ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 12 | December - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A PROSPECTIVE STUDY ON CHANGE IN CONDYLAR POSITION AND SKELETAL STABILITY ASSESSMENT FOLLOWING BSSO FOR MANDIBULAR SET BACK

Surgery

Dr.Krishna Prasad Prusty Assistant Professor, Department of general surgery, Gitam Institute of Medical Sciences Vishakapatnam.

ABSTRACT

BACKGROUND: Change in condylar position following mandibular bilateral sagittal split osteotomy (BSSO) has been implicated as an important factor in the appearance of immediate postoperative relapse during rigid fixation. It has been suggested that the control of the condylar segment following BSSO is the most important aspect in preventing relapse. Mandibular bilateral sagittal split osteotomy (BSSO) is often accompanied with the change in condylar position important factor in the appearance of immediate postoperative relapse during the rigid fixation. **OBJECTIVE:** This study was mainly undertaken to study the changes in position of the conydle in lateral and frontal cephalograms with patients undergoing SSRO sagital split ramus osteotomy for mandibular set back. **METHODS:** A prospective study from January-2018 to December-2019 was conducted on 30 patients with skeletal class 3 deformity undergoing surgery. All the study participants (aged between 15 – 35 years) attended the department of oral and maxillofacial surgery and provided informed, written and bilingual consent. SNB, Gonial angle, Pog – Parallel to SN, Pog – N perpendicular to SN, ramus inclination and mandibular length (Co-Gn) were measured by using frontal and lateral cephalograms pre operatively, immediately after surgery, after 3 months and after 6 months. A paired T test was used find the difference between the groups Fishers test was used to fins the time dependent changes in cephalometric measurements. **RESULTS:** This study reported significant differences in SNB, Gonial angle, Pog – N parallel to SN and Pog – N Perpendicular to SN, inter incisal angle and occlusal plane before and at 3 and 6 months of follow up after surgery. **CONCLUSION:** There was a significant change occurring in both proximal and distal segment including condyle. Overall, the surgery maintained the occlusal stability and skeletal stability.

KEYWORDS

Bilateral Sagittal Split Osteotomy, Condylar Sag, Cephalogram, Orthognathism

INTRODUCTION

Mandibular bilateral sagittal split osteotomy (BSSO) is often accompanied by the change in condylar position. It is an important factor in the appearance of immediate postoperative relapse during the rigid fixation.[1-3] The change in position of the condyle is difficult to identify and difficult to predict after orthognathic surgery.[4, 5] The surgery involves complex positional changes which should be assessed in systematic manner.

The condylar displacement can occur at 4 different positions including anterior – posterior, vertical, angulation change and along the long axis of the condyle.[6] The control of the condylar segment after BSSO is an important step in preventing the relapse.[7] Condylar sag results in change in the occlusion immediately after some time. The change in position of the condyle in the glenoid fossa results in this condylar sag after surgery by planned occlusion and rigid fixation of the bony fragments.

The condylar sag can be central or peripheral based on the position of the condyle. The cnetal sag occurs by positioning of the condyle inferiorly to the glenoid fossa and may not be in contact with any part of the fossa. The condyle can be moved back to the original position resulting in malocclusion soon after the decrease in the intraoperative oedema and release of Maxillo-mandibular fixation (MMF).

The peripheral condylar sag can be classified as type 1 and type 2. The peripheral condylar sag or type 1 is positioned inferiorly with peripheral contact with the fossa (lateral, medial, posterior or anterior), while the MMF is in position and teeth are in occlusion. Delayed occlusal relapse can occur and lead to malocclusion due to condylar resorption. These types of studies are scant in this part of the world. Hence, this study was mainly undertaken to evaluate the changes in position of the conydle in lateral and frontal cephalograms with patients undergoing SSRO sagital split ramus osteotomy for mandibular set back before surgery, immediately after surgery, 3 months and 6 months after the surgery.[8]

MATERIAL AND METHODS

Source of data

A prospective study was conducted in 30 patients attending department of oral and maxillofacial surgery. The patents with skeletal class 3 deformity were included in the study.

Sample Size

At the time of orthognathic surgery, they study patients ranged in the age between 15 to 35 years, with a mean age of 25 ±5 years.

Preoperative assessment of the patient

The clearance from institutional ethics committee was obtained before the study was started. An informed, written and bilingual consent was obtained from all the patients before they were included in to the study.

Method of data collection

Patients undergoing BSSO for mandibular set back and age between 15 to 35 years from January-2018 to December-2019 were included in to the study. About 30 patents chosen by convenience sampling underwent BSSO for their mandibular prognathism.

