Modifications to Increase Efficiency of the Begg Orthodontic Technique

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Abstract

Background: Orthodontic appliances that deliver results in a shorter time period without sacrificing the quality of the outcome are preferred. A modified fixed appliance, blending the merits of the Preadjusted Edgewise and Begg appliances was tested.

Methods: Thirty patients each were randomly assigned for treatment with one of the three fixed appliance techniques after qualifying for the inclusion and exclusion criteria established before the study. Peer assessment rating (PAR) index was used to compare the quality of treated cases. Total time as well as chairside time taken for treatment with the three techniques was also compared. ANOVA and paired student 't' test were used for statistical analysis.

Result: There was a significant reduction in PAR scores with all the three appliances. There was no significant difference in the quality of treatment outcome between the Preadjusted Edgewise appliance (PEA) and the modified Begg appliance. These appliances gave a significantly better improvement as compared to the Begg appliance. Chairside and total time taken was the least with the modified Begg appliance followed by the PEA and Begg appliances.

Conclusion: The suggested modification of the Begg appliance is efficient and economical as compared to PEA and Begg appliances in the treatment of cases with anterior teeth proclination as one of the elements of malocclusion.

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Key Words: Preadjusted edgewise appliance; Begg appliance; Peer assessment rating index

Introduction

Excessive protrusion of the teeth in both jaws, called bimaxillary dentoalveolar protrusion, is more common in Asia (including India) and Africa than in the Caucasian populations [1]. Correction of this aesthetic problem requires the retraction of teeth back over the basal jaw bones after extraction of suitable dental units (often the first premolars) in both the jaws. The fixed appliances available for this purpose belong to two main generic techniques i.e. the Begg and the Preadjusted Edgewise Appliance (PEA) technique. Treatment with the Begg technique is more economical though its practice is perceived to be more demanding on the clinician's skill and chairside time. However, the overall treatment time may be reduced in comparison with the PEA technique in the management of bimaxillary dentoalveolar protrusion. Some critics have raised doubts about the ability of the Begg appliance to achieve the high quality finish that is a routine with the PEA [2].

Orthodontic treatment is inherently a time-consuming process with the average comprehensive treatment time being anywhere from a year and a half to two and a half years or, rarely, even more than that. An optimally aesthetic outcome is often compromised if the treatment

is not carried through to conclusion.

The service environment has certain attributes that make the practice of orthodontics more challenging than in the civil setup. There is a constant movement of the population i.e. both the orthodontist and the patient are continuously under move on an average of about once in two years. Delivery of satisfactory orthodontic care in such a setting is very challenging since the preferences, abilities and training of the orthodontists are not the same; treatment plans can be very different for the same set of clinical problems.

The present study is an attempt to compare the two appliance techniques for their efficiency in the correction of bimaxillary dentoalveolar protrusion. A modified appliance that blends the merits of both the techniques was assembled from the components of the two appliances. The modified appliance while combining the affordability of the Begg appliance was tested for its efficacy as well as quality of finished result.

Material and Methods

The study used bondable Standard Edgewise Twin brackets (0.022" slot size) for incisors in both the arches (Fig. 1).

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This modification was aimed at providing better rotational control of these teeth due their positive two-point engagement of the arch wire. There is also a reduced need for use of uprighting auxiliaries with this arrangement. The setup can be seen in Fig 2.

Bondable Begg brackets were used for the buccal teeth i.e. the cuspids and bicuspid. This arrangement is favourable for controlled/free tipping of teeth in this segment. The inevitable extrusive strain that is caused on the incisors by the use of the edgewise brackets on these teeth is thus avoided. The use of a round wire in the initial stages of treatment does not hamper alignment in the anterior segment. Controlled tipping of the anterior teeth in patients with proclined incisors is also a desirable objective. Majority of patients reporting for orthodontic treatment have a component of proclination of incisors in their malocclusion. The Begg bracket would be expected to offer no significant biomechanical advantage over the edgewise bracket.

Thirty patients, matched for age, were selected from the orthodontic out patient list at AFMC, Pune. The problem list for all these patients brought out the following

- I. A tooth size – arch size discrepancy that necessitated reduction of tooth material by extraction.
- II. Proclination of the incisors in both arches with or without rotations.
- III. Similar needs of anchorage reinforcement.

