

# Comparison Of Two Different Osteosynthesis Technique To Evaluate Skeletal Stability In Advancement Genioplasty: A Retrospective Study

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## ABSTRACT

**Aim:** To evaluate the skeletal stability in wiring and plating fixation technique after genioplasty advancement.

**Methodology:** Patients who came for repair of cleft alveolus were enrolled within the study. Retrospectively all the Lateral Cephalogram were taken for patients undergoing Orthognathic Surgery; pre-operatively, 1-week post-operative and 1-year post-operatively after advancement genioplasty. Two groups were divided in keeping with the osteosynthesis technique used, Group 1- Wiring Osteosynthesis (n=38) and Group 2- Miniplate Osteosynthesis (n=38). Linear measurements were done after tracing all the Lateral Cephalograms.

**Results:** In the semi rigid group (wire fixation) a mean horizontal advancement of 5.97 mm was in the midst of a relapse of 1.623 mm. The mean superior repositioning of menton was 0.7 mm. This was in the middle of a relapse of 0.3 mm during a period of 1 year. Within the rigid group (miniplate) a mean horizontal advancement of 4.815 mm was in the course of a relapse of 0.2 mm. The mean superior repositioning of menton was 0.975 mm.

**Conclusion:** The results of our study and our clinical experience indicate that this single plate is a particularly simple and extremely useful method of stabilization.

**Keywords:** Genioplasty, Orthognathic surgery, osteosynthesis

## 1. INTRODUCTION

Genioplasty is an orthognathic surgery designed to reshape or change the scale of the chin that involves both bony and soft tissue components. The advanced genial segment has customarily been steadied with wire osteosynthesis. Studies have shown that this method affords good stability.<sup>1-3</sup> Kirschner wires and Steinman pins have also been used and are thought to provide good stability.<sup>4</sup> Bone plate osteosynthesis and screw fixation are other stabilization methods now widely used. In all cases, the chin should be rigidly fixed by either wires, miniplates or screws.<sup>5</sup> A priority has been post-operative relapse, resorption, and remodelling. Initially, wiring procedures were used to stabilize the osteotomized segments. Rigid fixation techniques were introduced in an effort to decrease the post-surgical relapse rate.<sup>6,7</sup> Advancement genioplasty, compared with alloplastic implantation, can provide both functional and aesthetic benefits for the patient.<sup>8-13</sup> Yet, despite numerous modifications and progress in advancement genioplasty,<sup>14-18</sup> facial plastic and plastic surgeons, unlike oral maxillofacial surgeons, seldom use this system.<sup>19,20</sup> Much of this literature about advancement genioplasty is found in oral surgery journals. It's likely that facial plastic surgeons' comfort and familiarity with alloplastic implants contributes to their more widespread use of those implants than of advancement genioplasty. Although an alloplastic chin implant is faster and easier to perform than an advancement genioplasty, it does result later in complications, including infection, chronic inflammation, extrusion, bone resorption, capsular contraction, displacement, and chin ptosis. Some have reported that advancement genioplasty allows for the rectification of more byzantine deformities, offers greater patient satisfaction, allows heightened predictability, and provides superior stability than alloplastic implantation.<sup>21</sup> In this study patients who have undergone direct osseous genioplasty together with other orthognathic procedures were selected to match the skeletal stability with rigid and semirigid fixation for advancement genioplasty by comparing the vertical and horizontal measurements on cephalometric radiographs followed-up to minimum 1 year.

## 2. AIM OF THE STUDY

To evaluate the skeletal stability in wiring and plating fixation technique after genioplasty advancement.

## 3. METHODOLOGY

Patients who came for repair of cleft alveolus within the department of oral and maxillofacial surgery of JMMCH & RI, Thrissur were enrolled within the study. Retrospectively all the Lateral Cephalogram were taken for patients undergoing Orthognathic Surgery; pre-operatively, 1-week post-operative and 1-year post-operatively after advancement genioplasty from the year January 2012 to January 2017 in our institution. Two groups were divided in keeping with the osteosynthesis technique used, Group 1- Wiring Osteosynthesis (n=38) and Group 2- Miniplate Osteosynthesis (n=38). Linear measurements were done after tracing all the Lateral Cephalograms (Figure 1). Data were tabulated and statistical analysis was done. Consent (in English and native language) was also obtained from the subjects after explaining the procedure to them. If our hypothesis is proven, that wiring osteosynthesis is enough to supply skeletal stability for the advancement genioplasty then plating system won't be required which can reduce the price of armamentarium, time duration of surgery, post-operative infection and second surgery to get rid of the hardware. The measurements analysed were as follows:

1. Horizontal position of the hard tissue chin (P-PG)—the distance from point P to PG parallel to OPL.
2. Vertical position of inferior aspect of the hard tissue (OPL-MEPL)—the perpendicular distance from the OPL to MEPL.<sup>3</sup>

The statistical analysis was applied using SPSS 25.0 and employing Descriptive statistics and Student's t-test for assessing the comparison between variables.

