ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2023; 9(2): 430-434
© 2023 IJADS
www.oraljournal.com
Received: 03-03-2023
Accepted: 05-04-2023

Seif-Allah Ahmed Sherif Nasr
Master's Degree Student, BDS, Cairo University, Cairo, Egypt

Amira A Aboalnaga
Lecturer, Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dentistry, Cairo University, Cairo, Egypt

Khaled Hazem Attia
Ph.D., Professor, Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dentistry, Cairo University, Cairo, Egypt

Mostafa Mohamed El Dawlatly
Ph.D., Assistant Professor, Department of Orthodontics and Dentofacial Orthopedics, Faculty of Dentistry, Cairo University, Cairo, Egypt

Corresponding Author:
Seif-Allah Ahmed Sherif Nasr
Master's Degree Student, BDS, Cairo University, Cairo, Egypt

Effect of changing the activation frequency of the arch wires on the pain perception in moderate crowding cases: A randomized controlled clinical trial

Seif-Allah Ahmed Sherif Nasr, Amira A Aboalnaga, Khaled Hazem Attia and Mostafa Mohamed El Dawlatly

DOI: https://doi.org/10.22271/oral.2023.v9.i2f.1755

Abstract
Purpose: The aim of this study is to compare the pain perception of two different frequencies of archwire activation.
Methodology: 19 patients were divided into 2 groups. In the intervention group the archwire was changed every 6 weeks while in the control group the archwire was changed every 4 weeks. Discomfort score data sheets were delivered to the patients after the orthodontic visit. The patient recorded the discomfort score after 4 hours, 24 hours, 3 days and 7 days.1 score means minimum discomfort while a 7 score means maximum discomfort.
Results: The difference in the discomfort score between both groups was statistically insignificant.
Conclusion: The discomfort scores between both activation frequency rates showed no significant difference and the pain decreased gradually throughout time in both groups.
Trial number registration: ClinicalTrials.gov with an identifier number.

Keywords: Class I crowding, leveling and alignment, discomfort score, archwire sequence

Introduction

Leveling and alignment of teeth is the initial stage of any orthodontic treatment. In this phase, wires are inserted into the bracket slots to align the teeth, starting with the more flexible archwires to allow for the full engagement of the bracket slot. As the teeth become more aligned, the cross-section of the archwires can be increased thus increasing their rigidity [1].

Based on a thorough systematic search, it was recommended that archwires should be changed every 4 weeks [2-4]. It is worthy to note that the archwires sometimes don't express their full force thus they were re-ligated. Nevertheless, other studies have tested the change of the wire every 6 weeks [5-7].

Patient discomfort arising from the force of the aligning archwires is a factor that should be considered during treatment. The goal must be decreasing the patient's discomfort as much as possible. Studies were done to assess the patient discomfort toward the orthodontic treatment [8, 9]. One study compared different archwire sequences and their effect on patient discomfort [10]. However, no study compared the effect of increasing the duration of the archwire and its outcome on patient discomfort.

The primary aim of this study was to measure the pain perception in patients having moderate class I crowding with two different archwire activation rates**.**

Materials and Methods

Study design

This randomized controlled trial is a parallel-group two-armed trial which was conducted following the guidelines of the (CONSORT) [11]. The study protocol was approved by the research ethics committee and was registered at ClinicalTrials.gov with an identifier number.

Patient selection and setting

The study was conducted in the outpatient clinic of the Orthodontic Department, Inclusion criteria: Age from 16 to 24 years old, cervical maturation index stage 6, upper moderate crowding (4-8 mm), no extractions are required, full permanent dentition except for the third molars, good oral hygiene, no systemic diseases, no previous extractions except for the wisdoms and no dental anomalies. Written informed consent was provided prior to enrollment in the study.

Sample size calculation

The sample size calculation was based on the study conducted by Maria de Castro [3]. Considering dropouts, a sample size of 20 patients was considered appropriate.

