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**Shailey**

3<sup>rd</sup> Year Post Graduate Student,  
Department of Orthodontics and  
Dentofacial Orthopaedics,  
Subharti Dental College, Swami  
Vivekananda Subharti  
University, Meerut,  
Uttar Pradesh, India

**Shalu Jain**

Reader, Department of  
Orthodontics and Dentofacial  
Orthopaedics, Subharti Dental  
College, Swami Vivekananda  
Subharti University, Meerut,  
Uttar Pradesh, India

**Pradeep Raghav**

Professor and Head, Department  
of Orthodontics and Dentofacial  
Orthopaedics, Subharti Dental  
College, Swami Vivekananda  
Subharti University, Meerut,  
Uttar Pradesh, India

**Pankaj Wadhwa**

2<sup>nd</sup> Year Post Graduate Student,  
Department of Orthodontics and  
Dentofacial Orthopaedics,  
Subharti Dental College, Swami  
Vivekananda Subharti  
University, Meerut,  
Uttar Pradesh, India

**Corresponding Author:**

**Shailey**

3<sup>rd</sup> Year Post Graduate Student,  
Department of Orthodontics and  
Dentofacial Orthopaedics,  
Subharti Dental College, Swami  
Vivekananda Subharti  
University, Meerut,  
Uttar Pradesh, India

## Correction of class II div 2 malocclusion with simple yet effective modified sectional archwire: A case report

Shailey, Shalu Jain, Pradeep Raghav and Pankaj Wadhwa

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### Abstract

Class II div 2 is a marked category of Class II malocclusion with typical features like retroclined maxillary incisors and severe deep over bite, caused by both skeletal and dentoalveolar factors. This case report describes the orthodontic treatment of a 21 years old male, with permanent dentition, sagittal skeletal Class I pattern, Class I molar and canine relationship with class II div 2 incisor relationship. His chief complaint was irregularly placed teeth in upper front region of the jaw. The patient had convex profile, incompetent lips and deep mento- labial sulcus with 100% overbite. Treatment mostly consisted of inclination correction of the incisors and opening of the bite with the help of modified sectional archwire in the maxillary arch and double L-loop mandibular archwire. Satisfactory improvement in the patient's esthetics was achieved along with improved overjet, overbite and inclination of incisors.

**Keywords:** hypodivergence, lower anterior facial height, lingual bonded retainer

### Introduction

Class II div 2 is a marked category of Class II malocclusion with typical features like retroclined maxillary incisors and severe deep over bite, caused by both skeletal and dentoalveolar factors, with the mandibular incisors occluding behind the cingulum plateau of their antimeres <sup>[1]</sup>. The subjects usually present a distinct craniofacial feature of hypodivergence of the jaw bases or horizontal growth pattern, acute gonial angle and reduced lower anterior facial height. The other notable dental features include Class II molar and canine relationship, possible labial inclination of maxillary lateral incisors, and supra erupted, upright mandibular incisors. The possible etiological factors are strong genetic predisposition, greater vertical posterior development of mandible with upward and forward rotation with skeletal hypodivergence and/or high lower lip line which may cover or rest on the cervical one third of the maxillary incisor crown <sup>[2]</sup>. This high lower lip line covering the maxillary incisors during their eruption cause them to retrocline. To correct a Class II div 2 incisor relationship, overbite reduction along with incisor inclination correction is critical.

### Case Report

A 21 years old male patient reported to the Department of Orthodontics and Dentofacial Orthopaedics, with a chief complain of irregularly placed teeth in upper front region of the jaw. Extraoral examination revealed that the patient had a convex profile with incompetent lips and deep mento-labial sulcus. No temporomandibular signs or symptoms were detected or reported. Intra oral examination revealed that the patient was in the permanent dentition stage, with Class I molar and canine relationship bilaterally, and Class II div 2 incisor relationship. Panoramic radiograph (Fig 1) revealed that alveolar bone level was normal. The root formation of all teeth was complete, with 28 being congenitally missing and 38 being impacted horizontally. All the teeth appeared to be caries-free with no pathological lesion seen.