#### 4. RESULTS:

In the semirigid group (wire fixation) a mean horizontal advancement of 5.97 mm was in the midst of a relapse of 1.623 mm. The mean superior repositioning of menton was 0.7 mm. This was in the middle of a relapse of 0.3 mm during a period of 1 year. Within the rigid group (miniplate) a mean horizontal advancement of 4.815 mm was in the course of a relapse of 0.2 mm. The mean superior repositioning of menton was 0.975 mm. This was in the middle of a relapse of 0.1 mm during a period of 1 year. The 2 groups differed significantly ( $P = 0.008505144$ ) in percentage horizontal change. The 2 groups failed to differ significantly within the percentage vertical change ( $P = 0.102416382$ ). From the above data it is analysed that rigid fixation was more stable compared to non-rigid fixation.

Table 1- Pre- and postoperative horizontal and vertical measurements and ratio of relapse in the two planes (mean±SD)

	HORIZONTAL				VERTICAL			
	P-PG	P-PG1	P-PG2	Ratio	OPL-MEPL	OPL-MEPL1	OPL-MEPL2	Ratio
<b>MINIPLATE</b>	13.6mm (2.2)	19.9mm (2.4)	19.6mm (2.5)	98.5 (4.2)	43.7mm (4.4)	41.8mm (4.2)	42.4mm (4.1)	101.6 (2.5)
<b>WIRING</b>	13.6mm (2.1)	19.3mm (2.5)	18.8mm (2.6)	97.5 (5.4)	44.3mm (3.4)	42.9mm (3.1)	42.9mm (3.2)	100.1 (2.2)

\* OPL = Occlusal Plane; MEPL = Menton horizontal plane; P = Posterior Reference Point, and PG = Pogonion. H = Horizontal and V = Vertical.<sup>1</sup>

Table 2- Advancement and resorption in Horizontal and Vertical Component.

	MINIPLATE		WIRING	
	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL
<b>T2-T1</b>	4.81 mm	0.7 mm	5.97 mm	0.9 mm
<b>T1-T3</b>	3.67mm	0.4mm	2.37mm	0.3mm
<b>T2-T3</b>	0.2 mm	0.3 mm	1.6 mm	0.1 mm
<b>P value for vertical changes</b>	0.102416382			
<b>P value for horizontal changes</b>	0.008505144			

\* T1- Preoperative measurements, P-PG; OPL-MePL, T2- Immediate post-operative, P-PG1; OPL1-MePL1, T3- One Year post-operative, P-PG2; OPL-MePL2, T2 to T1- Immediate surgical changes of hard tissues, T3 to T1- Follow up post-operative changes of hard tissues, T2 to T3- Relapse or resorption of hard tissues.<sup>1</sup>



Qualitative evaluation of bone remodelling showed that there have been areas of bone deposition and resorption occurring simultaneously within the genioplasty sites. Extensive bone deposition was observed along the anterior portion of the proximal segment, around and immediately above osteotomy site at the point B area. Another area of bone deposition was along the posterior edges of the distal segments bilaterally, where the proximal and distal segments interfaced, resulting in the rounding of the sharp edges resulting from the osteotomy. Altogether cases where a spot was present between the 2 segments of bone, new bone formation bridged this gap completely. But this remodelling pattern failed to affect the horizontal stability of PG. Henceforth the fixation devices for genioplasty should be placed on the parts of bone deposition.<sup>25</sup> During this study, plates used for fixation were placed in bone deposition areas. Palpation of the region intraorally and extra-orally failed to show any evidence of the hardware. None of the patients had pain or discomfort with and without palpation of the region. The usage of rigid fixation has some technical advantages with large advancements or when the chin is transposed three dimensionally. Screw osteosynthesis is a smaller amount time consuming and will afford more accurate positioning of the transected segment. Wire osteosynthesis is, however, less costly. Our study showed a post-operative resorption which is extremely less. Large advancements aren't possible with wire fixation technique. The full amount of advancement possible with wire fixation is that the total thickness of the cortex of the genium. Any advancement beyond this can be impracticable with wire fixation technique. The quantity of advancement can't be predicted. Wire fixation technique isn't as simple as plate fixation. Plate becomes palpable in patients in less soft tissue, where wire fixation is of prime importance.

## 6. CONCLUSION

The results of our study and our clinical experience indicate that this single plate is a particularly simple and extremely useful method of stabilization. Although there are minor discrepancies with regard to vertical and horizontal components much resorption and remodelling was observed just in case of wire fixation at bone resorption areas than at PG. The plate provides considerable advantages over other methods of fixation.

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