

A Surgeon-Friendly BSSO by the Novel Modification of Low Z Plasty: Approach Focus and Case Report: A Case Report

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Abstract

This case report is one of the series study of this novel mandibular osteotomy technique. The purpose of this case report was to introduce mandibular osteotomy technique called the Novel Modification of Low Z Plasty (NM-Low Z) which modified from previous Prasan's Low Z plasty. The technical approach were discussed and demonstrated in details. The case report was Skeletal class III mandibular prognathism which received lower jaw setback surgery with lengthening genioplasty by surgery first approach method. We had found benefits of this method which is not invading to airway dimension while performed a mandibular setback surgery. No any serious complication was reported after surgery. By only 3 months after surgery, the occlusion was ready for finishing orthodontic phase. Long term study is needed to conduct for skeletal stability.

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Introduction

Skeletal class III is malocclusion characterized by anterior crossbite as a result of mandibular prognathism with or without maxillary retrognathism. Moreover, the prevalence of Class III malocclusion is greater in Asian populations. The highest incidence (15.08%) was observed in Southeast Asian populations.¹ A normal occlusion can be achieved by growth modification in growing patients, orthodontic camouflage and orthognathic surgery combined with orthodontic treatment.²

To establish proper skeletal relationship in prognathic mandible cases, mandibular setback surgery can be done to move mandible backward along the occlusal plane or with clockwise rotation of maxillomandibular complex to alternate occlusal plane in double jaws surgery indicated cases.³ The first mandibular osteotomy procedure was reported by Hullihen in 1849.⁴ A century later, Trauner and Obwegeser have

developed a technique that called Bilateral Sagittal Split Osteotomy or BSSO.⁵ BSSO has become the most popular surgical method to move mandible backward and numerous BSSO modification techniques were proposed to increase the stability and reduced postoperative complication,^{6,7} for instance, modifications by Dalpont,⁸ Hunsuck,⁹ and Epker.¹⁰

In 2016, Prasan T and Laddawun S¹¹ have introduced the new BSSO technique called Low Z plasty technique (Prasan's modification). This Low Z plasty technique (Prasan's modification) has advantage over previous BSSO methods by a modification of posterior osteotomy cutting line on the lingual side at retromolar region to enhance the ability of mandibular setback in severe skeletal class III with anterior openbite deformity.¹¹ In consequence, this modification brought center of rotation in pitch axis of the mandible to locate at retromolar area. Therefore, surgeon can easily rotate distal segment with minimal muscle interference which theoretically decreasing of skeletal relapse. In addition, the mandible can be further set back without interfering the facial nerve that usually limits in conventional BSSO technique thus results in less chance of the facial paralysis. However, this technique requires additional bone trimming at proximal segment of cutting lines due

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to bone overlapping with distal segments during mandibular setback.

The aim of this article is to purpose and technical discuss the Novel Modification of Low Z plasty technique (NM-Low Z) for mandibular osteotomy used in orthognathic surgery cases and demonstrate case report utilizing of this surgical technique in our center.

The novel modification of Low Z Plasty (NM-Low Z): Approach Focus

This modification was derived from Low Z plasty technique (Prasan's modification). The horizontal cutting line was made through only cortical part of mandible. The starting point located at the most superior point of retromolar triangle (Fig. 1) and then extended 6-7 mm posterior-inferiorly depending on position of the mandibular canal detected by either panoramic radiograph or computed tomography scan. The sagittal cut then was made from the tip of triangle laterally along external oblique ridge to the buccal alveolar bone between first and second mandibular molars. Final, the vertical cut was done vertically through inferior border of mandible at the buccal side. After splitting the mandible into proximal and distal segments inferior alveolar nerve should be clearly identified and preserved (Fig. 2).

