientific criteria.[7] This has led to the use of various retainers and retention protocols.[8-11]

Studies by Wong and Freer[12] and Gottlieb et al[13-15] have shed light on retainer designs and protocols. In 2004, Wong and Freer[12] surveyed orthodontists in Australia and New Zealand to identify consistencies in retention procedures and found that the most commonly used retainers were maxillary invisible retainers and mandibular canine-to-canine bonded retainers. Orthodontists most commonly recommended a regular retention period of more than 2 years and defined permanent retention as "lifetime." Gottlieb et al[13-15] completed a 3-part comprehensive study intended to gather information on a range of orthodontic issues from diagnosis and treatment procedures to wires and softwares used. Their sample was recruited from orthodontists in the United States in 1986, 1990, and 1996. Hawley retainers declined in use from 1986 to 1996, whereas spring aligners, invisible retainers, and fixed bonded canine-to-canine retainers increased. Essix retainers were introduced by Sheridan et al[10] in 1993 and were evaluated only in the 1996 study. The retainer of choice appeared to change during the 10-year period. Retention protocols were not evaluated in either study.

[a]Assistant professor, Department of Orthodontics, School of Dental Medicine, Case Western Reserve University, Cleveland, Ohio.
[b]Private practice, Tuscaloosa, Alabama.
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Reprint request to: Manish Valiathan, Case Western Reserve University, School of Dental Medicine, Department of Orthodontics, 10900 Euclid Ave, Cleveland, OH 44106; e-mail, mxv13@case.edu.
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Original Article

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Assessment of Factors Affecting Adolescent Patients' Compliance with Hawley and Vacuum Formed Retainers

Dentistry Section

BEHNAM MIRZAKOUCHAKI[1], SAJJAD SHIRAZI[2], REZA SHARGHI[3], SAMANEH SHIRAZI[4]

ABSTRACT

Introduction: Success of orthodontic retention with removable retainers almost entirely depends on patients' compliance.

Aim: This study was carried out to investigate the relationship between adolescent orthodontic patients' compliance and various clinical and social factors.

Materials and Methods: The data were collected from 77 orthodontic patients aged 7-11 years old who had finished the full fixed appliance therapy. Hawley's retainers were used in 34 patients and 43 patients used Vacuum Formed Retainers (VFRs). The subjects completed a questionnaire including several identifiers allowing the respondents to be classified into subgroups. They were also asked to indicate how long they wore their retainers during the day, by writing the number of hours in the report-card for the next three months. Comparison of the results was performed by one-way ANOVA and independent sample-t tests.

Results: No significant differences were found between males and females. Type of the retainer, patients' grade of study, mothers' occupation, clinicians' and parents' attitudes and filling the report cards had significant effect on mean wear hours per day. When compliance of the patients was assessed according to treatment location, Living place, parents' educational degrees and ethnicity, no significant differences could be found.

Conclusion: The adolescent patients' compliance was greater with VFRs than with Hawley's retainers. Parental attitude and doctor-patient relationship had a great impact on adolescent patients' compliance.

Keywords: Orthodontic appliances, Patient cooperation, Questionnaires, Removable

INTRODUCTION

Orthodontics requires patients' cooperation much more than the other areas of health care. Uncooperative patients are defined as having a defiant or poor attitude towards the orthodontic treatment [1]. Lack of cooperation or compliance can destroy the best treatment plan and the most promising treatment strategy [2].

The aim of orthodontic retention is to stabilize the position of the teeth after orthodontic treatment in optimal aesthetic and functional positions [2]. Various methods of retention are applied. However, their success almost entirely depends on the patient's compliance since most orthodontic retainers are removable [3].

Patients' overall compliance depends on such factors as socioeconomic and demographic factors, educational level, doctor-patient relationship, general information about treatment, family background, regimen and comfort, influence of the treatment provider and parental guidance [4-8]. Some studies have proved that parents have a determining and critical role in cooperation of their children [9-11]. Many studies have also focused on identifying personal characteristics strongly correlated with a compliant orthodontic patient. However, the data from much of these studies have been contradictory, and other studies have yielded inconclusive results [3,12].

Considering compliance in the retention phase, some studies found it associated with factors like age, gender, educational level, type of retainer, time since removal of the fixed appliance and parental influence [3,5,8,13,14]. Other studies reported no influence of these factors on patients' compliance [2,8,13].

