Comparison of canine retraction with active tieback and power chain – an in vivo implant study

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Abstract
Orthodontic tooth movement is greatly influenced by the characteristics of the applied force. And the characteristics of the applied force depend on the orthodontic appliance used.
Crowding of dental arch often required extraction of 1st premolar to resolve the arch-length to tooth material discrepancy. Obviously, the creation of space in the dental arch through extraction therapy requires some mechanism to consolidate this space to achieve the desired treatment objectives.
Orthodontic space closure has always been a challenge for the orthodontist. With the preadjusted appliance, sliding mechanics is the most preferred method of closing extraction spaces. So this is a comparative clinical study between power chain and active tie-back to compare the canine movement in maxillary arch over the 4 month of continuous retraction using implant as a reference point because implant provide stable reference points for serial superimposition. And 45* oblique cephalometric radiograph for evaluate changes in right and left side separately.

Keywords: Implant, Stable reference point, Superimposition, Power-chain.

Introduction
Orthodontic tooth movement is greatly influenced by the characteristics of the applied force, like its magnitude, direction, movement to force ratio and the physiologic health of the periodontal tissue of individual patient. The characteristics of the applied force also depend on the orthodontic appliance used. In orthodontics, no consensus exists on how to move teeth most efficiently. An optimal approach should result in the highest possible rate of tooth movement without irreversible damage to the periodontal ligament, the alveolar bone, or the root and minimal discomfort to the patients.

Crowding of dental arch often required extraction of first premolars to resolve the arch-length to tooth material discrepancy. Obviously, the creation of space in the dental arch through extraction therapy requires some mechanism to consolidate this space to achieve the desired treatment objectives.

Orthodontic space closure has always been a challenge for the orthodontist. With the preadjusted appliance, sliding mechanics is the most preferred method of closing extraction spaces. For this there are several method of applying force like elastic modules, elastic chains, Niti coil spring, which provide a force of 100 to 200 gms. It has been suggested that forces of approximately 150 gm may be the ideal physiologic force for bodily movement of the canines.

Clinical literature reports highly variable rates of canine retraction. Rate range from approximately 0.2-2.5 mm per month. The measurement of tooth movement is done by change in position of tooth or teeth relative to the reference point. Errors have been detected when the adjusted tooth or anatomically stable points are used as reference points because the movement of adjacent tooth and growth changes takes place in cranial structures.

Although implant provide stable reference points for serial superimpositions. So this is a comparative clinical study between power chains and active tie-back to compare the canine movement in maxillary arch over the 4 month of continuous retraction using implant as a stable reference point and 45^{o} oblique cephalometric radiograph for evaluate changes in right and left side separately.

Materials and Methods
This prospective clinical study will comprise group of 18 patients including both males and females of aged 17 to 24 yrs, presenting for orthodontic therapy to the department of Orthodontics, Siddhartha Dental College, Tumkur. Subjects requiring extraction of first premolars with minimal crowding will be selected for the study. All patients will be treated with fixed orthodontic therapy using MBT prescription of 0.022 slot (A.O).

Canine retraction will be started after initial leveling and aligning on 0.019 *0.025 inch stainless steel base arch wire, engaged to the bracket slot and tied with stainless steel ligature. Canine retraction will be accomplished with power chain on one side and active tieback on contralateral side. Four microimplants will be placed in the maxilla. Two microimplant apical to the first molars (left and right) and one on each side of the midpalatal suture, apical to the central incisors.

The standardized 45 oblique cephalograms and dental cast will be taken before and at each 4 week interval. Lateral cephelometric tracings before and during the treatment will be superimposed by using the microimplant as reference point and measurement will be done for rate of retraction of canine for 4 months.

Statistical analysis

The data obtained were subjected to statistical analysis by using SSPS software. The mean and standard deviation was tabulated. Paired t-test was utilized to determine whether there was a significant difference in rate of canine retraction between two groups.

