

## Case Report

# K-Sir arch for simultaneous intrusion and retraction of the maxillary anterior teeth-A case report

### ABSTRACT

This case report shows the management of Angle's Class II division 1 Malocclusion with tooth size-arch length discrepancy of – 10 mm in maxillary arch and mandibular arches, proclined upper and lower anteriors, and crowding in relation to lower anteriors. Clinical evaluation revealed Class II dental and skeletal pattern, low mandibular plane angle, incompetent lips, increased overjet and overbite. Simultaneous intrusion and retraction of upper anterior teeth using Kalra Simultaneous Intrusion and Retraction arch was decided due unaesthetic excessive maxillary incisor showing at rest and to provide maximum space for the retraction of anterior teeth. Posttreatment changes were good and stable.

**Keywords:** Class II Malocclusion, Deep bite, Kalra Simultaneous Intrusion and Retraction ARCH

### INTRODUCTION

Malocclusions are considered in sagittal, transverse, and vertical plane. The maxillary dental arch overlaps the mandibular dental arch so does the maxillary anteriors over mandibular anteriors in both sagittal and vertical planes.<sup>[1,2]</sup> This sagittal overlap is called as overjet and the vertical overlap is called overbite. This is normal finding in human dentition. While patients presenting with unwarranted vertical overlap of the lower anteriors by upper anteriors is called as deep bite. This deep overbite is a orthodontic problem that may give rise to periodontal problems, functional problems, temporomandibular joint problems, improper chewing, and excessive tooth wear resulting in early loss of teeth.<sup>[3,4]</sup> Hence, correcting deep bite is one of the prime objectives of orthodontic treatment. Correction of this excessive vertical overlap requires sound diagnosis, a proper treatment plan and an effective appliance to achieve treatment results. One of the available options is Kalra Simultaneous Intrusion and Retraction (K-SIR) ARCH which is used for cases requiring

simultaneous intrusion and retraction of anterior teeth as in this case which had deep bite (40%) and proclined upper and lower anteriors.

### Diagnosis

A 17-year-old female presented with a chief complain of forwardly placed upper front teeth and lower incisor crowding. Extraoral examination revealed convex profile, incompetent lips, and acute nasolabial angle [Figure 1]. Intraoral examination revealed deep bite (40%), lower midline shift to right side, proclined upper and lower anteriors, and crowded lower anteriors. The molar and canine relationships were end on both the right side and left side. Model analysis revealed tooth size-arch length discrepancy of -10 mm in maxillary arch and mandibular arches [Figure 2].

### SANKALP AGNANI, KAMAL BAJAJ<sup>1</sup>

Department of Orthodontics, Pacific Dental College, Udaipur,

<sup>1</sup>Department of Orthodontics and Dentofacial Orthopedics, Mahatma Gandhi Dental College, Jaipur, Rajasthan, India

**Address for correspondence:** Dr. Sankalp Agnani, 413, Adarsh Nagar, Jaipur - 302 004, Rajasthan, India. E-mail: agnanisan@gmail.com

Received: 25-Feb-2020      Revised: 31-May-2020  
Accepted: 12-Jun-2020      Published: 09-Jul-2020

| Access this article online  |   |
|---|---|
| <b>Website:</b><br><a href="http://www.orthodrehab.org">www.orthodrehab.org</a> | <b>Quick Response Code</b><br> |
| <b>DOI:</b><br>10.4103/ijor.ijor_5_20   |   |

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Agnani S, Bajaj K. K-Sir arch for simultaneous intrusion and retraction of the maxillary anterior teeth-A case report. Int J Orthod Rehabil 2020;11:88-92.

### Treatment objectives

1. To achieve normal inclination of upper and lower anteriors
2. To achieve normal overjet and overbite
3. To achieve Class I molar, incisor, and canine relationship
4. To achieve Class I skeletal pattern
5. To achieve good facial profile.

### Treatment plan

Therapeutic extraction of 14, 24, 35, 45 teeth followed by fixed appliance therapy with 0.022 MBT prescription Preadjusted Edgewise Appliance. K-SIR arch [Figure 3] was used for simultaneous intrusion and retraction of upper anteriors after individual canine retraction in upper arch. Here, K-SIR arch was selected as both intrusion and retraction

can be done simultaneously, easy to fabricate, cost-effective as compared to TADs, and requires minimum amount of the patient cooperation.

