Comparison of skeletal stability with rigid and wire fixation in patients who have undergone Le Fort I and Anterior Segmental Maxillary Osteotomy

ABSTRACT

Background: Maxillary superior repositioning is widely regarded as the most stable procedure in orthognathic surgery, requiring minimal instruments for stabilization. Rigid fixation is considered the ideal method for long-term stability, leading to improved anatomic structures, enhanced recovery of bite forces, and better bite function.

Objective: To compare the skeletal stability following Le Fort I and anterior maxillary osteotomy with wire osteosynthesis and rigid fixation.

Materials and Methods: A total of 16 patients, including one male and 15 females, underwent Le Fort I and anterior segmental maxillary osteotomy along with fixation using either wire osteosynthesis or rigid fixation for correction of vertical and anteroposterior maxillary excess. Patients were assessed at preoperative, 1-week postoperative, and 6-month postoperative stages using a lateral cephalogram to evaluate skeletal stability.

Results: The wire osteosynthesis group showed significant differences in posterior maxillary vertical measurements compared to the rigid fixation group. However, there was no significant difference in anterior vertical and anteroposterior skeletal measurements between the two groups.

Conclusion: Wire osteosynthesis is a stable form of fixation for superior repositioning with segmentation of the maxilla for correction of vertical and antero-posterior excess.

Keywords: Anterior segmental maxillary osteotomy, Le Fort I osteotomy, rigid fixation, skeletal stability, wire osteosynthesis

INTRODUCTION

Orthognathic surgery is performed to reorganize the facial skeleton, correcting deformities to achieve harmoniously alignment with the skull base for perfect dental occlusion. Le Fort I osteotomy addresses various maxillary issues, including anteroposterior hypoplasia or hyperplasia, vertical excess or deficiency, anterior open bite, and transverse discrepancies. Skeletal stability post-surgery depends on factors such as orthodontics, scar retraction, nasal septum interference, fixation type, and occlusion quality. Ongoing discussions are exploring the intriguing balance between the skeletal stability and occlusal harmony of wire osteosynthesis versus rigid internal fixation.

In 1859, Von Langenbeck pioneered maxillary osteotomy. Subsequently, in 1868, David Williams Cheever of Boston executed a groundbreaking procedure, known as a Le Fort I osteotomy, to eliminate a sizable nasopharyngeal polyp. This technique, involving bilateral osteotomies, was later recognized as Cheever's "double operation," representing a significant milestone in the field.[1-3] The Le Fort I osteotomy, first introduced by Wassmund[4,5] in 1927, addressed anterior open bite. William

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Bell[6] further substantiated the biological foundation for the safety provided by Le Fort I downfracture osteotomy. Gunther Cohn-Stock,[7,8] known as the father of maxillary orthognathic surgery, introduced the anterior segmental maxillary osteotomy in 1921. This diversified the techniques, leading to modified designs of AMO with the downfracture methods gaining prominence, employed by Wassmund[4] and Wunderer.[9] The Wassmund method ensures optimal vascularity,[4] and Wunderer combined palatal flap elevation with labial pedicle preservation, and down-fracture utilizes circum-vestibular incision. Esthetic and functional success outcomes of orthognathic surgery hinge on long-term stability, with fixation methods such as rigid fixation and wire osteosynthesis playing crucial roles. Surgical directions, such as superior maxillary repositioning, impact post-surgical stability, emphasizing the multifaceted considerations in orthognathic procedures.

MATERIALS AND METHODS

Research design

A comparative research design included preoperative (T_1), 1-week postoperative (T_2), and 6-month postoperative (T_3) measurement approach.

Sampling method

A. **Population**: All the patients who reported for correction of facial deformity.
B. **Sample size**: A sample of 16 patients (one male and 15 female) in equal distribution of eight patients in two groups was formed based on the inclusion and exclusion criteria
   a. Inclusion criteria
      i. Patients demonstrating maxillary excess for which surgical intervention was necessary.
      ii. Maxillary superior repositioning with concurrent mandibular chin advancement performed was considered.
   b. Exclusion criteria
      i. Patients with craniofacial syndromes and associated facial deformity.
      ii. Patients who had to undergo two jaw surgeries for correction of facial deformity.
   c. **Selection**: Samples were selected using the purposive sampling method based on the inclusion and exclusion criteria.

Surgical procedure

Patients in Group I were treated with wire fixation using 26-gauge stainless steel wire [Figure 1], and Group II received rigid internal fixation using titanium plates and screws [Figure 2]. Both groups underwent Le Fort I and anterior maxillary osteotomy to correct maxillary excess in the vertical and anteroposterior directions. Fourteen patients had underwent concurrent genioplasty for correction of chin deficiency.

