RESEARCH ARTICLE

MANAGEMENT OF A BORDERLINE EXTRACTION CASE OF A FEMALE PATIENT HAVING A MIDFACE DEFICIENCY BY NON EXTRACTION PROTOCOL WITH PROXIMAL STRIPPING FOR PROFILE IMPROVEMENT AND SMILE ARC CORRECTION- A CASE REPORT

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Abstract
Class I malocclusion is one of the most common problems around the globe affecting around one-third of the patients who come for orthodontic treatment. This case report evaluates the management of Class I malocclusion with crowded dentition in a female patient have a retragnathic and deficient maxilla, with the help of proximal stripping of upper and lower anterior region followed by retraction and closure of spaces. This modality of treatment helped in camouflaging the prognathic looking dentition due to the underlying midface deficiency with the help of Proximal stripping stripping, thus eliminating the need for extractions to mask the defect. Clinical and cephalometric evaluation revealed skeletal Class I malocclusion with severe maxillary incisor proclination, concave to orthognathic facial profile, decreased mandibular plane angle, competent lips, increased overjet and overbite. Following fixed orthodontic treatment, marked improvement in patient's smile and facial profile were 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.

Introduction:
Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Class I malocclusion is more prevalent than any type of malocclusion after Class II malocclusion.¹ ² 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.³ Class I malocclusions can be treated by several means, according to the characteristics associated with the problem, such as anteroposterior discrepancy, age, and patient compliance.⁴ ⁵ The indications for extractions in orthodontic practice have historically been controversial.⁶ ⁷ On the other hand, correction of Class II div.1 malocclusions in nongrowing patients, with subsequent dental camouflage to mask the skeletal discrepancy, can
involves either retraction by non extraction means simply by utilizing the available spaces or by extractions of premolars.\textsuperscript{(9-10)} The extraction of 4 premolars is generally indicated when there is crowding or cephalometric discrepancy in the maxillary and mandibular arch.\textsuperscript{(11-12)} But fortunately some time with suitable mechanotherapy, satisfactory results with an amazing degree of correction can be achieved without extraction of permanent premolars. This is when, Proximal Stripping comes into play frequently. This case presents the correction of a Class I Crowded malocclusion in an adult female patient have a midface deficiency, with increased overjet, overbite and a bimaxillary protrusion merely simply by executing a non extraction protocol by proximal stripping of upper and lower anterior dentition followed by retraction and closure of spaces. The Non Extraction protocol shown in this case is indicative of how a borderline extraction case can be converted into a non extraction case by routine Fixed Orthodontic treatment, just by employing minimal proximal stripping to mask the discrepancy.

**Case Report:**

**Extra-Oral Examination**

A 18 year old female patient presented with the chief complaint of forwardly placed upper front teeth and malaligned upper front teeth. On Extraoral examination, the patient had a merely concave to Orthognathicfacial profile, grossly symmetrical face on both sides, competent lips, moderately deep mentolabial sulcus and a slightly decreased Nasolabial Angle, a Leptoprosopic facial form, Dolicocephalic head form, Average width of nose and mouth, minimal buccal corridor space, an unaesthetic, nonconsonant, flat smile arc and slightly anterior divergence of face. The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. However the patient presented with malar deficiency and increased visibility of sclera, thus indicative of maxillary deficiency. On Smiling, there was complete show of maxillary anterior teeth. However, mandibular teeth were not visible on smile.

**Pre Treatment Extraoral Photographs**

![Extraoral Photographs](image)

**Intra-Oral Examination**

Intraoral examination on frontal view shows presence of overlapping incisors, crowded anterior dentition, a deep overbite with almost coinciding upper and lower dental midlines. On lateral view the patient shows the presence of Class II div 1 incisor relationship, a Class I Canine relationship on both sides and a Class I molar relationship Bilaterally. Patient showed presence of a proclined left central incisor and retroclined right central incisor. Patient has an overjet of 4 mm and an overbite of 3 mm. The upper and lower arch shows the presence of a V shaped arch form and both upper and lower anterior region show flared out anterior teeth indicative of a bimaxillary dentoalveolar protrusion. OPG of the patient shows presence of all four 3rd molars in a developing stage. Lateral cephalogram is clearly indicative of proclined upper and lower anterior dentition again indicative of a Bimaxillary protrusion.
Pre Treatment Intraoral Photographs

