

STABILITY IN ORTHODONTICS AN OVERVIEW

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Abstract

The question of stability versus relapse has continued for decades and has resulted in much confusion and pessimism for many orthodontists. This has contributed to significant diversity in orthodontic treatment and retention.

Key words

Retention, Stability, Relapse.

INTRODUCTION

Stability

Maintaining teeth in an aesthetic, functional and healthy relationship for many years is one of the major goals of the orthodontic treatment. This is frequently referred to as "Stability" and should not be confused with the regular meaning as "the absence of movement". Hence the teeth should and in fact do adjust to their environment throughout life by varying degrees of movement.

It is also important that the orthodontist differentiate between post treatment changes in the dentition as a result of age related changes and "relapse". Webster defines "relapse" as "a return to a former worse state". Post treatment changes such as the collapse of the dental arch in either a lateral or antero posterior direction, primarily related to a "non-equilibrium" position of the dentition, constitutes relapse.

Age Related Changes:

Numerous studies have been attempted to identify possible treatment as well as growth related factors to changes in the dentition during the post treatment and post retention periods. Of particular interest to many investigators has been the study of lower incisor irregularity.

Irregularity Index (II) is defined as the summed displacement of the anatomic contact points of the mandibular anterior teeth from the mesial of one cuspid to the mesial of the contralateral cuspid. An II of less than 3.5mm was judged by a team of experienced orthodontists to demonstrate minimal irregularity and therefore appear clinically satisfactory. An II of greater than 6.5mm was judged to be severe irregularity.

It should be noted this measurement is not synonymous with that of tooth size to arch length

discrepancy (TSALD), which is the amount of space needed to ideally align the teeth. As a general rule-
An II of 6mm = TSALD of 3mm

It is important to understand the age related changes in the untreated occlusions. Various studies were done. A review of following is shown next-

BARROW AND WHITE ¹- 51 children evaluated
(RESULT) - Mandibular incisor crowding :
14% at the age of 6
51% at the age of 14

ESLAMBOLCHI ² - Treated and untreated children and untreated parents to age of 70.
(RESULT) - Age related changes in the dentition, particularly lower incisors crowding, occur up to the age of 70 in some individuals. On the other hand the velocity of change decreased after 40 years of age.

These studies suggest that the normal aging mandibular incisor crowding increases up to the age of 70 years, and its rate of change decreases slightly over time. To summarize it, the most important clinical implication from studies on untreated occlusions is that the lower incisor crowding to a certain degree is likely to occur in the majority of individuals as part of the aging process. In addition, mandibular arch width, particularly across the cuspids, as well as arch length, have a natural tendency to decrease over time. One should keep in mind, however, that these changes are usually only minor and not of the magnitude to be considered orthodontic failure or relapse!!

TREATMENT RELATED CHANGES IN THE DENTITION:

Numerous investigations have attempted to correlate post treatment changes in incisor alignment with treatment modalities such as extraction or non

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extraction treatment.

LITTLE et al³ assessed the long term stability of 65 cases a minimum of 10 years post retention. All cases were treated with four 1st premolar extractions and traditional edgewise alignments was variable and unpredictable. In general, arch length and width decreased after retention, whereas crowding increased. The success of maintaining satisfactory incisor alignment (II <3.5mm) was less than 30%, with 16% of the cases demonstrating severe crowding (II >6.5mm) many years after retainer removal.

Sinclair and Little* compared 65 untreated “normals” from the Burlington growth centre with 30 class I patients who had four first premolars extracted with edgewise orthodontic treatment. Pretreatment, posttreatment and 10 year post retention records were evaluated. Both groups demonstrated a similar annualized decrease in arch length. Interestingly, mandibular incisor irregularity increased twice as fast in the treated group as in the untreated group, suggesting that other factors contributed to incisor irregularity; possibly treatment mechanics.

Uhde, Sadowsky and BeGole** compared 59 non extraction and 37 extraction cases with an average post treatment time of 20 yrs. Their findings agreed with those of previous studies that, in general, various dental measures tend to return toward their original values, following treatment. Mandibular intercanine width was found to be most closely related to post treatment mandibular arch crowding (TSALD).

Sandusky*** found more favourable results in a study of 83 patients treated with premolar extractions and tweed mechanics. After a mean of 10.6 yrs post treatment, he found a mean anterior TSALD of only 0.7mm. Interestingly, Sandusky observed that during treatment the lower incisors were uprighted relative to the mandibular plane an average of 8 degrees, whereas after treatment they rebounded in an anterior direction by about 3 degrees. He suggested that slight over correction of the lower incisor angulation during treatment may minimize post treatment incisor irregularity. He explained that as the incisors proclined as a result of forward “rebound”, space would be created in the anterior region of the lower arch to compensate for any possible decrease in arch length and/or width.

Paquette, Beattie and Johnston**** compared the long term results of extraction and non extraction edgewise treatments in 63 patients with class II div 1 malocclusions. Although all patients were identified as equally susceptible to the two treatment strategies, 30 were treated non extraction and 33 were treated with four first premolar extraction. After an average post treatment interval of 14.5 yrs, 73% of the extraction patients exhibited good lower incisor stability (II <3.5mm), while 57% of the non extraction patients showed good stability. The type of treatment as well as the initial position of the dentition failed to explain the pattern of post treatment change. The authors speculated that these changes were a result of dento alveolar compensation produced by differential jaw growth during the post treatment period, i.e age related changes.