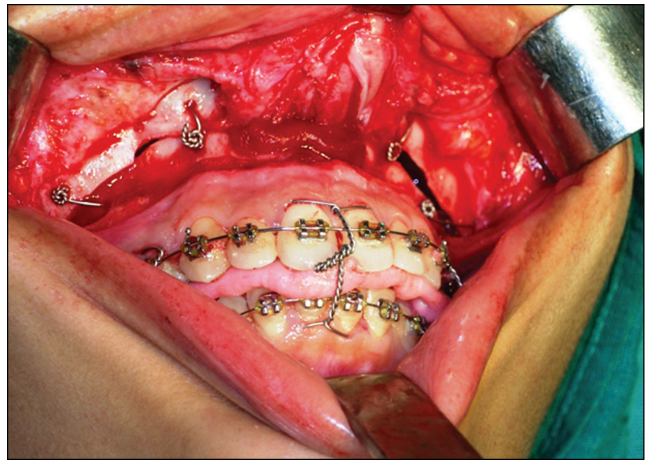


Figure 1: Maxilla stabilized with wire osteosynthesis

Figure 2: Maxilla stabilized with rigid fixation

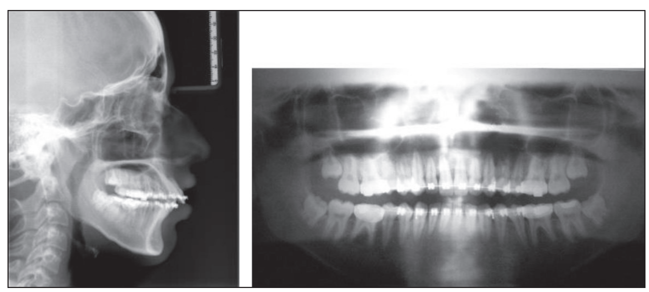


Figure 3: Preoperative lateral cephalogram and orthopantamogram-group I

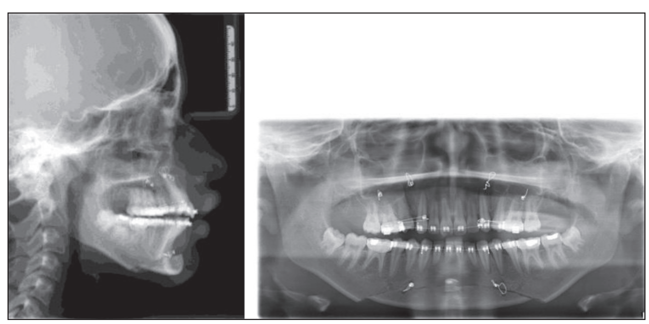


Figure 4: 1-week postoperative lateral cephalogram and orthopantamogram-Group I

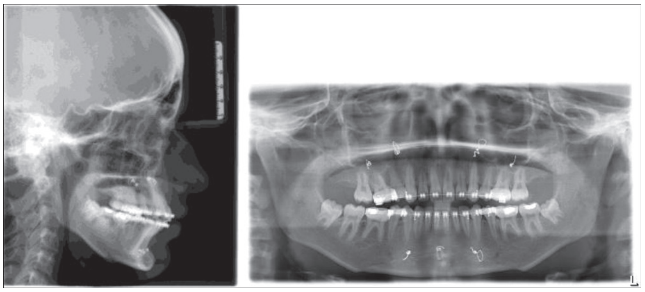


Figure 5: 6-month postoperative lateral cephalogram and orthopantamogram-Group I

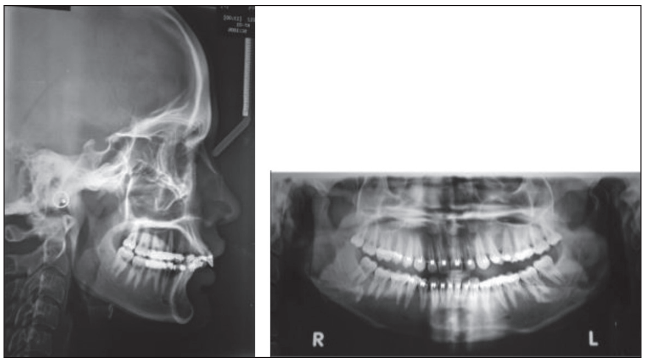


Figure 6: Preoperative lateral cephalogram and orthopantamogram-Group II

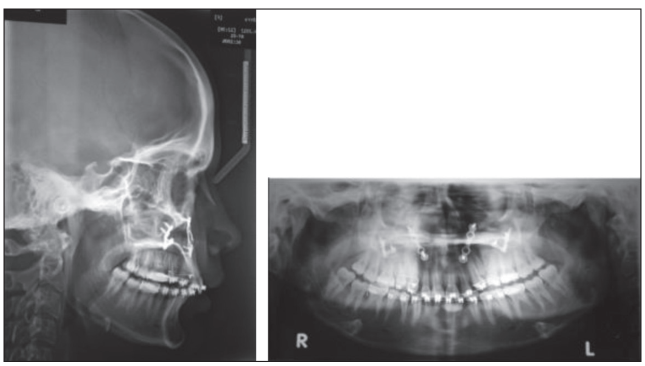


Figure 7: 1-week postoperative lateral cephalogram and orthopantamogram-Group II

Materials and measurements

a. The skeletal stability for both Group I [Figures 3–5] and Group II [Figures 6–8] was measured at three different periods; preoperative (T_1), 1-week postoperative(T_2), and 6-month postoperative (T_3) using a lateral cephalogram and analyzed using cephalometric analysis. The cephalometric analysis was carried out considering the following points[4] [Figure 9].

   i. Frankforts horizontal plane (FH) was taken as the horizontal reference plane
   ii. PNS (posterior nasal spine)
   iii. N (Nasion)
   iv. M point (center point of the widest area of the premaxilla)

The vertical and sagittal plane measurements were made from the following reference points.

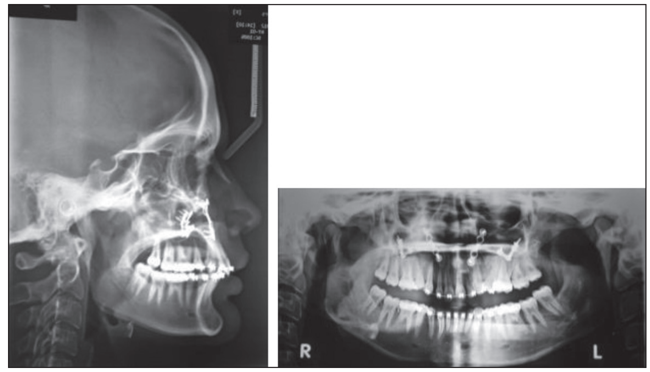