Randomization, allocation concealment, and blinding

The randomization was performed with a 1:1 ratio of allocation, the sequence was computer generated. The randomization numbers produced from the sequence generation were sealed in opaque envelope. At the time of intervention, each participant was allowed to choose an envelope from the sealed box. To ensure no bias, (H.O) was contacted, who was not part of the study, to allocate the participants according to the envelope number. Considering the nature of the intervention, patients and investigators could not be blinded during the study. The assessor (neither the main operators nor the supervisors) carried out the discomfort scores measurements blindly.

Interventions

The patients were randomly allocated to one of the two treatment groups: Group 1 (changing the archwire every 6 weeks) and group 2 (changing the archwire every 4 weeks). 0.022 × 0.028 slot Roth prescription brackets (master series, American orthodontics, USA) were bonded to the maxillary arch. The archwire sequences for both groups were 0.014 Nickel-titanium alloy (NiTi), 0.016, NiTi, 0.018, NiTi and 0.016 x 0.022, NiTi respectively. The wires were engaged in the brackets using Figure 8 ligation of the O-ties, this ligation was used to ensure that the archwire was secured inside the bracket slot (Fig. 1 & 2).

After insertion of the archwire, the patients were instructed to fill a seven-point Likert scale at 4 hours, 24 hours, 3 days and 7 days. The patients were given the discomfort data sheets (Fig. 3) and these sheets were delivered at the next appointment with the scores. 1 score means minimum discomfort while a 7 score means maximum discomfort.

Statistical analysis was performed with SPSS 20®, Graph Pad Prism® and Microsoft Excel 2016. All quantitative data were explored for normality by using Shapiro Wilk Normality test and presented as means and standard deviation (SD) values.

Tests used

- Shapiro Wilk Normality test for data exploration.
- Mann-Whitney test to compare between 2 groups of non-parametric data (Difference). A P-Value of less than 5% was considered statistically significant.

Results

Total of 35 patients were assessed for eligibility; 15 patients were excluded (10 didn't meet the inclusion criteria while the other 5 declined to participate). 20 patients were randomized equally in both groups. One patient from the intervention group was lost to follow up thus a total of 19 patients completed the trial. A consort diagram showing the flow of the patients through the study is shown in (Fig.4). The demographic and initial data of both groups are shown in (Table 1).

Mean discomfort scores at different time intervals for each group are shown in Table 2, figure [5]. For example, the score at 4 hours for the intervention group indicates the mean discomfort experienced for the whole archwire sequence at 4 hour (0.014, Nickel-titanium alloy (NiTi), 0.016, NiTi, 0.018, NiTi and 0.016 x 0.022, NiTi) and the same is applied at 24 hours, 3 days and 7 days.

Discussion

The patient discomfort scores were measured every 4 hours, 24 hours, 3 days, and 7 days after the insertion of each archwire as instructed by [12]. The discomfort scores were done using a Likert scale where 1 meant minimum discomfort and 7 meant severe discomfort. The patients received the data sheets and were instructed to return them filled at the next appointment as done by (Mandall *et al*., 2006) [10].

In this study, there was a rise in the discomfort levels at 4 hours and 24 hours and the scores decreased gradually at 3 days and 7 days. This result was corresponding to the studies conducted by [13].

In this study in hand, the difference between the discomfort score between the intervention and control groups was found to be insignificant (P-Value > 0.05). Likewise, Scott *et al*. (2008) measured the discomfort score when using different bracket systems (conventional and self-ligating brackets) and there was no significant difference between both groups, and the discomfort score decreased over time.

Furthermore, there were other studies that measured discomfort rates during leveling and alignment as [15] who used a visual analog scale from zero to 10 to express the discomfort levels and it was found that the severity of pain decreases gradually through time.

Conclusion

The discomfort scores between both activation frequency rates showed no significant difference and the pain decreased gradually throughout time in both groups.