Sampling technique

BSSO technique was adopted in these patients to correct their manidbular prognathism and rigid fixation was achieved by using Champy's mini plates and moncortical screws. MMF with elastics was used to maintain the stable occlusion. All patients received orthodontic treatment pre and post surgery.

Follow-up

For all 30 patients' lateral and frontal cephalograms to assess the skeletal changes before operation, immediately after surgery, three months and six months postoperatively were done.

Inclusion criteria

Patients undergoing BSSO for mandibular set back and age between 15 to 35 years.

Exclusion criteria

Syndromic patients and Bi Jaw surgery patients.

Following measurements were obtained in the study from study participants: Gonial angle, Pog - N parallel to SN, Pog – N perpendicular to SN, Occlusal plane to SN, Inter incisal angle and SNB.

Statistical Analysis

All the details were obtained by using predesigned proforma. Statistical analysis using paired T test was used find the difference between the groups Fishers test was used to fins the time dependent changes in cephalometric measurements.

RESULTS

Table 1: Comparison of SNB between different period of follow up

SNB	Mean difference	T value	P value, Sig
Pre operative – Immediately after surgery	5.83	8.967	0.000, Sig
Pre operative – 3 months after surgery	6.57	10.422	0.000, Sig

Pre operative – 6 months after surgery	6.73	11.282	0.000, Sig

This study has shown a significant difference in the SNB angle, when compared baseline parameters with the immediately after surgery, 3 months and 6 months follow up.

Table 2: Comparison of Gonial angle between different period of follow up

Gonial angle	Mean difference	T value	P value, Sig
Pre operative – Immediately after surgery	2.7	8.289	0.000, Sig
Pre operative – 3 months after surgery	2.37	7.089	0.000, Sig
Pre operative – 6 months after surgery	2.03	6.288	0.000, Sig

The comparison of gonial angle with the baseline and immediately after surgery, 3 months and 6 months of follow up had shown that there was a statistically significant difference.

Table 3: Comparison of Pog – N (Perpendicular) between different period of follow up

Pog – N (Perpendicular)	Mean difference	T value	P value, Sig
Pre operative – Immediately after surgery	0.2	1.795	0.83, NS
Pre operative – 3 months after surgery	0.23	2.041	0.050, Sig
Pre operative – 6 months after surgery	0.23	2.041	0.050, Sig

The Pog perpendicular to SN had shown a non significant difference between the pre operative and immediately after surgery. Significant difference at 3 months and 6 months of follow up.

Table 4: Comparison of Pog – N (Parallel) between different period of follow up

Pog – N (Parallel)	Mean difference	T value	P value, Sig
Pre operative – Immediately after surgery	7.7	13.376	0.000, Sig
Pre operative – 3 months after surgery	7.5	13.949	0.000, Sig
Pre operative – 6 months after surgery	7.36	13.608	0.000, Sig

The Pog Parallel to SN had shown a significant difference when compared with the baseline, 3 months after surgery and 6 months after surgery.

Table 5: Comparison of Inter incisal angle between different period of follow up

Inter incisal angle	Mean difference	T value	P value, Sig
Pre operative – Immediately after surgery	1.47	2.588	0.015, Sig
Pre operative – 3 months after surgery	1.57	2.726	0.011, Sig
Pre operative – 6 months after surgery	1.97	3.208	0.003, Sig

There was a statistically significant difference in the inter incisal angle between the baseline and immediately after surgery, 3 months after surgery and 6 months after surgery.

Table 6: Comparison of Occlusal plane to SN between different period of follow up

Occlusal plane to SN	Mean difference	T value	P value, Sig
Pre operative – Immediately after surgery	2.4	5.61	0.000, Sig
Pre operative – 3 months after surgery	3.17	5.905	0.000, Sig
Pre operative – 6 months after surgery	3.17	5.905	0.000, Sig

The Occlusal plane had also shown a significant difference between the baseline, immediately after surgery, 3 months after surgery and 6 months after surgery.