Figure 8: 6-month postoperative lateral cephalogram and orthopantamogram-Group II

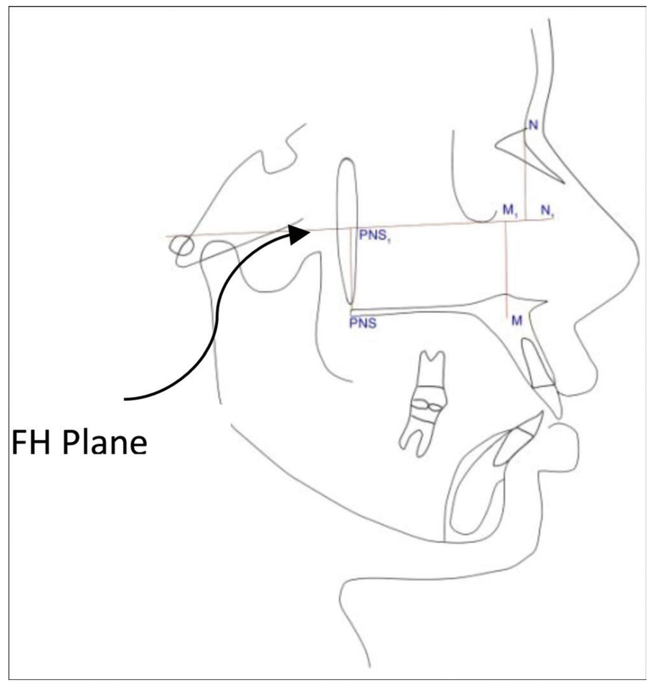


Figure 9: Cephalometric landmarks

I. From PNS, a perpendicular was drawn on to the FH plane. This point was termed PNS_1
II. From point M, a perpendicular was drawn on to the FH plane. This point was termed M_1.
III. From Nasion a perpendicular was drawn to the FH Plane. This point was termed N_1.

Vertical measurements

i. Posterior vertical measurements: PNS-PNS_1
ii. Anterior vertical measurements: M-M_1

Sagittal measurements

i. Anterior palatal measurements: M_1-N_1
ii. Posterior palatal measurements: PNS_1-N_1

Statistical analysis

Statistical Analysis SPSS (Windows version 22.0) was conducted using inferential statistics, such as an independent *t* test, to compare changes in occlusion between Group I (patients who underwent wire osteosynthesis) and Group II (patients who underwent rigid fixation) in the preoperative and 6-month postoperative period and skeletal changes in Group I (wire osteosynthesis) and Group II (rigid fixation), in the preoperative, 1-week, and 6-month postoperative periods. A paired *t* test was conducted to evaluate the changes in occlusion between Group I (wire osteosynthesis) and Group II (rigid fixation) during the preoperative and 6-month postoperative periods. ANOVA (analysis of variance) was used to assess the skeletal changes within Group I (wire osteosynthesis) and Group II (rigid fixation) in the preoperative, 1-week postoperative, and 6-month postoperative periods.

