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Management of mandibular incisor crowding with clear aligners and nickel titanium wires: A comparative study

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Abstract
Background: Esthetic orthodontic appliances such as esthetic labial appliances like plastic brackets, ceramic brackets, esthetic coated arch wires, lingual appliances and clear aligners are very popular among patients which are outcome of new advances in orthodontics. The present study compared treatment of mandibular incisor crowding with clear aligners and nickel titanium wires.
Materials & Methods: 40 patients with mandibular incisal crowding were selected. Two groups were formed of both gender. First group (Group I) patients were treated with nickel- titanium arch wires and second group (group II) patients with clear aligners. Crowding was assessed using little's irregularity index. The linear horizontal displacement of the anatomic contact points of mandibular anterior teeth was measured and added which denoted total irregularity score. Patients were recalled regularly at 4 weeks, 8 weeks and 12 weeks.
Results: At baseline, mean score in first group was 2.94 mm and in second was 2.70 mm, at 4 weeks in first group was 1.68 mm and in second group was 1.50 mm, at 8 weeks in first group was 0.94 mm and in second group was 1.4 mm and at 12 weeks in first group was 0.64 mm and in second group was 0.56 mm. The difference was non- significant (P> 0.05). The mean change in little's irregularity index score at 4 weeks in first group was 1.28 mm and in second group was 1.21 mm, at 8 weeks was 0.75 mm in first group and 0.46 mm in second group and at 12 weeks was 0.37 mm in first group and 0.74 mm in second group. The difference was significant ($P < 0.05$).
Conclusion: Both nickel titanium wires and clear aligners were equally efficient in managing mandibular anterior crowding.

Keywords: Clear aligners, Nickel titanium, malocclusion

Introduction
Esthetic orthodontic appliances such as esthetic labial appliances like plastic brackets, ceramic brackets, esthetic coated arch wires, lingual appliances and clear aligners are very popular among patients which are outcome of new advances in orthodontics [1, 2]. Among recent advancement, clear aligners are frequently used in patients having allergy from nickel which is component of stainless steel wires and brackets [3]. Moreover, these can be used in patients with mild to moderate crowding, spacing, non-skeletal constricted arches and in relapsed cases after fixed appliance therapy. These aligners demand less oral hygiene maintenance because these can be easily removed by patients itself and hence cleaning is not the issue [4].
Nickel titanium wires are indicated in cases with lower anterior teeth crowding. These are very efficient as compare to stainless steel wires and save time also. These are placed labially and useful in alignment of teeth [5]. Successful results of mild to severe malocclusions have been achieved with the use of clear aligners. Better esthetics, oral hygiene and comfort are advantages of clear aligners however,in controlling tooth movement clear aligners had some disadvantage. Thus the choice of treatment option is solely the decision of the orthodontist [6]. The present study was based on treatment of mandbular incisor crowding with clear aligners and nickel titanium wires.

Materials and Methods
40 patients with mandibular incisal crowding were selected from the department of orthodontics and dentofacial orthopedics IDST Modinagar. A written consent was taken from every patient after giving information regarding study.

Name, age, gender was taken. A thorough oral examination was done and dental impressions were made and casts were prepared. 2 groups were formed. First group (Group I) patients were treated with nickel- titanium arch wires and group II patients with clear aligners. Crowding was assessed using little's irregularity index. The linear horizontal displacement of the anatomic contact points of mandibular anterior teeth was measured and added which denoted total irregularity score. Patients were recalled regularly at 4 weeks, 8 weeks and 12 weeks. Statistical analysis of results was done. Statistical P value <0.05 was considered significant.

