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Case Report

Interdisiplinary collaboration of orthodontics and oral and maxillofacial surgery for the correction of severe class III skeletal pattern in an adult male with an hapsburg jaw - A case report on surgical orthodontics

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ABSTRACT

This case report, aims to present a combined orthodontic and surgical approach in the treatment of an adult male patient with skeletal class III malocclusion with an Hapsburg jaw. The malocclusion was decompensated by pre-surgical orthodontic treatment and then normal jaw relationship was achieved by Bilateral Sagittal Split Osteotomy Setback followed by debonding after 4 months. The treatment lasted for over 14months, it improved facial esthetics and profile of the patient significantly and resulted in a normal occlusion, overjet, and overbite and a pleasant smile.

1. Introduction

Recently, the number of adults seeking orthodontic treatment has increased significantly.[1,2] Treatment alternatives of correction of a skeletal class III in adults are either Orthodontic camouflage or a Combined orthodontic-orthognathic surgical therapy. It eventually depends mainly upon the severity of the malocclusion[3,4] and the amount of needed tooth movements.[3,5] If the skeletal discrepancy[6] cannot be corrected by camouflage, any dental compensation may produce a reasonably good occlusion[7] but at the expense of compromised esthetics. For adult patients having severe orthodontic problems, surgery to realign the jaws or reposition dentoalveolar segments is the only possible treatment option left. One indication for surgery is a malocclusion so severe that it cannot be corrected by orthodontics alone.[8] Class III malocclusion patients frequently show a combinations of skeletal and dentoalveolar components. Many cephalometric pecularities have been reported in class III patients, such as an acute cranial base angle, a retrusive maxilla, proclined maxillary and retroclined mandibular incisors, an increased lower anterior face height and obtuse gonial angle.[9,10] Prevalence of class 3 malocclusion in caucasians ranges from 0.8% to 4.0% and increases up to 12-13% in Chinese and Japanese population, while in American population class 3 malocclusion ranges from 3-4% of the population.[9–11] The surgical correction of prognathism is a procedure that dates back more than 100 years. In[12] 1849 Hullihen described a technique for the correction of such a deformity. Since that time refinements of technique and

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various methods have[13] been described. At the turn of the century Blair published several articles on this particular subject. Interest in the subject and in the various techniques used in its correction became widespread. After[14,15] Blair, came reports from Kazanjian, Dingman,[16,17] Reiter," Caldwell and Letterman, Moose, and many others. This case report is about the integrated efforts of Orthodontics and Oral and Maxillofacial surgery in the correction of an adult male patient with Severe Class III Skeletal pattern with a Hapsburg jaw.

2. Case Report

An adult male patient aged 30 years presented at Smile and Shine Orthodontic Clinic, Pune, Maharashtra, India, with the chief complaint of forwardly placed lower jaw and a forwardly placed chin. He was very unsatisfied with his facial profile. He desired a straight profile. He had an unesthetic facial and dental appearance. However, the patient presented with no relevant medical or dental history and was himself internally motivated for the treatment with extreme desire to improve his facial aesthetics. He had a severe class 3 malocclusion with 4mm of reverse overjet and 1mm of reverse overbite.

2.1. Clinical examination

2.1.1. Extraorally

Patient presented with dolicocephalic, leptoprosopic with concave profile and an anterior divergent face. He showed a consonant smile arc, competent lips, everted lower lip with increased exposure of lower lip vermilion. He had a vertical growth pattern and there was increased visibility of incisors at smile and mandibular protrusion with maxillary retrusion and reduced malar prominence. Lateral view showed increased mandibular prognathism, with a concave profile, an everted and hypotonic lower lip, an average nasolabial angle, reduced labiomental fold, well-defined inferior border of the mandible, a long chin-throat length with and an acute lip-chin-throat angle with increased chin prominence

Fig. 1: Pre Treatment Extraoral

2.2. Intraorally

This patient presented with a Class III molar and canine relationship and a complete anterior crossbite, along with a reverse overjet of 4 mm and a complete anterior and posterior crossbite with evidence of maxillary arch constriction The patient showed the presence of a midline diastema between upper central incisors and had flared our anterior teeth which indicated the presence of a tongue thrusting habit. There was a lower midline shift to left by 3 mm, and the upper midline shift couldn't be assessed due to the presence of a midline diastema. There was presence of thick bands of fibrous gingival tissue between the central incisors. There was presence of minimal crowding in the lower anterior region with mild rotations in both arches.