Ethical considerations

Ethical clearance was obtained from the Institutional Ethical Committee IEC/01/2011/MNDC, as well as informed consents were obtained from individual participants before the surgical procedure.

RESULTS

Skeletal stability comparison: Group I and Group II

1. Comparison of posterior vertical measurement PNS-PNS_1 between Group I (wire osteosynthesis) and Group II (rigid fixation) [Table 1].

There was a significant difference in the posterior vertical measurement (PNS-$PNS_{1)}$ between Group I and Group II during the T1 ($P = 0.006$), T2 ($P = 0.018$), and T3 ($P = 0.008$) periods.

2. Comparison of anterior vertical measurement M-M' between Group I (wire osteosynthesis) and Group II (rigid fixation) [Table 2].

There was no significant difference in the anterior vertical measurement (M-$M_{1)}$ between Group I and Group II in the T1 ($P = 0.185$), T2 ($P = 0.184$), and T3 ($P = 0.116$).

3. Comparison of posterior sagittal measurement (PNS_1-N_1) total between Group I (wire osteosynthesis) and Group II (rigid fixation) [Table 3].

There was no significant difference in the posterior sagittal measurement (PNS_1-N_1) between Group I and Group II in the T1 ($P = 0.107$), T2 ($P = 0.095$), and T3 ($P = 0.065$).

4. Comparison of anterior sagittal measurement M_1-N_1 total between Group I (wire osteosynthesis) and Group II (rigid fixation) [Table 4].

There was no significant difference in the anterior sagittal measurement M_1-N_1 between Group I and Group II in the T1 ($P = 0.064$), T2 ($P = 0.128$), and T3 ($P = 0.239$) [Graphs 1–4].

Table 1: Comparison of posterior vertical measurement between Groups I and II

Stage	Group	Mean ± SD	*N*	*t*	*P*
T1	Rigid fixation	24.8 ± 1.5	8	3.23*	0.006
	Wire osteosynthesis	30.6 ± 4.9	8		
T2	Rigid fixation	23.0 ± 1.5	8	2.69*	0.018
	Wire osteosynthesis	27.4 ± 4.3	8		
T3	Rigid fixation	23.5 ± 1.3	8	3.07*	0.008
	Wire osteosynthesis	28.8 ± 4.7	8		

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 2: Comparison of anterior vertical measurement between Groups I and II

Stage	Group	Mean ± SD	*N*	*t*	*P*
T1	Rigid fixation	31.8 ± 1.3	8	1.4	0.185
	Wire osteosynthesis	34.1 ± 4.5	8		
T2	Rigid fixation	26.0 ± 1.3	8	1.4	0.184
	Wire osteosynthesis	28.9 ± 5.7	8		
T3	Rigid fixation	26.4 ± 1.3	8	1.67	0.116
	Wire osteosynthesis	29.8 ± 5.5	8		

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 3: Comparison of posterior sagittal measurement between Groups I and II

Stage	Group	Mean ±SD	*N*	*t*	*P*
T1	Rigid fixation	53.1 ± 5.0	8	1.72	0.107
	Wire osteosynthesis	57.5 ± 5.1	8		
T2	Rigid fixation	49.9 ± 5.3	8	1.79	0.095
	Wire osteosynthesis	54.7 ± 5.5	8		
T3	Rigid fixation	50.0 ± 5.2	8	2.01	0.065
	Wire osteosynthesis	55.4 ± 5.6	8		

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 4: Comparison of anterior sagittal measurement between Groups I and II

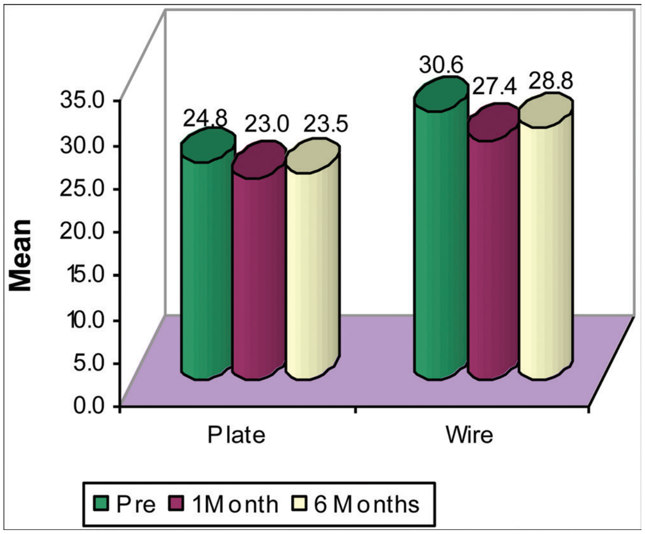
Stage	Group	Mean± SD	*N*	*t*	*P*
T1	Rigid fixation	10.7 ± 2.8	8	2.01	0.064
	Wire osteosynthesis	8.0 ± 2.5	8		
T2	Rigid fixation	6.9 ± 2.6	8	1.62	0.128
	Wire osteosynthesis	5.0 ± 2.0	8		
T3	Rigid fixation	7.0 ± 2.4	8	1.23	0.239
	Wire osteosynthesis	5.6 ± 2.1	8		

