European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 08, 2020

Evaluation Of Relapse In Orthognathic Surgery: An Original Research

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ABSTRACT
Aim: The present study was conducted to analyse the stability of outcomes achieved by surgical treatment of skeletal class III patients in terms of the rate and extent of relapses with the help of cephalogram.
Methodology: A total of 11 patients who had undergone orthodontic treatment combined with orthognathic surgery were included. The primary inclusion criterion was a skeletal class III treated by SSO surgery combined with maxillary advancement (Le Fort I) surgery. Analysis was based on three postoperative cephalograms per patient.
Results: We observed relapse (defined, in accordance with Proffit, as changes >2 mm or 2°) at a rate of 24% after SSO surgery. We noted a maxillary relapse in 6 of the 11 patients who had undergone Le Fort I surgery, with SNA values initially increasing by +3° from T0 and T1 in keeping with the advancement procedure and subsequently decreasing by −1° toward baseline yielding a relapse rate of 30%.
Conclusion: The majority of patients exhibited stable treatment outcomes. As with all surgical procedures, success demands of the surgeon an intimate knowledge and understanding of physiology and anatomy.

Keywords ***Skeletal malocclusion, Relapse, Relapse rate, Prognathism, Class III***

1. INTRODUCTION

Orthognathic surgery combined with treatment is that the most predictable approach for the treatment of dentofacial deformity and to realize satisfactory out-comes with long-term bone

stability.[1,2] However, masticatory muscle activity, deficient preoperative and postoperative orthodontics, surgical complications, inefficient fixation of bone segments, and the extent of the surgical movement can lead to bone instability and hence treatment relapse.[3] Multidisciplinary collaboration of an orthodontist with an oral and maxillofacial surgeon is important to realize favorable outcomes within the treatment of pronounced skeletal malocclusion. Around 5% of people within the general population exhibit class III anomalies with reverse overjet because the key manifesta¬tion.[4] The origins of skeletal malocclusion surgery go back to Hullihen in the middle of the 19th century.[5] By the mid and late 20th century, steady progress in surgical techniques had led to the development of sagittal ramus osteotomy by Obwegeser/Dal Point [6,7] and of Le Fort I osteotomy in the maxilla. These are today's standard techniques.[8] Procedures planned in cases of skeletal malocclusion so pronounced as to require orthognathic surgery should not be preceded by orthodontic compensation therapy, as this might later require corrective surgical adjustment. Rather, the target of presurgical treatment should be to make a harmonious sort of (i.e., to decompensate) the maxillary and mandibular dental arches independently of every other without considering the existing occlusion. Postoperative orthodontic therapy should be applied to refine the patient's occlusion. Fixed appliances are normally utilized in both of those orthodontic stages. Immediate or late relapse may occur in the wake of a surgical intervention. Immediate relapse is chiefly due to intraoperative error (notably to imprecise planning, a failure to fix the joint, or inaccurate osteosynthesis) and can be identified immediately after the procedure. Late relapse, by comparison, tends to occur after a considerable amount of time has elapsed since the day of surgery. These events may take the form of complete or partial retrogression toward the preoperative situation for several reasons such as growth spurts, functionally induced remodelling of hard tissue (e.g., bone resorption in the dorsal area of the mandibular condyle), unstable occlusal relationships, or the absence of myofunctional adaptation. Persistent tongue or orofacial muscle habits may also contribute to the occurrence of relapse.[9] Successful double-jaw orthognathic surgery requires methodical surgical accuracy, making it one among the foremost challenging surgical procedures provided within the scope of a contemporary maxillofacial surgery practice. Single jaw surgery, while less complex, also demands rigorous precision from start to end. From the first consultation, the surgeon must begin to factor the aesthetic, functional, and stability related demands of the anticipated surgical correction. Failure to try to to so risks the introduction of errors that ultimately increase the likelihood of surgical relapse. Pre-operative planning/execution errors, intra-operative errors at the time of surgery, or post-operative wound healing errors all contribute to early surgical relapse.

Aim Of The Study

The present study was conducted to analyse the stability of outcomes achieved by surgical treatment of skeletal class III patients in terms of the rate and extent of relapses with the help of cephalogram.

