Therapeutic extraction of premolars for correction of severe CROWDING - A case report on orthodontic camouflage

Bhushan Jawale¹, Lishoy Rodrigues^{2*}, Shrinivas Ashtekar³, Srinivas Basavreddy⁴, Anand Ambekar⁵

^{1,5}Professor, ²Post Graduate Student, ³Principal Professor and HOD, ⁴HOD and Professor, ¹⁻⁵Dept of Orthodontics and Dentofacial Orthopedics, ^{1,2}Sinhgad Dental College and Hospital, Vadgaon Bk, Pune, Maharashtra, ³VPDC Dental College and Hospital, Sangli, Maharashtra, ⁴SDM Dental College and Hospital, Dharwad, ⁵MIDSR Dental College and Hospital, Latur, Maharashtra, Karnataka, India

Corresponding Author: Lishoy Rodrigues

Email: lishoy95@gmail.com

Abstract

This case report evaluates the management of bimaxillary dentoalveolar protrusion in a female patient with a Class II malocclusion. The case required extraction of 1st premolars for correction of the proclined and forwardly placed upper and lower front teeth and also for correction of crowding in upper and lower front teeth. Clinical and cephalometric evaluation revealed skeletal Class II malocclusion with crowding and a convex facial profile, an average to vertical growth pattern, potentially incompetent lips, a posterior divergent face, increased overjet and average overbite. Following fixed orthodontic treatment by removal of 1st premolars in the upper and lower arch with retraction of anterior segment, a marked improvement in patient's smile, facial profile and occlusion was achieved and there was a remarkable increase in the patient's confidence and quality of life. The profile changes and treatment results were demonstrated with proper case selection and good patient cooperation with Fixed appliance therapy.

Keywords: Therapeutic Extractions, Severe Crowding, Bimaxillary Dentoalveolar Protrusion, Class II malocclusion, Fixed Orthodontic treatment, 1st Premolar Extraction, Orthodontic Camouflage.

Introduction

Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Class II malocclusion is more prevalent than any type of malocclusion. The number of adults seeking orthodontic treatment has increased significantly.^[1,2] Treatment alternatives of correction of a bimaxillary dentoalveolar protrusion are either Orthodontic camouflage by extraction of premolars 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 occlusion⁷ 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] Over the last few decades, there are increased number of adults who have become aware of orthodontic treatment and are demanding high quality treatment, in the shortest possible time with increased efficiency and reduced costs. Class II malocclusion patients frequently show a combinations of skeletal and dentoalveolar components. Many cephalometric peculiarities have been reported in class II patients, such as a prognathic maxilla and mandible, proclined maxillary and mandibular incisors, an increased lower anterior face height and obtuse gonial angle.^[9,10] Prevalence of class II

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 II malocclusion ranges from 3-4% of the population.^[9-11] The correction of bimaxillary prognathism is a procedure that dates back more than 10 decades. In^[12] 1849 Hullihen described a technique for the correction of such a deformity. Since that time refinements of technique and 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 presents the correction of a Bimaxillary dentoalveolar protrusion with a Class II malocclusion in an adult female patient with severe crowding and severely proclined maxillary and mandibular anterior teeth merely simply by executing extraction of maxillary and mandibular 1st premolars. The Extraction protocol shown in this case is indicative of how a convex unesthetic facial profile can be converted into an Orthognathic pleasant profile by routine fixed Orthodontic treatment with extraction of 4 premolars followed by retraction and closure of spaces.

Case Report

Extra-oral examination

A 25 year old female patient presented with the chief complaint of forwardly placed upper and lower front teeth and excessive show of front teeth. On Extraoral

examination, the patient had a convex facial profile, grossly symmetrical face on both sides with a retruded chin, potentially incompetent lips, moderately deep mentolabial sulcus and an acute Nasolabial Angle, a Leptoprosopic facial form, Dolicocephalic head form, average width of nose and mouth, minimal buccal corridor space, a consonant smile arc and slightly anterior divergence of face. The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. On Smiling, there was excessive show of maxillary anterior teeth. The patient had a toothy smile. On smiling she also showed the presence of crowded anterior dentition and an unaesthetic facial profile and smile. The patient was very dissatisfied with her smile.

Fig. 1: Pre treatment extra-oral photographs

Intra-Oral Examination

Intraoral examination on frontal view shows presence of an increased overjet and an average overbite with the lower dental midline shifted slightly to the right of the patient by 1mm. On lateral view the patient shows the presence of Class II incisor relationship, an End-on Canine relationship bilaterally and an End-on molar relationship bilaterally. There is crowding in the upper and lower anterior region with proclined and forwardly placed upper and lower anterior teeth. The upper and lower arch shows the presence of a U shaped arch form.