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

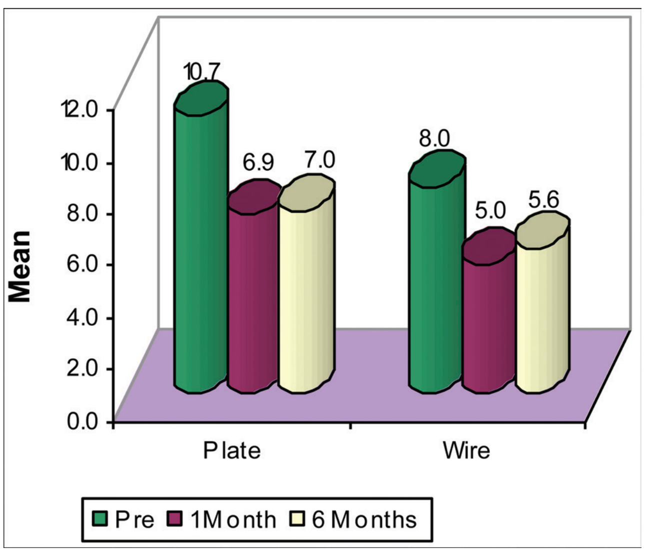
Skeletal stability - Group I (wire osteosynthesis)

1. Comparison of posterior vertical measurement PNS-PNS_1 at different periods of time for group I (wire osteosynthesis) [Table 5].

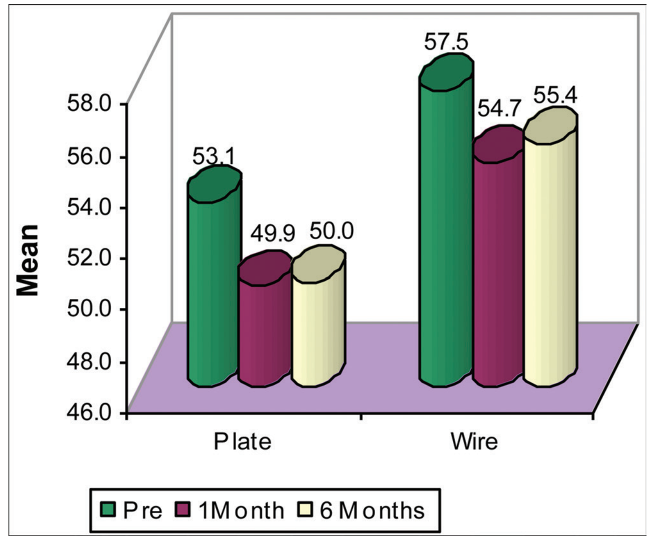
There was a significant difference exist in the posterior vertical measurement through the different periods of measurements. Pairwise comparison using



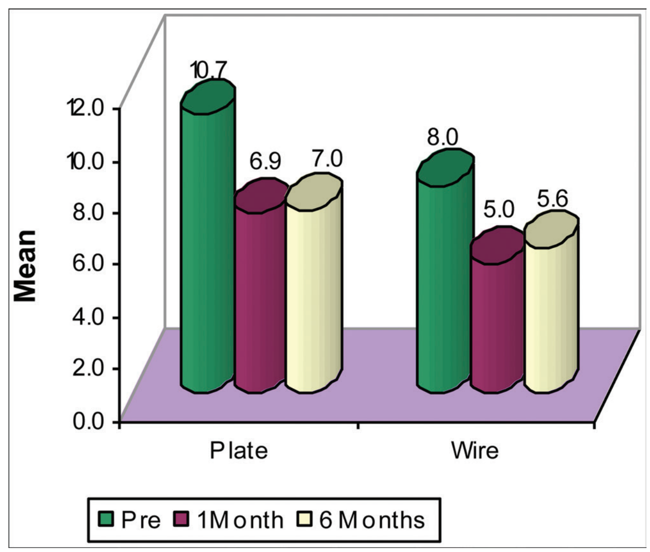
Graph 1: Comparison of posterior vertical measurement between the Group I and II



Graph 2: Comparison of anterior vertical measurement between the Group I and II



Graph 3: Comparison of posterior sagittal measurement between the Group I and II



Graph 4: Comparison of anterior sagittal measurement between Group I and II

Bonferroni's test showed that there was a significant difference between T1 and T2 ($P = 0.004$) and T1 and T 3($P = 0.017$), with no significant difference in T2 and T3 ($P = 0.084$)

2. Comparison of anterior vertical measurement M-M' at different periods of time for group I (wire osteosynthesis) [Table 6].