Fixed orthodontic appliances were placed on these patients as described above. Two more groups of thirty patients each with a comparable problem list received the standard Begg & Preadjusted edgewise (0.018" Roth prescription) appliances, who served as controls to assess the treatment outcome with regard to the following parameters:

- Comparison of weighted peer assessment rating (PAR)

Table 1

Peer assessment rating index based comparison of treatment results

Appliance	Pre treatment	Post treatment	Difference (improvement)	Improvement (%)
Begg	32.36	9.68	22.68	70
PEA	33.21	6.57	26.64	80
Modified Begg	31.82	7.32	24.50	76.7

Table 2

ANOVA based (Post treatment) comparison between groups by PAR

Appliances tested	Comparison group	Mean diff	Std error	Sig
Begg	PEA	-3.11*	0.62	0.000
	Modified Begg	-0.75	0.62	0.227
PEA	Begg	3.11*	0.62	0.000
	Modified Begg	2.36*	0.62	0.000
Modified Begg	Begg	0.75	0.62	0.227
	PEA	-2.36*	0.62	0.000

* The mean difference is significant at the 0.5 level.

scores [3] before and after treatment

- Clinical chairside time taken (a cumulative figure)

Records taken at the beginning and end of treatment were used to compare the skeletal parameters as well as PAR index for the study samples.

Results

Comparison of the reduction in PAR scores with the three techniques is given in Table 1.

ANOVA comparison of the reductions in PAR scores across the three groups are given at Table 2. Result of the comparison between the three groups for total and chairside time across the groups is given in Tables 3 & 4.

Descriptive data of cephalometric criteria comparing the outcome of treatment with the three techniques is given in Table 5.

Discussion

The Begg appliance enjoyed considerable popularity among the orthodontic community up to 1970 in America and Europe [4]. Thereafter its use has declined significantly. The reasons for the decline have mainly been the purported inability of the appliance to achieve the level of finish that the Edgewise and PEA offer routinely and a perceived lack of three dimensional control over teeth [5-7].

The story of the Begg appliance in India is a little different. The appliance, primarily due to its low cost, has retained its popularity to an extent. Orthodontics in the Armed Forces of India has had the Begg appliance as its mainstay till recently when the advent of the PEA has marginalized it to a large degree.

Maximization of the available time to extend the best possible treatment to the clientele is therefore an area

Table 3

Comparison of chair side and total time taken for completing treatment

Type of appliance	Average total time in minutes	Time per appointment	Number of appointments
PEA	304	14.13	21.6
Begg	239.3	11	22.2
Modified Begg	224.7	9.43	23.4

Table 4

ANOVA based comparison of treatment time

Appliances tested	Comparison group	Mean diff	Std error	Sig
Begg	PEA	65.03*	14.02	0.000
	Modified Begg	79.6*	14.02	0.000
PEA	Begg	-65.03*	14.02	0.000
	Modified Begg	14.57	14.02	0.302
Modified Begg	Begg	-79.6*	14.02	0.000
	PEA	-14.57	14.02	0.302

*The mean difference is significant at the 0.5 level.

Table 5

Descriptive data for comparison of treatment results with the three techniques

Measurement	Criteria for comparison of the appliances								
	Pre-treatment			Post-treatment			Change		
	PEA	Begg	Mod. Begg	PEA	Begg	Mod. Begg	PEA	Begg	Mod. Begg
SNA	84.25 ± 2.3	83.52 ± 2.6	84.81 ± 2.9	82.31 ± 2.4	81.74 ± 3.1	82.1 ± 2.2	2	1.8	1.6
SNB	81.12 ± 2.6	80.74 ± 2.4	81.29 ± 2.9	79.89 ± 2.5	79.91 ± 2.4	80.27 ± 2.3	1.8	1.2	1
ANB	3.6 ± 1.4	3.28 ± 1.8	3.33 ± 2.1	2.7 ± 1.7	2.33 ± 3.6	2.14 ± 1.8	1.5	1.1	1.3
IMPA	98.3 ± 7.2	97.8 ± 6.4	99.1 ± 5.1	94.3 ± 3.1	93.2 ± 5.0	93.5 ± 4.7	4.2	4.5	6.2
1 to SN	120 ± 7.3	119 ± 9.4	118 ± 9.2	105 ± 4.0	104 ± 9.0	103 ± 7.0	15	15.4	15.1
SN-Occl	18.1 ± 5.5	17.6 ± 6.4	17.9 ± 5.3	19.3 ± 2.1	18.3 ± 6.4	18.5 ± 3.1	0.9	1.6	0.9
SN-MP	34.7 ± 6.8	35.2 ± 5.9	35.7 ± 6.2	35.2 ± 4.8	36.7 ± 5.1	36.1 ± 5.8	1.1	1.6	1.2