There have been few studies regarding retainer compliance with Hawley's retainers compared to VFRs. Hichens et al., through the use of a questionnaire found that most people preferred VFRs over Hawley's retainers [15]. Kacer et al., noted that there is virtually no difference in preference of retainer [13]. Pratt et al., concluded that patient's compliance is greater with VFRs initially but, in overall it is greater with Hawley's retainers [3]. Nevertheless, there is a controversy regarding the frequency and the length of time which retainers should be worn during the post treatment phase. Suggestions for removable retainer wear vary from night time only/part-time only to nearly 24 hours a day for the first six months after debonding [16-18].

The purpose of this study was to evaluate the potential association of adolescent patients' compliance with several demographic, clinical and social variables. Specifically, we took a broader approach to understand adolescent patients' compliance by focusing on a combination of child and parent factors along with clinical and social variables that might help to predict treatment compliance.

MATERIALS AND METHODS

This cross-sectional study was carried out in the Department of Orthodontics at the Tabriz University of Medical Sciences and the first author's private practice from October 2013 to June 2015. The study design was independently reviewed and approved by the Committee for Research Ethics at the University (Ref Number: TBZMED.REC.428). An informed consent was obtained from parents or legal guardians, the patients gave written consent.

Considering 80% power, significance level of 5%, and 25% difference between wear times of Hawley's retainer and VFR groups, a sample size of 76 patients was needed for this study. The sample size was calculated using "Power and Sample Size" software (Version 3). However, 40 patients per each group (Hawley's retainer and VFR) were included to compensate for any lost to follow-ups [2,19,20].

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Factors affecting information retention in orthodontic patients

Jilpa H Patel [1], David R Moles, Susan J Cunningham

Affiliations + expand

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Abstract

Introduction: Our purpose was to determine the factors that affect patients' retention of information provided in different formats.

Methods: Eighty new patients attending clinics were randomly allocated into 1 of 2 groups. The first group was given a commercial information leaflet about orthodontic treatment, and the second group saw a visual computer program with the same information. Both groups were given additional verbal information. Short- and longer-term retention of information were assessed using a questionnaire. Age, sex, ethnicity, index of relative deprivation of area of residence, and the time taken to view or read the information were recorded. Linear regression analysis was undertaken to assess the relationship between retention of information and these variables.

Results: The response rates for the first and second questionnaires were 100% and 67.5%, respectively. The method of information provision was found to be the only statistically significant factor affecting information retention, with the visual computer program group achieving higher scores than the written information leaflet group.

Conclusions: Computer-based visual information was shown to be a better method for information retention. Consequently, it is worth considering providing information to orthodontic patients in a more visual format if it is to be retained most effectively.

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Patient compliance with orthodontic retainers in the postretention phase

Michael C Pratt [1], G Thomas Kluemper, Adam F Lindstrom

Affiliations + expand

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Abstract

Introduction: Retention is an important, even critical, component of orthodontic treatment. There is little research on practice protocols and patient compliance with long-term or short-term retention. This lack of information leaves our specialty with many opinions and practice protocols. The purposes of this study were to evaluate and quantify orthodontic retainer wear according to several variables, including patient age, sex, time in retention, and retainer type, and to identify predictors of compliance and reasons for noncompliance with removable orthodontic retainers.

Methods: Questionnaires were mailed to patients who finished full fixed appliance therapy in either the orthodontic graduate clinic or the orthodontic faculty practice at the University of Kentucky within the past 6 years. Of the 1085 questionnaires mailed, 280 were returned (25.8%). A logistic regression model that described the probabilities of retainer wear was created ($P < 0.0001$).

Results: Patient compliance was greater with vacuum-formed retainers (VFRs) for the first 2 years after debonding. However, compliance with VFRs decreased at a much faster rate than with Hawley retainers. Because of this, patient compliance was greater with Hawley retainers at any time longer than 2 years after debonding, and patient compliance overall was greater with Hawley retainers.

Conclusions: This evidence disagrees with the current anecdotal trend of orthodontists who favor switching from Hawley retainers to VFRs. An unexpected finding was that patients reported few esthetic concerns about retainers, and the few that were reported were equally distributed between Hawley retainers and VFRs.