Photographic Analysis:

**EXTRA-ORAL EXAMINATION**

- Grossly symmetrical
- Leptocephalic
- Dolicocephalic
- Average width of the nose and mouth
- Competant lips
- Smile arc: Flat
- Upper midline: coincident with the facial midline and lower midline

FRONTAL VIEW: SMILING

Profile: Straight
Lips: Competent
Nasolabial Angle: 98 degree
**Pre Treatment X-Rays**

![Pre Treatment X-Rays Image]

**STEINER’S ANALYSIS**

| Measurement           | Mean | Pre Rx | Inference                        |
|-----------------------|------|--------|----------------------------------|
| SNA                   | 82°  | 80°    | Average                          |
| SNB                   | 80°  |        | Average                          |
| ANB                   | 2°   | -1°    | Average                          |
| Go-Gn to Sn           | 32°  | 19°    | Horizontal growth pattern        |
| U1 to NA angle        | 22°  | 43°    | Proclined max incisors           |
| U1 to NA mm           | 4mm  | 7mm    | Forwardly placed max incisors    |
| L1 to NB angle        | 25°  | 25°    | Average                          |
| L1 to NB mm           | 4mm  | 4mm    | Average                          |
| Interincisal angle    | 130° | 114°   | Proclined upper and lower anterior |
| Occlusal plane - SN   | 14°  | 11°    | Horizontal growth pattern        |
| 'S' Line U Lip        | 0mm  | 1mm    | Average                          |
| 'S' Line L Lip        | 0mm  | 0mm    | Average                          |
### Tweeds Analysis

| Measurement | Mean | Pre Rx | Inference               |
|-------------|------|--------|-------------------------|
| FMA         | 25°  | 18°    | Horizontal growth pattern |
| FMIA        | 65°  | 65°    |                         |
| IMPA        | 90°  | 95°    | Proclined lower incisors |

**Wits appraisal:**
BO ahead of AO by 1 mm indicating mild anteroposterior skeletal discrepancy

### Ricketts Analysis

| Measurement | Mean (for 9 yrs) | Pre Rx | Inference               |
|-------------|------------------|--------|-------------------------|
| Facial axis(Ba-Na to Pt-Gn) | 90± 3.5° | 87°    | Average                 |
| Facial angle(N-pg to FH)     | 87± 3°    | 87°    | Average                 |
| Mandibular plane angle       | 26± 4.5°  | 16°    | Horizontal growth pattern |
| Convexity at Pt.A            | 2± 2mm    | 3 mm   | Average maxilla         |
| L1 to A - Pg                 | 1± 2 mm   | 2 mm   | Average                 |
| U6 to Ptn                    | Age + 3 yrs | 20 mm |                        |
| L1 inclination(1 to A-Pog)   | 22± 4°    | 26°    | Average                 |
| Lower lip to E plane(Pog-Pn) | 2 ±2 mm  | 1 mm   | Average                 |
## MC NAMARA ANALYSIS

| Measurement                                      | Mean   | Pre Rx | Inference                     |
|--------------------------------------------------|--------|--------|-------------------------------|
| N perp - A                                       | 0 - 1mm| 1 mm   | Average                       |
| N perp to Pog                                     | 0-4 mm | 4mm    | Average                       |
| Facial axis angle (Ptm-Gn)-(Ba-Na)               | 0± 3.5°| 3°     | Average                       |
| Mand. Plane angle (FH-GoMe)                      | 22 ± 4°| 17°    | Horizontal growth pattern     |
| Eff. Maxillary Length (Co-A)                     | 75 mm  |        | Reduced                       |
| Eff. Mandibular Length (Co-Gn)                   | 99 mm  |        | Reduced                       |
| Maxillomandibular differential                   | 24 mm  |        | Reduced                       |
| Lower ant. Facial ht (ANS-Me)                    | 50 mm  |        | Reduced                       |
| U1 to Pt. A                                      | 4.6 mm | 5 mm   | Average                       |
| L1 to A-Pog                                      | 1.3 mm | 2 mm   | Average                       |
| Nasolabial angle                                 | 102 ± 8°| 98°    | Average                       |
| Pharyngeal analysis U                            | 15-20  | 20 mm  | Adequate upper and lower airway passage |
|                                               |        | 11-14  | Average                       |

