

# Prosthognathic Rehabilitation of A Patient with Underlying Skeletal Discrepancy- A Case Report

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## ABSTRACT

Vertical and anteroposterior maxillary excesses can be treated with a combination of orthopaedic functional appliances, orthodontics and surgery. Treatment varies according to the age, patient reports for treatment. In patients who are treated with either of the above mentioned treatment modalities, if they require prosthetic replacement on a later date, especially of anterior teeth, prosthetic treatment alone does not give an aesthetic outcome. A partially edentulous, elderly patient with underlying skeletal discrepancy (Class II Skeletal deformity) in relation to 12,11,21,22 was treated with a combination of orthognathic surgery and prosthetic rehabilitation. An orthognathic surgery (leforte I osteotomy) was performed to manage vertical maxillary excess, class II skeletal pattern of maxilla and increased lower third facial height. Dental compensations in the mandibular arch were decompensated surgically with lower subapical osteotomy. Prosthetic restorations of missing anterior teeth were done later, such that facial and dental aesthetics. The records showed that the results were stable 12 months after prosthognathic (prosthodontic and orthognathic) treatment. A team approach enabled the female patient in her fifth decade of life, to receive better function, aesthetics and increased quality of life. Doing prosthetic restorations in patients with underlying skeletal discrepancies may become a challenge, which should be achieved without compromising on final outcome, with a calculated risk benefit ratio.

**Keywords:** Prosthognathic, Orthognathic surgery, Fixed prosthesis

## CASE REPORT

A 50-year-old female patient visited our Outpatients Department in Saveetha Dental College and Hospitals, Chennai, seeking improvements in her dental condition and profile. She had consulted us for replacement of missing teeth. On taking her detailed history, she revealed that her teeth had been extracted before seven months, for they had been periodontally compromised and she had been advised to have them restored prosthetically. On examination, extraorally, patient had incompetent lips and a gummy smile and she consciously tried to close her lips, thus straining the upper labial muscles on frontal profile. Her lip length was 19mm, which was relatively normal, which pointed out that there was an increased vertical maxillary excess [Table/Fig-1a]. Temperomandibular joint examination revealed bilaterally symmetrical movements, a normal mouth opening (32mm) and no deviation and deflection on opening, closing and lateral movements of jaw. Lateral profile revealed a low mandibular angle [Table/Fig-1b]. On intraoral examination, multiple missing maxillary anterior teeth (maxillary central and lateral incisors), fixed partial dentures in relation to 45,46,47, generalized gingivitis, and tooth stain were observed [Table/Fig-2]. An symmetric

U-shaped arch in the maxilla and a symmetric ovoid-shaped arch in the mandible were observed. The occlusal relationships between the maxillary and mandibular dentitions were complex (end on molar relation bilaterally). A full mouth radiograph (OPG) and lateral cephalograms were obtained [Table/Fig-3,4]. Cephalometric tracing was done to analyze skeletal, dentoalveolar and soft tissue relationships in the anteroposterior and vertical dimensions. The patient's lateral cephalometric radiograph presented a convex profile with a moderate Class II skeletal pattern. Exaggerated FMA (steep mandibular plane) values aided with the diagnosis of a vertical maxillary excess.

Clinically, on attempting to restore the missing teeth, a prosthetic removable denture was constructed, considering the size of the remaining tooth and its morphology. Tooth exposure was measured to be 8mm in rest position. Thus, the underlying skeletal deformity was analyzed and treatment was aimed at correcting the basal bone deformity before doing the prosthetic rehabilitation.



**[Table/Fig-1a]:** Pre-operative Photograph of a patient in frontal view during smile

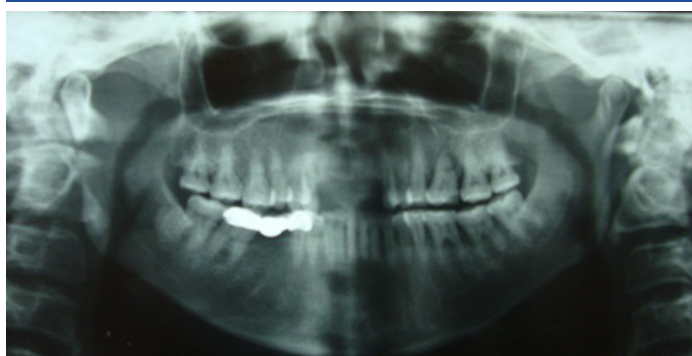
**[Table/Fig-1b]:** Pre-operative Photograph of a patient in side view during smile



**[Table/Fig-2]:** Intraoral Photograph of a patient in frontal view



[Table/Fig-3]: Pre-operative lateral cephalogram of patient was obtained



[Table/Fig-4]: Pre-operative orthopantomogram of patient was obtained

**Treatment Progress**

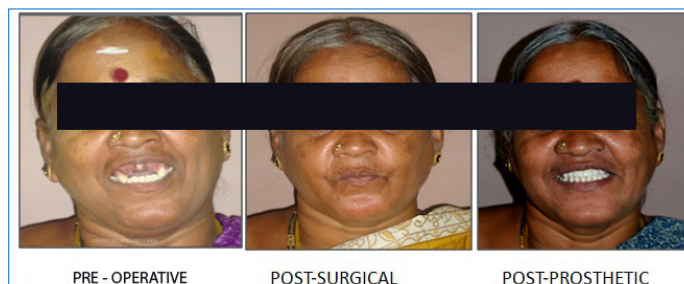
Synchronizing the clinical findings with the radiological findings, an orthognathic surgery (for correction of maxillary skeletal pattern) was planned, which was a leforte I maxillary intrusion (6mm) and setback, and correction of inclined lower anteriors with lower subapical osteotomy.

