The Super Cusp: A Patient Friendly Myofunctional Corrector

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ABSTRACT

Skeletal Class II malocclusion is a condition exhibiting either maxillary excess or mandibular deficiency or a combination of both. Various treatment approaches for correcting skeletal Class II malocclusions due to mandibular deficiency include functional appliance therapy, orthodontic camouflage and orthognathic surgery. Among these, timely treatment with functional appliances is considered the most effective treatment option in growing subjects. The purpose of present paper is to describe an efficient myofunctional corrector, ‘the Super cusp’, which allows occlusal settling, gives better comfort and is esthetically pleasing compared to any other functional appliances.

Keywords: Class II division I malocclusion, Myofunctional appliance, Palatal embrasures, Super cusp


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INTRODUCTION

The purpose of functional appliance therapy is to promote or redirect the growth of mandible in a favorable direction. Functional appliance therapy responds well within the growth period and therefore early identification by the clinician is of utmost importance. The risk of trauma to the maxillary incisors\(^1\), the psychological burden on young children,\(^2\) the time and complexity of impending fixed appliance phase, etc. can be reduced, if they are treated within the growth period using functional appliance therapy.

The most commonly used functional appliances for correcting Class II malocclusions are the functional regulator by Rolf Frankel\(^3\), Herbst appliance by Emil Herbst\(^4\) (later reintroduced by Pancherz),\(^5\) its modifications,\(^6-11\) and the Twin block appliance, developed by Clark WJ.\(^12,13\)

The functional regulator introduced by Rolf Frankel had the advantage of sagittal and transverse corrections in the growing child. But the bulkiness of the appliance reduced the level of patient compliance, which was most essential for a removable appliance.

The Herbst appliance is a fixed myofunctional appliance. The effectiveness of Herbst appliance over removable functional appliances is due to its reduced demand on the patient compliance. Since the link between the mandibular and maxillary dentitions is fixed in Herbst appliance, it might lead to fracture or debonding due to the high levels of stress on the components, particularly during lateral excursions.\(^14\)

The twin block appliance is a removable myofunctional appliance with maxillary and mandibular parts retained on the posterior teeth with Delta clasps. This particular design helps the patient to carry out his/her normal function, compared with the activator. Presence of bite block interocclusally does not provide the patient with a natural occlusion and at the end of the treatment, there is a chance of developing posterior open bite, which has to be later corrected with fixed appliance therapy.

The ‘Super cusp’ is a myofunctional corrector, to achieve mandibular advancement while minimizing the disadvantages of its precursors.

APPLIANCE CONSTRUCTION AND DESIGN

The Super cusp is a cast cobalt chromium design (Figs 1A and B) similar to lower cast partial denture without occlusal rest. This appliance utilizes the natural inclined plane present in the palatal embrasure of maxillary posterior teeth.

PARTS OF THE APPLIANCE

1. Lower major connector
2. Four minor connectors
3. Retentive clasps—engaging the last erupted lower posterior teeth.
4. Super cusps—four cast metalball-end extensions from the minor connector, which engages the palatal embrasures, when patient advances his bite from Class II to occlusion.

As the patient tries to bite in normal occlusion (existing Class II), the Super cusp will interfere with the occlusion (Fig. 2A), prompting the patient to advance the mandible,
for comfort and proper mouth closure. This will bring the upper and lower posterior teeth in a Class I intercuspation or very close to it (Fig. 2B).

**BITE REGISTRATION**

The upper and lower alginate impressions are made and casts poured. The bite registration is done by advancing the mandible forward so that the upper and lower posteriors are in Class I relation with minimal bite opening in the posterior region. In cases where the posterior intercuspation is compromised, an anterior edge to edge bite may be used as a guide for registering the bite. Incremental advancement is recommended in those cases where patients have limited mandibular forward posture and patient with large initial overjet. Maxillary and mandibular casts along with the construction bite is sent to the laboratory for the fabrication of the appliance.

**LABORATORY PROCEDURES**

Upper and lower cast with the registered bite is articulated and the wax pattern of the appliance constructed (Fig. 3). Wax pattern should be fabricated carefully so that the super cusps engages the palatal embrasures of the posteriors properly. The wax pattern should not interfere with the eruption of posterior teeth. The fabricated wax pattern is then invested and dewaxed. After dewaxing, molten metal is poured and finally finishing and polishing of the appliance is done as in case of cast partial dentures.

**CLINICAL MANAGEMENT**

First the appliance is checked against the working models. After insertion, check for the retention and comfort of the patient. As the patient tries to bite, the Super cusp will interfere with the occlusion. The patient is then asked to close in the most comfortable position. The patient will eventually close the mandible in the protruded position till the Super cusps engage the palatal embrasure of the upper posterior segment.

Clear instructions about the care and management of the appliance should be given to the patient. Cast partial design makes it easy to maintain good oral hygiene. The patient should be instructed to wear the appliance full time except
during sleep. The patient is also instructed to train himself to have food with the appliance on, by starting with a soft diet.

The patient is recalled at 4 weeks intervals. The appliance can be removed when ideal sagittal arch relationship is achieved.