Results

Table 1: Assessment of little's irregularity index

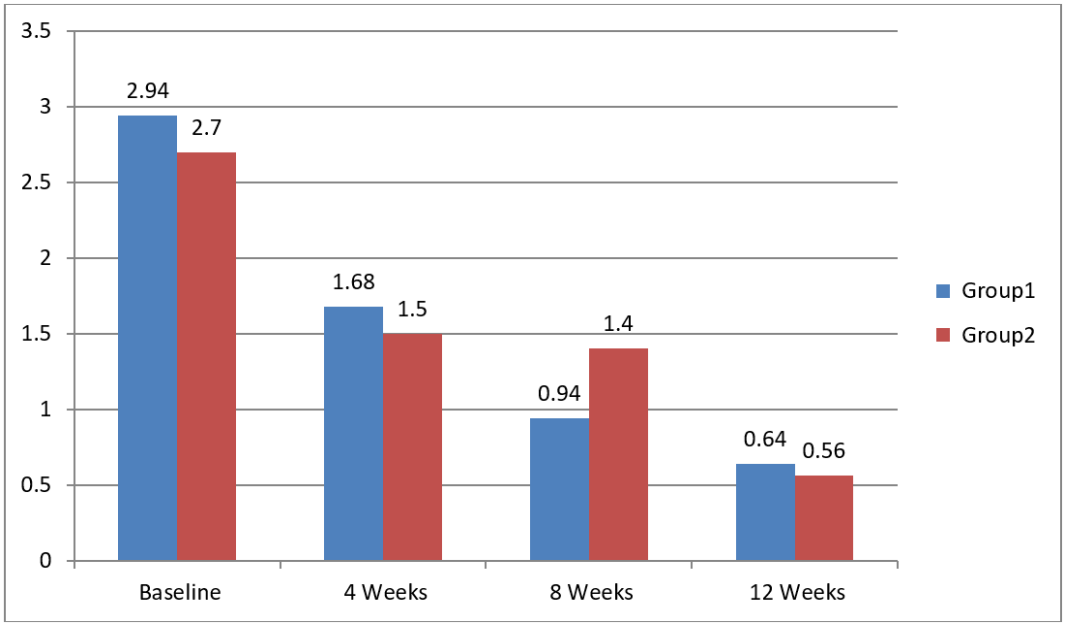
Duration	Group I	Group II	P value
Baseline	2.94	2.70	0.91
4 weeks	1.68	1.50	0.94
8 weeks	0.94	1.4	0.15
12 weeks	0.64	0.56	0.27

Table 1, graph 1 shows that at baseline, the mean score in group I was 2.94 mm and in group II was 2.70 mm, at 4 weeks in group I was 1.68 mm and in group II was 1.50 mm, at 8 weeks in group I was 0.94 mm and in group II was 1.4 mm and at 12 weeks in group I was 0.64 mm and in group II was 0.56 mm. The difference was non- significant (p>0.05).

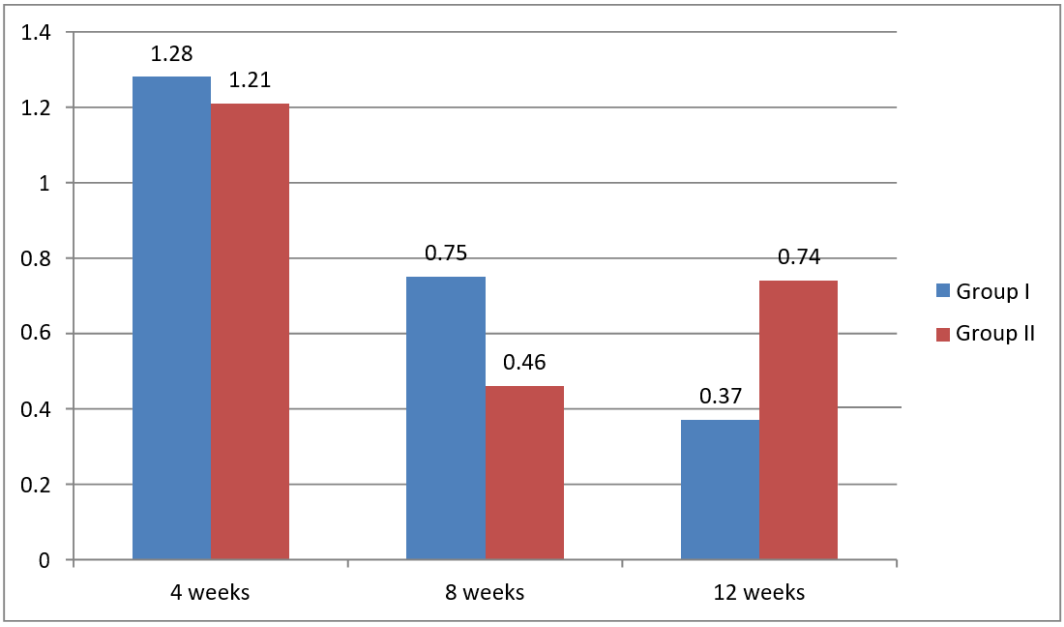
Table 2: Assessment of change of little's irregularity index score