DISCUSSION

The literature available envisages that sagittal split osteotomy as an excellent procedure in correcting the deformities of the mandible. The stability of the mandibular ramus osteotomy mainly depends upon a number of factors including amount of retrusion/ protrusion, clockwise rotation of the mandible, the method of fixation and amount of growth left with the individual. The chance of relapse increases with greater movement.[9]

An anatomical restoration of the temporo mandibular joint is utmost important in order to achieve the dental and skeletal stability. The condylar head position, surgeons' experience, movement of distal segment of the mandible and fixation are the factors which play important role in dental and skeletal stability.[10]

Temporo mandibular joint dysfunction can occur following BSSRO as a result of improper positioning of the proximal mandibular segment. A number of appliances have been devised to maintain the position of proximal segment in its position.[11, 12] A study by Sato *et al* (2014) have reported that the necessity of the condylar positioning devices are not always desirable for orthognathic surgery.[13]

The present study reported significant differences in SNB, gonial angle, Pog – N parallel to SN and Pog – N perpendicular to SN, inter incisal angle and occlusal plane.

The sella, Nasion, B point (SNB) angle describes the position of the mandible in relation to the anterior cranial base and is formed between the nasion-sella turcica line (NSL) and the line between nasion and B-point. Our study reported significant difference in the SNB angle, when compared baseline parameters with the immediately after surgery, 3 months and 6 months follow up. Similar results were recorded in study undertaken by Wohlwender *et al* (2011).[14]

Gonial angle, also called angle of the jaw or angle of the mandible refers to the angle formed by the junction of the posterior and lower borders of the human lower jaw. The gonial angle plays significant role in ensuring a harmonious facial profile, therefore changes in this angle after surgery may be an aesthetic concern for both the operating surgeon and the patient. In the current case, there was a significant decrease in the value of gonial angle at all three stages taken up in study. The results obtained in the current study are in agreement with studies by Bayat *et al* (2006)[15] and Jafarian (2005)[16] who recorded decrease in the gonial angle by (-5.9 degree) and (-2.6 degree) following mandibular setback by BSSO. The mandibular setback by BSSO give a better esthetic and occlusion, but it may result in increased incidence of neurosensory disturbance and unfavourable split.

Inter incisal angle: In the present study there was a statistically significant difference in the inter incisal angle between the baseline and immediately after surgery, 3 months after surgery and 6 months after surgery. The results of the current study are in accordance to the results of study by Rao et al (2014).[17]

Occlusal plane: According to Rickett's Bioprogressive Therapy, each facial type responds differently to the BSSO surgical procedure.[18] In the present study, the Occlusal plane had also shown a significant difference between the baseline, immediately after surgery, 3 months after surgery and 6 months after surgery. These results are in consistent with the results recorded by Yoshida *et al* (2000).[19]

This concludes that group had a transient tendency towards posterior movement at the gonial point and antero inferior movement at the condylar head (Sag). A study had postulated that, anteroinferior movement of the condyle is to be expected from the direction of the lateral pterygoid muscle and the pterygomassetric sling to proximal segment in IVRO, but in SSRO the proximal segment can be pulled posteriorly and superiorly by the temporalis muscle and masseter muscle ending in counter clockwise inclination of the condyle.[20] The PoG and Gn points tend to move superioposteriorly after the surgery. This may be affected by the condylar sag soon after surgery and the difference in the muscular attachments to the distal segment. The condylar sag soon after surgery so that the condyle changes from infero-anterior position to superior posterior position with relapse of proximal segment after bony adhesion and reattachment of the medial pterygoid muscle.[21]

A study by Costa *et al* (2008) had reported that, the techniques which are developed uses the geometrically corrected inter occlusal splint to

compensate the condylar lag and controls mandibular position and postoperative occlusion.[22]

The strength of the study includes collection of all data from the study participants without any loss to follow-up for six months. Since the sample size of the current study is quite small, it becomes the weakness of the study. Also, it is a single-center study and therefore the results obtained in this study shall not be completely applicable to all other institutional set-ups.

CONCLUSION

This study had shown that, the significant change occurring in both proximal and distal segment including condyle. The surgery had maintained the occlusal stability and skeletal stability. Although the values identified in the present study are likely different from those in actual clinical situations, these study findings will provide a reference basis both for the maxillofacial surgeons when performing the BSSO surgery to treat mandibular setbacks. Further studies need to be undertaken with larger samples and longer follow-up periods to substantiate the findings.

Conflicts of Interests

The authors declare no conflicts of interest.

