CHANGES IN THE GONIAL ANGLE FOLLOWING BILATERAL SAGITTAL SPLIT OSTEOTOMY AND EXTRA ORAL VERTICAL RAMUS OSTEOTOMY FOR MANDIBULAR EXCESS

A Dissertation submitted in
partial fulfillment of the requirements
for the degree of

MASTER OF DENTAL SURGERY
BRANCH – III
ORAL AND MAXILLOFACIAL SURGERY

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
Chennai – 600 032
2010 - 2013

CERTIFICATE

This is to certify that ***Dr.D.PRADEEP****,P.G. Student (2010-2013) in the Department of Oral and maxillofacial surgery, Tamilnadu Government Dental College and Hospital, Chennai-600 003, has done* dissertation *titled "CHANGES IN THE GONIAL ANGLE FOLLOWING BILATERAL SAGITTAL SPLIT OSTEOTOMY AND EXTRA ORAL VERTICAL RAMUS OSTEOTOMY FOR MANDIBULAR EXCESS" under our direct guidance and supervision in partial fulfillment of the regulation laid down by The Tamilnadu Dr.M.G.R. Medical University, Chennai, for MDS, Branch-III, Oral and Maxillofacial Surgery Degree Examination.*

GUIDED BY

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DECLARATION

I, **Dr.D.PRADEEP**, do hereby declare that the dissertation titled *"CHANGES IN THE GONIAL ANGLE FOLLOWING BILATERAL SAGITTAL SPLIT OSTEOTOMY AND EXTRA ORAL VERTICAL RAMUS OSTEOTOMY FOR MANDIBULAR EXCESS "* was done in the Department of Oral and Maxillo Facial Surgery, Tamil Nadu Government Dental College & Hospital, Chennai 600003. I have utilized the facilities provided in the Government dental college for the study in partial fulfillment of the requirements for the degree of **Master of Dental Surgery** in the speciality of Oral and MaxilloFacial Surgery **(Branch III)** during the course period **2010-2013** under the conceptualisation and guidance of my dissertation guide**, Prof.Dr.D.DURAIRAJ, MDS.** I declare that no part of the dissertation will be utilized for gaining financial assistance for research or other promotions without obtaining prior permission from the Tamil Nadu Government Dental College & Hospital. I also declare that no part of this work will be published either in the print or electronic media except with those who have been actively involved in this dissertation work and I firmly affirm that the right to preserve or publish this work rests solely with the prior permission of the Principal, Tamil Nadu Government Dental College & Hospital, Chennai 600 003, but with the vested right that I shall be cited as the author(s).

Signature of the PG student *Signature of Guide*

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This agreement herein after the "Agreement" is entered into on this day - 26th Dec 2012 between the Tamil Nadu Government Dental College and Hospital represented by its **Principal** having address at Tamil Nadu Government Dental College and Hospital, Chennai - 600 003, (hereafter referred to as, 'the college')

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DR.D.DURAIRAJ,52/yrs working as **Professor** in the Department of Oral&Maxillofacial surgery, at the college, having residence address at Sri Kumaran Illam,No.3/19,First Cross Street,Raghava Nagar,Moovarasampet,Chennai.600 091. (herein after referred to as the Principal investigator')

And

Dr.D.PRADEEP aged 26 years currently studying as **Post Graduate Student** in the Department of Oral&Maxillofacial surgery, Tamil Nadu Government Dental College and Hospital, Chennai-03 (herein after referred to as the 'PG Student and co-investigator').

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1.

2.

ACKNOWLEDGEMENT

I am extremely grateful to my esteemed guide ***Prof.Dr.D.Durairaj M.D.S.,*** *Professor, Department of Oral and Maxillofacial Surgery, Tamilnadu Govt. Dental college and Hospital, for his filial attitude, valuable guidance, encouragement, lending me his precious time and never ending patience, with out which this study would not have been possible and also for constant inspiration through out my post graduation period.*

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I would like to extend my gratitude to the professors & assistant professors of the Dept of Orthodontics, for providing me with patients and their invaluable assistance during the course of this study.

Narrow border of language could never express my respect and gratitude to all the patients who co-operated with me for this study.

I dedicate this study to my grandparents, my parents, my friends for their unconditional love and concern.

Last but not the least I would like to seek the ***blessings of the Almighty*** *without whose grace this endeavour wouldn't have been possible.*

INSTITUTIONAL ETHICAL COMMITTEE

Tamil Nadu Government Dental College and Hospital, Chennai-3

Telephone No: 044 2534 0343
Fax : 044 2530 0681

R.C.No. 0430/DE/2010

Date: **27-03-2012**

Title of the Work **"Change in the Gonial Angle Following Bilateral Sagittal split osteotomy versus Extra Oral Vertical Ramus osteotomy for Mandibular Excess"**

Principal Investigator: **Dr. D. Pradeep, III Year MDS Student**

Department Department of Oral & Maxillofacial Surgery

The request for an approval from the Institutional Ethical Committee (IEC) was considered for the following on the **IEC meeting held on 25-01-2012** at the Principal's Chambers, Tamil Nadu Government Dental College & Hospital, Chennai-3.

"Advise to proceed with the study"

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LIST OF ABBREVIATIONS

EVRO	**-**	**Extra oral vertical ramus osteotomy.**
IVRO	**-**	**Intra oral vertical ramus osteotomy.**
IVSO	**-**	**Intra oral vertical subcondylar ramus osteotomy.**
EVSO	**-**	**Extra oral vertical subcondylar ramus osteotomy.**
TMJ	**-**	**Temporomandibular joint.**
SSO	**-**	**Sagittal split osteotomy.**
BSSO	**-**	**Bilateral sagittal split osteotomy.**
BSSRO	**-**	**Bilateral sagittal split ramus osteotomy.**
CT	**-**	**Computed tomogram.**
OPG	**-**	**Orthopantamogram.**
Ceph	**-**	**Cephalogram.**
3D CT	**-**	**3 Dimentional Computed tomogram.**

CONTENTS

ABSTRACT

Background: Since ages human race have been genuinely concerned about their facial appearance. Mandibular prognathism (MP) or skeletal Class III malocclusion is one of the most severe maxillofacial deformities resulting in aesthetic concerns and also affect the normal functional abilities of an individual and disturbing psychological problem. One of the characteristic features of mandibular prognathism is obtuse gonial angle. In ensuring an esthetic harmonious facial profile, gonial angle plays an important role. Surgical treatment of the mandibular prognathism either Bilateral Sagittal Split Osteotomy(BSSO) or Extra Oral Vertical Ramus Osteotomy(EVRO) will improve this gonial angle.

Aim: The aim of this study is to evaluate the change in the Gonial angle following Bilateral Sagittal Split Osteotomy versus Extra Oral Vertical Ramus Osteotomy for Mandibular excess.

Methods: In this prospective study Eight patients with mandibular prognathism were included . That 8 patients (5 male and 3 female) were divided into two groups . In group I, 4 patients with mandibular prognathism were treated by BSSO with rigid fixation and MMF for 4 weeks. In group II, 4 patients with mandibular prognathism were treated by EVRO without rigid fixation and MMF for 6 weeks. Gonial angle is measured for all 8 patients in group I and group II , both pre operatively and post operatively using lateral cephalogram.

Results: In present study the decrease in gonial angle was observed following mandibular setback surgery by BSSO and EVRO.The average decrease in gonial angle in the first group(BSSO) was 4.7 degree and in second group(EVRO) was 7 degree .

Conclusion: By this study we conclude that in patients with increased gonial angle it is better to use EVRO technique as decrease in gonial angle was more that results in better esthetic face , better occlusion, less incidence of inferior alveolar nerve injury and inconspicuous scar. The mandibular setback by BSSRO also give a better esthetic and occlusion, but it may results in increased incidence of neurosensory disturbence and unfavourable split.Thus surgical technique for mandibular prognathism whether BSSRO or EVRO is always depend on surgeons preference and other individual factors.

Key words:- GONIAL ANGLE,BSSO,EVRO

INTRODUCTION

INTRODUCTION

"A thing of beauty is a joy forever." -John Keats

Your beauty, just like your capacity for life, happiness, and success, is immeasurable. Day after day, countless people across the globe get on a scale in search of validation of beauty and social acceptance **- Steve Maraboli**

Dentofacial deformities usually affect the upper or lower jaws that are out of proportion with the rest of the face and head. These deformities pose an aesthetic and functional problem that result in difficulty in speaking, chewing or biting. Studies indicate that dentofacial deformities affect 20% of the population.[79]

Mandibular prognathism (MP) or skeletal Class III malocclusion with a prognathic mandible is one of the most severe maxillofacial deformities. The word prognathism derives from Greek word *pro* (forward) and *gnathos* (jaw). Prognathism is a skeletal deformity which is characterised by abnormal protrusion of mandible[22]. **Joffe** defined mandibular prognathism as a disorder of craniofacial growth in which facial profile is impaired by excess prominence of mandible[91]. It's a genetic disorder and manifest as a familial recurrence[104,45].

The facial features often associated with mandibular prognathism include prominence of lower third of face, particularly in area of lower lip and chin in anteroposterior and vertical dimension, obtuse gonial plane, concave or straight profile, acute nasolabial angle, diminished or absence labiomental fold and anterior cross bite[40,93] .The massive jaw with protruding chin and heavy lip results in unacceptable esthetics, so patient likely to seek surgical treatment at younger age.

Surgery to correct the mandibular prognathism is for two reasons:

(1) Since orthodontic treatment alone cannot correct mandibular prognathism or skeletal class III malocclusion .