There was a significant difference existing in the anterior vertical measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test shows that there was a significant difference between T1 and T2 ($P = 0.000$) and T1 and T3 ($P = 0.000$), where there was no significant difference in T2 and T3 ($P = 0.123$).

3. Comparison of posterior sagittal measurement PNS'-N' at different periods of time for group I (wire osteosynthesis) [Table 7].

There was a significant difference in the posterior sagittal measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test shows that there was a significant difference between T1 and T2 ($P = 0.000$) and T1 and T3 ($P = 0.001$), where there was no significant difference in T2 and T3 ($P = 0.144$).

Table 5: Comparison of posterior vertical measurement at different periods of time –Group I

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean Diff.	*P*
T1	30.6 ± 4.9	8	18.53*	0.000	T1 & T2	3.25*	0.004
T2	27.4 ± 4.3	8			T1 & T3	1.88*	0.017
T3	28.8 ± 4.7	8			T2 & T3	1.38	0.084

T1=Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 6: Comparison of anterior vertical measurement at different periods of time- Group I

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean Diff.	*P*
T1	34.1 ± 4.5	8	64.28*	0.000	T1 & T2	5.19*	0.000
T2	28.9 ± 5.7	8			T1 & T3	4.31*	0.000
T3	29.8 ± 5.5	8			T2 & T3	0.88	0.123

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 7: Comparison of posterior sagittal measurement at different periods of time –Group I

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean Diff.	*P*
T1	57.5 ± 5.1	8	67.77*	0.000	T1 & T2	2.81*	0.000
T2	54.7 ± 5.5	8			T1 & T3	2.4*	0.001
T3	55.4 ± 5.5	8			T2 & T3	0.38*	0.144

(T1=Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative)
*significant at $P < 0.05$

4. Comparison of anterior sagittal measurement M'-N' at different periods of time for group I (wire osteosynthesis) [Table 8].

There was a significant difference exist in the anterior sagittal measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test shows that there was a significant difference between T1 and T2 ($P = 0.000$) and T1 and T3 ($P = 0.001$), where there was no significant difference in T2 and T3 ($P = 0.144$).

Skeletal stability –Group II rigid fixation

1. Comparison of posterior vertical measurement PNS-PNS_1 at different periods of time for group II (rigid fixation) [Table 9].

There was a significant difference exist in the posterior vertical measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test showed that there was no significant difference between T1 and T2 ($P = 0.077$), between T1 and T3 ($P = 0.285$), and T2 and T3 ($P = 0.826$).

2. Comparison of anterior vertical measurement M- M_1 at different periods of time for group II (rigid fixation) [Table 10].

There was a significant difference in the anterior vertical measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test showed that there was a significant difference between T1 and T2 ($P = 0.000$) and T1 and T3 ($P = 0.000$), where there was no significant difference between T2 and T3 ($P = 0.591$).

3. Comparison of posterior sagittal measurement PNS_1-N_1 at different periods of time for group II (rigid fixation) [Table 11].

There was a significant difference in the posterior sagittal measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test showed that there was a significant difference between T1 and T2 ($P = 0.001$) and T1 and T3 ($P = 0.003$), where there was no significant difference between T2 and T3 ($P = 1.000$).

Table 8: Comparison of anterior sagittal measurement at different periods of time – Group I

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean Diff.	*P*
T1	8.0 ± 2.5	8	58.87*	0.000	T1 & T2	3*	0.000
T2	5.0 ± 2.0	8			T1 & T3	2.6*	0.001
T3	5.4 ± 1.9	8			T2 & T3	0.38	0.144

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 9: Comparison of posterior vertical measurement at different periods of time –Group II

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean Diff.	*P*
T1	24.8 ± 1.5	8	4.96*	0.023	T1 & T2	1.75	0.077
T2	23.0 ± 1.5	8			T1 & T3	1.25	0.285
T3	23.5 ± 1.3	8			T2 & T3	0.5	0.826

(T1=Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative)
*significant at $P < 0.05$

Table 10: Comparison of anterior vertical measurement at different periods of time- Group II

Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean Diff.	*P*
T1	31.8 ± 1.3	8	180.64*	0.000	T1 & T2	5.75*	0.000
T2	26.0 ± 1.3	8			T1 & T3	5.38*	0.000
T3	26.4 ± 1.3	8			T2 & T3	0.38	0.591