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Randomized controlled trial

Acceptability comparison between Hawley retainers and vacuum-formed retainers in orthodontic adult patients: a single-centre, randomized controlled trial

Mohammed Saleh[1,4], Mohammad Y. Hajeer[2] and Dieter Muessig[3]

[1]Private Practice and Orthodontic Department, Saudi Swiss Dental Consultant Centre, Al-Khobar, Saudi Arabia, [2]Department of Orthodontics, University of Damascus Dental School, Syria, and [3]Centre for Orthodontics, Faculty of Dental Medicine, Danube Private University, Krems, Austria.

[4]Present address: Private Practice and Orthodontic Department, KJMC, Al-Ain City, United Arab Emirates.

Correspondence to: Mohammad Y. Hajeer, Department of Orthodontics, University of Damascus Dental School, Mazzeh Autostrad, Mazzeh, Damascus, Syria. E-mail: myhajeer@gmail.com

Summary

Background: Hawley retainers (HRs) and vacuum formed retainers (VFRs) are the most commonly used removable retainers in the orthodontic practice. Patients' cooperation in wearing these appliances is affected by the levels of discomfort and oral impairment. The evidence regarding their acceptably among orthodontic patients is limited.

Aims: To compare the acceptability of HRs and VFRs over a 6-month period in a group of fixed orthodontic patients.

Trial Design: Two-arm parallel-group randomized controlled trial.

Methods: Patients being treated at the Orthodontic Department of Saudi Swiss Consultant Dental Centre, Al-Khobar, Saudi Arabia, who met the inclusion criteria were invited to participate. Inclusion criteria were treatment only with fixed appliances, no lateral expansion treatment, no hypodontia, no cleft lip and palate, no surgical corrections, no extraction-based plans, 18 years old or greater, and willingness to wear maxillary and mandibular removable retainers. Participants were distributed randomly using concealed envelopes into two groups: HR group and VFR group. A pilot-tested questionnaire was filled at three times: 1 week after fitting of the retainer (T1), 3 months and 6 months following appliance fitting (T2 and T3, respectively). Ten questions were given on biting, fitting of the appliance, speech, appearance, oral hygiene, durability, gingival irritation, swallowing, self-confidence, and comfort. Responses were given on a visual analogue scale. Blinding was employed during data analysis.

Results: Ninety-four patients were included primarily. Six patients in the Hawley group and two patients in the VFR group failed to complete the study. Therefore, 86 patients were included the analysis (HR group: 41; VFR group: 45). No significant differences were found between the two groups in biting, fitting of the appliance, and hygiene perception, whereas significant differences were detected in speech ($P < 0.05$), appearance ($P < 0.001$), gingival irritation ($P < 0.001$), durability ($P < 0.001$), swallowing ($P < 0.001$), self-confidence, and comfort ($P < 0.001$). No harm to any patient was noticed during the trial.

Conclusions: Over a 6-month period of retention, VFR was significantly more acceptable than HR in speech, appearance, gingival irritation, swallowing, self-confidence, and comfort. Subjects in the HR group believed that their retainers were significantly more durable than those in the VFR group at the final assessment. Both retainers were equal regarding fitting of the appliance, biting, and hygiene perception.

Original Article

Relapse Tendency after Orthodontic Correction of Upper Front Teeth Retained with a Bonded Retainer

Sasan Naraghi[a]; Anders Andrén[b]; Heidrun Kjellberg[c]; Bengt Olof Mohlin[d]

ABSTRACT

Objective: To investigate the amount and pattern of relapse of maxillary front teeth previously retained with a bonded retainer.

Materials and Methods: The study group consisted of 135 study casts from 45 patients. Recordings from study models before treatment (T1), at debonding (T2), and 1 year after removal of the retainer (T3) were present. All patients had been treated with fixed edgewise appliances. The irregularity index (sum of contact point displacement [CPD]) and rotations of front teeth toward the raphe line were calculated at T1, T2, and T3.

Results: The mean irregularity index at T1 was 10.1 (range 3.0–29.9, SD 5.4). At T2 it was 0.7 (range 0.0–2.1, SD 0.7), and at T3 it was 1.4 (range 0.0–5.1, SD 1.2). Fifty-five teeth in 42 patients were corrected more than 20° between T1 and T2 (mean correction 31.4° range 20.0–61.7), and mean relapse in this group was 7.3° (range 0.0–20.5). Regarding alignment of the maxillary front teeth, the contact relationship between the laterals and centrals seems to be the most critical. A significant positive correlation was found between the amount of correction of incisor rotation and the magnitude of relapse but not between the amount of correction of CPD and the magnitude of relapse. Eighty-four percent of the overcorrected CPDs returned to a desired position.