## RAKOSI JARABAK ANALYSIS

| Measurement                                      | Mean   | Pre Rx | Inference                     |
|--------------------------------------------------|--------|--------|-------------------------------|
| Saddle angle                                     | 123± 5°| 127°   | Average                       |
| Articular angle                                  | 143± 6°| 137°   | Average                       |
| Gonial angle                                     | 128± 7°| 121°   | Average                       |
| Upper gonial angle                               | 52-55° | 55°    | Average                       |
| Lower gonial angle                               | 70-75° | 63°    | Horizontal growth pattern     |
| Sum of posterior angles                          | 396± 6°| 385°   | Horizontal growth pattern     |
| Mandibular plane angle                           | 32°    | 17°    | Horizontal growth pattern     |
| Angle of Inclination                             | 85°    | 85°    | Average                       |
| Basal plane angle                                | 25°    | 14°    | Horizontal growth pattern     |
| Palatal plane to occlusal plane                  | 11°    | 6°     | Horizontal growth pattern     |
| Occlusal plane to MP                             | 14°    | 8°     | Horizontal growth pattern     |
| Post to Ant. Face ht. ratio                      | 62-65% | 74,46 %| Horizontal growth pattern     |
| Y - axis (FH-SeGn)                               | 66°    | 57°    | Horizontal growth pattern     |
| U1 - SN                                          | 102± 2°| 122°   | Increased                     |
| U1-Palatal plane                                 | 70±5   | 50°    | Proclined max incisors        |
| L1 - MP                                          | 90± 3° | 95°    | Average                       |
### Pre Treatment Cephalometric Summary

| PARAMETERS       | PRE-TREATMENT |
|------------------|---------------|
| SNA              | 80°           |
| SNB              | 81°           |
| ANB              | -1°           |
| WITS             | 1mm (BO ahead of AO) |
| MAX. LENGTH      | 75mm          |
| MAN. LENGTH      | 99mm          |
| IMPA             | 95°           |
Diagnosis
This 18 years old female patient is diagnosed with a Retrognathic maxilla, a Class I skeletal pattern, Angle’s Class I malocclusion with a horizontal growth pattern, proclined upper and lower incisors and crowding in upper and lower anterior region with protruded upper and lower lips.

**PROBLEM LIST**

| Anteroposterior | Vertical | Transverse |
|-----------------|----------|------------|
| Dental          |          |            |
| Rotated 12, 13, 14, 15, 22, 23, 24, 25, 31, 32, 33, 41, 42, 43 | NIL | NIL |
| Labially tilted 12 and 21 and palatally tilted 11 | NIL | NIL |
| Crowding in upper and lower anterior teeth | NIL | NIL |
| Proclined max and mandibular incisors | NIL | NIL |
| Increased overjet | NIL | NIL |
| Skeletal        |          |            |
| NIL             |          | NIL        |

**TREATMENT OBJECTIVES**

- To correct proclined maxillary and mandibular anterior teeth
- To correct crowding in the maxillary and mandibular anterior teeth
- To correct rotated teeth
- To correct increased overjet and overbite
- To maintain Angle’s Class I molar relation on both sides
- To maintain Canine Class I relation on both sides
- To achieve a pleasing smile and a pleasing profile
MODEL ANALYSIS

**Bolton ratio:**
- Mandibular anterior excess: 2.48 mm
- Mandibular overall excess: 0.35 mm

**Arch Perimeter Analysis:**
- Need for proximal stripping

**Careys Analysis:**
- Need for proximal stripping

**Ashley Howe's Index:**
- Borderline case

**Chadda's Index:**
- Expansion not needed

**Pont's Index:**
- Expansion not needed

**Treatment Progress**
Complete bonding & banding in both maxillary and mandibular arch done, using MBT-0.022X0.028”slot. Ceramic brackets were used for the purpose of esthetics. Initially a 0.012” NiTi wire was used which was followed by 0.014, 0.016”, 0.018”, 0.020” NiTi wires following sequence A of MBT. After 6 months of alignment and leveling NiTi wires were discontinued. Proximal stripping of lower and upper anterior dentition was done. This provided space for retraction of the proclined maxillary and mandibular anterior dentition. Retraction and closure of spaces was then started by use of 0.019” x 0.025” rectangular NiTi with accentuated Anchor sweeps in the upper and lower stiff archwires for opening of bite to correct the increased overbite followed by 0.019” x 0.025” rectangular stainless steel wires. Anchorage was conserved by light retraction forces constantly monitoring the already well settled molar relation. This is the most important step in a borderline extraction case wherein anchorage conservation is of utmost importance. Finally light settling triangular 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 intercuspalion. The smile arc was consonant at the end of the treatment and the patient was very happy with her smile.
Mid Treatment Extraoral Photographs