2. METHODOLOGY

In our study, we included healthy 11 patients who had skeletal class III malocclusion, who had undergone orthognathic surgery and consequent orthodontic treatment at our clinical setting. The study participants had 7 male and 4 female patients with age range of 18-31 years. Patients were treated by Sagittal Split Osteotomy of the mandible combined with Le Fort I osteotomy for maxillary advancement with the usage of condylar positioning plates, occlusal splints. Patients who had undergone any other surgical procedures, having syndromic issues, less than 18 years of age were excluded from the present study. Three

successive cephalograms using Orthopantomograph were taken for each patient on the day of surgery T0, after 1 week T1 and after 12 months T2 of the treatment. Then the images were analysed with the help of Orthometric software using Segner and Hasund method, where distance between various landmarks (A, B, Me, Pg, ANS, PNS), were recorded. The study end-point was in accordance with Proffit et al., clinically relevant relapse was defined as retrogression of distances and angles by >2 mm and >2 ° toward their preoperative baseline values.10 Furthermore, the patients were assigned to three groups depending on changes in SNA and SNB angles following surgery. Both angles offer a basis from which to evaluate relapse by the changes undergone in accordance with the extent of maxillary or mandibular repositioning following a given procedure. Group 1 contained patients who exhibited relapse, i.e., in whom the SNB angle had decreased (or the SNA angle increased) as a result of surgical repositioning from T0 to T1 but who had then retrogressed toward baseline by T2, in order that the worth at T2 reflected an intermediate level between the values at T0 and T1. Group 2 comprised all patients in whom no relapse was observed, meaning that any difference in values from T1 to T2 remained within the range of measurement error. Group 3 included all patients in whom the change from T0 to T1 induced by surgical repositioning continued in the same direction (i.e., the SNB or SNA value kept decreasing or increasing, respectively) from T1 to T2. Data were analyzed with SPSS® v. 11.5.1 statistics software (SPSS Inc., Chicago, IL, USA). A t-test was wont to compare the varied parameters whose values were measured on the sequential cephalograms to every other. A 5% level of significance was defined.

3. RESULTS

Relapse based on postoperative changes in SNA and SNB angles: Total changes in the form of relapse were noted in 6 of the 11 patients who underwent mandibular setback surgery. Their SNB values decreased by −4° after the procedure (T1), then increased by +1° until the second postoperative cephalogram (T2) for a total mean change of −3° and a relapse of 23%. Another 5 patients showed no indications of relapse, with SNB values decreasing from T0 to T1 in accordance with the extent of surgical repositioning but remaining stable—or changing minimally within the range of measurement error— subsequently until T2. Negative relapse was observed in the remaining 3 patients, whose SNB values continued to decrease until T2. We noted a maxillary relapse in 6 of the 11 patients who had undergone Le Fort I surgery, with SNA values initially increasing by +3° from T0 and T1 in keeping with the advancement procedure and subsequently decreasing by −1° toward baseline yielding a relapse rate of 30%. (Table 1)

Table 1-Distribution of clinically relevant relapse (retrogression of >2 mm or >2°)

	T1–T2	**T0–T1**	**Relapse (%)**
SNA (°) Mean (median) ± SD	−2.50 ±0.75	+3.87 ±1.25	58
SNA (°) T value/p value	T=−5.683; p=0.000	T=−5.306; p=0.000	
SNB (°) Mean (median) ± SD	+3.21 ±1.4	−6.45 ±2.61	44
SNB (°) T value/p value	T=+7.770; p=0.000	T=+6.317; p=0.000	

N-A (mm) **Mean (median) ± SD**	−2.25 ±0.6	+2.50 ±1.23	72
N-A (mm) **T value/p value**	T=−5.257; p=0.000	T=−5.403; p=0.000	
N-B (mm) **Mean (median) ± SD**	+3.85 ±2.83	−9.15 ±2.38	32
N-B (mm) **T value/p value**	T=+12.787; p=0.000	T=+8.494; p=0.000	

