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Long-term stability following edgewise fixed appliance therapy

Milstein, Lionel

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CHAPTER 1: INTRODUCTION

An important challenge to the orthodontist is the maintenance of long term stability in orthodontically treated occlusions. Various authors (Shapiro, 1974; Little, Wallen and Riedel, 1981; Sadowsky and Sakols, 1982; Shields, Little and Chapko, 1985; Little, Riedel and Artun, 1988), have reported on changes which take place in dental relationships following completion of treatment. Some of these changes occur as part of a so-called "settling-in" phase. Such changes are in a vertical direction and are characterized by each individual posterior tooth making contact with its partner in the opposing arch. This is regarded as acceptable and normal for the establishment of occlusions which are to function harmoniously according to the dictates of the stomatognathic system (Andrews, 1972). When changes are excessive, however, the term "relapse"is often used. Relapse refers to a change in the horizontal spatial arrangement of teeth which results in either their overlapping, or a return to overjet relationships or by a return to the original deep overbite. Settling-in represents an acceptable adaptation which occurs under the influence of function, while relapse refers more to "a return of characteristics of the original malocclusion (Shapiro and Kokich, 1981) ".

The incisor segment of the mandibular dentition has been described by several authors as being the region most prone to relapse after active treatment and retention (Tweed, 1944; Riedel, 1960; Little, 1975). Relapse in this region is of serious concern to orthodontists particularly as so many patients seek orthodontic treatment primarily for correction of their crowded anterior teeth. Little, Wallen and Riedel (1981), in their study conducted at the University of Washington, found that satisfactory

mandibular anterior alignment was maintained in less than 30% of cases following orthodontic treatment, and that nearly 80% were likely to show marked crowding many years after removal of retainers. In two separate long-term studies conducted by Sadowsky and Sakols (1982), and Sadowsky et al (1994), the mandibular irregularity indices deteriorated by 9% and 33% respectively. The Irregularity Index (Little, 1975), is a measurement to determine the degree of mandibular anterior crowding. The anatomic points at which contact would be made are defined on each surface of the six mandibular anterior teeth. The distance between the contact points of the adjacent teeth are then measured, the sum of these 5 measurements providing the Irregularity Index as devised by Little (1975).

Orthodontic treatment itself may have an effect on dimensional changes in the dental arches which could be a contributing factor in post-treatment relapse. Riedel (1960) and Shapiro (1974) found that mandibular canine expansion during treatment was associated with a strong tendency for the intercanine width to return to its pretreatment dimension, although this occurred less frequently in Class II division II patients. However, Shields, Little and Chapko (1985) in their 10 year postretention study of 65 subjects who had undergone premolar extractions prior to treatment showed that arch length and width reduction with concomitant mandibular incisor crowding continued well into the 20 to 30 years age span. This reduction seemed to occur in spite of treatment maintenance of the initial arch width, treatment expansion or constriction.

Third molars have been implicated as one of the factors causing lower incisor crowding. Salzman (1965), attributed lower incisor crowding to the pressure arising from developing third molars.

Broadbent (1941), maintained that third molars played an insignificant role in late lower incisor crowding, while Richardson (1997), suggested that impacted third molars are unlikely to exert much mesial force, although third molars that erupted or attempted to erupt in reduced space could cause crowding problems. Furthermore, second molar extraction studies (Richardson, 1983; Richardson and Mills, 1990), have strongly reinforced the suggestion that mesial migration of mandibular teeth is greater in the presence of a developing third molar. These studies concluded that the reduction in crowding and the distal movement of first molars in patients whose second molars had been extracted compared with the increase in crowding and mesial movement of first molars in non-extraction subjects, provided convincing evidence of the effects of developing third molars on the anterior part of the arch.

The correction of an increased incisor overbite has a high tendency to relapse. Post-retention overbite increase appears to be related to the amount by which the overbite was reduced during treatment. Studies conducted by Little, Wallen and Riedel (1981) and Shields, Little and Chapko (1985), have shown that only between 30% to 50% of the overbite correction is maintained. The data presented by these authors indicated that the orthodontic intrusion of mandibular incisors was only a transitory effect and the normal course of dental eruption would continue, possibly aided by postretention relapse (extrusion) in some patients.