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MINISCREW IMPLANT SUPPORTED K-LOOP (MISK) SPRING FOR MOLAR DISTALIZATION : A PILOT TYPODONT STUDY

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INTRODUCTION

When designing of a molar distalizing appliance, two areas of particular concern are molar tipping and anterior movement of anchorage teeth. If the first molar is tipped back rather than moved bodily, it will not only pose occlusal problems but may not provide sufficient anchorage to distalizing the teeth anterior to it. Hence, molar distalizing appliances must allow effective control and manipulation of the moment–to-force ratio. By altering this ratio with K-loop spring[1] (Kalra, 1995) , the clinician can achieve bodily movement, controlled tipping, or uncontrolled tipping of maxillary molars, as the individual case dictates.

But anterior anchorage was always critical with K-loop spring appliance. Nowadays, miniscrew implants have been used clinically as temporary stationary anchorage for various orthodontic tooth movements, because of their ability to provide absolute anchorage.[2-3] We have modified the premolar arm of the K-loop spring by extending it vertically for its attachment with miniscrew implant to provide absolute anchorage for molar distalization.

AIM

The purpose of this trial was to introduce a treatment modality for maxillary molar distalization using Miniscrew Implant Supported K-Loop (MISK) spring for nonextraction treatment of patients with a class II malocclusion to distalize maxillary molars in an invisible, noncompliant, and efficient way, without mesial movement and proclination of anterior teeth.

MATERIALS AND METHODS

APPLIANCE DESIGN

The MISK spring consists of one active unit and one anchorage unit.

The active unit uses K-loop spring attached bilaterally or unilaterally as needed between first molar tube and first premolar bracket. The premolar arm of the K-loop spring extended vertically for its attachment with anchorage unit to provide anchorage for molar distalization (Fig.-1).

The anchorage unit uses miniscrew implant in the buccal alveolar bone between maxillary first premolar and canine for temporary and stationary anchorage to resist the anteriorly oriented reciprocal forces during molar distalization (Fig.-1).

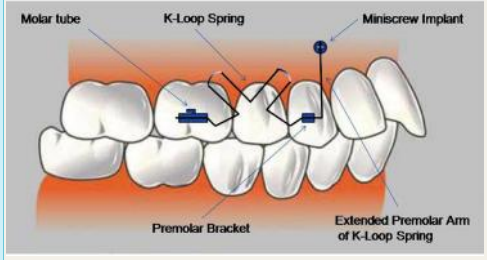

Figure-1: Miniscrew Implant Supported K-loop Spring

PILOT TYPODONT STUDY

A typodont set-up was prepared using prefabricated cold cure shells and hinge articulator. Occlusion set-up on typodont was prepared in wax with Class II molar and canine relationship and well aligned upper and lower teeth. The K-loop spring was placed between maxillary first molar tube and first premolar bracket and the extended premolar arm of the K-loop spring was ligated with bracket slot on the head of miniscrew implant (Fig.-2). The typodont was seated in a box with a heat lamp for 30 minutes to soften the wax, to allow the teeth movement on the typodont. This process provides a simpler control of wax softening than using a water bath. The pattern and amount of orthodontic tooth movement was accessed by photographic records (Fig.-3) and comparison made before and after simulated treatment.

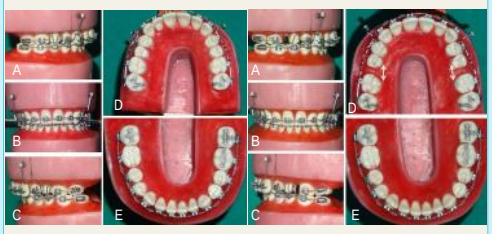

Figure-2.A-E: Class II malocclusion setup with MISK spring in place

Figure-3.A-E: Maxillary molar distalization by MISK spring after lamp heating

RESULTS OF PILOT STUDY

It was found on comparing the pre (before wax softening) and post (after wax softening) activation photographs that the MISK spring provided correction of Class II molar relationship. Both right and left side of maxillary molars were moved distally about 4mm without mesial movement of premolars. Implants were firm in their place without any mobility.This finding was also confirmed clinically.

A CLINICAL REPORT

In this case (Fig.-4.A) the K-loop spring was placed between maxillary molars tube and 1st premolars bracket and the extended premolar arm of the K-loop spring was ligated with miniscrew implants (Fig.-4.B). Treatment was continuing with this appliance for four month. It was found that the MISK spring provided correction of Class II molar relationship (Fig.-4.C-D). Based on photographic (Fig.-4.A-D) and radiographic (Fig.-4.E-F) records, it is concluded that the MISK spring effectively distalize the maxillary molars to correct the Class II molar relationship by moving the maxillary molars distally.

Figure-4 .A-F: Photographs and radiographs showing maxillary molar distalization using MISK spring

DISCUSSION

Class II malocclusion is the most frequent treatment problem in an orthodontic practice. With the recent trends towards non-extraction treatment several appliances have been advocated to distalize the maxillary molars. Despite the use of different components in the design of appliance to prevent anchorage loss, anterior anchorage was always critical with the molar distalizing appliances. With the use of Miniscrew implants, clinically an absolute anchorage can be achieved. Combining the finding of the typodont study and the clinical report, it is strongly suggested that MISK spring is effective in maxillary molar distalization. Regarding patient comfort, there was no complaint by the patient using the MISK spring, apart from difficulty with tooth brushing. The limitation of this study was that the result can not be claimed as a valid predictor, due to the fact that natural tissue could not be simulated by the typodont. Hence clinical trials with large sample size will be needed to confirm the results.

IMPLICATIONS FOR PRACTICE AND RESEARCH

Based on evidence provided, MISK spring should be selected with only for the patient with definite indication for maxillary molar distalization. Without well designed Randomized Controlled Trials (RCTs) using MISK spring, no definite implications for practice can be made. Hence, there is a need for further research regarding the utility of MISK spring, in the form of prospective randomised controlled trials (RCTs) with adequate sample size to allow conclusive recommendations to be made. Any future trials should be designed, carried out and reported according to the Consolidated Standards of Reporting Trials (CONSORT) guidelines.[4]

CONCLUSION

It is concluded that the MISK spring effectively distalize the maxillary molars to correct the Class II molar relationship in both the typodont and patient model by moving the maxillary molars distally. However, future clinical trials are needed to confirm its usage.

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