(2) Functional problems such as speaking or chewing (FONSECA)

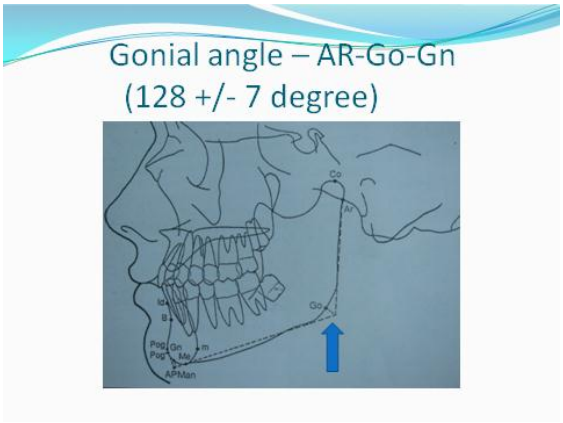
For this reason the speciality of maxillofacial surgery which deals with repositioning of the jaws (Orthognathic Surgery) is often necessary. Orthognathic surgeries are performed for skeletal deformities of jaws with the intend to enhance both function and esthetics[87]. Bilateral sagittal split osteotomy (BSSO) and Extra oral vertical ramus osteotomy (EVRO) are common techniques used for the correction of mandibular deformities. Both techniques have their own merits and demerits.

Extra oral vertical ramus osteotomy was popularised by **Caldwell and Letterman** in early 1950s, which is performed for correction of mandibular excess. Through the submandibular incision , lateral surface of the ramus is exposed and it is sectioned in a vertical fashion from the sigmoid notch to angle of mandible and entire body and anterior ramus of mandible is moved posteriorly to achieve proper occlusion[93].

Bilateral sagittal split osteotomy was first described by **Trauner and Obwegeser** and later modified by **Dalpont, Hunsuck and Epker**. BSSO accomplished intraoral by placing an incision over the anterior border of ramus. The

osteotomy cut is placed in a sagittal fashion that splits the ramus and posterior body of mandible, which allows setback of mandible[93].

External gonial angle plays a significant role in diagnosis of craniofacial disorder[92]. In ensuring an esthetic harmonious facial profile, gonial angle plays an important role[46,87]. One of the characteristic feature of mandibular prognathism is obtuse gonial angle[25]. Changes in this gonial angle particularly after surgery may be an aesthetic concern for both the surgeon and the patients.[46,87]



The gonial angle is considered to be a representative of mandible morphology. Gonial angle is the angle formed between the tangential line along the lower border of body of mandible and another along the posterior border of ramus of mandible. Its increase may cause the face to appear older[87]. Lateral cephalogram is being used to measure this gonial angle. Gonial angle is measured using– AR-Go-Gn points in lateral cephalograms. Its normal value is (128 +/- 7 degree). Both BSSO and EVRO alter the gonial angle following mandibular setback.

AIM

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OBJECTIVES

AIM AND OBJECTIVE

The aim of this study is to evaluate the change in the gonial angle following Bilateral Sagittal Split Osteotomy versus Extra Oral Vertical Ramus Osteotomy for Mandibular excess.

Objectives

- To achieve desired occlusion and esthetic result.
- To evaluate the advantages of these procedures in mandibular prognathism.

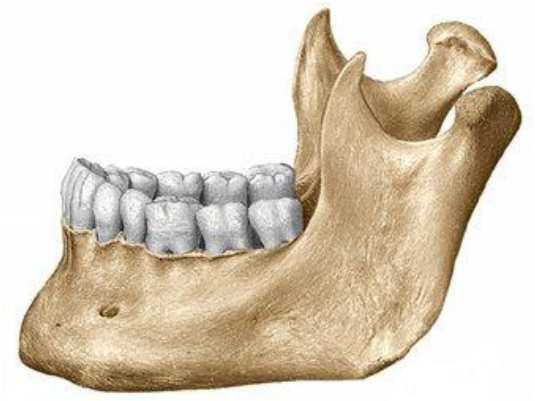
SURGICAL ANATOMY

SURGICAL ANATOMY

The mandible (lower jaw) is the strongest and largest bone of the face and it consists of horse shoe shaped curved, horizontal portion, the body, and two perpendicular portions, the rami,which projects upwards and unite with the ends of the body and it provides attachment to the muscles[117].

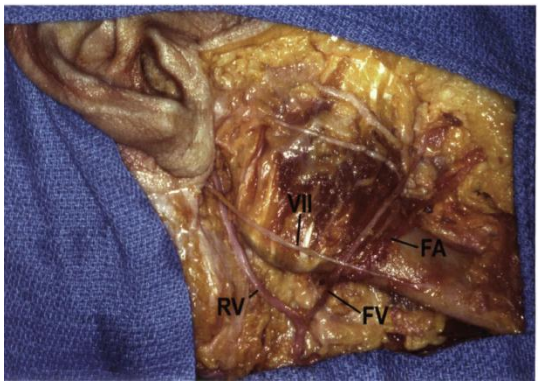
The Ramus of the mandible is quadrilateral in shape and it consists of two surfaces(medial and lateral), two processes and four borders. The lateral surface is flat and it gives attachment to the Masseter muscle. On the medial surface lies the mandibular foramen at its centre and it provides entry for the inferior alveolar neurovascular bundle[51]. In front of the mandibular foramen is a prominent ridge , the lingula.

The mandibular foramen leads into mandibular canal which runs obliquely downward and forward in the ramus and body of the mandible. The mandibular canal which contains inferior alveolar neurovascular bundle is situated nearer the medial surface of the mandible in its posterior third; and in the lateral surface in the anterior part[109]. At junction of the ramus and body is the angle of the mandible which provides attachment to the Masseter laterally, and the medial ptyregoid medially.The upper border of the mandible has two processes the coronoid and condyle seperated by deep concavity , the mandibular notch.



Marginal Mandibular Branch of the Facial Nerve

The marginal mandibular branch of facial nerve is the motor fibre to the facial muscles in the lower lip and chin is an important anatomical structure in submandibular approach for obtaining access to mandibular osteotomies. In most of the individuals it pass almost 1.2 cm below the lower border of mandible. So incision should be placed atleast 1.5 to 2cm below the lower border of mandible [1,103].

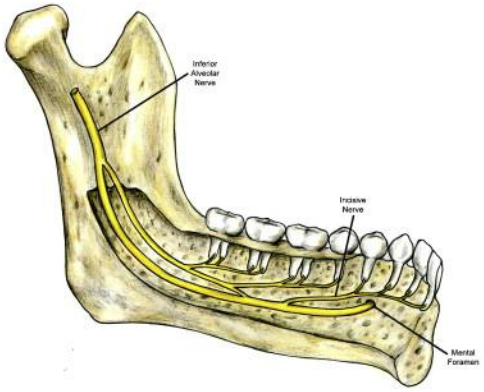


Facial Artery and vein

After it originates from the external carotid artery, the facial artery follows a cervical course and runs superiorly deep to stylohyoid and posterior belly of digastric to the medial surface of mandible and grooving through submandibular salivary gland as it rounds the lower border of mandible at the anterior border of masseter . The facial vein starts as the angular vein and runs along the artery posterior to it .

Inferior alveolar neurovascular bundle

The inferior alveolar nerve (IAN), branch of mandibular nerve enters the mandible through mandibular foramen and pass through the mandibular canal along with inferior alveolar artery and vein ,called the inferior alveolar neurovascular bundle[88]. It contains mainly sensory fibres and only a few motor fibres[127]. Primary blood supply to the mandible is from inferior alveolar artery which arise from the mandibular part of maxillary artery[84].



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Muscles commonly involved in the orthognathic surgeries of mandible are muscles of mastication and suprahyoid group of muscles.Muscles of mastication (masseter, medial ptyregoid,temporalis, lateral ptyregoid) have their effect on the skeletal changes ,especially relapse following mandibular osteotomies.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

DENTOFACIAL DEFORMITY

MAH ong (2004)[79] had done a retrospective study to investigate the spectrum of dentofacial deformities, demographic profile, management and surgical outcome in 34 patients and concluded that majority of the patients are young adult female patients with skeletal class III pattern and treated for mandibular prognathism**.**

K.F.Moos and A.F.Ayoub(2010)[71] had done a study on the surgical correction of dentofacial deformities in past, present and future. Over the last decade significant improvements have been acheived in the diagnosis and management of dentofacial deformities.

SURGICAL CORRECTION OF MANDIBULAR PROGNATHISM

EDWARD A. KITLOWSKI, M.D. BALTIMORE,MD.(1942)[22] evaluated the surgical correction of mandibular prognathism by two surgical methods 1.simple section of the bones on either side, 2. deals with the removal of sections of bone from the rami or the body of the mandible.They concluded that operations upon the body of the mandible can be performed without danger of permanent loss of sensation or of the vitality of the teeth.

Larry R. Merrill et al (1974)[75] developed a preliminary descriptive statistical statement in orthodontic terms on the nature of some of the osseous and dental changes characteristically associated with both the primary surgical correction of mandibular prognathism and the early postsurgical stage of tissue accommodation.

MONTY REITZIK MB (1988)[91]evaluated the surgical correction of mandibular prognathism using rigid internal fixation-a report of a new technique together with its long-term stability. A new surgical technique(Reverse-L osteotomy) has been presented with high degree of stability.

Ricardo Machado Cruz et al (2008)[104]examined specific genetic models of the familial transmission of mandibular prognathism in 2,562 individuals from 55 families. They conclude that there is a major gene that influences the expression of mandibular prognathism with clear signs of Mendelian inheritance and a multifactorial component.

