Case Report

Tug Of War Between Skeletal and Dental Anchorage – A Case Report

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ABSTRACT

Bimaxillary proclination is a common clinical occurrence requiring careful treatment planning and an equally careful execution1.To maintain or achieve an ideal Class I molar relation with an ideal incisor relationship anchorage preservation plays a crucial role in diagnosis and treatment planning. A plethora of mechanics using conventional intraoral and extra oral appliances have been used in past decades, but all have some or other advantages and disadvantages over one another. So to overcome their disadvantages orthodontic implants came into existence, as it's not a new concept, but yes its popularization took long time lapse, taking over the market over a small span of time, as one of the best means of anchorage control and space closure, but the biomechanical principals for anchorage (dental) control still holds its good in a different and unique sense for each and every case. This case report discusses one of such clinical situation where two different anchorage systems (skeletal anchorage and dental anchorage) have been used based on their advantages and disadvantages.

Key Words: Temporary anchorage devices (TADs), Class I malocclusion, Extraction, Skeletal Anchorage, Dental Anchorage, MBT metal brackets, Cortical and Cancellous bone..

INTRODUCTION

Daskalogiannakis (2000) defined anchorage as "resistance to unwanted tooth movement".[2] To overcome anchorage loss that happens inevitably during orthodontic tooth movement various appliances such as Nance holding arch, Transpalatal bar, and Extraoral tractions were used.[3] Consolidation of multiple teeth to form an anchorage unit also been used to anchor (maintain) molar position, and nature of bone in maxilla (cancelluos bone) and mandible (cortical bone) also aids to augment molar anchorage.[4]Skeletal anchorage is used when 'Absolute anchorage' is required using various skeletal fixtures such as Conventional Dental Implants, Palatal Endosseous Implants, Onplant[5], Mini implant, Spider Screw, Micro implant, C-orthodontic Micro implant, Impacted Titanium Post, Transitional Implants, Mini Plate, Zygoma Anchorage System, Zygomatic Ligatures, to generate tooth movement in any direction without detrimental reciprocal forces on supporting structure.[6] But the use of any of the described skeletal anchorage system or dental anchorage system should be considered using various factors like patient compliance, area of application, direction of movement, amount of tooth movement required, ease of application, nature of bone etc. This case report illustrates one of such clinical situation where two different anchorage systems (skeletal anchorage and dental anchorage) have been used based on their advantages and disadvantages.

CASE REPORT

An 18 year old female patient reported with a problem of forwardly placed upper front tooth (Figure-1).

Figure 1- Pre- Treatment Records

HISTORY

Patient doesn't give any relevant medical and dental history.

DIAGNOSIS

Extra oral examination reveals patient had mesoprosopic facial form, brachycephalic head shape, competent lips, and convex facial profile with posterior facial divergence.

Intra oral examination shows ideal canine and molar relation with an overjet and overbite of 3 mm. Proclinationirt upper and lower anteriors, rotation irt 21,22,33,43 and crowding irt lower anteriors.

Functional examination

Reveals an oro-nasal respiration.

Smile assessment

An 8 mm of incisor show during smiling and no significant gingival exposure.

Model analysis

Bolton's analysis shows an overall mandibular tooth size excess of 1 mm & mandibular anterior tooth size excess of 0.6 mm. Radiographic analysis Panoramic radiograph shows teeth were present with adequate bone support for fixed orthodontic therapy (Figure-1).

TMJ examination revealed normal size, shape and position of the condyle. On cephalometric assessment an ANB of 40 shows Skeletal Class I pattern and MPA of 330 with average growth pattern (Table-1). Other cepahlometric parameters such as 1/NA, 1/NB and IMPA were found to be increased suggesting proclined upper and lower incisors.

Treatment Goal: -

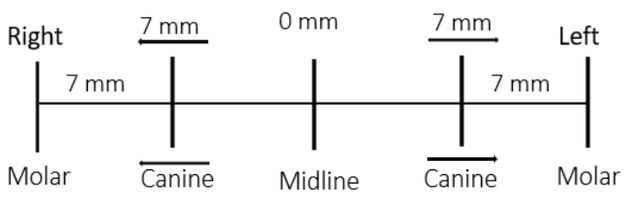
Our primary treatment goal was to address the patient's chief complaint, to reduce proclination thereby reducing facial convexity and obtaining static and functional occlusion with stability of the treatment results.

Treatment Objectives:

1. To level and align the teeth.
2. To maintain an ideal incisor relationship.
3. To maintain an ideal canine and molar relation bilaterally with good occlusal intercuspation.

Treatment Plan:

Symmetrical extraction of 14,24,34,44 was planned based on clinical and radiographic evaluation and was discussed with patient and her parents. After obtaining patient's consent, fixed orthodontic mechanotherapy was started. Dental VTO as in figure 3 shows anticipated changes in both arches.