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 11: Comparison of posterior sagittal measurement at different periods of time –Group II

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean diff.	*P*
T1	53.1 ± 5.0	8	26.34*	0.001	T1 & T2	3.25*	0.001
T2	49.9 ± 5.3	8			T1 & T3	3.13*	0.007
T3	50.0 ± 5.2	8			T2 & T3	0.13	1.000

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

Table 12: Comparison of anterior sagittal measurement at different periods of time – Group II

		Test of significance			Pairwise comparison		
Stage	Mean±SD	*N*	*F*	*P*	Pair	Mean diff.	*P*
T1	10.7 ± 2.8	8	139.34*	0.000	T1 & T2	3.81*	0.000
T2	6.9 ± 2.6	8			T1 & T3	3.69*	0.000
T3	7.0 ± 2.4	8			T2 & T3	0.13	1.000

T1 = Preoperative, T2 = 1-week postoperative, T3 = 6-month postoperative
*Significant at $P < 0.05$

4. Comparison of anterior sagittal measurement M_1-N_1 at different periods of time for group II (rigid fixation) [Table 12].

There was a significant difference exist in the anterior sagittal vertical measurement through the different periods of measurements. Pairwise comparison using Bonferroni's test showed that there was a significant difference between T1 and T2 ($P = 0.000$) and T1 and T3 ($P = 0.000$), where there was no significant difference in T2 and T3 ($P = 1.000$).

DISCUSSION

Orthognathic surgery is a highly intricate surgical procedure that aims to rectify facial deformities, which can have a profound impact on a patient's dental occlusion and overall facial aesthetics. This demanding procedure necessitates a seamless collaboration between a maxillofacial surgeon and an orthodontist to achieve optimal outcomes for the patient. The surgical team must be well-trained in facial analysis and have a strong understanding of the maxillofacial skeleton to achieve excellent surgical outcomes. Treating maxillofacial anomalies is a unique endeavor that requires particularly trained surgeons with significant knowledge of both anatomy and surgical techniques. This is essential in achieving successful bony reconstruction and attaining excellent surgical results. This study compares the skeletal stability in patients undergoing Le Fort I and anterior segmental maxillary osteotomy, with wire or rigid fixation, for maxillary excess correction. Sickels *et al.*, Proffit *et al.*, and Vijay *et al.* stated that maxillary superior repositioning is a stable procedure.[10-12] Our study conclusively demonstrates that there is no significant difference in skeletal stability between rigid and wire fixation, except in the posterior maxillary region, which is not clinically significant. Furthermore, similar to previous studies, we found no significant difference in the anterior maxilla after segmentation in both groups I and II. In our study, similar to the findings of Turvey *et al*.,[13] Winfried *et al*.,[14] and Kato *et al*.,[15] we observed no significant difference in the anterior maxilla after segmentation, both in the vertical and sagittal planes postoperatively in both groups I and II.

According to Kerkmanov *et al*.[16] and Fischer *et al*.,[17] there is no significant difference in the skeletal stability with or without maxillo-mandibular fixation in wire fixation. In our study, the maximum superior repositioning in Group I (wire fixation) was found to be 7 mm, and no postoperative maxillo-mandibular fixation was necessary. Fourteen patients from both Group I (wire fixation) and Group II (rigid fixation) underwent genioplasty performed by a single surgeon, resulting in stable postoperative outcomes without the need for maxillo-mandibular fixation.

In our study, there was no significant difference in skeletal stability between Group I (wire fixation) and Group II (rigid fixation), except in the posterior maxilla. Christopher *et al.*[18] in their study of 20 patients who had undergone Le Fort I down-fracture with rigid fixation reported a vertical relapse of 0.38 ± 1.01 mm at the posterior maxilla and vertical relapse of 0.69 ± 0.89 mm at the anterior maxilla. Haers *et al.*[19] reported a vertical relapse of 0.2 ± 1.0 mm at the posterior maxilla and 0.4 ± 1.3 mm vertical relapse in the anterior maxilla during the 1-year postoperative period, in their study of 19 cases of maxillary intrusion and fixation with wire osteosynthesis. In their comparative study, Murray *et al*.[20] reported a vertical relapse of 0.67 ± 0.75 mm and 0.78 ± 1.13 mm over 1 year at the posterior maxilla for both 2-plate and 4-plate rigid fixation, demonstrating the potential differences in outcomes between the two fixation methods. In the anterior maxilla, a vertical replacement of 0.54 ±0.89 mm and 0.56 ± 0.68 mm was reported. In our study, we found the vertical relapse in Group I (wire fixation) was 1.38 ± 0.3 mm and 0.5 ± 0.2 mm in Group II (rigid fixation) at the posterior maxilla, and in the anterior maxilla, the vertical relapse was 0.88 ± 0.3 mm in the Group I (wire fixation) and Group II (rigid fixation) 0.38 ± 0.00 mm during the 6-month postoperative period (T3). In our study on the sagittal plane, a vertical relapse of 0.38 ± 0.1 mm posteriorly and 0.38 ± 0.1 mm anteriorly in Group I (wire osteosynthesis) and 0.13 ± 0.1 mm posteriorly and 0.13 ± 0.2 mm anteriorly in Group II (rigid fixation) were noted. Christopher *et al.*[18] reported a relapse of 0.38 ± 0.61 mm posteriorly and 0.41 ± 0.59 mm anteriorly, in the sagittal plane. Murray *et al.*[20] reported a relapse of 0.68 ± 0.65 mm and 1.03 ± 0.99 mm at the anterior maxilla at the sagittal plane in their comparative study of 2- and 4-plate fixations. Haers *et al.*[19] reported a relapse of 1.0 ± 0.9 mm at the anterior maxilla in the sagittal plane for maxillary intrusion and fixation with wire osteosynthesis.