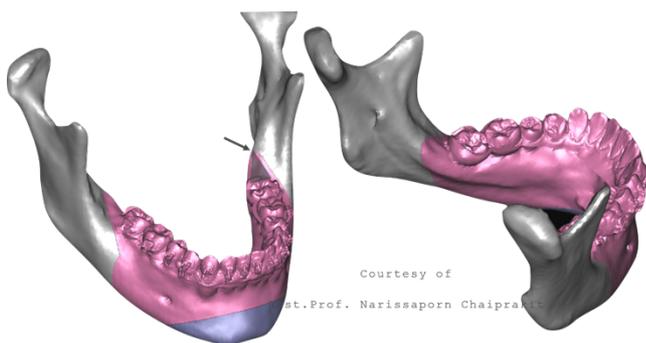


Figure 1. The horizontal cutting line located at the most superior point (Arrow head) of retromolar triangle (Grey area). The posterior extension at medial side was depended on position of mandibular canal.

In addition, during a larger amount of mandibular setback which usually increases intergonial width and results in less pleasant

facial esthetic in Asian culture. An extra-trimming of cortical bone at the medial side of proximal segment was recommended to avoid aforementioned compromising of beauty (Fig. 3).



Figure 2. (A) The sagittal cut was extended laterally from the tip of retromolar triangle along the external oblique ridge until reach the buccal alveolar bone of first and second mandibular molar where the vertical cut (B) was made vertically to the inferior border of mandible. (C) An inferior alveolar nerve was identified and preserved after splitting the osteotomy line.



Figure 3. An additional bony trimming at the medial side of proximal segment is recommended in larger amount of mandibular setback cases which enhanced for superior facial esthetic result.

This NM-Low Z Plasty technique allows many advantages. In case of larger amounts of mandibular setback or advancement for correction of the severe skeletal deformity, this technique provides less torque to mandibular condyle leading to good skeletal stability and esthetic satisfactory to patients. With this new surgical technique would reduce the chance to interrupt the vital structures, like styloid process and facial nerve, and possibly shortening the pharyngeal airway space during the mandibular setback which can cause an airway problem.

Condylar displacement were observed in both surgery first and orthodontic first approach by conventional osteotomy technique in mandible.^{12,13} Conventional BSSRO in

mandibular asymmetry cases require additional intentional osteotomy of distal segment to prevent rotational torque to condylar proximal segment.¹⁴ However, this would also increase chance of less bony contact which related to fixation stability. Regarding to prevent rotational torque to proximal segment, this novel modification of Low Z plasty technique suggest to remove the bony interference on the internal surface of the proximal segment thus results in lessening torque pass through the proximal segment when fixation has performed and increasing the possibility to do the counterclockwise/clockwise rotation of the mandible.^{3,15-17} In addition, without the bony interference, the surgeon could perform asymmetrical setback for facial asymmetry cases without torque to the proximal segment that leading to the skeletal relapse and it also resulted in a better facial profile of the patients. Moreover, surgeons can be moved the maxillomandibular complex more freely result in enhancing better surgical process when performed with the Surgery First Approach (SFA) cases. Unlike conventional approach, this novel modification of Low Z plasty technique is not required temporalis tendon muscular detachment for Lingula identification. The simpler osteotomy steps have made shortening of operative period that leads to less intra-operative and postoperative swelling.

At present, this NM-Low Z Plasty technique is one of the lower jaw surgery manipulation methods used for orthognathic surgical cases in Thammasat University Hospital.

Case Report

A 24-Year-old female was seeking for definitive treatment of long chin with face asymmetry and uneven smile (Fig. 4). The diagnosis was skeletal class III mandibular prognathism with normodivergent pattern of mandible with facial asymmetry. She had done camouflage orthodontic treatment; however, an orthodontist cannot close the anterior gap caused by reversed overjet. After treatment plan discussion with patient and orthodontist in our team, a single lower jaw surgery first approach for mandibular setback was purposed. The lateral cephalometric and panoramic radiograph were taken and analyzed before surgery (Fig. 4 and Table 1). The surgical planning was mandibular setback and genioplasty. The surgical method

was NM-Low Z plasty technique which followed along the previous mentioned in approach focus section. Initially, the full thickness flap exposure to the mandibular ramus and body was done in a regular pattern. After that, the mandibular osteotomy was performed by fissure and round bur. The osteotomy line was started from the posterior, the posterior modified vertical or slightly oblique osteotomy on the lingual retromolar region. Then the sagittal and vertical osteotomy were performed to cut from the posterior horizontal cut to the buccal side on the external oblique ridge. Final, the vertical cut was done on buccal cortex of mandible between the first and the second molars. After complete the osteotomy, a sagittal split of the body of the mandible was performed by chiseling through the lateral cortex of mandible. Occlusal splint was used to guide the final position of the mandible. Bony interference on the proximal segment was removed and bone segment was stabilized with titanium miniplates 2.0 mm and screws. The operation was taken about an hour and no any postoperative severe complication was reported. The patient had very well recovery and adaptation to the new created skeletal relationship.