**TIMING OF THE TREATMENT**

The prime time for the correction of Class II malocclusions with the ‘Super cusp’ is during the onset of the pubertal peak in growth period. As stated by Pancherz, late functional/orthopedic therapy of the Class II malocclusion just after the onset of the peak in the growth velocity is recommended to favor maximum treatment effect and reduce the time of post-treatment retention. This also coincides with settling phase of the erupted premolars.

**CASE REPORT**

An 11-year-old female patient presented with a chief complaint of forwardly placed upper front teeth. Extraoral examination showed apparently symmetrical face with convex profile and incompetent lips (Figs 4A to C). On intraoral examination, all the permanent teeth were present except third molars, with Class II molar and canine relations on both sides. She had an overjet of 8 mm with a 60% overbite (Figs 4D to G). The visual treatment objective (VTO) was positive (Fig. 5). Cephalometric analysis confirmed a Class II skeletal pattern with an ANB value of 5°, Wits appraisal of 3 mm, effective mandibular length of 104 mm indicative of a deficient mandible (Fig. 6 and Table 1) and forward posture of lower lip (Table 2).

The aim of treatment was to promote the growth of mandible thereby correcting the skeletal Class II relation, using the Super cusp.

Records were made, bite registered and the Super cusp was fabricated. The appliance was then inserted and instructions given (Figs 7A to C). The patient was reviewed every month. Five months later there was a notable improvement in the profile (Figs 8A to C), with an overjet reduction by 6 mm (Fig. 9). There was adequate mandibular advancement with molars and canines in Class I relation (Figs 10A to C).

After the phase of mandibular advancement, fixed appliance therapy was started for final settling and finishing. Within 5 months, occlusion was settled (Figs 11A to E).

**DISCUSSION**

The Super cusp works on the principle of the inclined planes as in case of twin block appliance introduced by Clark. The main difference is that this appliance utilizes the natural inclined plane present on the palatal embrasures of maxillary posterior teeth instead of the inclined planes created in between the maxillary and mandibular parts of the twin block appliance. Patient is more comfortable compared with the twin block appliance as the Super cusp is a single arch mandibular cast partial design. The adaptation to this appliance by the patient seems to be faster than with the classic twin block appliance because of this design.

The Super cusp allows the patient to bite in the natural occlusion compared to the twin block appliance that does not provide the patient a proper intercuspation as the bite blocks are placed interocclusally. At the end of the treatment, there is a chance of developing posterior open bite in twin block appliance therapy, which has to be later corrected with fixed appliance. The Super cusp allows settling the occlusion as there is no interference by the appliance.

The chance of breakage of the Super cusp is less as compared with the classic twin block appliance due to its metallic framework.

Since there is no link between the upper and lower parts of the appliance, it allows the patient to have a good range of jaw movement making it comfortable to wear in contrast with the Herbst appliance. Another advantage
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Fig. 5: Photograph showing positive VTO

Fig. 6: Pretreatment lateral cephalogram

Figs 4D to G: Pretreatment intraoral photographs of the patient

Figs 7A to C: Intraoral photographs after insertion of Super cusp
of this appliance is that it is strong enough to sustain the pressure produced by the occlusal forces generated during biting and chewing.

The metallic framework of the appliance allows for reduced thickness of the appliance without compromising on the strength, thereby making it minimally intrusive in the oral space.

Maintenance of good oral hygiene has always been a major problem with intraoral orthodontic appliances. It is easy to remove plaque and food debris from and around the Super cusp appliance.

This appliance also allows carrying out the fixed appliance treatment along with the functional correction. The fixed appliance can be placed as soon as the patient gets...
comfortable with the Super cusp, which reduces the overall treatment time significantly.

CHARACTERISTICS OF THE APPLIANCE

- Inconspicuous and comfortable design
- Reduced chairside time
- Ease of insertion
- Hygienic
- Possible to overlap the functional and fixed phases so that treatment time is reduced.
- Simple fabrication technique
- Less intrusive in the oral space
- Need not store in water as the metallic design is dimensionally stable.

Figs 9: Post-treatment lateral cephalogram

Figs 10A to C: Intraoral photographs of the patient after removal of Super cusp

Figs 11A to E: Intraoral photographs of the patient after occlusal settling
LIMITATIONS OF THE APPLIANCE

• A mild mesial tilting of lower first molar may sometimes be noticed. This could be due to the pressure on the anterior part of the retentive clasp as a result of the leveraging action of the Super cusps attached on the anterior segment of the major connector, during mastication.

• The Super cusps typically engage the palatal embrasures of the upper posterior teeth. This makes the use of ‘Super cusp’ difficult in early mixed dentition phase.

• The chrome-cobalt design makes it more expensive than the regular acrylic appliances.

CONCLUSION

The Super cusp with its characteristic properties allows better patient tolerance and cooperation. While ensuring Class II corrections by mandibular advancement, it keeps the undesirable tooth movements and functional interferences to the minimum. There is considerable reduction in the total treatment time as the functional and fixed phases of the treatment can be done simultaneously.

REFERENCES

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