**Surgical and prosthetic rehabilitations:** Treatment which was aimed at restoring the dental aesthetics alone didn't satisfy the patient. Therefore, after analyzing the situation, a surgery was planned. The associated risk of orthognathic surgery was explained to the patient and a written consent was obtained from her.

Under general anaesthesia, leforte I osteotomy (intrusion and setback of maxilla) and lower subapical osteotomy were done and the skeletal discrepancy and dental compensation were thus corrected. Surgery was performed by oral and maxillofacial surgeons. Duration of the surgical procedure was approximately two and a half hours. A pre-surgical planning and a model surgery helped in attaining the desired skeletal position. Complications such as excessive blood loss, ischaemic changes, nasal bleeding, osteomyelitis, non union of bone, condylar sag [1-3] can occur. No complications were reported in this patient. However, patient developed maxillary sinusitis which resolved with one week of treatment, with antibiotics, nasal decongestants and steam inhalation. After three months, a prosthetic treatment was started. A tooth preparation which could accept full veneer metal ceramic restorations was done. A metal ceramic crown six unit bridge was fabricated and it was luted with adhesive glass ionomer luting cement (FujiCEM; GC America, Alsip, USA). Finally, the occlusion was adjusted to ensure that no functional interferences existed

during jaw movements. Oral hygiene instructions were given and regular reviews were scheduled. Extraoral photographs taken at the end of the treatment have been presented in [Table/Fig-5,6]. Total duration of the treatment, inclusive of surgery, post-operative follow up, was four months. Beyond this, the patient was regularly followed up.

Maxillary depth is an angular measurement formed by Frankfort horizontal plane and a line from nasion through point A (NA line) Mandibular Depth is the angle formed by Frankfort horizontal plane and a line from nasion through point B of the mandible (NB line) Frankfort Mandibular plane angle is the angle created by a line from the menton through the gonion relative to the Frankfort horizontal plane. (Normal value is 25+/-5 degrees. Lower incisor angulation relates the long axis of the mandibular incisor to the NB line and is normally 20+/-2 degrees Nasolabial angle is a line tangent to the columella through the subnasale and a line tangent to the upper lip. Pogonion projection is measured from the most protrusive point of bony pogonion to the NB line with normal relationship of 4+/-2 mm. Upper lip length measured from base of the nose (subnasale) to the inferior part of the upper lip (upper lip stomion) Considering the difference in the maxillary depth (86 degree) and mandibular depth (78 degree) radiologically confirms the diagnosis of anteroposterior excess of maxilla. Exaggerated FMA (Steep mandibular plane) values aided with the diagnosis of vertical maxillary excess. And clinically on attempting to restore the missing teeth, a prosthetic removable denture was constructed considering the size of the remaining tooth and its morphology. Tooth exposure was measured to be 8mm in rest position [Table/Fig-7].



[Table/Fig-5]: Extraoral photographs of a patient at various intervals in frontal view



[Table/Fig-6]: Extraoral photographs of a patient at various intervals in lateral view

Maxillary Depth	86 degree
Mandibular Depth	78 degree
Frankfort Mandibular Plane Angle (FMA)	38 degree
Lower incisor angulation	38 degree
Nasolabial angle	98 degree
Lower anterior dental height	48mm
Pogonion Projection	4mm
Upper lip length	19mm

[Table/Fig-7]: Cephalometric Values

**DISCUSSION**

The correction of malocclusions with severe skeletal deformity generally requires surgery, combined with orthodontic or prosthetic

odontic treatment. A purely camouflaged orthodontic treatment or a pure prosthodontic treatment may result in an unsatisfactory, unstable and irreversible outcome. Multiple decayed or missing teeth may increase the difficulty and duration of orthodontic treatment due to the lack of appropriate anchorage for tooth movement, especially in adult cases which present with multiple long-spanned prostheses [4].

