

Comparative study of complications during Herbst treatment with Cantilever Bite Jumper and removable mandibular acrylic splint

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Abstract

Objective: To assess and compare the type of complications during Herbst treatment with Cantilever Bite Jumper (CBJ) and removable mandibular splint. **Methods:** Twenty one consecutive Herbst patients treated with the CBJ were compared with twenty one consecutively treated Herbst patients with stainless steel crowns on the maxillary first molars and a removable mandibular acrylic splint. The initial mean age for the CBJ group was 12 years and 3 months and for the Splint group was 11 years and 3 months. Both groups used the Herbst appliance for 12 months. Based on the patients' clinical records an occurrence survey of complications during Herbst treatment was performed. **Results:** There were 24 complications for the CBJ and 53 for the Splint group, which were statistically different (Mann-Whitney test, $p < 0.05$). The prevalence of patients exhibiting complications during treatment was 66.67% in the CBJ and 85.71% in the Splint group. The frequencies of complications were also statistically different between the groups. **Conclusions:** The CBJ exhibited a significantly smaller number of complications during Herbst appliance treatment than the removable mandibular splint. Herbst appliance with first molar crowns and a cantilever on the mandibular molars is preferable to the removable mandibular acrylic splint because of savings in clinical and laboratory time.

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Editor's summary

Recent studies about Herbst appliances found that complications depend on the type of device used. The greatest frequency of fractures was found for banded appliances, but most cases of accidental debonding were found when metal splints were used. No differences were found in overall frequency of complications between banded appliances and designs with metal splints. So far, no study has compared the frequency of complications between cantilever bite jumper (CBJ) appliances and models that have removable acrylic lower splints. This study compared the occurrence of fracture between two types of Herbst appliances, and results provided data to support clinical decisions about the best choice. Group 1 comprised 15 men and 6 women that had Class II malocclusion and mean age of 12 years and 3 months at the beginning of the treatment. Patients were treated using the CBJ (Ormco, Glendora, CA), which has four steel crowns for the mandibular and maxillary first molars. Group 2 comprised 11 men and 10 women that had Class II malocclusion

and mean age of 11 years and 3 months at the beginning of the treatment. Patients in this group were treated using the Herbst appliance with steel crowns in the maxillary first molars and removable mandibular acrylic splint. Maxillary molars were connected using a transpalatal arch. The telescopic system used with these Herbst appliances was Dentaurem type I (Ispringen, Germany).

Seven patients (33.3%) in the CBJ group and 3 (14.29%) in the Splint group had no complications, and according to the results of the Fisher exact test, there were no significant differences in prevalence of number of patients with complications between the two types of appliances. However, the evaluation of total number of complications during treatment with Herbst appliances revealed 24 occurrences in the CBJ group (mean, 1.1 per patient) and 53 in the splint group (mean, 2.5 per patient), and this difference was statistically significant. Therefore, our findings confirmed the clinical impression that the CBJ appliance has greater resistance to fracture.

Questions for the authors

1) Fixed appliances, such as the Herbst appliance, do not require patient cooperation. However, patient compliance seems to be important to preserve the integrity of the appliance. Which complications of the Herbst appliance should be assigned to lack of patient cooperation?

The Herbst appliance is not indestructible, and, during insertion, the patient should always receive the same information about eat-

ing that is given to a patient that will use a conventional fixed appliance. If the patient eats hard or sticky foods, several complications may occur: accidental crown debonding, screw loosening, Rod distortion, crown fractures, lower splint fracture, and transpalatal arch fracture. These complications affect patients using CBJ as well as appliances with removable lower splints. In the splint group, patients might stop using the lower part of the appliance, which is removable to facilitate oral hygiene, but this is a rare situation.

2) Did the authors find any differences in clinical effects as the Herbst appliance design was changed?

A recent unpublished study¹ compared the effect of Class II correction using these two types of Herbst appliances and assessed results using Johnston superimposition cephalometric analysis. Several differences were found: apical base change and mandibular growth/displacement were greater in the splint (3.9 mm and 5.2 mm) than in the CBJ group (3.0 mm and 4.00 mm), but these differences were not statistically significant. Another important conclusion was that there were no differences in anterior movement of mandibular incisors: the value was 1.3 mm in both groups, although less protrusion was expected in the splint group.

3) Are technical advances expected in the near future for the treatment using the Herbst appliance?

Rollo bands (American Orthodontics, Sheboygan, WI) are currently used for appliance fixation. They have the same resistance as

steel crowns, but are much easier to remove because of an opening on the occlusal surface. Moreover, the mandibular axles of cantilevered systems are currently placed at a more posterior position, in the region of the mandibular second premolar, which gives the appliance a better esthetic effect and does not impinge on soft tissue. In regard to the telescopic system, appliances designed for direct attachment are currently preferred, as they obviate the need of screws to fasten the system. As previously seen, one of the most important causes of complications is screw loosening. Some companies have developed telescopic systems in a single piece, in which the tube (upper part) and the Rod (lower part) form a single block, like a shock absorber, and do not come apart. However, they are not yet clinically efficient, to justify the high prices charged for these appliances. A strong future trend is the attempt to use skeletal anchorage, particularly in the mandibular arch², to install the appliance, to maximize the desired skeletal effects and to minimize collateral dental effects.

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