List of figures

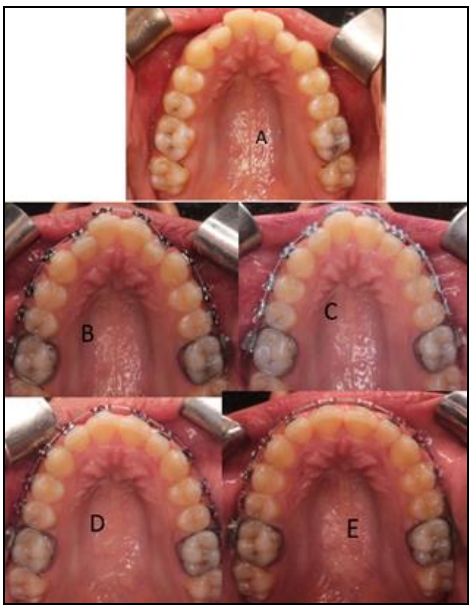

Fig 1: Intraoral photographs showing the progression of the alignment with each month in the intervention group (A = Pretreatment, B = 0.014, NiTi, C = 0.016, NiTi, D = 0.018, NiTi and E = 0.016 x 0.022, NiTi)

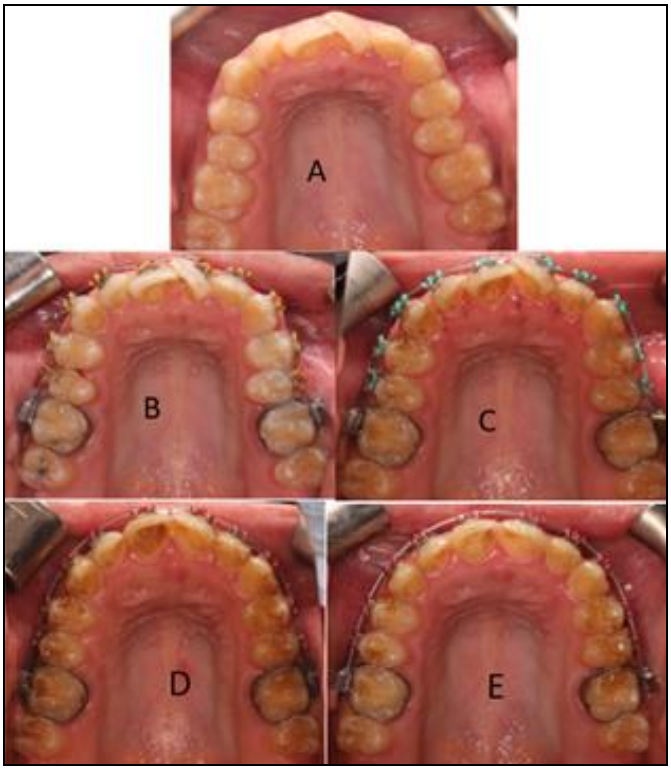

Fig 2: Intraoral photographs showing the progression of the alignment with each month in the control group (A = Pretreatment, B = 0.014, NiTi, C = 0.016, NiTi, D = 0.018, NiTi and E = 0.016 x 0.022, NiTi).