SKELETAL STABILITY AFTER MANDIBULAR SETBACK

A. F. Ayoub et al (2000)[7] evaluated skeletal stability after the correction of mandibular prognathism by SSO and IVSO using lateral cephalographs of 31 patients .They concluded that the difference in skeletal stability between the groups was significant with VSO is the more effective technique for correcting mandibular prognathism**.**

Dogan Dolanmaz et al (2004)[18] evaluated the stability of absorbable and titanium plate and screw fixation for sagittal split ramus osteotomy. They concluded that additional intermaxillary fixation may be needed to support the absorbable plate and screw fixation system in the early postoperative period after SSRO.

Masayoshi Kawakami et al,(2004)[82] examined the effect of partial glossectomy on skeletal stability and postoperative changes after mandibular setback in 21 (tongue reduction group) and 19 patient (control group).There was no significant difference between the 2 groups .

K. Ueki, K. Nakagawa et al (2005)[74] assessed skeletal stability after BSSO and fixation with a poly-L-lactic acid (PLLA) plate(group I) and titanium plate(group II), and analyzed the change in the condylar long axis .They conclude that the change in condylar angle is greater in group II than group I.

W. A. Borstlap, P. J. W. Stoelinga et al (2005)[121] study was to assess post-operative stability of bilateral sagittal split set-back osteotomies using two miniplates and clinical parameters including nerve function, TMJ function, occlusal relapse and patient satisfaction and concluded that sagittal split set-back osteotomy fixed with miniplates appeared to be a relatively safe and reliable procedure giving rise to adequate results and a high degree of patients satisfaction.

Andris Abeltins et al (2011)[6] compare the stability of BSSO (21 CASES) with EVRO (30 cases) after correction of class III malocclusion by means of bimaxillary orthognathic surgery. They conclude that no difference in the stability between the BSSO and VRO groups.

Koichiro Ueki et al (2011)[65] compared the time-course changes in condylar long-axis and skeletal stability after SSRO with an unsintered hydroxyapatite (u-HA)/ poly-L-lactic acid (PLLA) plate, PLLA plate, or titanium plate..They concluded that no significant differences in postoperative time-course changes among three groups.

Kwang-Seob Byeon et al(2012)[70] evaluate the postoperative stability after BSSRO for the treatment of mandibular prognathism(control group), in addition to a posterior ostectomy of the distal segment(experimental group 1) and mandibular angle resection(experimental group 2). Less postoperative instability was present in the experimental groups than in the control group.

MODIFICATION OF CONVENTIONAL BSSRO

ANDREAS JOVANOVIC et al (1996)[4] Modified Technique to Determine the Desired Length of Bicortical Screws in Sagittal Split 0steotomies by using the marked drill. The technique makes the use of a depth-measuring device unnecessary, saves

time, and decreases the risk of change in the position of the proximal and distal fragments during this procedure.

Kenichi Sasaki et al(2003)[58] compared Dal Pont-Obwegeser technique (BSSO),with use the parallel bilateral sagittal split osteotomy (PBSSO) reported by Omori et al2 in 1979. PBSSO has the advantage that it does not change the condylar axis but it carries the risk of inferior alveolar nerve injury.

Chul-Hwan Kim et al (2007)[12] simultaneous mandibular angle resection in BSSRO in 26 cases of mandible prognathism.They concluded simultaneous mandibular angle resection and BSSRO proved to be a useful modification of the conventional BSSRO to reduce the tension in the pterygomasseteric muscle sling and to obtain more esthetic results clinically.

Hiroyuki Sakamaki et al (2007)[34] presented a modified method of SSRO for treating relapsed mandibular protrusion with bilateral malposition of the mandibular foramen.They performed a modified SSRO in the area above the mandibular foramen to avoiding damaging the inferior alveolar nerve.

P. Schoen et al (2011)[99] assessed the modification of the Obwegeser–Dal Pont operation technique by splitting 100 pig mandibles by an additional osteotomy at the caudal border of the mandible and concluded that new technique allows very gentle and superficial chiselling, leaving the IAN untouched.

METHODS OF FIXATION FOR BSSRO

J. McManners, K.F. Moos, A. El-Attar et al(1997)[53] evaluated use of absorbable pin made from poly-p-dioxanone (Ortbosorb, Johnson and Johnson, UK) was used to internally fix osteotomies of the mandibular ramus. Study done in 10 patients .They

concluded no patient complained of discharge from the site of the implant or of any change in sensation of the lip.

Paul J.W. Stoelinga et al (2003)[98]*assessed the* Fixation of Sagittal Split Osteotomies With Miniplates with monocortical screws and compared it with other fixation methods(lag screws and positional screws). He concluded that miniplates have some advantages over lag screws and positional screws.

Mark W. Ochs(2003)[86] evaluated the Bicortical Screw Stabilization of Sagittal Split Osteotomies.He concluded that the use of 3 bicortical screws offers the most cost effective, rigid, and predictable way to fixate a sagittal split osteotomy.

Y. Yamashita, T. Otsuka et al (2011)[123] study compared two methods of rigid fixation (bicortical screws and monocortical miniplates) and concluded that no significant differences in the masticatory functions and neurosensory disturbance even 5 years after surgery between two methods.

Izumi Yoshioka et al (2012)[39] compared the material-related complications using biodegradable(110 case) and titanium miniplates (90 case)after bilateral sagittal split mandibular setback surgery and concluded that no statistically significant difference in the incidence of complications between the 2 groups.

S. S. -P. Hsu et al (2012)[110] evaluated the differences in surgical changes and post-surgical changes between bi-cortical and mono-cortical osteosynthesis in the correction of skeletal Class III malocclusion with BSSO and concluded that no significant differences in sagittal and vertical changes between the two groups both methods had similar postoperative stability.

F. R. L. Sato et al (2012)[27] study was to compare the mechanical stress over hemimandible substrate and hardware after SSRO fixed with five different techniques (3 linear 608 screw; 3 linear 908 screw; 3 inverted L screw ;1 conventional

miniplate;1 locking miniplate with four monocortical screws.)using (3D) finite element analysis.They concluded that the reversed L arrangement provided the most favourable stress dissipation behaviour.

OSSEOUS HEALING FOLLOWING BSSRO

I. Kallela, P. Laine, R. Suuronenet al (1999)[42] evaluated osteotomy site healing in 47 patients, treated with BSSRO and SR-PLLA screws for rigid internal fixation and concluded BSSOs can be safely and effectively fixed using SR-PLLA screws.

T. Hasegawa, C. Tateishi, R. Uchida et al(2011)[115] examined stable osseous healing in the cleavage between the bone fragments 1 year after SSRO using CT in 13 patients with mandibular prognathism.

EFFECTS OF MANDIBULAR SETBACK SURGERY ON AIRWAY SPACE

Masayoshi KAWAKAMI et al (2005)[81] assessed the postoperative changes in hyoid position and pharyngeal airway space retrospectively in 30 patients who had undergone mandibular setback surgery and concluded that pharyngeal airway space was maintained shortly after surgery, while the hyoid bone moved inferiorly to compensate for reduction of the oral volume.

T. Muto, A. Yamazaki, S. Takeda, Y. Sato et al (2007)[114] evaluate the effect of BSSRO setback on the morphology of the pharyngeal airway, especially the structures of the soft palate and pharyngeal airway space (PAS) in 49 women using lateral cephalograms. Results show that mandibular setback surgery markedly decreases the PAS and changes the morphology of the soft palate.

K. Kitagawara et al (2008)[59] determined the effects of mandibular setback surgery on craniofacial and pharyngeal morphology and on respiratory function during sleep

in 17 patients and concluded no significant change at the oropharyngeal airway and inferior displacement of the hyoid bone were seen postoperatively with decreased SpO_2 during sleep was found just after surgery.

Jae-Seung Kim et al (2010)[43]investigate the difference in the pharyngeal airway after SSRO procedures between male and female patients with Class III malocclusion.. They concluded that after the SSRO procedure, the pharyngeal airway became narrow in both genders.

D. Hasebe, T. Kobayashi, M. Hasegawa et al(2011)[20] examined the effects of mandibular setback surgery on pharyngeal airway space and respiratory function during sleep and concluded that large amount of mandibular setback might inhibit biological adaption and cause sleep-disordered breathing.

Tadaharu Kobayashi et al(2012)[111] evaluated the effect of mandibular setback on pharyngeal airway space and respiratory function during sleepin in 78 patients and concluded that (SpO_2) was significantly worse post operatively and it is gradually improved and no patient had sleep disordered breathing 6 months after surgery and they adapt to new environment for respiratory function during sleep.

COMPLICATIONS IN BSSRO

H. Sakashita, M. Miyata et al (1996)[36] 21-year-old man experienced facial nerve palsy 2 days after BSSO setback surgery and possible causes are direct trauma to the nerve and post operative hematoma.

Thomas TELTZROW et al (2005)[112] evaluated perioperative complications following sagittal split osteotomy of the mandible in a series of 1264 consecutive patients during a 20-year-period.. They concluded that complications of BSSRO

(infection,paresthesia,haemorrhage, partial weakness of the facial nerve, non union of osteotomy site, unfavourable split) carry severe limitations in health related quality of life, it remains an overall safe procedure, demanding, however, comprehensive informed consent.

H. Witherow et al, (2006)[35] encountered the unusual complication of postoperative fracture of the lingual plate in four patients after BSSO and concluded that significant risk factors were a vertical mandibular height of 2 cm or less distal to the last molar tooth , and a depth of 0.6 cm or less from the apex of last molar root or impacted third molar to the lower border.

Su-Gwan Kim et al (2007)[107] evaluates the incidence of intra- and postoperative complications of orthognathic surgery and concluded that most common complication was a neurosensory deficit and most serious complication was severe intraoperative bleeding.

Andrew Ban Guan Tay et al (2008)[5] assessed the feasibility of Immediate Repair of Transected Inferior Alveolar Nerves in Sagittal Split Osteotomies in 3 cases and concluded that none had functional problems such as drooling, lip-biting, or speech difficulties at 1 year after surgery.