Fig. 2: Pre Treatment Intraoral

2.3. List of problems

1. Prognathic mandible
2. Concave profile with skeletal class III pattern
3. Prominent chin
4. Angle's class III molar and canine relationship
5. Midline Diastema
6. Reverse overjet
7. Proclined upper and retroclined lower incisors
8. Non coincident midlines
9. Crowding in lower anterior region
10. Rotation of individual teeth

2.4. Treatment objective

1. To achieve class I skeletal and dental relation
2. To correct rotation of individual teeth
3. To achieve ideal overjet and overbite
4. To correct crowding in the lower arch
5. Achieving the ideal inclination of U/L incisors
6. To correct the dental midlines
7. To correct the midline diastema
8. To improve the patients smile
9. To improve the patients profile

Fig. 3: Pre treatment radiographs

2.5. Treatment plan

Pre-surgical orthodontics was performed followed by a bilateral surgical split osteotomy for mandibular setback was planned in order to achieved goals of facial aesthetics, functionally optimum occlusion, minimum trauma to the patient and to achieve a straight facial profile. Cephalometric analysis was performed with pretreatment radiographic records which included lateral cephalograms, orthopantomogram (OPG) and PA cephalogram. Radiographs revealed a Class III skeletal pattern with mandibular prognathism, increased vertical chin height, an increased maxillary dental and skeletal height and upper anterior proclination with lower anterior retroclination. After a combined clinic discussion with the Oral and Maxillofacial Surgeon, it was planned to perform a mandibular setback with bilateral sagittal split osteotomy (BSSO), with presurgical and postsurgical orthodontics to obtain facial aesthetics and an optimum functional occlusion. To relieve maxillary and mandibular crowding, presurgical extraction was not needed in this case and hence was not performed. Also one more unique feature was the although 3^{rd} molars were present in this patient, we did not find the need to extract them before surgery as enough space was available to perform the BSSO incision cuts. After discussion with the Oral & Maxillofacial surgeon, a mandibular setback of 6.0 mm was planned to achieve a class I molar and canines relationship and an esthetically pleasing profile .

Fig. 4: MID treatment extraoral after decompensation

2.6. Pre-surgical orthodontics

Pre-surgical orthodontics was done to achieve decompensation of the malocclusion. Firstly a 0.016 NiTi wire in upper and 0.014 NiTi in lower arch was placed, followed by 0.017x0.025 NiTi wires in upper and lower arch.

Both arches were aligned till 0.019 × 0.025 SS wire with 0.022 slot edgewise brackets. The lower incisors were decompensated by proclining them and the both arches were coordinated. An 0.021 X 0.025 inch S.S archwires were placed for stabilization 2 weeks before surgery

Fig. 5: MID treatment intraoral after decompensation

2.7. Pre surgical orthodontic objectives

1. Alignment and leveling of both arches
2. Decompensation of proclined upper incisors and retroclined lower incisors
3. To correct angulations of every tooth on their respective bases.

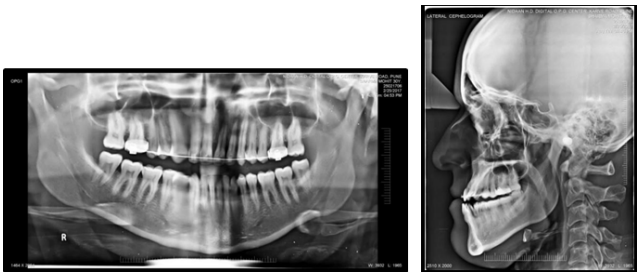

Fig. 6: MID treatment radiographs

2.8. Cephalometric Prediction Technique

Cephalometric prediction tracing was done both with computer image prediction software and also manually using the template method. In template method, maxillary and mandibular profiles were traced on an acetate paper. Then from these templates, trial sections were made and amount for osteotomy were detected.[18] Cut sections of both arches were fitted back to desired occlusal relation. At last, soft tissue outline in regard to the reference ratios were traced, and the postsurgical changes were evaluated. Computer-based analysis in which cephalometric landmarks were digitized and the surgical positioning was monitored was then done. Calculations, measurements and analyses weredone using cephalometric digital software.

