**Case Report**

Adjunctive use of a surgical splint for leveling the curve of Spee following mandibular advancement

**ABSTRACT**

Deep curve of Spee is a very common problem among Class II malocclusion patients associated with mandibular deficiency. The curve of Spee is maintained and leveled following surgical mandibular advancement. The same surgical splint which is used to guide the mandibular advancement can also be used for the leveling of deep curve of Spee. This case report highlights the leveling of deep curve of Spee by the same surgical splint used during the surgical mandibular advancement. Thus, it helps to increase the lower facial height and also improves the overall facial appearance.

**Keywords:** Bilateral sagittal split osteotomy, deep bite, mandibular advancement, skeletal class II, surgical splint

**INTRODUCTION**

The success of orthognathic surgery depends on the accurately fabricated surgical splint.[1-3] The three-dimensional position of maxilla and mandible in relation to the skull can be altered surgically with Le Fort I osteotomy of maxilla and bilateral sagittal split osteotomy (BSSO) of mandible.[4] The surgical splint not only guides the desired bone-based sagittal movement[5,6] but also helps in control of transverse dimension.[4] An exaggerated curve of Spee is a common problem among patients with skeletal deep bite malocclusions. In patients with short lower anterior face height, there is a greater need for extrusion of posteriors for the leveling of curve of Spee.[7] The leveling of curve of Spee by selective eruption of posterior teeth using functional appliances in patients with skeletal deep bite is commonly observed among adolescents.[8,9] The same principle can also be used for the leveling of the curve of Spee among adult patients following surgical mandibular advancement. There is no report in the literature mentioning the use of surgical splint for the correction of deep bite following mandibular advancement. This case report highlights the leveling of deep curve of Spee by the same surgical splint which is used during the surgical mandibular advancement.

**CASE REPORT**

An 18-year-old boy reported with a chief complaint of forwardly placed upper front teeth. There was no significant medical and dental history. On extraoral examination, he had an apparently symmetrical face with convex profile, gummy smile, and incompetent lips. Intraoral examination revealed Angle’s Class II division 1 malocclusion with deep bite (80%), 10 mm overjet, crowding in the lower anterior region, mandibular midline deviated to right by 2 mm [Figure 1]. Cephalometric parameters are mentioned in Table 1. The final Adjunctive use of a surgical splint for leveling the curve of Spee following mandibular advancement. Natl J Maxillofac Surg 2022;13:130-5.
Table 1: Details of cephalometric parameters at various stages of treatment

| Parameters                        | Norm          | Pretreatment | Presurgical | Posttreatment |
|----------------------------------|---------------|--------------|-------------|--------------|
| SN length (mm)                   | 65.3±3.00     | 67           | 67          | 67           |
| Maxilla                          |               |              |             |              |
| SNA (°)                          | 81.31±3.59    | 85.5         | 86          | 86           |
| Maxillary length (mm)            | 44            | 49           | 49          | 49           |
| N to A point (mm)                | 0.00±3.1      | 2            | 3           | 3            |
| Mandible                         |               |              |             |              |
| SNB (°)                          | 77.72±3.46    | 80           | 80          | 82.5         |
| N to B point (mm)                | −10           | −6           | −5          | −2           |
| N to Pog (mm)                    | −6.84±5.56    | −4           | −3          | −1           |
| Mandibular length (mm)           | 69            | 74           | 74          | 79           |
| Maxillomandibular relationship   |               |              |             |              |
| ANB (°)                          | 3.64±1.60     | 5.5          | 6           | 3.5          |
| Wits (mm)                        | −1            | 4.5          | 4           | 3            |
| APP-BPP (mm)                     | 4.5           | 10           | 9           | 5            |
| Vertical relationship            |               |              |             |              |
| FMA (°)                          | 26.00±4.5     | 20           | 19          | 22           |
| SN-MP (°)                        | 33.00±6.03    | 28           | 27          | 29           |
| Y Axis (°)                       | 61.80±3.4     | 60           | 59          | 61           |
| Gonial angle (°)                 | 133.40±6.70   | 121          | 121         | 122          |
| J ratio (%)                      | 68.86±5.11    | 71           | 72          | 71           |
| Upper incisor                    |               |              |             |              |
| U1:SN (°)                        | 104.86±6.43   | 116          | 104         | 100          |
| U1:NA (mm)                       | 5.90±2.87     | 9            | 2           | 0            |
| U1:NA (°)                        | 23.50±6.79    | 30           | 18          | 14           |
| Lower incisor                    |               |              |             |              |
| IMPA (°)                         | 100.00±6.44   | 106          | 90          | 92           |
| L1:NB (mm)                       | 6.36±2.41     | 7            | 3           | 3            |
| L1:NB (°)                        | 27.77±5.94    | 33           | 16          | 21           |
| Inter-incisor angle (°)          | 128.80±9.76   | 112          | 141         | 142          |
| Soft-tissue parameter            |               |              |             |              |
| E-line: Upper lip (mm)           | −2−3          | 1.5          | 0           | −1.5         |
| E-line: Lower lip (mm)           | −1−2          | 4            | 3           | 1            |
| Nasolabial angle (°)             | 99.00±8.00    | 94           | 96          | 98           |
| Inter labial gap (mm)            | 0             | 5            | 0           | 0            |
| Lip strain (mm)                  | 0             | 2            | 0           | 0            |

diagnosis revealed Angle’s Class II division 1 malocclusion on Class II skeletal base associated with mandibular deficiency, normodivergent growth pattern, and proclined upper and lower incisors. Treatment plan involved extraction of all first premolars for the dentoalveolar decompensation and alignment of teeth followed by surgical mandibular advancement for the correction of underlying skeletal disharmony.