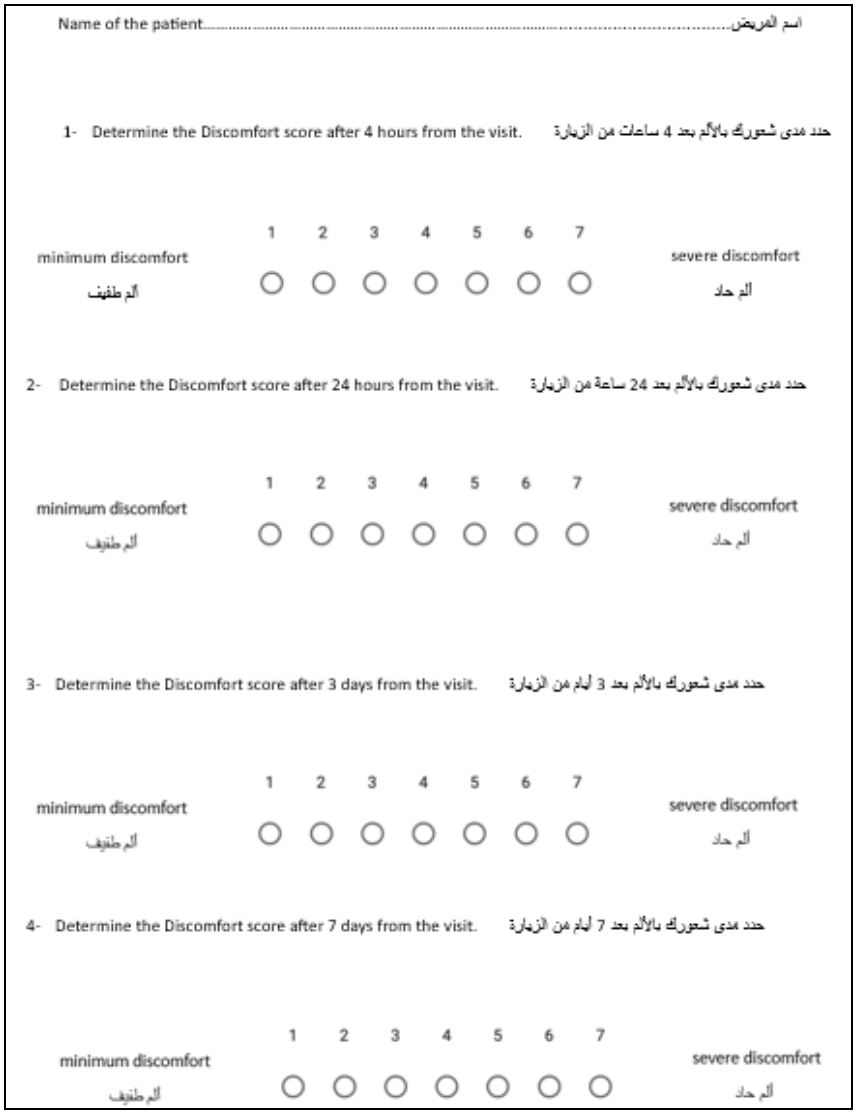

Fig 3: A questionnaire on the discomfort score at 4H, 24H, 3 days and 7 days