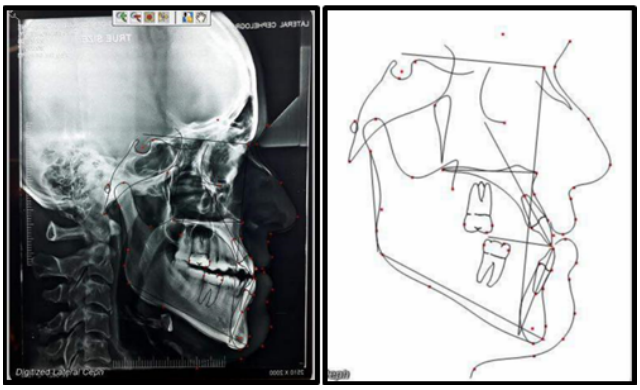

Fig. 7:

2.9. Mock surgery

Fabrication of occlusal splints with Model surgery for surgery was the next step in the planning sequence. Lower dental cast was then repositioned simulating the movement of the jaws as directed by digital and manual prediction. The final occlusal splint was then fabricated, based on this position. Both upper and lower dental casts were mounted on a semiadjustable articulator with the help of a facebow transfer and bite registration taken with the patient's jaws in the posteriorly retruded contact position also called the centric relation.

Fig. 8: Splint During Surgery

2.10. Surgical procedure

Retromolar posterior area was exposed and made visible using a modified third molar incision. A BSSO with short lingual split was done using surgical saws. Medial pterygoid muscle was detached by performing the split, with 6 mm of mandibular setback and 7° of counter-clockwise rotation, was achieved successfully. The BSSO setback was performed symmetrically thereby improved facial and dental symmetry. Rigid type fixations using

Fig. 9: Splint provided post surgery

fourhole miniplates and screws on both sides were used in both jaws. Intermaxillary elastics on braces were placed for 14 days in the immediate postoperative phase. Good bone healing and tolerance was seen. The goal was to achieve ideal occlusal relationships, with respect to canine and molar class, coincidence of the dental midlines and overjet and overbite. Cooperation of Patient was very good throughout the treatment. The splint and archwires with intermaxillary fixation done continued for three weeks and the patient was advised to use elastics. Cephalometric finding post treatment showed normal jaw relationship

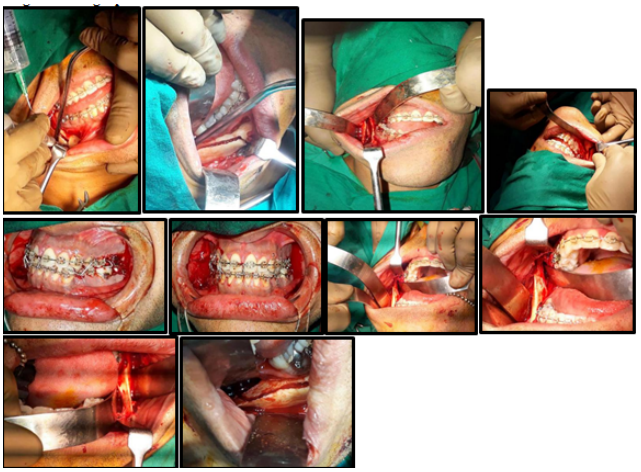

Fig. 10: Surgical Photographs

2.11. Surgical correction objectives

1. Mandibular setback of 5mm and rigid fixation with splints
2. To achieve optimal facial esthetics, and to obtain an optimal overbite-overbite relationship

2.12. Post-surgical orthodontics

Orthodontic treatment actively was resumed 4 weeks after surgery when a good range of jaw movement was achieved and good bone healing and tolerance was seen. The patient was observed closely after the surgery and was advised to perform opening as well as lateral jaw movements. Goal was to achieve an ideal occlusal relationship ideal overjet, ideal overbite and coincidence of the dental midlines. Detailing of occlusion was accomplished by settling using short inter-maxillary elastics. In postsurgical orthodontics the arch wires were changed from 0.017×0.025 NiTi to 0.019× 0.025 to 0.021× 0.025 in SS wires. Any residual diastema closure was achieved, and occlusion was perfected by segmental settling with short inter maxillary elastics. After approximately 4 months of treatment, fixed appliances were debonded and the post treatment retention phase was initiated with fixed retainer in both arches and additional removable retainer plate in upper arch was given. In both arches, a 0.018 inch multistranded coaxial 3-to-3 retainer was bonded. Post treatment radiographs were then taken and evaluated for treatment changes by superimposition.