Chandu, N. J. Lee, A. Stewart (2008)[8] reported unusual fracture of the mandible that occurred 20 months after a bilateral split sagittal osteotomy. They concluded that transmission of force via the plate to the anterior screws, osseointegration of the anterior screws, Stress shielding and delayed/ incomplete healing are the four mechanisms considered to explain this unusual fracture pattern.

Marcus Stephen kriwalsky et al (2008)[83] evaluated a relation between occurence of bad split during SSO and presence of third molar, patients age or surgeons

experience. They concluded that third molars and surgeon experience had no influence and older patient seemed more risk than young ones.

L. Pacheco Ruiz, J. Chaurand Lara et al (2011)[78] reported a case of Facial nerve palsy following BSSO setback surgery. Facial nerve compression is the most likely aetiology perhaps due to the relationship between the posterior border of the mandibular ramus and the facial nerve in the open-mouth position adopted for SSO (usually less than 1 cm).

David S. Precious et al (2012)[17] reported a case of False Aneurysms After Sagittal Split Ramus Osteotomies. False aneurysms after orthognathic surgery are rare occurrences but can pose diagnostic and management challenges.

ADVANTAGE OF BSSRO

Walter J. PEPER SACK et al (1972)[118] Long Term follow-up of the Sagittal Splitting Technique for Correction of Mandibular Prognathism. They did atleast 5 years follow-up after surgery for evaluation. . Years after surgery (at least 5) 75 % of our cases had a good profile.

Larry M. Wolford (2000)[76] discusses the indications and advantages of the SSRO for correction of mandibular prognathism. The advantages of being able to correct the jaw alignment, have an excellent bony interface, apply RF for stability and to promote primary bone healing, have accurate control of the condylar position, and the benefits of no MMF, make the SSRO superior to the IVRO and ILO.

Chiung-Shing Huang et al (2006)[11] reported that postoperative intrabony remodeling changes occur in the mandible after sagittal split osteotomy for mandibular prognathism. This remodeling occurred more in the condylar and gonial areas, while the chin remained relatively stable.

CONDYLAR POSITION AFTER MANDIBULAR SETBACK BY BSSRO

K. Ueki et al (2001)[73] elucidated the relation between changes in the condylar long axis and TMJ function after BSSO set back secured by standard titanium plates in 22 patients; bent titanium plates in 20 patients and concluded that the condylar long axis differed significantly and no sign of TMJ functional impairment was noted in the bent-plate group.

Constantin A. Landes et al (2003)[15] study attempts to optimise condylar position in the osteotomy patient in 23 bimaxillary operated patients had intraoperative joint positioning by positioning splint and plates. They conclude proximal segment-positioning splint effectively positioned the condyle in the desired direction.

Koichiro Ueki et al(2008)[66] compared the time-course changes in condylar long-axis and skeletal stability after SSRO with bicortical locking plate fixation versus monocortical conventional plate fixation and concluded that no significant differences between two groups.

EFFECT OF MANDIBULAR SETBACK SURGERY ON TMJ

Dora Z . Nemeth et al (2000)[19] evaluated prospectively to compare the long term(2 years)signs and symptoms of temporomandibular joint disorder after BSSO in 127 patients with rigid and wire fixation and concluded that no statistically significant difference between wire and rigid fixation.

B. Fang, G.-F. Shen et al (2009)[10] assessed that combined orthodontic and orthognathic treatment (including bilateral SSRO and rigid internal fixation) can be

used safely to correct skeletal class III malocclusion with mandibular hyperplasia without causing additional TMJ symptoms using lateral cephalogram and MRI.

NEUROSENSORY DISTURBANCE FOLLOWING BSSO

Kirk L. Fridrich et al(1995)[60] also stated that as long as the inferior alveolar nerve was intact, the long term chance (at least 6 months) for neurosensory recovery was good, despite manipulation.

Fujioka M, Hirano A, Fujii T(1998)[26] compared the effects of bicortical rigid fixation and monocortical fixation on the incidence and recovery of inferior alveolar nerve disturbance and concluded that monocortical osteosynthesis has less damage to inferior alveolar nerve leading to better restoration of neurosensory function in patients whom nerve damage was moderate.

L. Ylikontiola, J. Kinnunen, K. Oikarinen (1998)[77] assessed functional impairment of the inferior alveolar nerve after sagittal split osteotomy in 30 Patients by an electric vitality scanner, light touch, two-point discrimination, tactile discrimination, and thermal discrimination and concluded that electric sensibility testing of mandibular teeth is a useful method .

Kiyomasa Nakagawa et al (2003)[61] reported that relationship between the canal and the osteotomy site is related to long-term hypesthesia in BSSO postoperatively.

J.P.Richard van Merkestyn et al(2007)[55] assessed the technical effects of BSSO on permanent NSD of the inferior alveolar nerve and concluded that the use of sagittal split separators without chisel results in low percentage of persistent hypoesthesia of the IAN.

Xue-Wen Yang et al(2007)[122] evaluate neurosensory disturbances (NSDs) and jaw movement after BSSO with the Hunsuck modification and miniplate fixation to

correct mandibular prognathism. Among 63 patients they concluded a reduced TMJ clicking, the presence of NSDs, and reduced mouth opening after Hunsuck-modified BSSO.

SOFT AND HARD TISSUE CHANGES OF THE FACIAL PROFILE AFTER BSSRO FOR MANDIBULAR SETBACK

Alexander Gaggl et al (1999)[3] analyzed the changes in soft tissue profile after BSSO setback and concluded that it is of great importance to consider both the direction and the surgical method when predicting profile changes in the vertical as well as sagittal plane after orthognathic surgery.

G. Mars¸an, E. O¨ ztas¸ et al (2009)[31] reported that mandibular setback surgery was effective in producing an orthognathic profile in adult Class III subjects with mandibular prognathism..

Christof Urs Joss et al (2010)[14]evaluate the ratio of soft tissue to hard tissue in BSSO setback with rigid and wire fixation using literature search and concluded that evidence-based conclusions on soft tissue changes are difficult to draw due to inferior study designs and lack of standardized outcome measurements.

Hee-Yeon Suh et al (2012)[33] proposed a more accurate method to predict the soft tissue changes after after Class III mandibular setback surgery. The multivariate PLS method was more satisfactory than the conventional OLS method in accurately predicting the soft tissue profile change .

POST OPERATIVE RELAPSE FOLLOWING MANDIBULAR SETBACK BY BSSRO

Glenda H. de Villa et al (2005)[29]*evaluated* long-term maxillomandibular changes after surgical correction of mandibular prognathism using BSSO in 20 patients using

cephalometric radiographs. They concluded that no correlation between the magnitude of setback and the amount of relapse at B point and pogonion.

Hyun-Sil Choi et al(2005)[37]reported that there was no significant correlation between the amount of transverse displacement of the proximal segment due to mandibular setback and horizontal postsurgical relapse of the mandible.

Christof Urs Josset al (2008)[13] evaluate relapse and its causes in bilateral sagittal split setback osteotomy with rigid internal fixation using Literature research and concluded that BSSO for mandibular setback in combination with orthodontics is an effective treatment of skeletal Class III and a stable procedure in the short- and long-term.

MODIFICATION IN INSTRUMENTS USED FOR BSSRO

EDWARD ELLIS ,III AND W.J. GALLO (1987)[23] assessed the use of pneumatic osteotome to simplify orthognathic surgery(maxillary and sagittal ramus osteotomies).The advantage of pneumatic osteotome is the feel the surgeon obtain when using it to section the bone and less surgical trauma and prevents unnecessry distraction and torquing of the condylar head.

José Nazareno Gil et al(2007)[49] showed the efficacy of a basilar osteotome to properly separate the mandible and prevent the bad split of the segments during the BSSO.

Toshitaka Mutoet al(2008)[116] used a specially designed bone cleaver to perform SSRO in more than 100 patients with mandibular prognathism and concluded that it facilitates splitting of the ramus without damaging the IAN or other soft tissues.

Michael R. MARKIEWICZ et al (2008)[90] assessed the modification of the commonly used inferior border channel retractor for BSSO by hollowing out the shank and working surface that results in less dulling of the cutting instrument, less

damage to the channel retractor, less debris in the surgical wound, and most importantly, less damage to the surrounding soft tissue.

M. Kerry Herd et al (2012)[89] introduced a T shape spreader an easily constructed instrument for facilitating the SSO. The instrument is robust and cost effective. They found the tactile feedback provided by the T shaped handle is invaluable that avoids bad split.

CHANGES IN STOMATOGNATHIC FUNCTION FOLLOWING MANDIBULAR SETBACK SURGERY

M. Iwase, M. Ohashi et al (2006)[96] evaluate bite force, occlusal contact area and masticatory efficiency before and after BSSO and concluded that all three parameters had improved after surgery.

Yoshiko Nakata et al (2007)[124] investigated the changes in stomatognathic function through orthognathic treatment in patients with mandibular prognathism and concluded that masticatory muscles may adapt to the new environment achieved with surgically corrected dentofacial structure, although the activities remain at lower levels as compared with the controls.

K. Ueki, K. Marukawa et al (2007)[72] evaluate the differences in bite force changes and occlusal contacts after SSRO and IVRO with and without Le Fort osteotomy in Sixty female patients with mandibular prognathism and suggests that the combination does not affect postoperative time-dependent changes.

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COMPARISON OF BSSRO vs VRO

J.P.R. van merksteyn et al (1987)[54] reported that in 124 patients of BSSO and 34 patients VRO ,the incidence of intra operative complication in BSSO was 25.8% and VRO was 11.8%.