Conclusions: Minor or no relapse was noted at the 1-year follow-up. (*Angle Orthod* 2005;76: 570–576.)

KEY WORDS: Retention; Rotation; Crowding; Irregularity; Incisors

INTRODUCTION

Morphologic stability is one important goal after orthodontic treatment, and from the patients point of view, stability of the upper front teeth is of considerable importance.[1,2] Relapse, the tendency for teeth to return toward their pretreatment positions, has been the subject of many studies,[3–9] the long-term results reported from Seattle being the most extensive.[3,17] Because of type of malocclusion, treatment procedure, cooperation during and after treatment, growth, etc,[5,7–9] variability in long-term treatment outcome is quite common. Additional factors are type and duration of retention.[10] There is some information in the literature regarding maxillary irregularity after retention with a maxillary Hawley retainer,[6,7,11,12] but many studies[8,9,10,12] do not specify the retention method in the upper arch, the duration of retention, or the length of the postretention period at the time of examination.

Bonded multistrand wire has been used as a method of retention for 30 years[13,14] and is now a reasonably reliable form of retention[15,16] in a short-term perspective. Bonded retainers appear to be accepted well by patients and are relatively independent of patient cooperation. The relapse tendency of the upper front teeth after correction of contact point displacements (CPDs) and rotations and after use of bonded retainers has yet to be reported.

Surbeck et al[17] found that the pattern of pretreatment rotational displacement of maxillary anterior teeth had a tendency to repeat itself after retention.

[a] Consultant Orthodontist, The County Orthodontic Clinic in Växjö, Kronoberg, Sweden.

[b] Consultant Orthodontist, The County Orthodontic Clinic in Mariestad, Västra Götaland, Sweden.

[c] Associate Professor, Faculty of Odontology Orthodontics, The Sahlgrenska Academy at Goteborg University, Goteborg, Sweden.

[d] Professor, Faculty of Odontology Orthodontics, The Sahlgrenska Academy at Goteborg University, Orthodontics, Goteborg, Sweden.

Corresponding author: Dr. Sasan Naraghi, The County Orthodontic Clinic, Klostergatan 16 B, Växjö, Kronoberg S-352 31, Sweden (e-mail: sasan@telia.com)

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Original article

Factors influencing fixed retention practices in German-speaking Switzerland

A survey

Einflussfaktoren für den Umgang mit Kleberetainern in der deutschsprachigen Schweiz

Eine Fragebogenerhebung

Sina N. Arnold[1] · Nikolaos Pandis[2] · Raphael Patcas[1]

Abstract

Aim. Several surveys evaluate different retention approaches among orthodontists, but none exist for general dentists. The primary aim of this survey was to record the preferred fixed retainer designs and retention protocols amongst general dentists and orthodontists in Switzerland. A secondary aim was to investigate whether retention patterns were associated with parameters such as gender, university of graduation, time in practice, and specialist status.

Methods. An anonymized questionnaire was distributed to general dentists (n=401) and orthodontists (n=398) practicing in the German-speaking part of Switzerland. A total of 768 questionnaires could be delivered, 562 (73.2%) were returned and evaluated. Descriptive statistics were performed and responses to questions of interest were converted to binary outcomes and analyzed using multiple logistic regression. Any associations between the answers and gender, university of graduation (Swiss or foreign), years in practice, and specialist status (orthodontist/general dentist) were assessed.

Results. Almost all responding orthodontists (98.0%) and nearly a third of general dentists (29.6%) reported bonding fixed retainers regularly. The answers were not associated with the practitioner's gender. The university of graduation and number of years in practice had a moderate impact on the responses. The answers were mostly influenced by specialist status.

Conclusion. Graduation school, years in practice, and specialist status influence retention protocol, and evidence-based guide-

[1] Department of Orthodontics and Pediatric Dentistry, Center of Dental Medicine, University of Zurich,

[2] Department of Orthodontics and Dentofacial Orthopedics, Dental School, Medical Faculty, University of Bern

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Zusammenfassung

Studienziel. Zu spezifischen Retentionsprotokollen liegen mehrere Erhebungen unter Kieferorthopäden, nicht jedoch unter Allgemeinzahnärzten vor. Gegenstand dieser Fragebogenerhebung waren primär die unter Allgemeinzahnärzten und Kieferorthopäden in der Schweiz bevorzugten Konstruktionen und Protokolle für festsitzende Retainer (Kleberetainer). Als sekundäres Studienziel sollten diese Gewohnheiten auf Zusammenhänge mit diversen Variablen wie Geschlecht, Studienort, Berufserfahrung und Spezialisierungsgrad untersucht werden.