Fig. 2: Pre treatment intra-oral photographs

Pre treatment cephalometric readings

Parameters	Pre- treatment
SNA	84°
SNB	81°
ANB	3°
WITS	2mm
Max. Length	86mm
Man. Length	99mm
IMPA	118°
Nasolabial Angle	87°
U1 TO NA Degrees	44°
U1 TO NA mm	9mm
L1 TO NB Degrees	39°
L1 TO NB mm	8mm
U1/L1 Angle	103°
FMA	27°
Y AXIS	72°

1. Steiners analysis shows a prognathic maxilla and mandible, Class II Skeletal pattern, an average to vertical growth pattern, proclined maxillary and mandibular anteriors, forwardly placed maxillary and mandibular anteriors and protrusive upper and lower lips.
2. Tweeds analysis shows an average to vertical growth pattern and proclined mandibular incisors
3. Wits appraisal shows AO ahead of BO by 2mm indicating Skeletal Class II pattern
4. Rickett's analysis shows a vertical growth pattern, averagely positioned condyles and proclined maxillary and mandibular anteriors
5. McNamara analysis shows a prognathic maxilla and mandible, an average growth pattern, average lower anterior facial height, an acute Nasolabial Angle and proclined maxillary and mandibular incisors
6. Rakosi Jaraback analysis shows an average to vertical growth pattern and proclined maxillary and mandibular incisors
7. Holdaway soft tissue analysis shows increased maxillary and mandibular sulcus depth and increased strain of lips along with a retruded chin position
8. Downs analysis shows a Class II Skeletal pattern, an average to vertical growth pattern and proclined maxillary and mandibular anterior teeth

Diagnosis

This 25 year old female patient was diagnosed with a II malocclusion with a prognathic maxilla and mandible and an average to vertical growth pattern, increased overjet and average overbite, proclined upper and lower incisors, crowding in the upper and lower anterior region, protruded upper and lower lips, a retruded chin, moderately deep mentolabial sulcus, potentially incompetent lips and a convex facial profile.

List of problems

1. Proclined maxillary and mandibular anterior teeth

2. Crowding in maxillary and mandibular anterior region
3. Prognathic maxilla and mandible
4. Convex facial profile
5. Retruded chin
6. Decreased Nasolabial angle
7. Potentially Incompetent lips
8. Increased lip strain
9. Non coincident dental midlines

Treatment objectives

1. To correct proclined maxillary and mandibular anterior teeth
2. To correct crowding in the maxillary and mandibular anterior teeth
3. To correct maxillary and mandibular prognathism
4. To correct the posterior divergence of face
5. To correct the retruded chin position
6. To correct the decreased Nasolabial angle
7. To correct the dental midlines
8. To decrease the lip strain
9. To achieve a pleasing smile and a pleasing profile

Treatment plan

1. Extraction of 14, 24, 34 and 44
2. Fixed appliance therapy with MBT 0.022 inch bracket slot
3. Initial leveling and alignment with 0.012", 0.014", 0.016", 0.018", 0.020" Niti archwires following sequence A of MBT
4. Retraction and closure of spaces by use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. Absolute anchorage in the upper arch with the help of interraderic implants between 15, 16 and 25,26
5. Buccal and palatal Interraderic implants between 15 and 16 for correction of occlusal cant
6. Final finishing and detailing with 0.014" round stainless steel wires
7. Retention by means of Begg's Wrap-around retainers along with lingual bonded retainers in the upper and lower arch.

Treatment Progress

Complete bonding & banding in both maxillary and mandibular arch done, using MBT-0.022X0.028" slot. Initially a 0.012" NiTi wire was used which was followed by 0.014, 0.016", 0.018", 0.020" Niti archwires following sequence A of MBT. After 6 months of alignment and leveling NiTi round wires were discontinued. Retraction and closure of spaces was then started by use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires. Reverse curve of spee in the lower arch and exaggerated curve of spee in the upper arch was incorporated in the heavy archwires to prevent the excessive bite deepening during retraction process and also to maintain the normal overjet and overbite. Anchorage was conserved in the upper arch by using absolute anchorage with the help of orthodontic mini-implants and light

retraction forces were applied constantly monitoring molar relation and getting it into a Class I from and End-on relation. This was achieved by using absolute anchorage in the upper arch and a group A anchorage in the lower arch. Varying anchorage is the most important step in an extraction case wherein anchorage conservation is of utmost importance. Retraction and closure of spaces was done with the help of Elastomeric chains delivering light continuous forces and replaced after every 4 weeks due to force decay and reduction in its activity. Finally light settling elastics were given with rectangular steel wires in lower arch and 0.012" light NiTi wire in upper arch for settling, finishing, detailing and proper intercuspation. The increased overjet was corrected with an ideal occlusion at the end of the fixed appliance therapy. Also the profile of the patient improved significantly from being convex to now more Orthognathic with a pleasant and consonant smile arc on smiling. Also, the Nasolabial angle improved significantly at the end of treatment.