### Treatment progress

After extractions of premolars, anchorage control was done by lace backs for canine control, bend backs for incisor control; Nance palatal arch in upper and lingual holding arch in lower for molar control was given. After initial alignment and leveling was achieved with 0.016" NiTi, 0.017 × 0.025" NiTi wire, 0.019 × 0.025" SS wire was placed. In lower arch en-masse retraction was continued using type I active tie back and in upper arch individual canine retraction was done using type I active tie backs. After achieving Class I canine relation, K-SIR arch was placed in upper arch for



Figure 1: Pretreatment extraoral photographs



Figure 2: Pretreatment intraoral photographs



Figure 3: KSIR arch for simultaneous intrusion and retraction after individual canine retraction in upper arch

simultaneous intrusion and retraction of upper anteriors and 0.019"×0.025" stainless steel was placed in the lower arch for torque expression and space closure. Class II elastics were given to correct Class II skeletal pattern. No complications were encountered during use of K-SIR arch, apart from a first 7 days for patient getting used to loops and slight tissue impingement which was sorted early.

### Activation of Kalra Simultaneous Intrusion and Retraction Arch

As in K-SIR arch, stresses built due wire bending are released by doing a trial activation of the springs. The legs of each of the springs are extended horizontally to determine the neutral position and the U loop will be 3.5 mm wide in this position. On activation of 3 mm, the distance between the medial and distal legs is significantly reduced. On initial activation, the retraction force creates larger tipping moments in comparison to the opposing moments generated by the V bends. This brings about a controlled tipping of the teeth into the extraction space and once deactivation of the loops occur the moment to force ratio increases causing bodily movement of the teeth followed by root movement. This allows for the activation to be done after every 6–8 weeks till the space is closed.

### Treatment results

The Class I canine and molar relationship were established, and the spaces were closed. All treatment objectives were achieved including established occlusion. Upper and lower arches showed good alignment with the upper and lower midline centered. Facial profile of the patient was significantly improved after the treatment [Figures 4 and 5].

### Treatment assessment

All the treatment objectives were achieved by the end of 20 months. Angle's Class II malocclusion was changed to Class I relation. Comparison of pretreatment and posttreatment cephalometric variables and lateral cephalometric superimposition was done between pre and post treatment [Table 1 and Figure 6].

### Retention protocol

Retention protocol for this patient was accomplished with removable wrap around retainer in upper arch with instructions for full time wear during the first 6 months, followed by 6 months night time wear. Bonded lingual retainer was given in lower arch.

### DISCUSSION

Usually in edgewise system, retraction of the six anterior teeth is carried out in 2 steps: first canine retraction is done and then incisor retraction.<sup>[5]</sup> However, in Tip-Edge and Begg techniques, En masse retraction of six anterior teeth is done.<sup>[4]</sup> The reason for individual retraction in the edgewise technique is that molar anchorage is preserved. However, Burstone and Nanda have proven molar anchorage control, using nonfrictional loop mechanics for en masse retraction of the anterior teeth and producing results at par with conventional edgewise sliding mechanics. In this case a

**Table 1: Pre- and post-treatment of cephalometric variables**

| Variables                | Norms         | Pretreatment     | Posttreatment       |
|--------------------------|---------------|------------------|---------------------|
| SNA                      | 82°           | 83°              | 82°                 |
| SNB                      | 80°           | 78°              | 79°                 |
| ANB                      | +2            | 5°               | 3°                  |
| Na perpendicular to pt A | 1.1 mm        | 2 mm             | 1 mm                |
| N-Pog (facial angle)     | 87.8° (82-95) | 86°              | 87°                 |
| GoGn-SN                  | 32°           | 25°              | 26°                 |
| Y-AXIS                   | 53-66°        | 60°              | 60°                 |
| Facial axis              | 90±3°         | 90°              | 90°                 |
| Gonial angle             | 128±7°        | 112°             | 120°                |
| Jaraback index, %        | 62-65         | 67.5%            | 67.3%               |
| Interincisal angle       | 135°          | 114°             | 138°                |
| Upper incisor to NA      | 22°, 4 mm     | 31°, 8 mm        | 20°, 3.5 mm         |
| Lower incisor to NB      | 25°, 4 mm     | 29°, 6 mm        | 24°, 4 mm           |
| Upper incisor to SN      | 102°          | 113°             | 100°                |
| Lower incisor to A-Pog   | 2.7 mm        | 3 mm             | 2 mm                |
| IMPA                     | 90°           | 105°             | 97°                 |
| S-line                   | 0 mm          | U=3 mm<br>L=5 mm | U=-0.5 mm<br>L=0 mm |
| Nasolabial angle         | 102°          | 82°              | 107°                |