Methode. An alle Kieferorthopäden (n=398) in der deutschsprachigen Schweiz sowie eine zufällige Stichprobe aus Allgemeinzahnärzten (n=401) wurde ein anonymisierter Fragebogen ausgesendet. 768 Fragebögen konnten zugestellt werden, und 562 Fragebögen (73,2%) wurden retourniert und konnten ausgewertet werden. Die auf einschlägige Fragen gegebenen Antworten wurden zum einen einer deskriptiven statistischen Auswertung unterzogen sowie zum anderen in binäre Ergebnisse umgerechnet und einer multiplen logistischen Regressionsanalyse auf Zusammenhänge mit Geschlecht, Studienort (Schweiz/Nichtschweiz), Berufsjahre und Spezialisierungsgrad (Kieferorthopäde/Allgemeinzahnarzt) unterzogen.

Resultate. Fast alle Kieferorthopäden (98,0%) und von den Allgemeinzahnärzten ein knappes Drittel (29,6%) versorgen nach eigenen Angaben regelmäßig Patienten mit Kleberetainern. Die Antworten zeigten keinen Zusammenhang mit dem Geschlecht der Befragten sowie einen mäßigen Einfluss des Studienortes und der Berufserfahrung. Den größten Einfluss hatte der Spezialisierungsgrad der Befragten.

Schlussfolgerung. Die Gepflogenheiten im Umgang mit Kleberetainern variieren nach Studienorten, Berufserfahrung und Spezialisierungsgrad. Um die Auswirkungen dieser Unterschiede zu minimieren, sollten evidenzbasierte Richtlinien zum Umgang mit

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Controversy

Retention: Type, duration and need for common guidelines. A survey of Norwegian orthodontists

Vaska Vandevska-Radunovic, DDS, MSc, PhD[1]
Lisen Espeland, DDS, PhD[2]
Arild Stenvik, DDS, PhD[3]

Aims: *To survey retention protocols and need for practical retention guidelines among orthodontists in Norway and to compare the results with similar studies in other countries.* ***Methods:*** *A questionnaire was mailed to all members of the Norwegian Association of Orthodontists. It included questions about their background and their current retention protocol, as well as their perceived need for common retention guidelines.* ***Results:*** *The response rate was 77.7% (69.3% males and 30.7% females). The most common maxillary retainer was a combination of a fixed and removable retainer, followed by a clear thermoplastic retainer. In the mandible, a fixed retainer bonded to all anterior teeth was most common (66.4%). Retention in the maxilla lasted 2 to 3 years (34.7%) or 3 to 5 years (23.8%). In the mandible, 41.5% of the orthodontists left the retainer in place for >5 years. When retention lasted more than 3 years, 70% of the orthodontists left the responsibility for retainer checkups to the patients or the general practitioners. The main reason for choosing a certain retention protocol was clinical experience (57.4%). Only 3.5% of the orthodontists based their protocols on information from the literature. Half of the orthodontists, significantly women, expressed a need for common retention guidelines.* ***Conclusions:*** *In Norway, bonded retainers alone were reported to be most commonly used in the mandible, while bonded retainers used in combination with a removable retainer appear to be the most commonly used appliances in the maxilla. This is similar to the most frequently used retainers in other countries, but there are disparities in duration and follow-up protocols. Most female orthodontists desire common retention guidelines.* Orthodontics (Chic) 2013;14:XXX–XXX. doi: 10.11607/ortho.964

Key words: *retention protocols, orthodontic retainers*

[1]Professor, Department of Orthodontics, University of Oslo, Norway.
[2]Professor and Head, Department of Orthodontics, University of Oslo, Norway.
[3]Former Professor, Department of Orthodontics, University of Oslo, Norway.