SNA: Sella-Nasion-'A' Point angle ;'A'; SNB: Sella-Nasion-'B' Point angle; 'B'; ANB: The difference between SNA & SNB angle in degrees; IMPA: Incisor Mandibular Plane Angle; 1 to SN: Angle between maxillary central incisor and the Sella-Nasion plane; SN - Occl: Angle between the SN and Occlusal planes; SN-MP: Angle between the SN and mandibular plane

Fig. 1 : Standard Edgewise & Begg brackets used in the study

of constant endeavor by all service orthodontists. The present study was also an attempt towards the same goal. The merits and demerits of the Begg as well as PEA have been mentioned elsewhere.

All the cephalometric criteria compared showed a trend towards improvement of the occlusal parameters and the difference was statistically significant. There was no statistically significant difference between the average number of appointments with the use of the three appliances. However, there was a statistically significant difference between the three appliances when the total average time and average time per appointment was compared (Table 4). The decreasing order of the time taken for each appointment was PEA > Begg > Modified Begg. The reduced chairside time required with the Begg and modified Begg appliances may be the result of less exacting wire bending. A sizable proportion of the cases selected for this study showed one or more features of dento-alveolar protrusion. This

Fig. 2 : Set up of the modified appliance for a class III camouflage case

Fig. 3 : Degree of freedom allowed by Begg & Edgewise brackets

specific presentation lends itself better to treatment with the Begg appliance since tipping backwards of the anterior teeth is a desired objective in such cases. A reduction in the chairside time implies that more number of patients can be seen during a given frame of time. The modified Begg appliance clearly demonstrated its advantage here.

A fact that is generally not given enough importance is that the proportion of Indian orthodontic patients who have some degree of dentoalveolar protrusion needing correction is high as compared to their western

Fig. 4 : Effect of intrusive force on non-upright incisors

Fig. 5 : Effect of change of inclination on intrusion efficiency

counterparts. That itself makes the Begg appliance a reckonable treatment modality. The free tipping and retraction of the anterior segment that can be achieved with this appliance without resorting to too many anchorage-enhancing auxiliaries, is a definite advantage over the PEA (Fig. 3). Various studies have claimed a reduced time required for treatment of cases with the Begg appliance [7].

The worst critics of the appliance though, do concede that the principle of free mesiodistal tipping that underlies the appliance philosophy holds merit, especially when retraction of the anterior segment is a goal of treatment planning. The Begg bracket is ideally suited for this type of tooth movement in the buccal segment i.e. from the cuspids through to the molar teeth [9]. The incisor movement however does not fall in this plane when retraction is carried out. These teeth fall in a plane that is nearly at a right angle to the posterior segment. Free mesiodistal tipping with the Begg brackets does not offer any advantage here. In fact the two-point contact of the wire with the bracket base, as offered by most Edgewise and PEA prescriptions, holds an advantage here, especially in the correction of crowded anterior segments with slipped proximal contacts in various planes. Root paralleling of the aligned teeth is an essential objective for stability of the achieved result over a period of time.

Intrusion of the anterior teeth is often required to be done in order to achieve levelling of the arches. In non-growing individuals, this is a challenge since the bite

Fig. 6 : Midline correction with the modified Begg appliance

must be opened with the help of true intrusion of the anterior segment into the anterior alveolus [10]. Conventionally, orthodontic literature lays a lot of emphasis on the positioning of the roots in the centre of the alveolus as visualized on the lateral cephalogram. There is however very little importance given to the paralleling of the roots in the facial plane before intrusive mechanics is initiated. With Begg mechanics, the paralleling of the roots does not come automatically with engagement of the arch wire in the bracket since the wire allows a large degree of tipping freedom to the bracket bonded to the tooth.

The following movements of the incisor roots take place as an intrusive force is applied to the mandibular incisors. This has been discussed by Fletcher as a disadvantage of the appliance in this plan (Fig. 4).

1. The roots tend to converge towards the midline.
2. The line of action of the intrusive force applied to the anterior segment tends to introduce a moment on to the incisors which in turn further tips the teeth distally. All these effects are pronounced as the amount of tooth size basal bone discrepancy increases. This discrepancy may manifest as overt imbrication of the anterior teeth or as labial flaring of these teeth as seen in the presentation of a bimaxillary dentoalveolar protrusion [9].

