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Treatment of a Class II Malocclusion Complicated by Digit-Sucking

Abstract: This article describes the management of a 12-year-old girl who presented with a Class II division 1 incisor relationship on a Class II skeletal base with an overjet of 10 mm and a thumb-sucking habit. This patient was treated with a modified Herbst appliance to correct the Class II skeletal pattern and break her thumb-sucking habit.

CPD/Clinical Relevance: It is important to recognize a digit-sucking habit early as this needs to be eliminated prior to starting orthodontic treatment. This can complicate treatment of patients who require treatment with functional appliances.

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The prevalence of digit-sucking varies between 12–34% in 9-year-olds.[1-3] There is little published literature on the prevalence of digit-sucking habits in the UK. A relatively recent study undertaken in Kettering reported that 23.6% of children reported a history of a habit and 12.1% reported a prolonged habit past the age of 7 years old.[4]

Management of a digit-sucking habit is initially conservative and can include the following:

- Educating the patient and parent(s) and an explanation of the digit-sucking habit and its implications;
- The patient must consciously want to stop the digit-sucking habit and can be 'rewarded' for not sucking his/her digit;
- Making the digit a less viable option:
  – This can include painting the digit with an unpleasant tasting substance, eg *Bitrex*;
  – Covering the digit with adhesive bandages;
- Making access to digits difficult:
  – This can include taping a cotton glove/plastic bag over the digit-sucking hand;
- An intra-oral approach to make it difficult to prevent digit placement:
  – An upper removable appliance, but this is dependent on patient compliance;
  – A fixed appliance which normally consists of transpalatal arch design with an extension inferiorly.

If intercepted early, the anterior open bite caused by the digit-sucking habit can resolve, but this can take several years. Management of a patient with this particular habit is complicated because, prior to starting any orthodontic treatment, the digit-sucking habit has to have been discontinued because any treatment undertaken without this will relapse.

A Class II malocclusion in a growing individual can be managed by growth modification with functional appliances. Functional appliances can be defined as fixed or removable orthodontic appliances, which use the forces generated by the stretching of muscles, fascia or periodontium to bring about change to the existing skeletal or dental relationship.[5] There is strong evidence to suggest that the large amount of correction achieved is dento-alveolar.[6-11]

Functional appliances have been popular in Europe since the mid-20th century.[12] The introduction of the Clark twin block, in the late 1970s, caused popularity of this treatment modality in the UK.[13] The fixed-functional appliance option is the Herbst appliance, which was originally described by German professor Emil Herbst at the International conference in Berlin 1905, and later reinforced with a case series.[14] However, it wasn't until the late 1970s that the Herbst appliance was popularized by Hans Pancherz.[15-18] Recent evidence suggests that, although the treatment effect is the same as twin block, as a result of better patient co-operation, treatment time is shorter.[19]

Regardless of which functional appliance is used, there is a finite time limit for facial orthopaedic treatment which is suggested to be during, or shortly after, the pubertal growth spurt.[20-22] Therefore, a Class II malocclusion which is complicated by a digit-sucking habit becomes difficult to treat owing to the

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Figure 1. Pre-treatment extra-oral view.


Figure 2. Profile view.


Figure 3. Intra-oral anterior view.


Figure 4. Right intra-oral view.

time required to cease the habit prior to commencing active orthodontic treatment.

Case report

A 12-year-old girl (EB), was referred by her GDP to the Orthodontic Department at Seacroft Hospital, Leeds. Her main presenting complaint was that she was unhappy with her upper teeth sticking out. The medical history was unremarkable. However, further questioning revealed that EB sucked her thumb during the day- and night-time.

EB presented with a Class II skeletal pattern due to a retrusive mandible with normal Frankfort Mandibular Plane Angle (FMPA) and normal vertical proportions. Her soft tissue analysis demonstrated an increased naso-labial angle and incompetent lips at rest (Figures 1 and 2). Intra-orally, she presented with a Class II division 1 incisor relationship with a decreased and incomplete overbite and an overjet of 10 mm with upper and lower centrelines coincident (Figure 3). The right and left buccal segments had a Class II relationship (1/2 unit) (Figures 4 and 5). The upper incisors were proclined and the lower incisors were retroclined with mild crowding. Routine radiographic investigations were undertaken (Figures 6 and 7) and the cephalometric analysis confirmed the clinical impressions (Table 1).