**Presurgical orthodontics**

The dentoalveolar decompensation was achieved by all first premolars’ extraction. The comprehensive orthodontic treatment involved preadjusted edgewise appliances (Roth prescription, 0.018” slot) for alignment and leveling of upper and lower arches. Proclination of upper and lower incisors and crowding in lower arch were resolved. Intrusion of upper anterior teeth was achieved with sequential use of 0.016,” 0.016 × 0.022,” and 0.017 × 0.025” stainless steel arch wires incorporating curve of Spee. A curve of Spee in lower arch was maintained, and well-coordinated upper and lower arches were prepared. After clinical and cephalometric assessment [Table 1] as well as coordinating the upper and lower study models, mandibular advancement with extrusion of posterior teeth was finalized. The presurgical orthodontics phase took approximately 15 months to achieve all the goals.

**Fabrication of surgical splint with modification**

Bite registration with 6 mm of mandibular advancement and 4 mm of bite opening in posterior segments was recorded with modeling wax. When the bite was registered, bilateral Class I canine and molar relation with coinciding midlines was achieved. The working models with construction bite were mounted on articulator with accurate replication of clinically
determined correct sagittal and vertical positioning of the mandible. The surgical splint was prepared using self-cure acrylic. The thickness of acrylic splint was kept sufficient to prevent its fracture. The occlusal splint was checked for any sharp points or edges and polished. The holes were prepared in posterior bite block on either side to secure the splint with upper arch wire using 0.01” stainless steel ligature after surgery. The final splint was checked in patient’s mouth before surgery [Figure 2].

Orthognathic surgery and postsurgical orthodontics
The BSSO was performed and the mandible was advanced using modified surgical splint. Once the advanced mandible is fixed with titanium bone plates, the intermaxillary fixation was released and occlusal splint was secured to upper 0.017 × 0.025” stainless steel arch wire with 0.010” stainless steel ligature.

After 1 week of mandibular advancement, the splint was removed and trimmed to create a clearance of 1–1.5 mm over the lower premolars and molars to allow the eruption of lower posteriors without developing lateral tongue thrusting. The splint was again secured to upper arch wire. The mandibular arch wire was sectioned distal to canines so that posterior teeth can erupt freely. The same procedure was continued in every 4 weeks till the lower posteriors contact with upper posteriors. The whole procedure took 4 months after mandibular advancement and then occlusion was finished and orthodontic appliances were removed. The treatment changes are shown in Figures 3 and 4. The postsurgical phase involved about 11 months for correction curve of Spee and finishing of the occlusion.

DISCUSSION
In nongrowing adult patients with significant skeletal jaw discrepancy, the goals of treatment are often difficult to achieve by orthodontics alone. [7,10] Thus, the combined approach of orthodontics along with surgery was considered in this case. Presurgical orthodontics involved all first premolar extractions for dentoalveolar decompensation, i.e., correction of gummy smile with intrusion of upper anterior teeth along with correction of crowding and proclination in lower anterior teeth. Presurgical decompensation accentuated the skeletal deformity which was necessary for achievement of normal occlusal relationship following sagittal advancement of retrognathic mandible. Upper and lower arches were coordinated to achieve a normal transverse relationship following mandibular advancement.

Mandibular anterior segmental subapical osteotomy could have been considered to correct the deep overbite. [10] However,
this treatment option was ruled out in this case due to reduced lower facial height and complexity of presurgical orthodontic preparation. In growing children undergoing functional appliance therapy, the decision to level the curve of Spee by intrusion of incisors or extrusion of the posteriors depends on the initial facial height of the individual. The same principle was followed in this case, the deep curve of Spee was maintained presurgically. As it is difficult to level the curve of Spee with vertical settling elastics alone, thus modified surgical splint was used to assist the extrusion of the mandibular posterior teeth, which was achieved with sequential trimming of the splint. Thus, it has effectively increased the lower facial height and also reduced the treatment duration.

The total treatment time was 26 months. Overall, the treatment was very much satisfactory to the patient. However, there was still excessive visibility gum on full smile. The patient was explained that the excessive visibility of the gum was due to over activity of upper lip muscles. Various treatment options such as surgical repositioning of upper lip and periodical injection of botulinum toxin were given to the patient. However, the patient was happy with his smile and refused for any further treatment.

CONCLUSION

The surgical splint used for the guidance of mandibular advancement can be used for the correction of deep bite. This method not only helps in controlling the sagittal and transverse dimensions, but also guides for simultaneous leveling of the mandibular occlusal plane which improves the lower facial height and thus the enhancement of facial aesthetics.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given
his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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