Time interval	Group I	Group II	P value
4 weeks	1.28	1.21	0.91
8 weeks	0.75	0.46	0.12
12 weeks	0.37	0.74	0.01

Table 2, graph 2 shows that mean change in little's irregularity index score at 4 weeks in group I was 1.28 mm and in group II was 1.21 mm, at 8 weeks was 0.75 mm in group I and 0.46 mm in group II and at 12 weeks was 0.37 mm in group I and 0.74 mm in group II. The difference was significant (p<0.05).



Graph 1: Assessment of little's irregularity index score



Graph 2: Assessment of change of little's irregularity index score

Discussion

Fixed orthodontics has been used extensively in the management of malocclusions. Nickel titanium wires are super-elastic wires having higher torsional strength and stress constancy [7]. As comparison to other wires, their physiological compatibility, shape memory, dynamic interference, wear resistance and hysteresis is superior. All these properties make these wires useful in shorter inter-bracket span, such as mandibular lower incisors [8]. Advent of new orthodontics techniques have been proved helpful in management of various orthodontic malocclusion. These treatment options have resulted in improved esthetics and are comfortable for the patient. Factors such as treatment period, cost, appearance after treatment and comfort determine whether the patients will opt treatment or not [9]. Successful results of mild to severe malocclusions have been achieved with the use of clear aligners. Better esthetics, oral hygeine and comfort are advantages of clear aligners. However disadvantage of clear aligners is difficulty in controlling tooth movement. Thus the choice of treatment option is solely the decision of the orthodontist [10].

In our study we observed that the mean score in first group was 2.94 mm and in second group was 2.70 mm at baseline, at 4 weeks in first group was 1.68 mm and in second group was 1.50 mm, at 8 weeks in first group was 0.94 mm and in second group was 1.4mm and at 12 weeks in first group was 0.64 mm and in second group was 0.56mm. Ong *et al*. [11] in their study, 132 patients were divided into three archwire sequence groups. Discomfort level was recorded at 4 hours, 24 hours, 3 days and 7 days post insertion of every archwire. There was no significant difference in the reduction of irregularity between the arch wire sequences at any time point of the time to reach the working arch wire. Between the archwire sequences no significant differences in overall discomfort were found. In our study we found that mean change in little's irregularity index score at 4 weeks in first group was 1.28 mm and in second group was 1.21 mm, at 8 weeks was 0.75 mm in group I and 0.46 mm in second group and at 12 weeks was 0.37 mm in group I and 0.74 mm in second group. Bhatia *et al*. [12] included 20 patients who had mild to moderate crowding which were divided into two groups-Aligner group & NiTi group. Records were taken at 4 week intervals till 12 weeks in both the groups. Results showed that over a fixed time the mean for Little's irregularity index scores, the difference was found to be statistically significant for both the groups. The maximum change in the score was observed between baseline to 4 weeks of treatment for both modalities. West *et al*. [13] compared two arch wires 0.0155-inch diameter multiple-stranded stainless steel wire and 0.014-inch diameter nickel-titanium alloy wires in 74 arches. The degree of initial alignment found with the two wires was similar over this 6-week period. Lower labial segment showed some difference in inter bracket span which was usually reduced. Improved alignment was seen in super elastic nickel-titanim wire. Limitation of study was its small sample size.

Conclusion

It was found that both clear aligners and nickel titanium were equally efficient in lower incisal crowding.

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