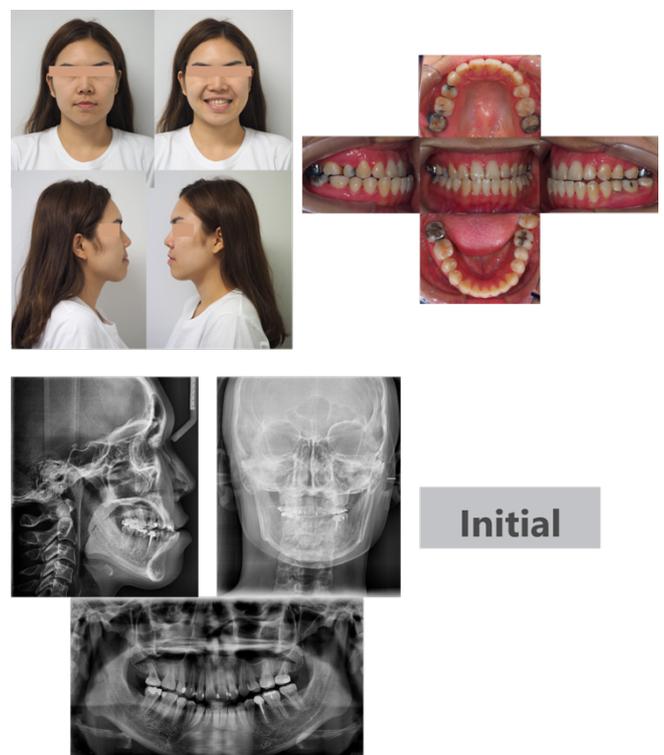


Figure 4. Initial extra and intra-oral photographs and radiographic examination.

After removing intermaxillary fixation wires, orthodontic wire adjustment were used for leveling and align. The patient was instructed for early mobilization and smile exercise. For postoperative changes follow up, cephalometric superimposition between preoperative and 3 months postoperative was done (Fig 5). The mandible was set backward for 5 mm and upward for 1.5 mm. as previously method of measurement described by Reyneke.³ The occlusal plane was found to be clockwise rotation for 4 degree due to orthodontic tooth movement immediately after surgery. In addition, airway dimension was maintained and increased in the lower pharynx which could be an evidence to proof that this method of osteotomy technique was not invaded to airway area even in mandibular setback only. Overall facial profile was excellent improved and numbness at lower lip remained 10% compared to immediately post operation. The occlusion was ready for orthodontic finishing phase (Fig 6).

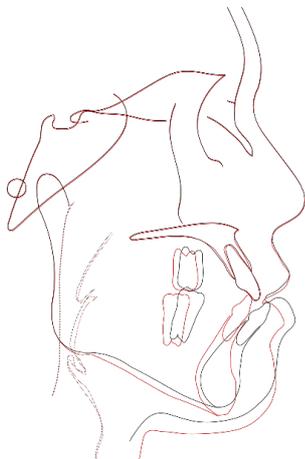


Figure 5. Lateral cephalometric superimposition before surgery (Black line) and 3 months after surgery (Red line).

Discussion

The NM-Low Z plasty procedure provides larger bone contact for skeletal stability reason. As a result of less stripping of the masseter muscle and medial dissection, postoperative swelling and hemorrhage were extremely decreased. None of intra or extra-oral additional suction drainage was placed which allowed patient for much more comfort. The less stripping the masticatory muscles also benefit to increase the vascularization to the proximal bone segment which reduced the bone resorption.