### Clinical Examination

Extraoral features revealed that the patient had convex profile and incompetent lips (Fig 2). Intraoral features revealed that the patient had retroclined maxillary central incisors and mandibular incisors while proclined maxillary lateral incisors.

The over jet was 0.5mm and the overbite was 6mm or 100% with a curve of spee of 3mm. The molar and canine relationship was found to be Class I bilaterally, along with Class II div 2 Incisor relationship. The maxillary and mandibular arches had squarish arch forms with moderate crowding (Fig 3).

Radiographic interpretations were suggestive of prognathic maxilla and mandible with  $SNA = 86^\circ$  and  $SNB = 83^\circ$ . An ANB of  $3^\circ$  suggested that the patient had Class I skeletal pattern. He had an acute gonial angle and horizontal growth pattern with values  $GoGn-Sn = 19^\circ$  and  $FMA = 17^\circ$ . The maxillary central incisors were retroclined and retropositioned with UI-NA linear being 0mm and angular  $6^\circ$ . The mandibular incisors were also retroclined and retropositioned with values LI – NB linear -1mm and angular  $6^\circ$  and IMPA of  $81^\circ$ . The Interincisal angle was also  $166^\circ$ . In soft tissue, upper lip – S line was -1mm suggestive of retrusive upper lip while lower lip – S line was 2mm and lower lip – Ricketts E-plane was 1mm suggestive of normal lower lip. The upper and lower lip lengths were normal with values 23mm and 53mm respectively. The nasolabial angle was found to be  $93^\circ$  (Fig 4).



Fig 1: Pre-treatment OPG



Fig 3: Pre-treatment intraoral photographs

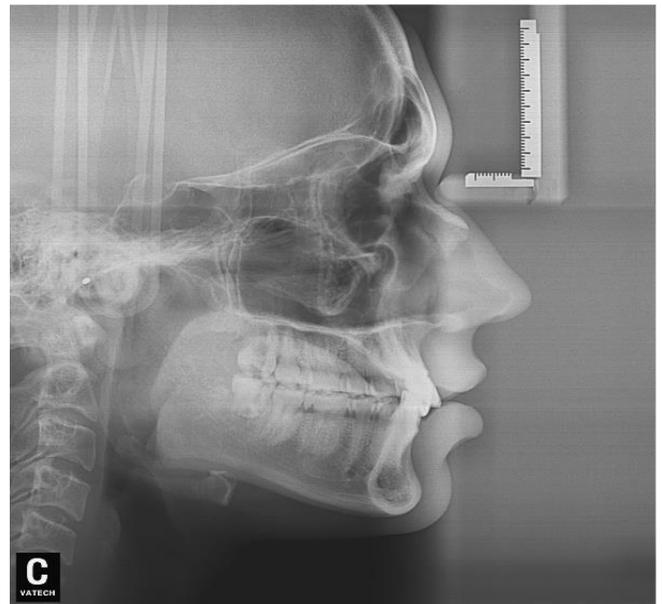


Fig 4: Pre-treatment Lateral cephalogram



Fig 2: Pre-treatment extraoral photographs

### Treatment Objectives

1. To achieve functionally optimum and aesthetically acceptable occlusion
2. Accept the skeletal class II pattern
3. Eliminate dental crowding of both maxillary and mandibular arches
4. Correction of increased over bite and reduced overjet
5. Levelling, aligning, and coordinating the dental arches
6. Maintaining Class I molar and canine relationship
7. Correction of inclination of upper and lower incisors and interincisal angle
8. Correction of Class II div 2 incisor relationship
9. Achieve competency of lips
10. Retain corrected results