This tendency of untoward movement is to be resisted or corrected by the use of uprighting springs which introduce counter-moments. However the introduction of uprighting springs increases the anchorage and results

in reducing the ability of tooth to freely tip in the sagittal plane. On the other hand, if Edgewise brackets are used in the incisor region from the beginning of treatment, these untoward effects can be avoided without infringing upon the basic principle of Begg treatment strategy i.e. free tipping in the facio-lingual plane for the incisors as illustrated in the following diagram (Fig. 5)

A qualitative comparison of the outcomes of the three appliances was necessary in order to confirm that the differences in the chairside time were not due to deficiencies in the achievement of treatment goals. The weighted peer assessment rating (PAR) score is a well established and universally accepted index for assessment of the quality of treatment outcomes [11]. The initial PAR scores for the three appliance groups studied did not reveal any significant statistical difference between them. The post treatment PAR scores showed a significant difference between the three groups as shown in Table 1. Further statistical analysis revealed that the difference between the PEA and modified Begg appliance were not significant whereas the differences were significant when these two appliances were compared with the Begg appliance. The main difference was seen in the alignment and midline correction of the mandibular anterior segment. This was probably the area that was most improved with the use of edgewise appliance brackets in these segments. While the midlines were matching at the conclusion of treatment for all patients, it took longer to achieve the same with the Begg appliance. The difference between these appliances was seen in the alignment of contact points also, where the alignment is not as good as due to the single point contact between the single Begg bracket and the archwire as observed with the twin Edgewise and PEA brackets. We could not come across any such study and the findings were not compared. However the results point towards an improvement in the overall outcome measures with the use of the modified Begg appliance with better economy.

A midline discrepancy is a common finding in the pre-treatment stage. The modality of midline correction in the Begg technique involves the use of sequential tipping and uprighting of the incisors. This leads to a longer period of time being spent in the correction of midline discrepancies. Once the midline correction has been achieved with Begg appliance, it needs to be maintained actively by the careful use of uprighting springs which must now be calibrated to deliver only stabilizing moments instead of active counter moments as required during the correction stage.

This disadvantage of the Begg technique is very

simply and efficiently overcome by the use of standard Edgewise brackets in the segment requiring midline correction (Fig 6). Due to the wide bracket contact, the uprighted teeth can now be moved by sequential use of push coil springs and this correction is self- retaining.

To conclude all the three appliances i.e. PEA, Standard Begg and the modified Begg appliance are capable of delivering consistent, acceptable results in extraction cases. There was a significant difference in the time required for treatment completion between the Begg and modified Begg appliances, the latter being less time consuming. The modified Begg appliance being more economical than and as efficient as the PEA has the potential to replace the Begg appliance without any loss of efficiency.

Conflicts of Interest

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Intellectual Contribution of Authors

Study Concept : Col V Sharma, Col J Sengupta

Drafting & Manuscript Revision : Col V Sharma, Col J Sengupta

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References

1. Bills DA, Handelman CS, BeGole EA. Bimaxillary dentoalveolar protrusion: traits and orthodontic correction. *Angle Orthod* 2005; 75:333-9.
2. Buchanan, Russell, Clark. PAR-based comparison of Begg and PEA techniques. *JO* 1996;23:351-7.
3. Richmond S, Shaw WC, O'Brien KD, et al. The development of the PAR index (Peer Assessment Rating): reliability and validity. *Eur J Orthod* 1992;14:125-39.
4. Proffit WR. *Contemporary Orthodontics* Mosby 2000;3rd ed.
5. Barton JJ. A cephalometric comparison of cases treated with the Edgewise and Begg techniques. *Angle Orthod* 1973; 43: 119-26.
6. Venezia AJ. Comparison of results of Pure Begg and Edgewise. *Angle Orthod* 1973; 43:289-300.
7. Begg, R, Kesling, PC. *Begg Orthodontic Theory And Technique*. 3rd ed. Philadelphia: W B Saunders Company 1977.
8. Papaioannou-Maragou O, Papaioannou A. Comparison of treatment results with the Edgewise and the Begg approach. *J Clin Pediatr Dent* 1994;19:27-30.
9. Fletcher GGT. *The Begg appliance and technique*. Wright. PSG; Bristol, 40. 1981.
10. Xu Tian-Min, Lin Jiu-Xiang, Hu Kui, Huang Jin-Fang. Bite opening mechanics as applied in the Begg technique *BJO* 1994;21:189-95.
11. Richmond S, Shaw WC, Roberts CT, Andrews M. The PAR Index (Peer Assessment Rating): methods to determine outcome of orthodontic treatment in terms of improvement and standards. *Eur J Orthod* 1992; 14:180-97.