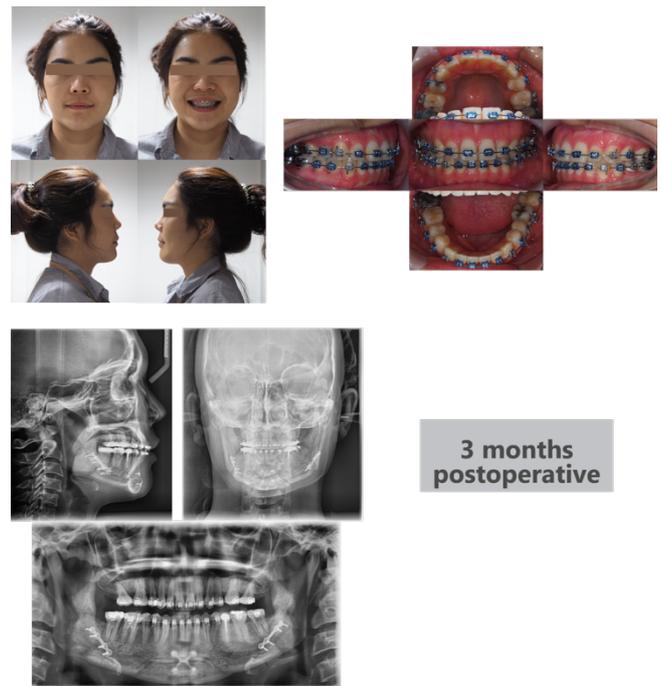


Figure 6. Extra, intra-oral photographs and radiographic examination 3 months after single lower jaw surgery.

Measurement	Norm (Mean±SD)	Pre-op Value	Post-op Value
SNA	82° ± 3.5°	80°	80°
SNB	80.9° ± 3.4°	85°	79°
ANB	1.6° ± 1.5°	-5°	+1°
Mandibular length (Co-Gn) (mm)	122.3 ± 4.0	111	113
Midface Length (Co-A) (mm)	93.2 ± 4.0	75	75
Mand. Skeletal (Pg-N-Perp) (mm)	-4.0 ± 5.3	+4	0
SN - MP	32.9° ± 5.2°	30°	31°
U1 - Palatal Plane	110.0° ± 5.0°	112°	114°
L1 - MP	95.0° ± 7.0°	103°	96°
Overbite (mm)	2.5 ± 2.0	+1	+2
Overjet (mm)	2.5 ± 2.5	-6	+2
NLA (Nasal Angle)	110.0° ± 9.5°	88°	92°
L1 - NB	25.3° ± 6.0°	38°	32°
L1 - NB (mm)	4.0° ± 1.8°	10	7
Upper Lip to E-Plane (mm)	-6.0 ± 2.0	-1	-2
Lower Lip to E-Plane (mm)	-2.0 ± 2.0	+4	-1

Table 1. Cephalometric measurement.

The modification of the vertical or slightly oblique osteotomy on the medial side of retromolar region posteriorly to internal oblique ridge leading to greater amount of the mandibular setback when compared with conventional BSSO technique and Low Z plasty technique (Prasan's modification). Hence, the distal segment will not

interrupt the vital structures for instance, styloid process and facial nerve. Mandibular setback by conventional technique was found to reduce pharyngeal airway volume by 15% and 12% in one jaw and two jaws surgery respectively.¹⁸ Thus in NM-Low Z plasty method was designed to produce the less extension of posterior border of distal segment makes possible mandibular setback without compromising pharyngeal airway space.

One of crucial factors regarding stability is condylar position during distal segment relocation either surgery-first and orthodontic-first approach.¹² Condylar torque and displacement during fixation can lead to unfavorable temporomandibular disorder after orthognathic surgery.^{19,20} The proposed NM-Low Z plasty method could give more benefit in this regards. Bony interference removal at medial surface of the proximal bone segment, provides force system for less torque to mandibular condyle and prevents transverse changes to mandibular angle width thus derived for esthetic reason. With this advantage, the surgeon could perform asymmetrical mandibular setback in cases of facial asymmetry with low chance of skeletal relapse.

This article is the first one of the NM-Low Z plasty research series. Post-operative stability and long term follow up are in the process of data analysis and reports.

Declaration of Interest

The authors report no conflict of interest.

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