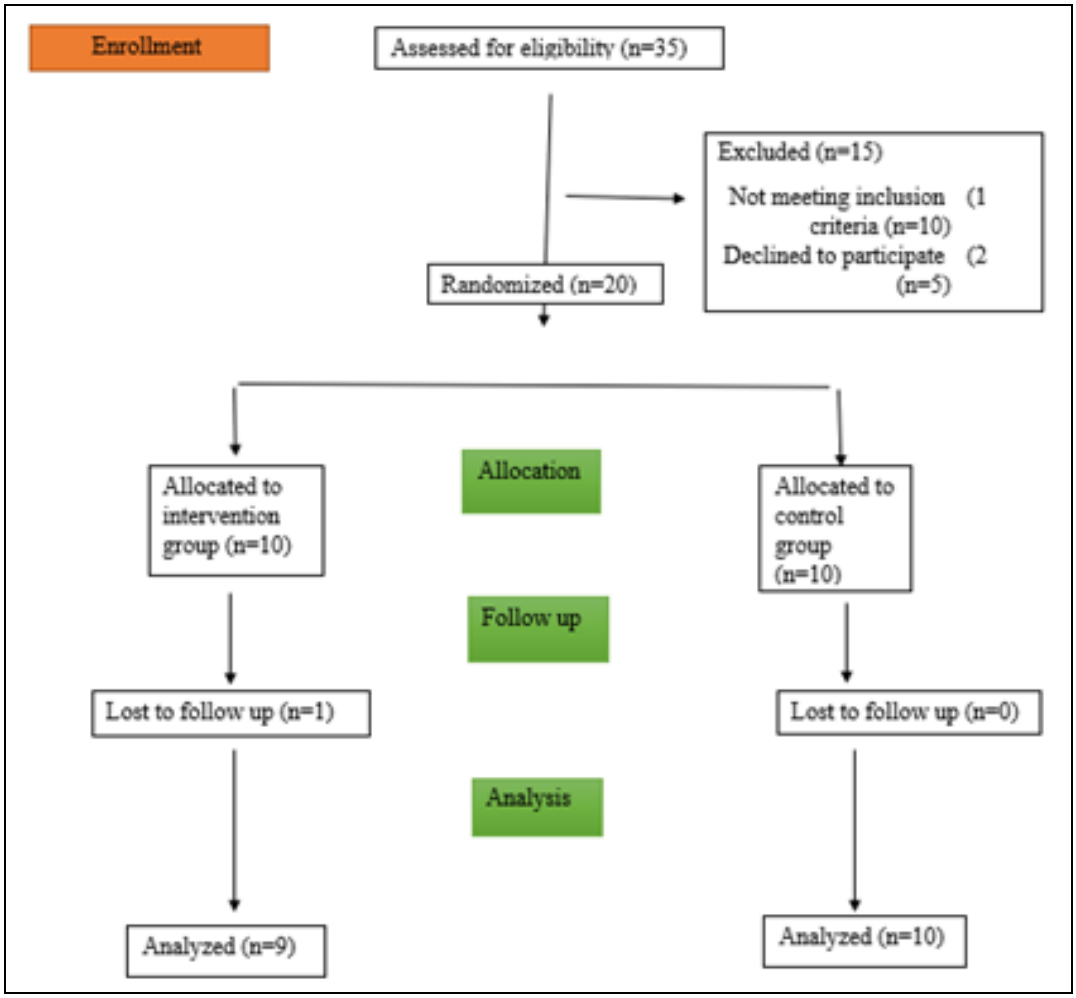

Fig 4: A CONSORT diagram showing diagram showing the flow of the patients through the study