Treatment progress:

Following the extraction of all four first premolars, fixed orthodontic mechanotherapy with a pre-adjusted edgewise appliance of 0.022" x0.028" slot (3M Unitek™) metal bracket prescription was initiated. An initial 0.014"and 0.012" round

NiTi was used for the levelling and alignment of both arches

respectively. 5months later and after obtaining enough levelling and aligning, gradually 0.019" x 0.025" SS heavy wire placed in upper and lower arches.

En-mass retraction of the upper and lower six front teeth was carried out using TADs (Figure-2). Two implants of 1.5mm X 8mm (S K surgical, Pune) dimension in upper arch and two implants of 1.5mm X 6mm dimension in lower arch were placed in between 2nd premolar and 1st molar region. Traction force was applied from implant to power arm of 8 mm length (directing force nearer to center of resistance) in upper arch. In lower arch Class I force applied from crimpable hook of 6 mm length. Mini-implants were used for space closer to maintain anchorage but lower implant failure laid us to switch over to dental anchorage, so we decided to take advantage of cortical nature of mandibular bone for retraction of anterior segment with an added advantage of lower anterior teeth with small conical root facilitating easier retraction (Figure-2) using Class I force.

Table 1 (Reading Of Patient's Lateral Cephalogram Tracing)

Measurements	Norm	Pre-Treatment	Post –Treatment
SNA (angle)	82^0	83^0	81^0
SNB (angle)	80^0	79^0	78^0
ANB (angle)	2^0	4^0	3^0
U I to N-A(mm)	4 mm	7 mm	4 mm
UI to N-A (angle)	22^0	27^0	24^0
L I to N-B (mm)	4 mm	6 mm	4 mm
L I to N-B (angle)	25^0	30^0	26^0
U I to LI (Interincisal-angle)	131^0	117^0	128^0
MPA		32^0 33^0	31^0
IMPA		90^0 100^0	94^0

FIGURE 2- U= 0.019"x 0.025" SS with continuous intrusion arch (25^0 anchor bend), L= 0.019" x 0.025" SS with Class I force

In upper arch, continuous intrusion arch (0.016" A J wilcock SS) was tied between central incisors to prevent any torque loss. Extraction space was closed within 14 weeks, thereafter 0.014-inch round NiTi wire was used for 10 weeks for settling the final occlusion. After which brackets were debonded and a removable upper retainer and lower lingual bonded retainers were placed.

TREATMENT RESULT

Post-treatment records show positive changes in profile of the patient in form of reduction in convexity, reduced muscle tension, corrected proclination of maxillary and mandibular teeth with coincident midline to facial axis and dental midline also (Figure 4). Pre and post cephalometric changes are seen in table 1.

Figure 4- post treatment records

DISCUSSION

Anchorage control is one of critical step for a successful orthodontic treatment outcome. Anchorage value differs in all 3 planes of space, depending on the area of concern. Generally, anchorage loss is explained in relation to mesial movement of the posterior section of dental arches. In both arches management for controlling anchorage loss is different owing to the nature of bone present i.e. more of cancellous bone in maxilla and in mandible more of cortical bone.[7] So less chances of anchorage loss in mandibular arch with added advantage of morphological features of lower anterior teeth.

Maxilla is composed of spongy bone that are composed of trabeculae. Look like thin threads, which are not as heavy as the osteons (compact bone) as seen in mandibular bone. Compact bones are tough and heavy while spongy bones are light, so are able to withstand masticatory forces well as compared to spongy bone. Cortical bone present in mandible is more prone to resorption, so tooth movement is slower as compared to maxilla. This less tooth movement is advantageous while maintain anchorage in lower arch but could be disadvantageous during retracting of posterior teeth in case of minimum anchorage, if required.[7]

Therefore, clinicians over the years have made an effort to find bio-mechanical solutions to maintain anchorage Tweed[8],

Holdaway[9] and Merrifield[10] found different methods of anchorage to increase the efficacy of treatment.

This present case report explains why and how a thorough knowledge of biomechanical principle effects our treatment mechanics.

CONCLUSION

Orthodontic implants were placed in both arches but mid-treatment failure of implants in lower arch did not compromise on quality of retraction or anchorage value of lower arch using biomechanical advantage of dental anchorage by applying Class I force.

Appliances are being developed and will continue to improvise with the passage of time but this will not erase the need for the orthodontist to think, implement basic principles of bio-mechanics in common sense manner, yes but refinement may decrease the physical effort put forth in treatment.[11]

DECLARATION OF PATIENT CONSENT

Author certify that all appropriate patient consent was obtained. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. Patient understand that his/her/their names and initials will not be published and due efforts will be made to conceal his/her/their identity, but anonymity can't be guaranteed.

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