Post treatment cephalometric readings

Parameters	Post-treatment
SNA	83°
SNB	81°
ANB	2°
WITS	1.5mm
Max. Length	84mm
Man. Length	100mm
IMPA	94°
Nasolabial Angle	105°
U1 TO NA Degrees	24°
U1 TO NA mm	2mm
L1 TO NB Degrees	25°
L1 TO NB mm	2mm
U1/L1 ANGLE	132°
FMA	26°
Y AXIS	69°

Fig. 3: Post treatment extra-oral photographs

Fig. 4: Post treatment intra-oral photographs

Discussion

Treatment of a moderately crowded Class II malocclusion with extractions of all 1st premolars is challenging. A well-chosen individualized treatment plan, undertaken with sound biomechanical principles and appropriate control of orthodontic mechanics to execute the plan is the surest way to achieve predictable results with minimal side effects. Class II malocclusion with Bimaxillary Dentoalveolar protrusion might have any number of a combination of the skeletal and dental component. Hence, identifying and understanding the etiology and expression of Class II malocclusion and identifying differential diagnosis is helpful for its correction. The patient's chief complaint was forwardly placed upper and lower front teeth with excessive show of front teeth. The case was of a clearcut bimaxillary dentoalveolar protrusion with severely proclined upper and lower anterior dentition. The selection of orthodontic fixed appliances is dependent upon several factors which can be categorized into patient factors, such as age and compliance, and clinical factors, such as preference/familiarity and laboratory facilities. The execution of all 1st premolar extraction followed by Fixed appliance therapy appropriately resulted in an improvement in the patient's convex profile in this case. The most important point to be highlighted here is the decision to extract the premolars. After analysing the case thoroughly and reading all pretreatment cephalometric parameters along with evaluating the patients profile clinically, a decision was made of extracting the 1st premolars. Proximal stripping with retraction and closure of spaces could not be executed in this case as this would not address all the patient problems at the end of the treatment. The patient had excessive proclination of maxillary and mandibular anterior teeth along with crowding in the upper and lower arch. Also the patient had a convex profile with an acute nasolabial angle and a severely decreased Interincisal angle. All these

findings made it essentially imperative to extract all 1st premolars. This case could not be managed by non-extraction or proximal stripping. Extractions also very efficiently improved the patients profile changing it from being convex to more orthognathic at the end of the treatment. There was improvement in occlusion, smile arc, profile and position of chin. Successful results were obtained after the fixed MBT appliance therapy within a stipulated period of time. The overall treatment time was 16 months. After this active treatment phase, the profile of this 25 year old female patient improved significantly as seen in the post treatment Extra oral photographs. Removable Begg's retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch.

Comparison of pre and post treatment cephalometric readings

Parameters	Pre-treatment	Post-treatment
SNA	84°	83°
SNB	81°	81°
ANB	3°	2°
WITS	2mm	1.5mm
Max. Length	86mm	84mm
Man. Length	99mm	100mm
IMPA	118°	94°
Nasolabial Angle	87°	105°
U1 TO NA Degrees	44°	24°
U1 TO NA mm	9mm	2mm
L1 TO NB Degrees	39°	25°
L1 TO NB mm	8mm	2mm
U1/L1 Angle	103°	132°
FMA	27°	26°
Y AXIS	72°	69°

Fig. 5: Profile changes after treatment

Conclusion

This case report shows how Bimaxillary Dentoalveolar Protrusion case can be managed with Extraction of 4 premolars by means of appropriate use of simplified fixed orthodontic treatment and efficient conservation of

anchorage at the same time. The planned goals set in the pretreatment plan were successfully attained. Good intercuspation of the teeth was achieved with a Class I molar, incisor and canine relationship. Treatment of the proclined and forwardly placed upper and lower anterior teeth included the retraction and retroclination of maxillary and mandibular incisors with a resultant decrease in soft tissue procumbency and facial convexity. The profile changed from convex to orthognathic. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. Patient had an improved smile and profile. The correction of the malocclusion was achieved, with a significant improvement in the patient aesthetics and self-esteem. The patient was very satisfied with the result of the treatment.

Funding

None.

Conflict of Interest

None.