In order to draw a statistically significant conclusion regarding the potential superiority of wire osteosynthesis or rigid fixation

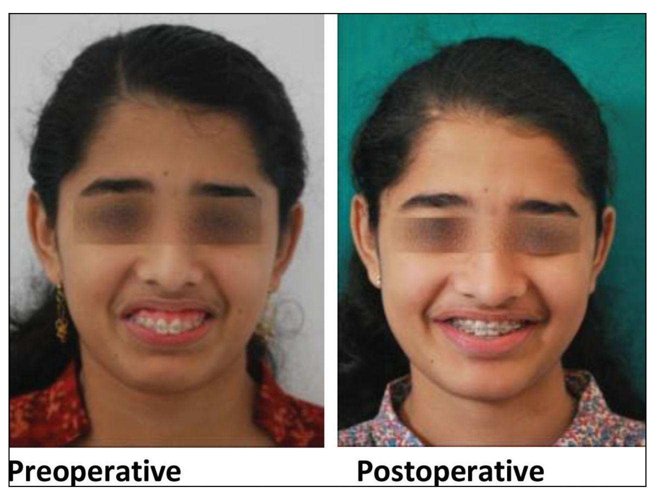


Figure 10: Group I (wire osteosynthesis) preoperative and postoperative

Figure 11: Group II (rigid osteosynthesis) preoperative and postoperative

in terms of postoperative stability, it is imperative to conduct further data collection and prospective research involving a more extensive sample size with participants exhibiting diverse facial characteristics. This will help confirm any true differences between the interventions Kloukos *et al*.[21] Ueki *et al.*[22] said that the results showed that stability did not depend on the use or otherwise of Biopex(®). The intragroup analysis showed no statistically significant difference in skeletal stability between Groups I (Wire) and II (Rigid) in both vertical and sagittal directions. There was a relapse in both Groups I (wire) and II (rigid). In our study, the relapse was less than 2 mm in both Groups I and II. Proffit *et al*.[23] stated in their study of 28 patients that changes in the postoperative period of vertical relapse between 2 and 4 mm are considered to be significant.

Based on the research by Anyanechi *et al.*[24] and Will *et al.*[25] it has been suggested that wire osteosynthesis is capable of sustaining forces and movements during the wire fixation period, facilitating the alignment of the callus and enabling the teeth to accommodate minor skeletal changes. This indicates that in current practice, this method may continue to be valuable, especially in settings with limited access to rigid internal fixation equipment. Van Sickels[26] reported that in rigid fixation, there are more occlusion-related problems as compared with those with wire osteosynthesis. The comparison of the two groups I (wire fixation, Figure 10) and II (rigid fixation, Figure 11) revealed that skeletally both groups I and II had a relapse in the 6-month postoperative period but not to a significant level. Group I had more relapse than Group II in the posterior maxilla.

CONCLUSION

In orthognathic surgery, minor post-surgical relapse is anticipated as the bone and soft tissues adapt to their new position. Comparing the results of the skeletal stability for both wire and rigid fixation revealed similar results, except in the posterior maxilla. As the occlusal stability is supposed to be achieved more easily with wire osteosynthesis, wire osteosynthesis can be considered a better stable form of fixation than rigid fixation for stabilization of superior repositioning of the maxilla using Le Fort I and anterior maxillary osteotomy for correction of vertical and anteroposterior maxillary excess.

Cutting-Edge Advances in Knowledge and Application

This research study contributes to the existing global literature on skeletal stability techniques, focusing on the two most commonly preferred methods. It underscores the necessity of providing health education specifically tailored to patients seeking aesthetic surgery for jaw correction.

Declaration of patient consent

All appropriate patient consent forms were obtained. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understand that name and initials will not be published, and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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