A RETROSPECTIVE
CEPHALOMETRIC STUDY OF THE
EFFECT OF THE FRÄNKEL APPLIANCE,
THE CLARK TWIN BLOCK AND THE ACTIVATOR ON
CLASS II DIVISION 1 PATIENTS

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for the Degree of Master of Dental Surgery

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SUMMARY

The complete evaluation of facial balance and harmony includes an examination of the facial profile. The relationship and balance between the size of the nose, lips and chin are essential for a balanced facial appearance. In the past, Angle (1907) believed that soft tissues automatically adopt a harmonious relationship once a "normal" occlusion is established. In 1957 Riedel stated that the soft tissue profile was closely related to the skeletal and dental structures. This, however, may not be the case. In 1959 Subtelny confirmed that the bony and soft tissue profiles matured along opposing paths, and it could not be assumed that the soft tissue profile was similar to the underlying skeletal profile. Burstone (1958) and Neger (1959) stated the variation of the actual soft tissue thickness may influence the differences between the hard and soft tissue profile.

Functional appliances are mainly used to correct "retrognathic mandibles" in skeletal Class II patients. Functional appliances transmit, eliminate or guide natural forces of growth, muscle function and tooth eruption. Typical treatment time is twelve to eighteen months. They may act by redirection of growth and changing its timing (Fields, 1993) and it is controversial whether they produce changes in absolute size. Nevertheless, the overlying soft tissues are affected.

A review of the literature suggests a lack of published data on the effects of functional appliances on the soft tissue profile.

The present research involved an observational retrospective study to determine if any differences exist in the soft tissue profile of Class II division I patients before and after treatment with three different functional appliances; the activator with headgear, the Clark Twin Block, and the Fränkel.

The aim of this thesis was to test the null hypothesis, that the soft tissue profile response is independent of the type of functional appliance used in the correction of Class II division I patients.
The criteria for sample selections included:

1. Angle Class II, division 1 malocclusion.
2. At least one Class II molar relationship.
3. A minimum overjet of 4mm
4. No prior serial extractions, nor any concurrent orthodontic treatment during the course of functional therapy.
5. The absence of observable major dental and craniofacial deformity.
6. Pretreatment radiographs taken within 90 days before the start of active treatment. End of treatment radiographs taken within 90 days after discontinuation of functional therapy, or the radiograph was taken and treatment continued for a varying length of time, prior to the retention period.
7. All individuals were of Caucasian origin.

The three individual functional appliance samples were obtained from three private practices. No attempt was made to determine success of the treatment response in case selection.

The sample consisted of 94 Class II division 1 patients. Thirty-five consecutive patients (17 males and 18 females) were allocated to the activator group, thirty patients (17 males and 13 females) to the Clark Twin Block group, and twenty-nine patients (15 males and 14 females) to the Fränkel group.

The mean ages of the Fränkel (10.8 years), the activator with headgear (11.1 years) and the Clark Twin Block (10.6 years) were similar, with a range of 8.0 to 14.7 years. Mean treatment times varied between the groups, activators with headgear being used for an average of 610 days, Fränkels for 596 days, while Clark Twin Blocks were worn for 465 days. Differences in age, sex and treatment time were considered.

Soft tissue analysis was performed and compared to the dento-skeletal structures on cephalometric radiographs which were adjusted for magnification prior to the analysis. Error statistics were determined and evaluated in an effort to validate reliability. Statistical comparison of data was executed to determine if sexual dimorphism was
present and to determine if the soft tissue profile was independent of the type of functional appliance used. In addition, a comparison with appropriate untreated controls was made, so as to determine the effect of functional appliance treatment.

Some differences were discovered between males and females pre-treatment, especially in the Fränkel group. The overjet in the Fränkel group, was 3.2mm in the males and 6.2mm in the females. Post-treatment, more variables were significantly different between males and females, especially in the Clark Twin Block group. The significant overjet difference in the Fränkel group was no longer evident.

The SNA angle decreased in females of the Clark Twin Block group. The SNB increased in all groups, thus effectively decreasing the ANB angle. The application of the activator with headgear appeared to limit the anterior displacement of the maxilla, yet the maxillary complex continued to descend vertically.

Upper incisors uprighted with treatment in all three groups. Lower incisors proclined in the Clark Twin Block and Fränkel groups. All groups showed statistically significant decreases in overjet and overbite. The biggest overjet decrease was seen in the Clark Twin Block group. The least overbite decrease was detected in the activator with headgear group. The Frankfort-mandibular plane angle did not change significantly during treatment in any of the appliance groups.

Facial convexity decreased most in the Clark Twin Block group, then the Fränkel group and then the activator with headgear. The nasolabial angle changed similar amounts between the groups, yet the labiomental fold decreased most in the Fränkel group. The soft tissue changes appeared to be correlated to some extent with the underlying hard tissues however a wide variation in response was evident. The null hypothesis that the soft tissue profile change is independent of the type of functional appliance used in correction of the Class II division 1 patient was rejected.

Long-term evaluation is necessary to determine the stability of the treatment effects. This has been recommended for future research.