References

- Boyd RL, Leggott PJ, Quinn RS, Eakle WS, Chambers D. periodontal implications of orthodontic treatment in adults with reduced or normal periodontal tissues versus those of adolescents. *Am J Orthod Dentofacial Orthop.* 1989;96:191-8.
- Gottlieb EL, Nelson AH, Vogels DS. 1990 JCO study of orthodontic diagnosis and treatment procedures. Part 1: Results and trends. *J Clin Orthod.* 1991;25:145-56.
- Bailey LJ, White R Jr. Assessment of patient for orthognathic surgery. *Semin Orthod.* 1999;5:209-222.
- Tulloch Jf, Lenz BE, Phillips C. Surgical Versus orthodontic correction for class II patients: age and severity in treatment planning and treatment outcome. *Semin Orthod.* 1977;72:1-22.
- Graber TM, Vanarsdall RL, Vig KWL. Orthodontics. Current principles and techniques edn. 3. St Louis: Mosby, 2000.
- Proffit WR, White RP Jr. Who needs surgical-orthodontic treatment ?. *Int J Adult Orthodon Orthognath Surg.* 1990;5:81-89
- Turvey Ta Orthognathic surgery: A significant contribution to facial and dental esthetics. *J Am Dent Assoc.* 1998;117:49e-55e.
- Trivedi B, Mahadevia S, Shah R, Thakker D. Combined Orthodontic and Surgical Approach in an Adult Patient with Skeletal Class III Malocclusion. *J Adv Oral Res.* 2014;5(3):24-7.
- Kharbanda OP, Sidhu SS, Sundaram KR, Shukla DK. Prevalence of malocclusion and its traits in Delhi children. *J Indian Orthod Soc.* 1995;26:98-103.
- Ishii N, Deguchi T, Hunt NP. Craniofacial differences between Japanese and British Caucasian females with a skeletal Class III malocclusion. *Eur J Orthod.* 2002;24:493-9.
- Lew KK, Foong WC. Horizontal skeletal typing in an ethnic chinesepopulation with true class 3 malocclusion. *Br Orthod.* 1993;20:19-23
- Hullihen, S. P.: Case of Elongation of the Under Jaw and Distortion of the Face and Neck, Caused by a Burn, Successfully Treated. *Am J D SC.* 1849;9:157.
- Blair VP. Operations on the Jaw-bone and Face, Surg. *Gynec Obst.* 4: 67, 1907.
- Kazanjian VH. Treatment of Mandibular Prognathism With Special Reference to Edentulous Patients. *Oral Surg, Oral Med Oral Path.* 1951;4:680.
- Dingman R0. Surgical Correction of Mandibular Prognathism, an Improved Method. *Am J Orthodontics Oral Surg.* 1944;30:683.
- Edward R. Surgical Correction of Mandibular Prognathism. *Alpha Omegan.* 1951;45:104.
- Caldwell, Jack B, Letterman GS. Vertical Osteotomy in the Mandibular Rami for Correction of Prognathism, *J Oral Surg.* 1954;12:185.
- Smith JD, Thomas PM, Proffit WR, "A comparison of current prediction imaging programs," *Am J Orthod Dentofac Orthop.* 2004;125(5):527-36.
- Rivera SM, Hatch JP, Dolce C, Bays RA, Van Sickels JE, Rugh JD et al. Patients' own reasons and patient-perceived recommendations for orthognathic surgery. *Am J Orthod Dentofacial Orthop.* 2000;118:134-41.
- Proffit WR, Philips C, Dann C, Turvey TA. Stability after surgical orthodontic correction of skeletal Class III malocclusion. I. Mandibular setback. *Int J Adult Orthodon Orthognath Surg.* 1991;6:7-18.
- Proffit WR, Philips C, Turvey TA. Stability after surgical orthodontic correction of skeletal Class III malocclusion. III. Combined maxillary and mandibular procedures. *Int J Adult Orthodon Orthognath Surg.* 1991;4:211-25.
- Bailey LJ, Cevidanes LH, Proffit WR. Stability and predictability of orthognathic surgery. *Am J Orthod Dentofacial Orthop.* 2004;126(3):273-7.
- Kiran J, Isaac A, Shanthraj R, Madannagowda S. Surgical-orthodontic treatment of Class I malocclusion with maxillary vertical excess--a case report. *Int J Orthod (Milwaukee, Wis.).* 2012;23(2):57-62.
- Bjork A, Skieller V. Normal and abnormal growth of the mandible. A synthesis of longitudinal cephalometric implant studies over a period of 25 years. *Eur J Orthod.* 1983;5:41-3.
- Eggensperger N, Raditsch T, Taghizadeh F, Iizuka T. Mandibular setback by sagittal ramus osteotomy: a 12-year follow-up. *Acta Odontol Scan.* 2005;63:183-8.
- Cho HJ. Long-term stability of surgical mandibular setback. *Angle Orthod.* 2007;77(5):851-6.
- Viswapurna PS, Al Hashmi A. Orthodontic surgical treatment of a skeletal class iii malocclusion.
- Luther F, Morris DO, Karnezi K, "Orthodontic treatment following orthognathic surgery: how long does it take and why? A retrospective study," *J Oral Maxillofac Surg.* 2007;65(10):1969-76.