**Figure 4: Posttreatment extraoral photographs**



Figure 5: Posttreatment intraoral Photographs

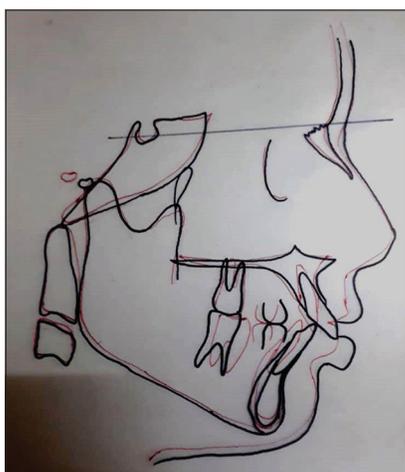


Figure 6: The pre- and post-treatment lateral cephalometric superimposition on S-Na

combination of both was used as individual canine retraction was done using type I active tie backs in upper arch and then K-SIR arch was used for simultaneous intrusion and retraction of upper anteriors.

K-SIR archwire is a modification of the segmented loop mechanics of Burstone and Nanda. It is a continuous 0.019"  $\times$  0.025" TMA archwire with closed 7 mm  $\times$  2 mm U-loops at the extraction sites. To obtain bodily movement and prevent tipping of the teeth into the extraction spaces, a 90° V-bend is placed in the archwire at the level of each U-loop. This V-bend, when centered between the first molar and canine during space closure, creates two equal and opposite moments to counter the moments caused by the activation forces of the closing loop. A 60° V-bend located posterior to the center of the interbracket distance produces an increased clockwise moment on the first molar, which augments molar anchorage as well as the intrusion of the anterior teeth. To prevent the buccal segments from rolling mesio-lingually, 20° anti-rotation bend is placed in archwire just distal to each U-loop.

The second premolars are bypassed to increase the interbracket distance between the two ends of attachment. This allows the clinician to utilize the mechanics of the off-center V-bend. The archwire should be reactivated every 6–8 weeks until all space has been closed.<sup>[6]</sup>

As the name suggests prime indication for the K-SIR archwire is simultaneous intrusion and retraction of anterior teeth, so it is to be used in deep overbite and excessive overjet cases. Hence, patients requiring both intrusion and retraction of anterior teeth can be treated using K-SIR archwire.

The 0.019"  $\times$  0.025" TMA has enough strength and stiffness to resist distortion and produce required moments. It also produces relatively low forces and a low load-deflection rate. TMA can be activated twice as much as stainless steel without undergoing lasting deformation and it produces half the force per unit activation.

## CONCLUSION

By understanding the biomechanics involved using K-SIR arch, we can achieve simultaneous movements and successful outcome.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. 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. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

### REFERENCES

1. Graber TM, Swain BE. Orthodontics: Current Principles and Techniques. St. Louis: Mosby Co.; 1985.
2. Graber TM. Orthodontics: Principles and Practice. 3<sup>rd</sup> ed. Philadelphia: W.B. Saunders; 1972.
3. Proffit WR, Field HW, Ackerman JL, Bailey LT, Tulloch JF. Contemporary Orthodontics. 3<sup>rd</sup> ed. St. Louis: C.V. Mosby Co.; 2000.
4. Jayade VP. Refined Begg's for Modern Times. 1<sup>st</sup> ed. Karnataka State, India: Mrs. Anuradha V. Jayade, Hubli; 2001.
5. Bennett JC, McLaughlin RP. Management of deep overbite with a preadjusted appliance system. J Clin Orthod 1990;24:684-96.
6. Kalra V. Simultaneous intrusion and retraction of the anterior teeth. J Clin Orthod 1998;32:535-40.