### Treatment Mechanics and Progression

Considering all aspects of the case in detail, non-extraction treatment plan was established, starting with fixed mechanotherapy in the upper and lower arches (Standard edge wise MBT 0.018" slot bracket). Before initial alignment & levelling of both jaws, modified sectional archwire with two helices, constructed using 0.016" Australian round wire, was engaged in the maxillary arch, ligating it in the brackets slots

of the retroclined maxillary centrals and the maxillary molars bypassing all the buccal teeth. Two segmental archwires of 0.014" niti was used to engage and align the buccal segment of the maxillary arch (Fig 5). With monthly activation of the modified sectional archwire, maxillary central incisor inclination correction was achieved in a period of 5 months. Next, to level and align the entire maxillary and mandibular arches, sequential continuous archwires were placed, beginning with 0.012" niti, 0.014" niti, 0.016" niti and finally 0.016" x 0.022" niti. This also corrected the labial inclination of maxillary lateral incisors. There was a step seen between the mandibular canines and incisors due to supraeruption of the lower incisors, which contributed to the deep overbite. So, to correct this deep curve of spee, appropriate bends were given in an 0.016" ss archwire, i.e. two L-loops were made mesial to mandibular canines bilaterally. The overbite correction was achieved in 3 months, meanwhile upgrading the maxillary archwire from 0.016"x 0.022" niti to 0.017"x0.025" ss sequentially (Fig 6).



**Fig 5:** Levelling and alignment with modified sectional archwire



**Fig 6:** Curve of spee correction with double L-loop archwire in mandibular arch

## Results

Over bite was improved from 6 mm to 3mm and overjet also improved from 0.5mm to 2.5mm. Satisfactory interdigitation and soft tissue changes were obtained. The periodontal tissues remained healthy during the entire course of treatment. Patient's esthetics were also improved satisfactorily.

## Discussion

A deep overbite is a common malocclusion found in nearly 20% of children and 13% of adults, representing about 95.2% of vertical occlusal problems. The exaggerated curve of Spee has been shown repeatedly to be the leading cause of this malocclusion, followed by overeruption of maxillary incisors [3].

Treatment of deep overbite in a patient with a normal skeletal pattern should aim to produce rapid disclusion of the mandibular incisors and to improve the incisor display without flattening the smile arc. Its treatment is recommended in order to reduce or prevent tissue trauma from tooth contact, facilitate possible future reconstructive dental work and reduce increased tooth wear. The importance of leveling the curve of Spee in the correction of deep bite has been well documented [4]. Ng and colleagues found that while true incisor intrusion can be achieved with a variety of appliances, the use of segmented mechanics is especially effective.<sup>5</sup> The amount of intrusion depends on various factors such as amount of incisor display, the distance between the roots and cortical bone; and the chosen mechanics.

With the help of simple mechanics employed by the modified sectional archwire mentioned above, we were able to achieve satisfactory amount of intrusion along with axial inclination correction of maxillary central incisors with minimal iatrogenic side-effects, but due to the current pandemic situation the treatment was delayed and patients could not report to the clinic for prolonged duration. Hence, the finishing and detailing is yet to be achieved. The retention plan includes lingual bonded retainer in upper and lower arches along with Hawley's retainer to be worn full time for a period of 6 months followed by night time wear for next 6 months. Amarnath BC presented a clinical overview of deep bite management and concluded that most of the deep bite cases require a prolonged retention protocol, which usually constitutes use of a removable appliance with a potential biteplane incorporated on to it [6]. Bite depth can be maintained by wearing retainer only at night, after stability in other regards has been achieved. Shannon and Nanda reported that they found less curve of Spee relapse in their fixed retainer patients compared with their removable retainer patients at 2.8 years posttreatment [7].

## Conclusion

Non-extraction treatment of Class II div 2 malocclusion is an effective choice of treatment, specially in mild to moderate crowding. However, several factors must be considered before making the final treatment decision. All biomechanics must be employed very carefully by the orthodontist, particularly the ones involving intrusion and inclination correction of the anteriors to avoid any iatrogenic effects.

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