Fig. 1: Active tieback inserted on right upper quadrant

Fig. 2: Power chain inserted on left upper quadrant

Fig. 3: Implant placed on left side apical to first molar

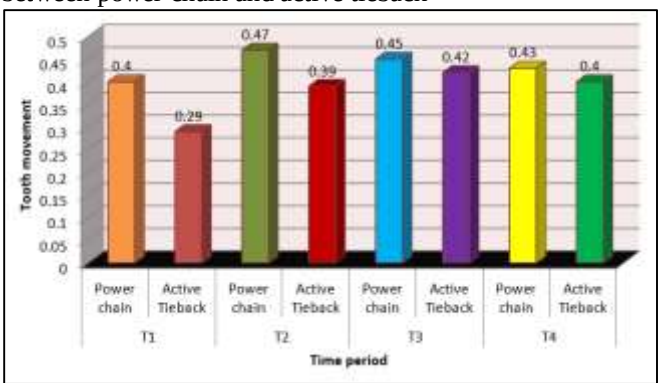
Fig. 4: Implant placed on apical to central incisors

Fig. 5: Implant placed on right side apical to first molar

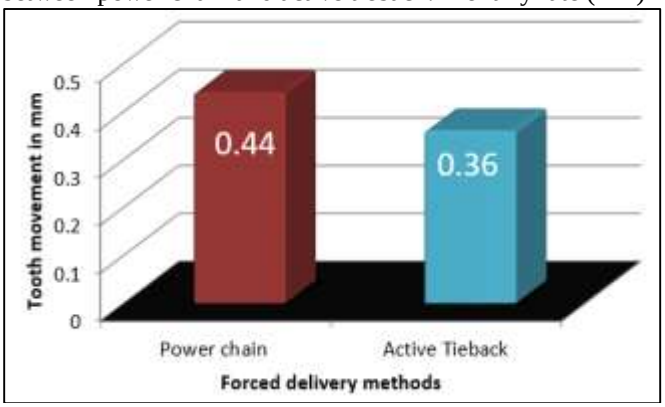
Results

It was found that for active tieback mean rate of canine retraction was 0.36±0.03 mm per month and for power chain it was 0.44±0.02 mm per month. P value of < 0.001 showed that there was statistically difference between rates of retraction. Comparison of monthly rate of canine retraction between power chain and active tieback showed that there was statistically significant difference between first, second and third month, but at fourth month there was no statistically difference in rate of tooth movement.

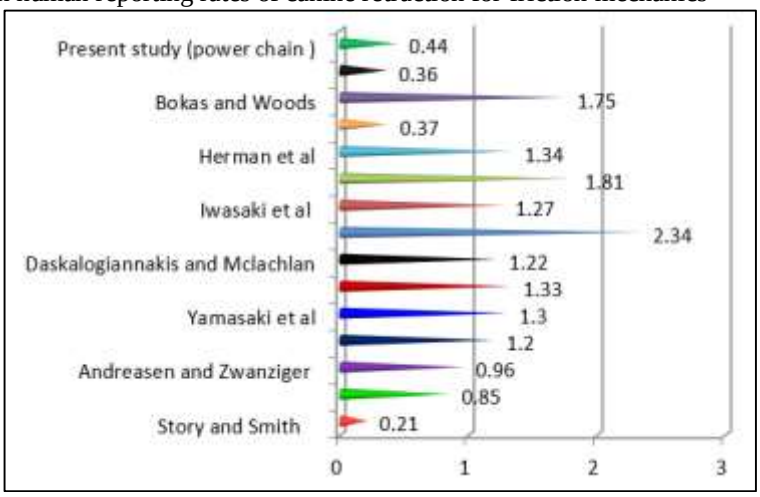
Graph 1: Comparison of monthly rate of canine retraction between power chain and active tieback



Graph 2: Comparison of average rate of canine retraction between power chain and active tieback. Monthly rate (mm)



Graph 3: Clinical studies in human reporting rates of canine retraction for friction mechanics



Conclusion

Rate of canine retraction was faster with power chain than active tie back. Rate of canine retraction was lesser during tooth movement in initial first month as compared with 2nd, 3rd and 4th month. Both active tie back and power chain showed evidence of clear lag phase in initial first month of canine retraction.

Source of Funding

None.

Conflict of Interest

None.

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