Fig. 11: Post treatment radiographs

2.13. Post surgical orthodontic objectives

1. Settling of Occlusion
2. Finishing and detailing.

Fig. 12: Post surgical extraoral photographs

Fig. 13: Post surgical intraoral photographs

3. Discussion

This case report emphasizes on the treatment of an adult Indian male patient with dental and skeletal class III relationships. Surgical–orthodontic treatment for achieving an acceptable occlusion and a good esthetic result was the best option in this case. Rivera et al reported that patients underwent othognathic surgery to improve esthetic, functional problems. But, these benefits from the orthognathic surgery are not always realized.[19] Main reasons for not a very satisfactory treatment outcome could be relapse of surgical changes. It has been reported that the relapse following setback are one of the highest for a surgical procedure.[20–22] Establishing common objectives concerning the outcome of proposed surgical orthodontic therapy is a very important part of the treatment planning process. Hence an experienced multidisciplinary team approach delivers a satisfactory outcome.[23] Most relapse after setback surgery occurs during the postsurgical phase in the first two months following surgery. Similar findings were reported by Mobarak.[24] An additional minor relapse during the span from two months to a year after surgery. Minimal relapse beyond the first post-postoperative year, similar to that reported by Eggensperger et al was observed.[25] This rebound tendency affects not only the final occlusion, but also the facial esthetics. In Class III loer jaw setback surgery, many surgeons tend to push the segments backward during the fixation procedure. However this seems to be the main reason for the forward relapse of mandible in the majority of the mandibular setback surgery subjects. All the dental compensations are removed by presurgical orthodontics. After rigorous evaluation, presurgical phase of orthodontic intervention was initiated with the aim to achieve ideal inter- and intra-arch coordination, always keeping in mind the goals of the subsequent surgical repositioning.[18] Both manual and digital cephalometric predictions were employed in this case at the end of presurgical phase. Ideal skeletal relationship is achieved by surgical osteotomy and BSSO setback of the prognathic mandible. Postsurgical orthodontics guides the normal occlusal position by correcting any emerging dental discrepancies.[18] Post-surgical orthodontics was done in this case for 4 months, and it primarily involved finalization of the occlusion and retention. The duration of the final orthodontic phase greatly depends on the degree of preparation achieved during pre-surgical treatment. Good dental retention is a very important contributor to

Table 1: Cephalometric Values

Variable	Pre-treatment	Post-treatment	Change	One year follow-up
SNA	83°	82°	-1°	82°
SNB	84°	79°	-5°	79°
ANB	-2°	2°	4°	2°
WITS	-8mm	2mm	10mm	2mm
N ⊥ Pt A	1mm	0mm	-1mm	0mm
N ⊥ POG	4 mm	-4 mm	-8 mm	-4 mm
Angle of inclination	85°	85°	0°	85°
Go-Gn to SN	32.5°	32°	-0.5°	32°
Eff. Max. Length	91 mm	89 mm	-2 mm	89 mm
Eff. Man. Length	128 mm	121 mm	-7 mm	121 mm
Y- Axis	67°	69°	+2°	69°
Facial axis	-2°	-3°	-1°	-3°
Upper incisor – NA	22 mm	15 mm	-7 mm	15 mm
Upper incisor – NA	53.5°	32°	-21.5°	32°
Upper incisor – SN	130°	113°	-17°	113°
Upper incisor to maxillary plane angle	138°	120°	-18°	120°
Lower incisor to mandibular plane angle	101°	94°	-7°	94°
Lower incisor to NB	15 mm	8 mm	-7 mm	8 mm
Lower incisor to NB	38°	27°	-11°	27°
Interincisal angle	94°	127°	+33°	127°
Maxillary mandibular planes angle	32°	27°	0°	27°
Upper anterior face height	55 mm	58 mm	+3 mm	58 mm
Lower anterior face height	81 mm	77.5 mm	-3.5 mm	80 mm
Face height ratio	46%	47%	+1%	47%
Lower incisor to APo line	19 mm	7 mm	-12 mm	7 mm
Lower lip to Ricketts E Plane	10 mm	3 mm	-7 mm	3 mm