Koichiro Ueki et al (2002)[64] compare the changes in temporomandibular joint (TMJ) morphology and clinical symptoms after SSRO (23 case) and IVRO (20 case) with and without a Le Fort I osteotomy amd suggest that SSRO does not improve anterior disc .displacement; IVRO improves anterior disc displacement in the initial postsurgical period, and both procedures may improve TMJ symptoms.

Masaaki Nishimura et al (2004)[80] examined the cause of joint effusion (JE) appearing postoperatively in the TMJ of patients with mandibular prognathism on MRI.Postoperatively 12 TMJs (40%) of the IVRO group and only 1 TMJ (5%) of the SSRO group had JE due downward movement of the condyle.

A. Al-Bishri et al (2005)[2] assessed the neurosensory disturbance (NSD) after SSO(50 patients)and IVRO (79 patients) and concluded that NSD obtained by questionnaires and records differed indicating a disagreement between the judgement of the surgeon and the patient's opinion.

D Takazakura et al(2007)[21] evaluated the hypoesthesia of the lower lip using trigeminal somatosensory evoked potential in three groups - obwegeser (Ob) group, obwegeser –dalpont(ODP)group and IVRO group and concluded that IVRO group showed earliest recovery from hypoesthesia.

Izumi Yoshioka et al (2008)[38] study was to compare the postoperative changes of proximal and distal segments after IVRO and SSRO with semirigid internal fixation in thirty Japanese adults with prognathic mandible and concluded that stability after IVRO is equal to that after SSRO with semirigid internal fixation.

Niels Hågensli et al (2012)[97] compare the outcome after EVSO with rigid fixation and BSSO for correction of mandibular prognathism and concluded that no clinically significant differences were observed in long-term stability.

EVALUATION OF MANDIBULAR ANATOMY RELATED TO BSSO USING COMPUTED TOMOGRAPHY(CT)

William K. Tom et al (1997)[120] reported that by placing the medial osteotomy near the tip of the lingula, there is a sufficient width of bone with an adequate cancellous layer that will decrease the chance of a unfavourable split.

Y. Tsuji, T. Muto et al(2005)[126] investigated the position and course of the mandibular canal through the mandibular ramus using computed tomographic (CT) imaging in 35 patients with skeletal Class III prognathism and concluded that safest location for the buccal corticotomy is anterior to the mandibular angle.

I. H. Yu, Y. K. Wong (2008)[41] evaluated the mandibular anatomy related to BSSO using 3-dimensional computed tomography scan images that helped surgeons gain more understanding of nerve position during surgery.

EVALUATION OF ANTI LINGULA

Grant Hogan, DDS, MD, and Edward Ellis III, DDS(2006)[32] assessed origin of the term "antilingula" and explores the literature to determine why there is a bony lump on the lateral surface of the mandibl and concluded that use of the "antilingula" for marking the location of ramus osteotomies is illogical.

Shahid R.AZIZ et al (2007)[105] determined the realibility of using the antilingula as a guide to osteotomy placement for IVRO using 18 cadaveric mandibles and concluded that position of lingula was posterior-inferior to the position of anti lingula. By making an osteotomy cut 5mm posterior to the antilingula there was no risk of damaging the neurovascular bundle.

INFERIOR ALVEOLAR NEUROVASCULAR BUNDLE

MARGARET A. JERGENSON et al (2005)[84] reported the Unique Origin of the Inferior Alveolar Artery and concluded that its aberrant position could make it more vulnerable to damage in orthognathic surgical procedures

M. Anthony Pogrel et al (2009)[88] evaluated the arrangement of the structures within the inferior alveolar neurovascular bundle and confirmed that the inferior alveolar vein lies superior to the nerve and artery appears to be solitary and lies on the lingual side of the nerve, slightly above the horizontal position.

Sung Tae Kim et al (2009)[109] reported three types of buccolingual location of the mandibular canal and the inferior alveolar vessel was located superiorly to the inferior alveolar nerve in 80% of the cases, and so, damage to the superior part of the mandibular canal would also damage this vessel.

ENNES, J. P. & MEDEIROS, R. M. Et al (2009)[51] identified the MF location in human mandibles and concluded that despite the great variation of MF position, its most frequent location is in the mean third of MR both in anteroposterior and superoinferior directions.

Zaidi ZF, Hanif Z. (2010)[127] assessed the variations in the origin and course of the inferior alveolar neurovascular bundle. Anatomical variations in this region should be kept in mind while performing invasive procedures.

T. Hanzelka, R. Foltan et al (2011)[113] evaluate the influence of IAN handling in 290 patients who underwent BSSO and concluded that Mandibular hypoplasia or progenia did not represent a predisposition for the development of paresthesia.

EFFECT OF THIRD MOLARS ON BSSRO

David S. Precious et al (2004)[16] assessed whether impacted third molars should be removed concomitant with SSO. By doing so it limits risk, is cost efficient,

minimizes unwanted postsurgical consequences, and provides a reliable, deft means by which planned surgery can be accomplished.

J. Beukes, J.P. Reyneke, P.J. Becker (2012)[52] evaluate the influence of anatomical dimensions of the ramus of the mandible and the presence of lower third molar on sagittal split ramus osteotomy and found that, unlike the presence of third molars, there was no single anatomical measurement that contributed to the level of difficulty of the sagittal split osteotomy.

Jean-Charles Doucet et al (2012)[48] Reported that the presence of third molars during SSOs is not associated with an increased frequency of unfavorable fractures. Concomitant third molar removal in SSOs also decreases proximal segment IAN entrapment but only slightly increases operating time .

Jean-Charles Doucet et al(2012)[47] investigate the effects of the presence or absence of a mandibular third molar on the neurosensory recovery of the IAN after SSO and concluded that the presence of third molars during SSO minimizes postoperative neurosensory disturbance of the IAN.

VERTICAL RAMUS OSTEOTOMY

KNUT TORNES (1987)[62] analysed the clinical and surgical observations of IVSO(55 cases) and EVSO(203 cases).The EVSO approach demonstrated shorter operation time, less blood loss,shorter hospital stay,post op sweeling, nausea and vomiting was also in favour of EVSO. But both technique were considered satisfactory and safe.

K.Tornes and P.J.Wisth (1988)[63] evaluated the difference in stability between the intra oral and extra oral vertical subcondylar ramus osteotomy for mandibular

prognathism and concluded that nasomandibular wiring in addition to IMF results in increased stability.

G.E. Ghali et al (2000)[28] assessed the benefits of using IVRO as the preferred treatment for mandibular prognathism and concluded that benefits of IVRO are lower incidence of IAN injury, technical simplicity (faster, cheaper, safer) and ability to reposition the condyle , if necessary.

M.J.Troulis et al (2000)[94] demonstrated the feasibility of endoscopic exposure , dissection and osteotomy and rigid fixation for mandibular set back by EVRO procedure.

William Weber(2001)[119] describes a modified ramus osteotomy that is relatively easy and predictable to perform. It is amenable to the application of rigid fixation, places the neurovascular bundle at less risk than the BSSO, and does not tend to cause large condylar deflections.

***Y. Manor, D. Blinder, S. Taicher et al* (2001)[125]** assessed the Modified technique of Intra-oral vertical ramus osteotomy for correction of mandibular prognathism. They concluded that modified technique improves visibility without higher morbidity .

Maria J. Troulis et al (2004)[85] assessed the outcome of the Endoscopic Vertical Ramus Osteotomy and its Early Clinical Results in 14 patients and concluded that endoscopic vertical ramus osteotomy with rigid fixation is feasible for correction of a variety of mandibular deformities.

M.Papadaki et al (2007)[95] assessed the feasibility of using Er:YAG laser to perform vertical ramus ramus osteotomy and to determine the most efficient energy per pulse for its completion.They concluded that human and pig cadaver heads were osteotomised bilaterally using 2000Mj/ pulse that was most efficient and bone cuts were smooth with no carbonization in all cases.

Julia Naoumova et al (2008)[50] investigate changes in the soft tissue profile following VRO and to evaluate gender and age differences in the ratios of soft-to-hard tissue change and conclude that Soft and hard tissue changed in a 1:1 ratio at the mentolabial fold and the chin for females and 1:1,1 for males. The ratios were greater in females than males. Age effects on the ratios were not significant.

Koroush Taheri Talesh et al (2010)[67] assessed the relapse following intra oral vertical ramus osteotomy for mandibular setback and IMF for 1 week.They concluded that the mean skeletal horizontal relapse after 1 year in 40 treated patients was 0.6mm.

Soonshin Hwang et al (2010)[106] assessed the change in hyoid, tongue,pharyngeal airway, and head posture in patients who had mandibular setback by IVRO in 60 patients and concluded that hyoid and tongue moved posteriorly and it has a tendency to relapse back to its original position. But final pharyngeal airway width remained narrower for long observation period.

Raúl González-García et al (2012)[101] evaluated the benefits of endoscopically-assisted IVRO and ISCO for the treatment of symmetric mandibular prognathism and concluded that it provides complete visualization of the osteotomy site that overcome the traditional limitations of direct visualization in IVRO and ISCO.

Kun-Tsung Lee et al(2011)[69] evaluate the changes in the transverse dimensions by VRO in the treatment of mandibular prognathism in 20 patients and concluded that surgical correction of mandibular prognathism using VRO led to an increase in the transverse dimensions.

GONIAL ANGLE

ELLI JENSEX et al (1942)[24] study is an attempt to evaluate the literature available on the gonial angle, a detail of the mandible which is important in orthodontic diagnosis. A survey of the literature reveals diverse interpretations of the term " gonial angle".