**N-A/N-B distance between the A or B point and the perpendicular to NSL crossing the N point, SD standard deviation*

4. DISCUSSION

Over the past 50 years, surgical techniques and influencing factors in skeletal malocclusion procedures have steadily improved following extensive research on the stability of surgical outcomes. To facilitate further progress, advances in surgical techniques and influencing factors that are achieved must be continuously reviewed. Given their age range of 18-31 years, this study's patient cohort can be readily compared to other those in studies by Kierl et al. [11] and Dowling et al. [12] whose patients' mean ages were 26.6 and 27.3 years, respectively. To obtain additional linear values, we incorporated a coordinate system into the cephalograms. Such systems are documented in the literature but were based on different reference lines. 13,14 Frequently, the NLS line or Frankfort plane (or even the natural head position) was selected as the x-axis and a perpendicular drawn from the NSL line through the S or N point as the y-axis. Coordinate systems based on the sella and nasion points are the most reliable, being objectively reproducible on cephalograms and not subject to change by surgery, nor do they affect any values as long because the head is correctly positioned during the radiographic examination. One problem liable to affect any cephalometric assessment of reference points for the Frankfort horizontal plane are radiopacities (ear rods of the cephalostat, acoustic meatus) that can make it difficult to define an objectively reproducible reference line. While a coordinate system offers linear distance values as its major advantage, the use of different reference lines makes it difficult to compare data in the literature. [15] The present study confirms this pattern, showing a relapse rate of 39% versus 23% in the presence of 10–14 mm versus 6–10 mm of repositioning. We did not obtain similar findings in the maxilla, where relapse remained at a statistically significantly constant 27% versus 28% across different degrees of surgical repositioning. It is important to keep in mind, however, that mandibular-advancement results are among the most stable of surgical outcomes according to Proffit et al.[16] In addition, many of the values involved, especially in minor cases of repositioning, have been so low that they remained below the clinically relevant level of 2 mm.[17] It is therefore appropriate to exercise caution in interpreting these results. All of this study's patients underwent screw osteosynthesis, as many trials have demonstrated this fixation method's superior stability since its intro-duction in 1974.[18-20] Whether stability is enhanced or compromised by repositioning surgery in one or both jaws is controversially discussed within the literature. Proffit et al. [16] reported more stable outcomes of bimaxillary surgery (maxillary advancement combined with mandibular setback), while mandibular setback procedures yielded less stable results when performed alone. To explain this finding, they proposed that the larger mean degrees of repositioning involved in procedures confined to the mandible would ultimately increase the tendency for relapse. Scheuer und Höltje, by

contrast, reported considerably better stability after procedures confined to the mandible than after bimaxillary procedures.[21] Cephalometric analysis can not to be used without clinical support, requiring facial analysis to complement and elucidate cephalometric data.[22] The analysis of facial assists in defining the movement necessary for obtaining the best result.[23] The analysis must include facial structures of the midface that does not show up in conventional cephalometric analysis like infraorbital rhyme subpupilar region, beyond the contour of the alar base that are important indicators of the anteroposterior position of the maxilla.[24] The balance between the muscular structures, bone, joint, dental and respiratory functions, speech, chewing and swallowing, is fundamental to the stability of the treatment.[25] The beauty is directly related to symmetry, noting a balance in size, shape and organization of anatomical features between opposite sides relative to a reference plane median.[26] The planning for orthognathic surgery should be performed more as an art form than science. Avoid the use of cephalometric values as treatment goal, without making the necessary adjustment to the patient. All these analyze should be critically evaluated with respect to the individual needs of each patient, and their complaints and desires should be a priority in the treatment plan.[27] The second follow-up examination in our study was conducted after a minimum of 6 and a maximum of 12 months. Adding longer observation periods (e.g., 24 or 36 months) are going to be a crucial goal in future investigations to verify the long-term stability of outcomes. The investigation results we obtained can be considered representative when considering other combined regimens of orthodontic treatment and orthognathic surgery. Stable treatment outcomes were observed within the overwhelming majority of our treated patients during follow-up examinations. The maxillary advancement procedures are more stable. The surgical correction of dentofacial deformities is both reliable and predictable. As with all surgical procedures, success demands of the surgeon an intimate knowledge and understanding of physiology and anatomy.

5. CONCLUSION

Stable treatment outcomes were observed in the vast majority of our treated patients during follow-up examinations. The maxillary advancement procedures are more stable. The surgical correction of dentofacial deformities is both reliable and predictable. As with all surgical procedures, success demands of the surgeon an intimate knowledge and understanding of physiology and anatomy.

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