Little, Reidel and Stein***** evaluated the stability of non extraction treatment in the mixed dentition in order to determine if early treatment would yield better long term results. The treatment involved increasing the arch length by means of fixed edgewise appliances, active lingual arches, lip bumpers or removable appliances. Arch length had to have been increased a minimum of 1 mm to qualify for inclusion in the study. Patients were studied a minimum of 6 yrs post retention, and showed both a decrease in arch width and increase in crowding. Twenty three of the 26 patients (89%) demonstrated clinically unsatisfactory alignment (II >3.5mm) as well

as a reduction in mandibular intercanine width following retention. The authors concluded that the “arch length increase may yield the poorest stability”. The findings of this study are significant and do not support the generally held belief that early treatment is more stable. This study provides some evidence to challenge the notion of non extraction treatment through “developing the arches” and questions the premise of such a treatment approach in yielding stable results. If the mandibular dental arch dimensions post treatment return to their original value with such treatment strategies, what have we “developed?”

RECENT STUDIES ON TREATMENT RELATED CHANGES IN THE DENTITION:

More recently, Franklin^^ investigated the longitudinal dental and cephalometric changes in 114 patients treated with tweed edgewise orthodontics. Pre treatment, post treatment and post retention records were obtained and measure for all 114 subjects. All subjects had lower banded cuspid to cuspid retainers removed after 3 yrs., with an average post retention follow up period of 11.97 yrs.

Satisfactory long term stability was achieved in the majority of patients (79%) in this sample. Despite minimum expansion of <1mm during treatment, mandibular intercanine width decreased to slightly less than its original value following active treatment. Another point of interest was the finding that a significant greater reduction in this dimension occurred in those subjects who received more expansion during treatment. Mandibular incisor irregularity increased following treatment. Only minimal changes were observed in the majority of the subjects, reflecting “developmental” changes rather than “relapse”.

Additional study by Schroeder studied the long term stability of class II div 1 four premolar extraction treatment. Dental casts and cephalograms of 27 patients were evaluated pretreatment, post treatment and 9 yrs postretention. In general during the post retention period, arch widths and arch lengths decreased overbite increased overjet remained stable, interincisal angle increased irregularity increased and the occlusal plane flattened. The mandibular canine width, which was expanded only 0.57mm during treatment, constricted 1.5mm post retention. Mandibular incisors were retracted a mean of 1.94mm during treatment. They advanced on average 0.10mm post retention. Mandibular incisors were uprighted an average of 2.13 degrees during treatment and proclined 0.24 degrees post retention. The mandibular irregularity pretreatment, post treatment and post retention was on average 5.54mm, 1.45mm and 2.49mm. From here it was concluded that though changes were seen in the post retention period, little relapse of the treatment was observed.

All these studies suggest that satisfactory long term stability following orthodontic treatment can be expected in the majority of patients if sound treatment principles are employed.

FACTORS ASSOCIATED WITH POST RETENTION DENTAL CHANGES

Associations and relations that were found by Franklin, Marks and Schroeder were:

- The mandibular incisors showed the most rebound followed by the canines and then the molars.
- The greater the proclination of mandibular incisor during treatment, the greater the irregularity
- Post retention. Post retention reduction in anterior arch length correlated with increased irregularity. One of the highest predictors of post retention irregularity was the degree of irregularity

- remaining after treatment.
- Post retention irregularity was most highly correlated with vertical dentoalveolar changes after retention.
- Post retention, all mandibular arch width dimension decreased, very slightly.

ELEMENTS OF SUCCESSFUL TREATMENT

- A burning desire for excellent treatment results.
- Establishing proper goals: good facial esthetics and a healthy functional, stable dentition.
- Recognizing biologic limitations and treating within the confines of the envelope imposed by the soft tissue and the basal bone.
- Prior and prompt treatment objectives prior to starting of treatment-
- Maintain the original mandibular arch form.
- Minimise the expansion of the mandibular intercanine and intermolar width.
- Upright and retract the lower incisors or at least maintain the mandibular incisors in their original position.
- Obtain an ANB of 2 degrees +/-2 degrees.
- Achieve a super class I occlusion.
- Overcorrect the anterior overbite and overjet.
- Control the posterior vertical dimension by minimizing the extrusion of the molars.
- Maintain the cant of the occlusal plane.
- Eliminate Bolton tooth size discrepancies.
- Upright the mandibular molars and premolars.
- Establish proper rotation of the maxillary 1st molars.
- Avoid relative intrusion of the mandibular incisors.
- Establish an inter incisal angle of approx 130-135 degrees.
- Parallel roots adjacent to extraction sites.
- Diverge the root of the mandibular incisors.
- Rotations should be corrected totally.
- Perform supracrestal fibrotomy of severely rotated teeth.

Proper Mechanotherapy to be used.
Commitment to fulfill treatment objectives.

CONCLUSION

A reawakening needs to occur in our profession where by the measure of success is based upon compassion and the drive for excellence. It is the prime responsibility of the clinician to look after the best interest of their patients. The rewards to the patient and the self satisfaction of obtaining an aesthetic, healthy, functional and stable result far outweigh the effort and discipline it takes to achieve it. It is hoped that the orthodontists will provide a first step toward better defining the reactions of the untreated and treated dentition and help better delineate factors associated with stability and relapse.

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