G.W.Thompson et al (1974)[30]evaluted the longitudinal changes and determine the relationships of the gonial angle to other craniofacial dimensions.serial cephalograms of 111 female patients analysed. They concluded that

1.mandibular length is not related to gonial angle size

2.mandibular body length is related to size of gonial angle

3.size of the gonial angle at one age is significantly related to its later size

4.the initial gonial angle size does not indicate the later gonial angle changes.

ERIK JONSSON et al (1981)[25]evaluated the changes in the gonial angle after surgical correction of mandibular prognathism by BSSRO and subcondylar osteotomy and conclude that the gonial angle was found to increase in cases treated by BSSRO and decreased in oblique sliding osteotomy.

M. Bayat et al (2006)[87]evaluated the change in the gonial angle after mandiblular setback with the BSSRO technique and to measure postsurgical relapse two years after surgery and concluded that Surgical correction of mandibular prognatism using BSSRO and IMF can cause a decrease in the gonial angle.

Kahraman Gungor et al (2007)[57] determine the possible change in gonial angle over time in ancient Anatolian populations with the present to demonstrate the symmetry of the gonial angle in the jaws and the sexual dimorphism.They concluded that no significant differences between the right and left gonial angles of the individuals but there was a significant difference at the left gonial angle between sexes . Furthermore,

no statistically significant difference was found for the gonial angle between the selected past populations with the present sample

Sujoy Ghosh et al (2009)[108] assessed changes in the gonial angle in relation to age, gender, and dental status in 1000 patients (500 males and 500 females) and concluded that the gonial angle increases with age and as teeth are lost.

Mostafa Shahabi et al (2009)[92]compared the external gonial angle using lateral cephalograms and orthopantomograms in Class I patients and concluded that for determination of the gonial angle, an orthopantomogram may be a better choice than a lateral cephalogram**.**

Javad Yazdani et al (2010)[46] evaluate gonial angle changes after mandibular setback by BSSO and VRO techniques in 58 male patientswith mandibular prognathism. Gonial angle decrease was observed in the present study following mandibular setback by the VRO and BSSO techniques. This decrease in the VRO group was significantly Greater.

Kun-Tsung Lee et al (2011)[68] assess changes in the gonial region in patients who had mandibular setback surgery by IVRO and concluded that Surgical correction of mandibular prognathism using IVRO can lead to an increase in the gonial angle.

RAGHDA AL-SHAMOUT et al (2012)[100] investigate the influence of age and gender differences on three mandibular parameters gonial angle, ramus height and bigonial width in 209 dentate Jordanian subjects using digital panoramic radiography and concluded that Gonial angles and bigonial widths increased with increasing age, however, ramus height increased from 11-29 years then decreased with increasing *age.*

MATERIALS & METHODS

MATERIALS AND METHODS

This study assessed Eight patients (5 male and 3 female) who reported to the Department of Oral and Maxillofacial Surgery, Tamilnadu Govt. Dental College & Hospital, Chennai with mandibular prognathism requiring mandibular set back were included in this prospective study.

Inclusion Criteria :

1. Mandibular prognathism.
2. Patients who completed their growth period.
3. Patients presenting no systemic contraindications for surgical procedure.
4. Patients who are motivated enough to comply with treatment regime.

Exclusion criteria:

1. Mandibular retrognathism.
2. Medically compromised patients.
3. Patients in their growth phase.
4. Patients not willing for long term follow up.

Ethical approval was obtained for the study from the institutional ethical committee and informed consent obtained from each patient in the regional language (Tamil) explaining the nature of the surgical procedure and the study.

The patients were 5 males and 3 females with age ranging from 20 to 25 years. Thorough clinical examination was carried out in each individual. Routine investigation, model analysis and radiographic analysis were done. Presurgical

assessment was done to evaluate the general condition of the patient to undergo surgery under GA .Treatment options were explained to the patients.

Cephalometric analysis was done to assess the magnitude of mandibular excess and gonial angle in each individual. In patients with extreme cases of mandibular prognathism (i.e., more than 7mm of setback) consideration were given for EVRO. Pre surgical orthodontic treatment was done in few patients to decompensate dental component.

For EVRO surgical procedure CT Scan analysis was done using 3D CT of mandible to assess the position of the Antilingula and mandibular foramen. Antilingula present over the lateral surface of the ramus of the mandible and mandibular foramen located on the medial side of the ramus of mandible. The distance between the posterior border of the ramus to the antilingula and mandibular foramen was measured. Also the distance from midpoint of sigmoid notch to the mandibular foramen and antilingula were measured. Osteotomy cut in the lateral surface of the ramus was made by using the above mentioned measurements in the CT scan. Henceforth injury to inferior alveolar neurovascular bundle can be avoided.

Using lateral cephalograms Prediction tracing were done for each patient. Then upper and lower plaster models were prepared and after doing face bow transfer upper and lower models were articulated in Semi adjustable anatomical articulator. Then the mock surgery was done, lower cast set back to desired level and surgical splint was prepared. Lateral cephalogram were traced preoperatively and post operatively. The degree of change in the gonial angle was measured.

PROFORMA

Name: Date of Birth: Date:

Telephone No.: Age : Sex: Op. No.

Fathers name/guardian name:

Postal Address: Occupation:

History

CHIEF COMPLAINT:

HISTORY OF PRESENT ILLNESS:

SOCIAL HISTORY:

1. Psychological status:
2. Expectation
3. Motivation: Internal/ External

FAMILIAL MALOCCLUSION HISTORY:

Parent's General and Dental conditions

Siblings General and Dental conditions

PHYSICAL GROWTH STATUS:

Growing/Growth spurt complete

CHILDHOOD DISEASE: Cranio facial anomalies present/Absent

HABITS: None

Lip & Nail Biting/ Finger/ Thumb sucking/ Dummy sucking/ Mouth Breathing / Tongue Thrusting

1. Duration
2. Frequency
3. Intensity
4. Age stopped

H/O Tonsillectomy or Adenoidectomy

INJURIES

FAMILIAL MALOCCLUSION HISTORY:

Parents (Type of malocclusion) Similar / Dissimilar

Siblings (Type of malocclusion) Similar / Dissimilar

PRE-NATAL HISTORY

Informer

Delivery Type

Drugs taken during pregnancy

POST NATAL HISTORY

Feeding Breast / Bottle combination

Duration and frequency

Milestones of development

Childhood diseases

Rickets/Diphtheria/Scarlet fever/Epilepsy/Mumps/Measles/Allergy.

HISTORY OF PREVIOUS ORTHODONTIC TREATMENT:

PHYSICAL EXAMINATION RECORD:

PHYSICAL STATUS

Built : Ectomorphic /Endomorphic/Mesomorphic Posture

Body type: Gait : Weight : Height :

Present health good/fair/poor

EXTRA ORAL EXAMINATION

1. Shape of the Head : Mesocephalic / Dolicocephalic / Brachycephalic

2. Facial Form : Mesoprosopic/ Dolicoprosopic/Europrosopic

3. Facial Profile : Straight / Concave / Convex

4. Facial Divergence : Anterior / Posterior / Straight

5. Facial Symmetry : Symmetrical / Asymmetrical

6. Clinical FMA :

7. Inter Labial Gap :

8. Lip Posture : Competent / Incompetent

Upper lip : Short / Long / Normal

Lower lip : Short / Long / Normal

9. Mento Labial sulcus : Normal / Deep / Shallow

10. Nasolabial angle : Obtuse / Acute / Right angle

11.Chin : Retruded / Normal / Protruded

FUNCTIONAL EXAMINATION:

Respiration : Nasal/Oral / Oro nasal/Abnormal

Mastication :

Speech : Normal / Abnormal

Deglutition : Normal / Abnormal

Amount of Incisors exposure : During Speech/ During smile

Perioral Muscle activity : Normal / Hyperactive / Hypotonic

TMJ symptoms :

Mandibular deviation on opening : Normal/deviated

Path of closure : Normal/deviated

INTRA ORAL EXAMINATION

Soft tissues:

Oral hygiene status **:** Good/ satisfactory/ poor

Gingiva : Normal / Edematous / Fibrous

Brushing habits : Good / Satisfactory / Poor

Frenal attachments : Normal/ Abnormal

Tongue : Size / posture / Movements

Palatal contour : Normal/ Shallow/ Deep

Oral Mucosa : Normal/ Abnormal

Tonsils and adenoids : Normal/Abnormal

Hard tissues

Number of permanent teeth present :

Number of deciduous teeth present :

Number of unerupted teeth:

Supernumerary / Missing teeth:

Size/shape / Form of teeth : Normal Abnormal

Texture : Normal/ Hypoplastic

Caries:

Endodontically treated :

Occlusal facets wear:

Key ridge position:

INTER ARCH EXAMINATION

	MAXILLARY ARCH	**MANDIBULAR ARCH**
Shape		
Arch Symmetry		
Arch Alignment		
Crowding		
Spacing		
Rotation		
Palatal Contour		

MAXIMUM MOUTH OPENING:

Freeway space:

Curve of spee:

Antero posterior relationship:

First Molar relation : Right/Left

Canine relation : Right/Left

Incisor relation : Overjet

Vertical relationships:

Over bite	Normal
	Deep bite
	Open bite

Transverse relationship :

Cross bite / Scissors bite/open bite

Midline relation of mandibular to maxillary arch:

Midline	Upper : Deviation Present / Absent
	Lower : Deviation Present / Absent
	Together