Leforte I osteotomy is routinely performed today, with the blood supply to the osteotomized maxilla from the palatal mucosa providing an adequate nutrient pedicle for single stage total maxillary osteotomies. Blood flow to the osteotomized maxilla has been explained by Bell WH and by Krivenko et al., [5-9]. Changes in the pulpal blood flow to the tooth and gingival after Leforte I osteotomy have been studied and they have been documented in literature by Justus et al., [10]. Leforte I osteotomy which is carried out along with orthodontically controlled tooth movements such that occlusions, is maintained in an acceptable position, pre-operatively and post-operatively, as stable occlusions also aid in healing of osteotomized bone margins [11]. Orthognathic surgery has been effectively used in cases with malunited fractures, which result in occlusal discrepancies [12]. In this case, to prosthetically rehabilitate the patient, the underlying skeletal discrepancy was corrected relatively at an older age and stable results were achieved. A Leforte I intrusion and setback were planned and they were executed. Alar cinching is done to reduce widening/flaring of the alar base after impaction of the maxilla superiorly. According to Howley et al., an alar cinch suture has preliminary benefits [1]. According to Stewart et al., a cinch suture is effective in mitigating the increase in nasal width that is produced by the osteotomy, and the effect is stable in the medium term [2].

Complications such as excessive blood loss, ischaemic changes, nasal bleeding, maxillary sinusitis, osteomyelitis, non union of bone, condylar sag [1-3] can occur. However, mostly, these complications are avoided with careful systematic treatment planning and careful execution of the surgical procedure, while giving due respect to underlying philosophy of orthognathic surgery. The incidence of non-unions is reported to be (0.33 to 0.8%) in published data. A non-union is mostly associated with osteosynthesis instability, occlusal instability and situations with postoperative infections. Maxillary mobility is the key sign to screen for [13] in the post-operative phase, to check for adequate union of the osteotomized bone. Post-Leforte I osteotomy infections such as maxillary sinusitis have

been reported in literature to be around 1.1% [14]. Maxillary sinusitis results as the sinus membrane is breached during the osteotomy and it usually resolves with antibiotics and steam inhalations. Leforte I osteotomy is a well-accepted procedure for correction of facial skeletal deformities, and it can be used in combination with prosthetics to achieve better clinical outcomes, as has been discussed in this clinical situation.

## CONCLUSION

A team approach enabled the female patient in her fifth decade of life, to receive better function, aesthetics and increased quality of life. Risk benefit ratio for the desired outcome should be calculated, based on which an interspeciality coordination can make a huge difference in the final outcome.

## REFERENCES

- [1] Howley C, Ali N, Lee R, Cox S. Use of the alar base cinch suture in Le Fort I osteotomy: is it effective? *Br J Oral Maxillofac Surg.* 2011; 49(2):127-30.
- [2] Stewart A, Edler RJ. Efficacy and stability of the alar base cinch suture. *Br J Oral Maxillofac Surg.* 2011; 49(8):623-6. Epub 2011 Apr 13.
- [3] Vincent C, Mercier JM, Perrin JP, Khonsari RH. Stability of Le Fort I impaction osteotomies. *Rev Stomatol Chir Maxillofac.* 2012; 113(2):76-80.
- [4] Stenvik A, Larheim TA, Storhaug K. Incisor and jaw relationship in 27 persons with osteogenesis imperfecta. *Scand J Dent Res.* 1985; 93: 56-60.
- [5] Bell WH. Revascularization and bone healing after anterior maxillary osteotomy: a study using rhesus monkey. *J Oral Surg.* 1969; 27:249.
- [6] Bell WH. Biologic basis for maxillary osteotomies. *Am J Phys Anthropol.* 1973;38: 279.
- [7] Bell WH. Leforte I osteotomy for correction of maxillary deformities. *J Oral Surg.* 1975;33:412-16.
- [8] Bell WH, Fonseca RJ, Kennedy JW, Levy BM. Bone healing and revascularization after total osteotomy. *J Oral Surg.* 1975;33:253.
- [9] Krivenko OG, Gun'ko VL, Loginova Nk, Chertykovtsev VN. The dynamics of the blood supply to the maxillary complex following a maxillary osteotomy. *Stomatologija (Mosk).* 1989;68(5):56-8.
- [10] Justus L, Chang BL, Bloomquist D, Ramsay DS. Human gingival and pulpal blood flow during healing after Lefort I osteotomy. *J Oral Maxillofac Surg.* 2001;59(1):2-7.
- [11] Imholz B, Richter M, Dojcinovic I, Hugentobler M. Non-union of the maxilla: a rare complication after Le Fort I osteotomy. *Rev Stomatol Chir Maxillofac.* 2010; 111 (5-6):270-5.
- [12] Satoshi Yokoo, Takahide Komori, Shungo Furudoji, Yasuyuki Shibuya, Chizu Tateishi. Orthognathic Surgery for Occlusal Reconstruction of Old Malunited Jaw Fracture. *Kobe J. Med. Sci.* 2006; 52 (3): 37-47.
- [13] Ueki K, Marukawa K, Hashiba Y, Nakagawa K. Assessment of the relationship between the recovery of maximum mandibular opening and the maxillomandibular fixation period after orthognathic surgery. *J Oral Maxillofac Surg.* 2008;66(3):486-91.
- [14] Kramer FJ, Baethge C, Swennen G, Teltzrow T, Schulze A, Berten J, Brachvogel P. Intra- and perioperative complications of the LeFort I osteotomy: a prospective evaluation of 1000 patients. *J Craniofac Surg.* 2004; 15(6):971-7.

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