CORRESPONDENCE
Dr Vaska Vandevska-Radunovic
Department of Orthodontics, University of Oslo
Postbox 1109 Blindern
0317 Oslo, Norway
Email: vaskav@odont.uio.no

Maintenance of the orthodontic treatment result and prevention of relapse require the use of some type of retention appliances.[1,2] More than 100 years ago, Norman Kingsley wrote that "the success of orthodontia as a science lies in retention devices."[3] Despite scientific and technologic developments since that time, retention remains a source of controversy among professionals, and there is no agreement about the type, duration, or follow-up for a common retention protocol.[4]

A systematic review that evaluated the effectiveness of different retention strategies after orthodontic treatment revealed that there are no evidence-based guidelines as to the type of retainer or the duration of retention that

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A survey on orthodontic retention procedures in the Netherlands

Anne Marie Renkema*, Elke Tilly Hélène Sips*, Ewald Bronkhorst** and Anne Marie Kuijpers-Jagtman*

Departments of *Orthodontics and Oral Biology and **Community and Restorative Dentistry, Radboud University Nijmegen Medical Centre, The Netherlands

SUMMARY The objective of this study was to survey retention procedures used in orthodontic practices in the Netherlands.

A questionnaire was sent to all 279 orthodontists working in the Netherlands. The questionnaire consisted of six parts, mainly containing multiple-choice questions. Information as to background data on the individual orthodontist, retention in general, frequency of different types of removable or bonded retainers that were used, retention protocol, and the type and size of the wire used for bonded retainers was assessed. All statistical analyses were performed using Statistical Package for Social Sciences version 12.0.1. Tests for the relationship between two items were based on the chi-square test.

The overall response rate was 91 per cent. Most orthodontists placed a bonded retainer in the upper and lower arch, except when the upper arch was expanded during treatment or when extractions were performed in the upper arch, in which case they placed a removable retainer. Opinions varied with regard to how many hours the removable retainers should be worn and the duration of the retention phase. Contraindications for bonded retainers were given by 96 per cent of the orthodontists, with poor oral hygiene being the most commonly mentioned. As far as bonded retainers were concerned, 84 per cent of the orthodontists preferred permanent retention. Fifty-nine per cent of the orthodontists believed that a practice guideline for retention after orthodontic treatment needs to be developed, which was confirmed by the varied responses in this survey.

Introduction

To minimize or even prevent relapse, almost every patient who has had orthodontic treatment is given some type of retainer. Two surveys on the type of retainer used by orthodontists have been published (Keim *et al.*, 2002; Wong and Freer, 2004). The survey of Keim *et al.* (2002) among specialist practitioners in the United States of America (USA) showed that, although decreasing, the Hawley retainer remained the most commonly used retainer, while 'invisible' retainers had continued to gain popularity. In addition, the use of bonded had retainers increased with nearly one-third of the clinicians using them routinely in the mandibular arch. Compared with two prior surveys, conducted in 1990 and 1996, respectively, the respondents prescribed more permanent retention, 27 per cent in 2002 compared with 15 per cent in 1990 and 23 per cent in 1996 (Keim *et al.*, 2002). However, the response rate in that survey was only 9 per cent, so no conclusions could be drawn. The second survey was carried out in Australia and New Zealand (Wong and Freer, 2004). The response rate was 59 per cent. The results showed that upper clear retainers and lower canine-to-canine bonded retainers were most commonly used. Half of the surveyed orthodontists used a specific retention period, with a median of 2 years. Orthodontists applied permanent retention in either a very high or a very low percentage of their cases. The conclusion of that study was that retention procedures were variable and depended largely on personal preferences. Wong and Freer (2004) concluded that there does not seem to be any consistent pattern in the application of retention methodologies.

The purpose of the present investigation was to survey retention procedures used in orthodontic practice in the Netherlands.

Materials and method

Full lists of the names and addresses of orthodontists were obtained from the Dutch Association of Orthodontists and the Dutch Dental Association. The questionnaire was sent to 279 orthodontists in October 2005. One month later a reminder was sent to 106 orthodontists who had not returned the questionnaire. In January 2006, the non-responding orthodontists were contacted by telephone. If requested, another copy of the questionnaire was sent. If the orthodontist was not willing to return the questionnaire, the reason for not responding was recorded.

The questionnaire consisted of six parts, mainly containing multiple-choice questions, which had been piloted on four orthodontists and subsequently modified. Background information on the individual orthodontist was assessed in part A. It contained questions concerning the type of practice in which the orthodontist was working. If the orthodontist was working as a locum only, or was retired, the questionnaire was excluded from the analysis. Part B consisted of questions on retention in general, for example 'What is the reason for choosing a specific kind of retainer?'