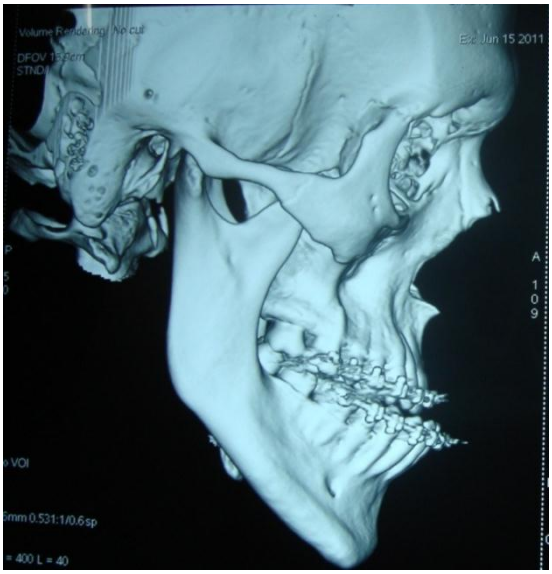
Investigations:

1. Study cast
2. Model Surgery
3. Cephalometric analysis 1.COGS
   2.Steiners
4. Clinical photographs : Extra oral & Intra oral
5. OPG
6. Pre&post-operative reformatted CT scans

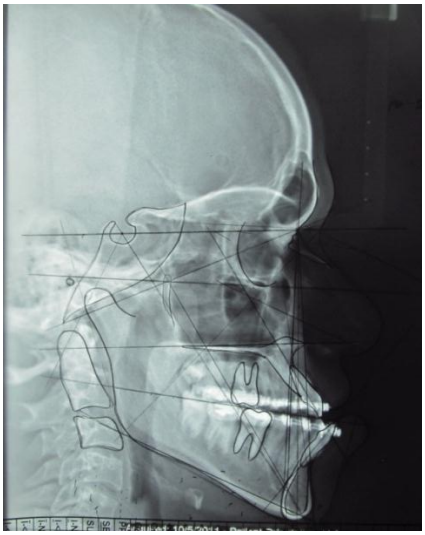
DIAGNOSIS:

TREATMENT PLAN:

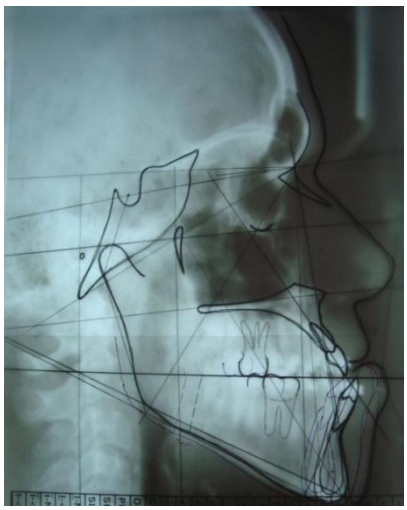
3D CT of mandible to assess the position of the Antilingula



Pre-Op Lateral Ceph



Prediction Tracing



SEMI ADJUSTABLE ARTICULATOR

MODEL SURGERY

SURGICAL SPLINT

ARMAMENTARIUM

MICROMOTOR & HANDPIECE

SURGICAL PROCEDURE

SURGICAL PROCEDURE

BILATERAL SAGITTAL SPLIT OSTEOTOMY:

Anaesthetic procedure

Under nasoendotracheal tube,patient intubated and GA maintained.

Soft tissue dissection

The soft tissue of the cheek is pulled out with two langenbeck hooks and a broad austin retractor.The 2cm long incision begins at the anterior aspect of the ramus along the external oblique ridge and ends in the facial vestibule at first molar region.After a sharp dissection of the mucosa ,mucoperiosteal flap is reflected over the body of the mandible and it continues posteriorly over the anterior aspect of the ramus,freeing the temporalis muscle attachment. Once the periosteum has been lifted back to the posterior border of the inner cortex, the created tunnel should be wide enough to allow medial osteotomy cut without tension on the neurovascular bundle. Wide tissue dissection should be avoided to maintain adequate blood supply.

Osteotomy cut - The osteotomy cut starts above the lingula parallel to the occlusal plane using the long rotating bur (lindemann bur). The cut is deepened at the inner cortex of the ascending ramus only slightly into the medullary bone. At the anterior border of the ascending ramus, the cut is continued inferiorly through the lateral cortical bone at a 90 degree angle to the bone surface. It ends between first and second molar. Then using the obwegeser or channel retractor vertical cut is placed between first and second molar till the inferior border.then using the smith spreader proximal and distal fragments are seperated.

Osteosynthesis with miniplates

Then the distal segment is setback to a desired level and fixation of the proximal and distal fragments is done using the miniplates for stable fixation.

Wound closure

Wound was irrigated with betadine and saline and closed using 3-0 vicryl after acheiving hemostasis**.**

EXTRA ORAL VERTICAL RAMUS OSTEOTOMY

Anaesthetic procedure

Under nasoendotracheal tube, patient intubated and GA maintained.

Soft tissue dissection

Patient is painted and drapped with head down and neck in an extended position. The skin is marked prior to the injection of a vasoconstrictor(Adrenaline with saline in a concentration of 1: 1,00,000). The incision is placed 1.5 to 2 cm inferior to the mandible. Initialy 4 cm incision is carried through the skin and subcutaneous tissues to the level of the platysma muscle.Retraction of the skin edges reveals the underlying platysma muscle which is sharply incised .After exposing the platysma white superficial layer of deep cervical fascia is seen.The facial vein and artery are usually encountered as well as the marginal mandibular branch of the facial nerve while dissecting through superficial layer of deep cervical fascia.The facial vessels can be isolated, clamped, divided, and ligated if they are intruding into the area

The pterygomasseteric sling is sharply incised with a scalpel along the inferior border. The periosteal elevator is used to strip the masseter muscle from the entire lateral surface of the ramus and it is exposed .Retraction of the masseter muscle is facilitated

by inserting a suitable retractor into the sigmoid notch (Channel retractor, Sigmoid notch retractor).

Osteotomy cut

Using the channel retractor the lateral surface of the ramus is completely exposed from the sigmoid notch till the angle of mandible.Then anti-lingula was identified on the lateral surface of the ramus. Anti-lingula indicates the position of the entry of inferior alveolar neurovascular bundle into the mandibular foramen.then the osteotomy cut was made using the surgical hanpiece and 701 S.S white surgical bur from the midpoint of sigmoid notch to the angle of mandible in a straight line posterior to the anti-lingula prominence.then the cut was completed using the thin spatula osteotome. By making an cut posterior to an antilingula we can avoid damaging the inferior alveolar nerve.Then the proximal segment was mobilised by gently detaching medial pterygoid muscle. This segment is placed lateral to the distal segment which is setback to the desired level. Then intraorally the occlusion was checked after the distal segment is mobilised posteriorly to a desired position .

Then using the surgical splint lower jaw is positioned in relation to upper jaw in a desired setback position by placing IMF.

Closure

Wound was irrigated with betadine and saline and it is closed layerwise after hemostasis is acheived. Patient was kept in IMF for 4 weeks after which active physiotherapy is begun.

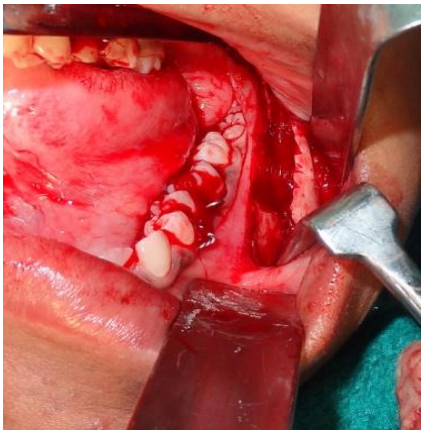
BILATERAL SAGITTAL SPLIT RAMUS OSTEOTOMY

SURGICAL PROCEDURE

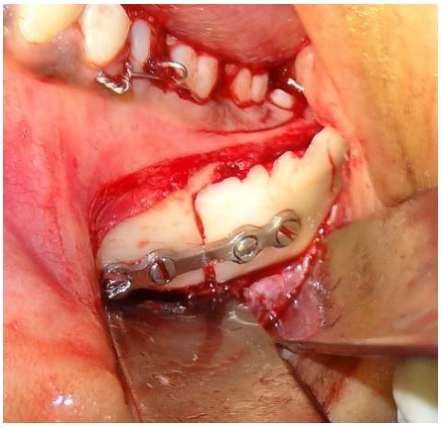
EXPOSURE OF RAMUS

OSTEOTOMY CUT

SEPERATION OF FRAGMENTS



MINIPLATE FIXATION

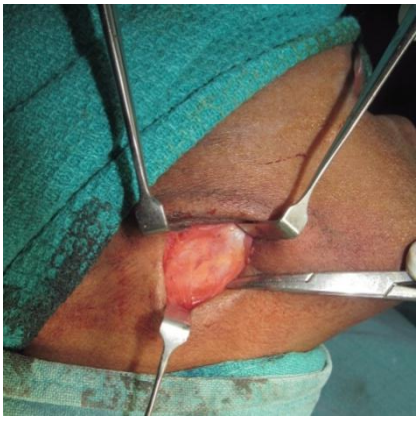


EXTRA ORAL VERTICAL RAMUS OSTEOTOMY

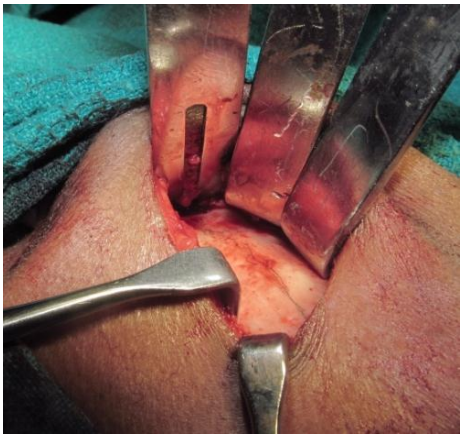
SURGICAL PROCEDURE

INCISION

EXPOSURE OF PLATYSMA



EXPOSURE OF RAMUS



OSTEOTOMY CUT

SURGICAL ACRYLIC SPLINT

WOUND CLOSURE

CASE REPORTS

GROUP I

CASE-1

Name : Ms. LAKSHMI PRIYA O.P.No : 106036

Age : 20 yrs Sex : Female

Postal address : NO.10,babu street, kodungaiyur, chennai-118.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth and lower jaw