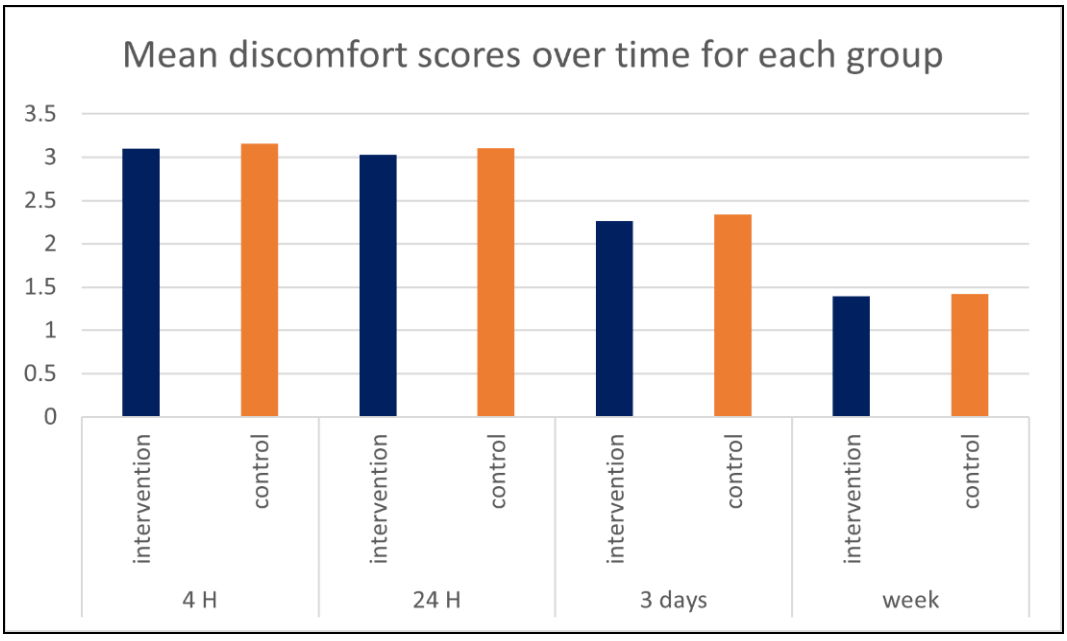

Fig 5: Mean discomfort scores over time for each group

References

1. Ong E, Ho C, Miles P. Alignment efficiency and discomfort of three orthodontic archwire sequences: a randomized clinical trial. J Orthod. 2011;38(1):32-9.
2. Cobb III NW, Kula KS, Phillips C, Proffit WR. Efficiency of multi-strand steel, superelastic Ni-Ti and ion-implanted Ni-Ti archwires for initial alignment. Clin Orthod Res. 1998;1(1):12-9.
3. Maria de Castro Serafim C, De Araújo Gurgel J, Mota Tiago C, Rodolfo de Jesus Tavarez R, Maia Filho M. Clinical efficiency of two sequences of orthodontic wires to correct crowding of the lower anterior teeth. The Scientific World Journal; c2015.
4. Nabbat SA, Yassir YA. A clinical comparison of the effectiveness of two types of orthodontic aligning archwire materials: A multicentre randomized clinical

trial. Eur J Orthod. 2020;42(6):626-34.
5. Azizi F, Extiari A, Imani MM. Tooth alignment and pain experience with A-NiTi versus Cu-NiTi: A randomized clinical trial. BMC Oral Health. 2021;21(1):1-8.
6. Aydın B, Şenışık NE, Koşkan Ö. Evaluation of the alignment efficiency of nickel-titanium and copper-nickel-titanium archwires in patients undergoing orthodontic treatment over a 12-week period: A single-center, randomized controlled clinical trial. The Korean Journal of Orthodontics. 2018;48(3):153-62.
7. West AE, Jones ML, Newcombe RG. Multiflex versus superelastic: A randomized clinical trial of the tooth alignment ability of initial arch wires. American Journal of Orthodontics and Dentofacial Orthopedics. 1995;108(5):464-71.
8. Ngan P, Kess B, Wilson S. Perception of discomfort by patients undergoing orthodontic treatment. American Journal of Orthodontics and Dentofacial Orthopedics. 1989;96(1):47-53.
9. Wilson S, Ngan P, Kess B. Time course of the discomfort in young patients undergoing orthodontic treatment. Pediatr Dent. 1989;11(2):107-10.
10. Mandall NA, Lowe C, Worthington HV, Sandler J, Derwent S, Abdi-Oskouei M, *et al*. Which orthodontic archwire sequence? A randomized clinical trial. The European Journal of Orthodontics. 2006;28(6):561-6.
11. Schulz KF, Altman DG, Moher D. Consort 2010 statement: updated guidelines for reporting parallel group randomised trials. J Pharmacol Pharmacother. 2010;1(2):100-7.
12. Wilson S, Ngan P, Kess B. Time course of the discomfort in young patients undergoing orthodontic treatment. Pediatr Dent. 1989;11(2):107-10.
13. Ong E, Ho C, Miles P. Alignment efficiency and discomfort of three orthodontic archwire sequences: a randomized clinical trial. J Orthod. 2011;38(1):32-9.
14. Scott P, Sherriff M, DiBiase AT, Cobourne MT. Perception of discomfort during initial orthodontic tooth alignment using a self-ligating or conventional bracket system: a randomized clinical trial. The European Journal of Orthodontics. 2008;30(3):227-32.
15. Chandel N, Dogra A, Thakur T, Mandhotra P. Assessment of impact of orthodontic pain on quality of life of patients undergoing orthodontic treatment; c2020.

How to Cite This Article
Nasr SAS, Aboalnaga AA, Attia KH, Dawlatly MMEL. Effect of changing the activation frequency of the arch wires on the pain perception in moderate crowding cases: A randomized controlled clinical trial. International Journal of Applied Dental Sciences. 2023;9(2):430-434.

Creative Commons (CC) License
This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.