Mid Treatment Intraoral Photograph
Kobayashi Ties To Aid Engagement Of Elastics
Since the ceramic brackets did not have hooks for engagement of settling elastics, Kobayashi ties were tied around the buccal segment brackets bilaterally to aid in the engagement of triangular settling elastics. The patient routinely used the settling elastics for 2 weeks until there was good intercuspation of the buccal segment. Good alignment of teeth was seen in the upper and lower arch at the end of the treatment.

Buccal Settling With Triangular Elastics

| PARAMETERS | POST-TREATMENT |
|------------|----------------|
| SNA        | 81°            |
| SNB        | 80°            |
| ANB        | 1°             |
| WITS       | 1mm            |
Pre Debonding Intraoral Photographs
Discussion:
Treatment of Class I malocclusion with crowding in adults without extractions of 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 I malocclusion might have any number of a combination of the skeletal and dental component. Hence, identifying and understanding the etiology and expression of Class I malocclusion and identifying differential diagnosis is helpful for its correction. The patient's chief complaint was forwardly placed and malaligned upper front teeth. 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 proximal stripping along with Fixed appliance therapy appropriately resulted in an improvement in the patient's profile in this case. The SNA value showed an increase from 80 to 81 degrees, the SNB value changed from 81 to 80 degrees. The mandibular incisor proclination reduced from 95 to 92 degrees, the nasolabial angle changed from 98 degrees to 102 degrees thus improving the patient's profile drastically and the Frankfurts mandibular plane angle changed from 18 to 20 degrees due to the counter clockwise rotation of the mandibular plane. The smile arch of the patient significantly improved from being flat and non consonant to more pleasing and consonant. The upper and lower incisor proclination values, both angular and linear measurements improved significantly. Successful results were obtained after the fixed MBT appliance therapy within a stipulated period of time. The overall treatment time was 13 months. After this active treatment phase, the profile of this 18 year old female patient improved. Removable hawleys retainers followed by Fixed lingual bonded retainers were then delivered to the patient.

Comparison Of Pre Treatment And Pre Debonding Cephalometric Readings

| PARAMETERS                  | PRE- TREATMENT | POST-TREATMENT |
|-----------------------------|----------------|---------------|
| SNA                         | 80°            | 81°           |
| SNB                         | 81°            | 80°           |
| ANB                         | -1°            | 1°            |
| WITS                        | 1mm (BO ahead of AO) | 1mm           |
| MAX. LENGTH                 | 75mm           | 74mm          |
| MAN. LENGTH                 | 99mm           | 97mm          |
| IMPA                        | 95°            | 92°           |
| NASOLABIAL ANGLE            | 98°            | 103°          |
| U1 TO NA DEGREES            | 43°            | 31°           |
| U1 TO NA mm                 | 7mm            | 2mm           |
| L1 TO NB DEGREES            | 25°            | 23°           |
| L1 TO NB mm                 | 4mm            | 2mm           |
| U1/L1 ANGLE                 | 114°           | 131°          |
| SADDLE ANGLE                | 127°           | 128°          |
| ARTICULAR ANGLE             | 137°           | 136°          |
| GONIAL ANGLE                | 131°           | 132°          |
| FMA                         | 18°            | 20°           |
| Y AXIS                      | 57°            | 62°           |

Conclusion:
This case report shows how a borderline extraction case can be managed with a Non Extraction Protocol by means of proximal stripping and properly conserving Anchorage. The planned goals set in the pretreatment plan were successfully attained. Good intercuspidation of the teeth was maintained with class I molar relationship. Treatment of bimaxillary protrusion and localized spacing included the retraction and retroclination of maxillary and mandibular incisors with a resultant decrease in soft tissue procumbency and convexity. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. The overjet become near ideal and normal overbite was found. Patient had improved smile and Profile without the need for extractions. 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.
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