EB's mother mentioned that, prior to referral, conservative methods had already been tried to break her habit but were unfortunately unsuccessful. In thumb-sucking cases, it is important that the child expresses a desire to stop the habit. EB was keen to stop her habit but needed some active assistance as it was still occurring at bed-time. In view of her age and malocclusion type, it was imperative that functional appliance treatment was commenced as soon as possible. In the UK, the twin block is the appliance which is used in the majority of Class II malocclusions to reduce overjets.[13] However, owing to its removable design, there are potential compliance issues which are heightened due to the thumb-sucking habit. As a result of this, a 'fixed' design was considered which incorporated a habit-


Figure 5. Left intra-oral view.


Figure 7. Lateral cephalogram.

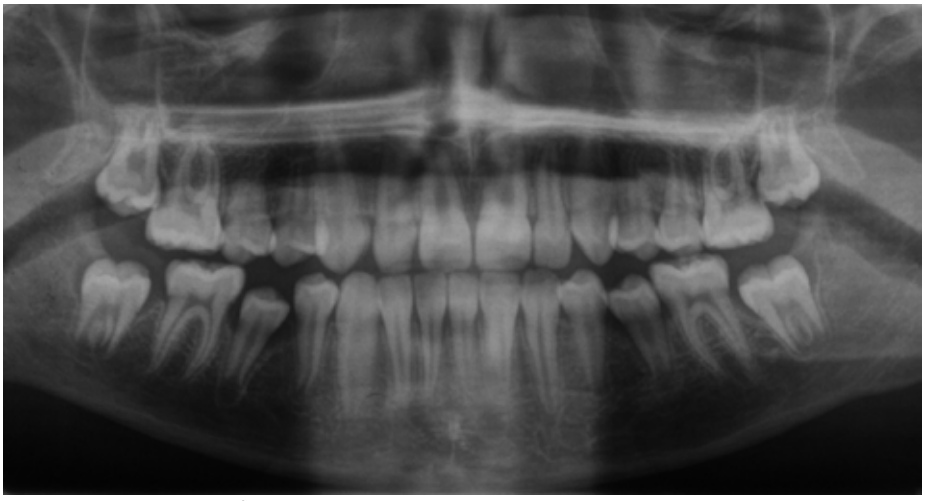
Figure 6. Dentopantograph.

breaking appliance within a functional appliance.

Modified Herbst appliance

The modified Herbst appliance consisted of a banded Herbst design with stainless steel bands on the first permanent molars and the first premolars.

Figure 8. Upper arch of the Modified Herbst appliance.

Figure 9. Right view of the cemented Modified Herbst appliance.

Figure 10. Anterior view of the cemented Modified Herbst appliance.

Figure 11. Left view of the cemented Modified Herbst appliance.

The bands were soldered together with 0.9 mm stainless steel wire. A bilateral telescope mechanism attached to the bands with screws held the mandible in the postured position.

The main modification was in the upper segments: both segments were joined by a 0.9 mm stainless steel wire in the anterior palate area with vertical extensions to dissuade digit placement (Figure 8). The advantages of this design are that a fixed habit-breaking solution is provided and Class II correction can be achieved at the same time with a fixed functional appliance.

The modified Herbst appliance was cemented with glass-ionomer cement (Figures 9–11). Owing to the advantages of the fixed appliance, the patient was reviewed after one month to ensure that she was coping well with the appliance and was then reviewed three-monthly. EB was compliant with treatment and,

Figure 12. Post-treatment extra-oral view.

Figure 13. Post-treatment profile view.

Figure 14. Post-treatment intra-oral anterior view.

Figure 15. Post-treatment right intra-oral view.

Figure 16. Post-treatment left intra-oral view.

Figure 17. Post-treatment lateral cephalogram.

due to the habit-breaking component, immediately stopped sucking her thumb. After six months of active treatment was completed, the patient's incisors were over-corrected to an edge-to-edge relationship and there was an improvement in her facial profile (Figures 12–16). The lateral cephalometric analysis suggests that, over this small period of time, there has been some anterior mandibular growth with retroclination of the upper incisors (Figure 17 and Table 2).

Cephalometric Landmarks	Cephalometric Values
SNA	89°
SNB	82°
ANB	7°
MMPA	21°
UIA	122°
LIA	84°
IIA	133°

Table 1. Pre-treatment cephalometric values.

Cephalometric Landmarks	Cephalometric Values
SNA	89°
SNB	85°
ANB	3°
MMPA	23°
UIA	106°
LIA	85°
IIA	146°

Table 2. Post-treatment cephalometric values.

Conclusions

Digit-sucking habits are relatively common in young children. In the small percentage of older children in which it persists, it can lead to disruption of the malocclusion that characteristically leads to an anterior open bite due to intrusion of the incisors and extrusion of the molars. Treatment is initially conservative but can be time consuming prior to starting active treatment.

This can be a problem for patients that require functional appliance treatment within their growth period. A modified Herbst appliance can provide an efficient solution for these types of patients.

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