REFERENCES

1. Manjunath N. M, Preema M. Pinto, Veerendra Kumar, Vikram S. Reddy. "Change in Condylar Position and Skeletal Stability Assessment Following BSSOfor Mandibular Set Back". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 38, September 21, 2015; Page: 5991-5996.
2. Han JJ, Hwang SJ. Three-dimensional analysis of postoperative returning movement of perioperative condylar displacement after bilateral sagittal split ramus osteotomy for mandibular setback with different fixation methods. Journal of Cranio-Maxillofacial Surgery. 2015 Nov 1;43(9):1918-25.
3. Holzinger D, Willinger K, Millesi G, et al. Changes of temporomandibular joint position after surgery first orthognathic treatment concept. Sci Rep. 2019;9(1):2206.
4. Cevidanes LH, L'Tanya JB, Tucker SF, Styner MA, Mol A, Phillips CL, Proffit WR, Turvey T. Three-dimensional cone-beam computed tomography for assessment of mandibular changes after orthognathic surgery. American journal of orthodontics and dentofacial orthopedics. 2007 Jan 1;131(1):44-50.
5. Bettega G, Cinquin P, Lebeau J, Raphael B. Computer assisted orthognathic surgery: clinical evaluation of a mandibular condyle repositioning system. J Oral MaxillofacSurg 2002;60:27-34; discussion 34-25.
6. Tabrizi R, Shahidi S, Bahramnejad E, Arabion H. Evaluation of Condylar Position after Orthognathic Surgery for Treatment of Class II Vertical Maxillary Excess and Mandibular Deficiency by Using Cone-Beam Computed Tomography. J Dent (Shiraz). 2016;17(4):318-325..
7. Becktor JP, Rebellato J, Becktor KB, Isaksson S, Vickers PD, Keller EE. Transverse displacement of the proximal segment after bilateral sagittal osteotomy. J OralMaxillofacSurg 2002; 60:395-403.
8. KichiroUeki, Mayumi Shimada, Kiyomasa Nakagawa and Etsuhide Yamamoto, change in condylar long axis and skeletal stability following sagittal split ramus osteotomy and intra oral vertical ramus osteotomy for mandibular prognathia. J. Oral and Maxillofac. Surg. 2005;63;1494-1499.
9. Kim YK. Complications associated with orthognathic surgery. J Korean Assoc Oral Maxillofac Surg. 2017;43(1):3-15.
10. Bordoni B, Varacallo M. Anatomy, Head and Neck, Temporomandibular Joint. [Updated 2019 Feb 6]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020.
11. Lee CY, Jang CS, Kim JW, Kim JY, Yang BE. Condylar repositioning using centric relation bite in bimaxillary surgery. Korean J Orthod. 2013;43(2):74-82.
12. John P Reyneke, Feretti C intraoperative diagnosis of condylar sag after bilateral sagittal split ramus osteotomy.Br J Oral Maxillofacsurg 2002;40:285-292.
13. Sato FR, Asprino L, Moreira RW, de Moraes M. Comparison of postoperative stability of three rigid internal fixation techniques after sagittal split ramus osteotomy for mandibular advancement. Journal of Cranio-Maxillofacial Surgery. 2014 Jul 1;42(5):e224-9..
14. Wohlwender I, Daake G, Weingart D, Brandstätter A, Kessler P, Lethaus B. Condylar resorption and functional outcome after unilateral sagittal split osteotomy. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2011 Sep 1;112(3):315-21.
15. Bayat M, Jafarian M, Habashi OG. Correlation between gonial angle and different variables after bilateral sagittal split ramus osteotomy. Frontiers in Dentistry. 2006:19-23.
16. Jafarian M, Rouhi AA. Gonial angle changes following mandibular set back using bilateral sagittal split ramus osteotomy (BSSRO).
17. Rao S, Selvaraj L, Lankupalli AS. Skeletal stability after bilateral sagittal split advancement and setback osteotomy of the mandible with miniplate fixation. Craniomaxillofacial trauma & reconstruction. 2014 Mar;7(1):9-15.
18. Ricketts RM. Bioprogressive therapy as an answer to orthodontic needs Part I. American journal of orthodontics. 1976 Sep 1;70(3):241-68.
19. Yoshida K, Rivera GA, Matsuo N, Takaishi M, Inamoto H, Kurita K. Long-term prognosis of BSSO mandibular relapse and its relation to different facial types. The Angle Orthodontist. 2000 Jun;70(3):220-6.
20. Chen, C.-M., et al., The Effect of Pterygomasseteric Sling's Area in the Postoperative Stability after Mandibular Setback Surgery. BioMed research international, 2017.
21. Zafar H, Choi DS, Jang I, Cha BK, Park YW. Positional change of the condyle after orthodontic-orthognathic surgical treatment: is there a relationship to skeletal relapse?. J Korean Assoc Oral Maxillofac Surg. 2014;40(4):160-168.
22. Costa F, Robiony M, Toro C, Sembronio S, Polini F, Politi M. Condylar positioning devices for orthognathic surgery: a literature review. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2008 Aug 1;106(2):179-90.