retain the final occlusion that was achieved surgically, ensuring occlusal stability, which will surely have positive repercussions on the final tissue stability. The facial changes that resulted from the treatment were pronounced and greatly improved the patient's self image. One year after retention, extra-and intraoral photographs indicated that the treatment results were stable.

Fig. 14: Post treatment extraoral photographs

Fig. 15: Post surgical intraoral photographs

4. Results

4.1. Skeletal changes

There was a reduction in the SNB angle and mandibular length with improvement of profile on lateral cephalogram.

4.2. Dental changes

Midline diastema was corrected, class I molar and canine relation was achieved, crowding was relieved, optimal overbite and overjet were achieved and all spaces were closed.

4.3. Radiographic changes

Cephalometrically, a significant decrease in mandible by -5 degrees (SNA- 84 degrees to 79 degrees), ANB angle (2 degrees), WITS analysis showed a significant improvement from -8mm to 2mm and it remained constant even 1

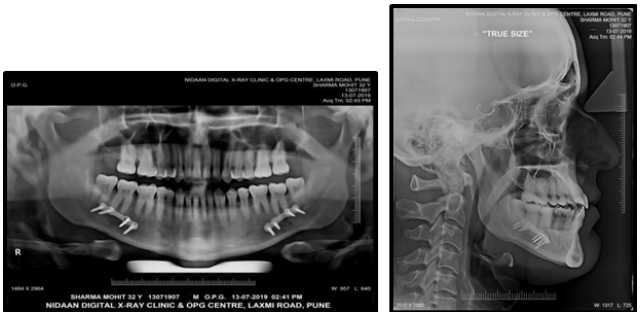

Fig. 17: One year follow up radiographs

Fig. 18: One year follow up extraoral photographs

year post treatment. Main finding wa a change in the effective mandibular length from 128 mm to 121 mm. Growth improvement was seen in the Y axis value which changed from 67 degree to 69 degrees. Upper incisor proclination changed from 22mm to 15 mm and from 53.5 degree to 32 degree. Lower incisor proclination changed from 14mm to 8 mm and from 39 degree to 27 degree. Interincisal angle changed from 94 degrees to 127degrees, thus significantly decreasing the proclination and the increased lower anterior facial height reduced from 80 mm to 77.5mm. The maxillomandibular plane angle changed from 32 degree to 27degree. Cephalometrically, following changes were observed— A superimposition of the pre- and post treatment cephalometric tracings shows the decrease in proclination of upper and lower anterior teeth with a normal inter-incisal angle. The shortening of mandible due to BSSO setback can also be seen. Acceptable root parallelism was achieved and bone loss did not occur

4.4. Soft tissue changes

The procumbent lower lip before treatment was changed into ideal form, nasolabial angle improved, chin throat angle improved, facial profile was changed to a straight profile and the aim of achieving a pleasing smile and profile was achieved. All pretreatment objectives were met in this case. The facial appearance was improved as a result of both skeletal and dental changes and class I skeletal relationship was achieved at the end of surgical and orthodontic treatment.

Fig. 16: Pre and post comparison

5. Conclusion

It is very Imperative that Class III discrepancy be diagnosed and evaluated according to its etiology and treatment be done with appropriate surgery, including not only mandibular surgery, but also maxillary surgery, in order to attain a normal facial profile. As orthodontics progressesto develop techically and wholely, we do expect that advances in diagnosis and treatment planning are inevitable.[26]Duration of final treatment phase depends on the amount of preparation that is achieved during presurgical phase of treatment.[27] It is important however to emphasize that good retention does contribute to maintaining the appropriate occlusion that is achieved surgically, ensuring and guaranteeing the occlusal stability, which will surely have positive repercussions on the final tissue stability.

6. Source of Funding

None.

7. Conflict of Interest

None.

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