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

PHYSICAL STATUS:

Built : Mesomorphic Height : 148 cms

Weight : 45 kgs Gait : Normal Body type: athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Mesocephalic
Facial Form	:	Mesoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow
Nasolabial angle	:	Obtuse

Clinical FMA : Average

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 2 mm

During smile 4 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Reverse Overjet (mm) : 2 mm

b) VERTICAL RELATIONSHIPS

Overbite : 4mm

DIAGNOSIS: This is a case of class III malocclusion with an orthognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) orthognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN: MANDIBLE SETBACK – BSSO

PRE-OPERATIVE

POST-OPERATIVE

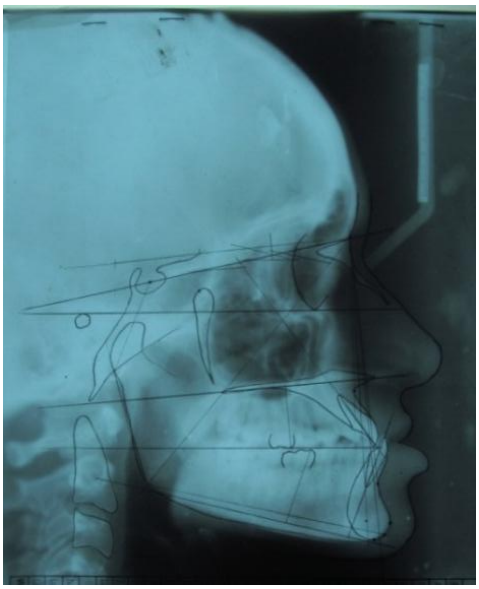
PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE



POST-OPERATIVE

CASE-2

Name : Ms. Shajitha banu O.P.No : 936211

Age : 20 yrs Sex : Female

Postal address : No.121/4, Bharathithasan st, Avadi,chennai-115.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

PHYSICAL STATUS:

Built : Mesomorphic Height : 145 cms

Weight : 41 kgs Gait : Normal Body type: athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Mesocephalic
Facial Form	:	Mesoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow
Nasolabial angle	:	Obtuse

Clinical FMA : Average

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 4 mm

During smile 6 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Reverse Overjet (mm) : 4 mm

b) VERTICAL RELATIONSHIPS

Overbite : 3mm

DIAGNOSIS: This is a case of class III malocclusion with an retrognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Retrognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN: MANDIBLE SETBACK - BSSO

MAXILLARY ADVANCEMENT - LEFORT I OSTEOTOMY

PRE-OPERATIVE

POST-OPERATIVE

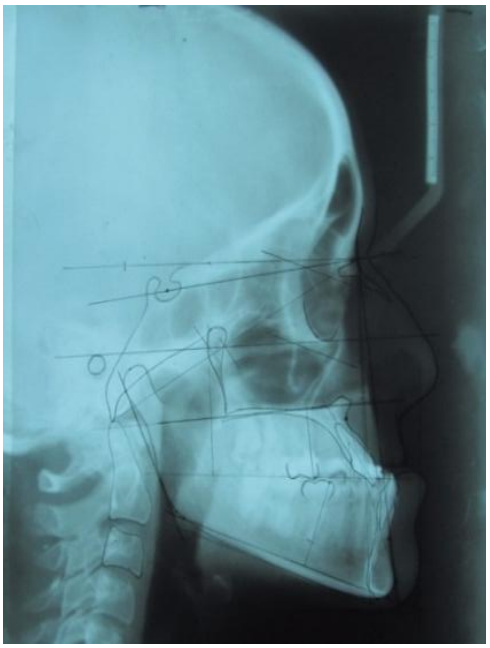
PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE



POST-OPERATIVE

CASE-3

Name : Ms. BHAVANI O.P.No : 846721

Age : 20 yrs Sex : Female

Postal address : NO.22,G.K.M colony, kolathur,chennai-102.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth and lower jaw

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

PHYSICAL STATUS:

Built : Mesomorphic Height : 150 cms

Weight : 62 kgs Gait : Normal Body type: athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Dolicocephalic
Facial Form	:	Leptoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow
Nasolabial angle	:	Obtuse

Clinical FMA : High angle

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 4 mm

During smile 6 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Reverse Overjet (mm) : 6mm

b) VERTICAL RELATIONSHIPS

Overbite : edge to edge

DIAGNOSIS: This is a case of class III malocclusion with an retrognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Retrognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN: MANDIBLE SETBACK - BSSO

MAXILLARY ADVANCEMENT - LEFORT I OSTEOTOMY

PRE-OPERATIVE

POST-OPERATIVE

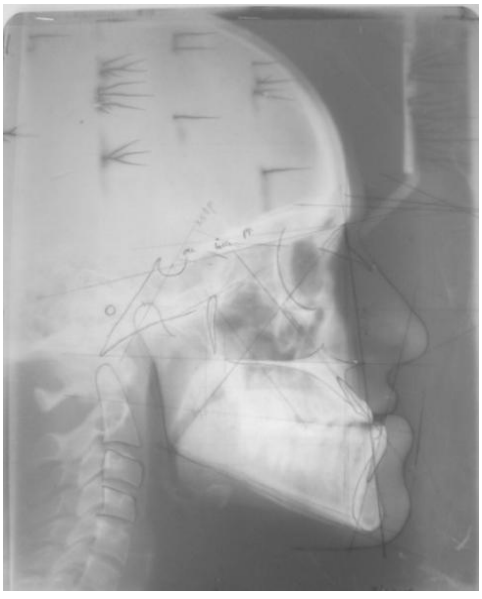
PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE



POST-OPERATIVE

CASE -4

Name : Mr.Manikandan O.P.No : 801123

Age : 20 yrs Sex : Male

Postal address : No.32, Bhagavathiamman koil st, Mannadi,Chennai-4

HISTORY

Presenting complaints : Forwardly placed lower anterior teeth and lower jaw

Parent's general and Dental conditions : Normal

Siblings General and Dental conditions : Normal

HABITS : None

PHYSICAL EXAMINATION RECORD

PHYSICAL STATUS: Built : Mesomorphic Height : 167 cms

Weight : 66 kgs Gait : Normal Body type: athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Mesocephalic
Facial Form	:	Mesoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow
Nasolabial angle	:	Obtuse
Clinical FMA	:	Average

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 3 mm

During smile 6 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Reverse Overjet (mm) : 6mm

b) VERTICAL RELATIONSHIPS

Overbite : edge to edge

DIAGNOSIS: This is a case of class III malocclusion with an retrognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Retrognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN: MANDIBLE SETBACK – BSSO

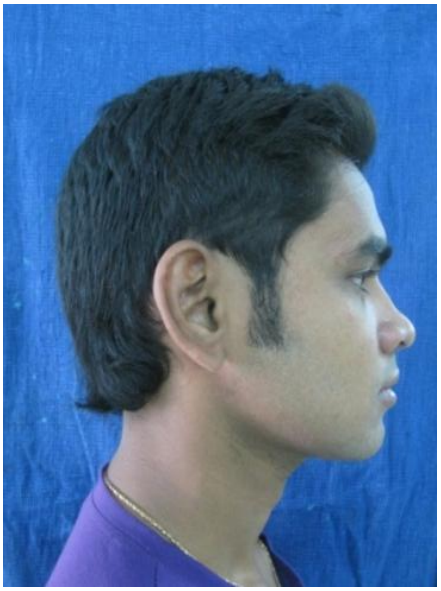
MAXILLARY ADVANCEMENT - LEFORT I OSTEOTOMY

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE



PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

CASE -5

Name : Mr.ABDUL NAHEEM O.P.No : 702216

Age : 20 yrs Sex : Male

Postal address : NO.9, Bunder Garden St,Perambur, Chennai-82.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

1.PHYSICAL STATUS:

Built : Mesomorphic Height : 165 cms

Weight : 70 kgs Gait : Normal Body type: athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Dolicocephalic
Facial Form	:	Leptoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow
Nasolabial angle	:	Obtuse

Clinical FMA : High

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 4 mm

During smile 6 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Overjet (mm) Reverse- 6mm

b) VERTICAL RELATIONSHIPS

Overbite edge to edge

DIAGNOSIS: This is a case of class III malocclusion with an retrognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Retrognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN: MANDIBLE SETBACK - EVRO

MAXILLARY ADVANCEMENT - LEFORT I OSTEOTOMY

PRE-OPERATIVE

POST-OPERATIVE

PRE -OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

CASE-6

Name : Mr.Nidhin prakash O.P.No : 773214

Age : 20 yrs Sex : Male

Postal address : New.No.10, Old No.32, Market Street, Thiruvallur.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

1.PHYSICAL STATUS:

Built : Mesomorphic Height : 166 cms

Weight : 70 kgs Gait : Normal Body Type: Athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Dolicocephalic
Facial Form	:	Leptoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow
Nasolabial angle	:	Obtuse

Clinical FMA	:	Average
Chin	:	Protruded
Perioral Muscle activity	:	Normal
Amount of Incisor Exposure	:	During speech 3 mm
		During smile 6 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Overjet (mm) Reverse- 6mm

b) VERTICAL RELATIONSHIPS

Overbite edge to edge

DIAGNOSIS: This is a case of class III malocclusion with an retrognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Retrognathic maxilla

ii) Prognathic mandible

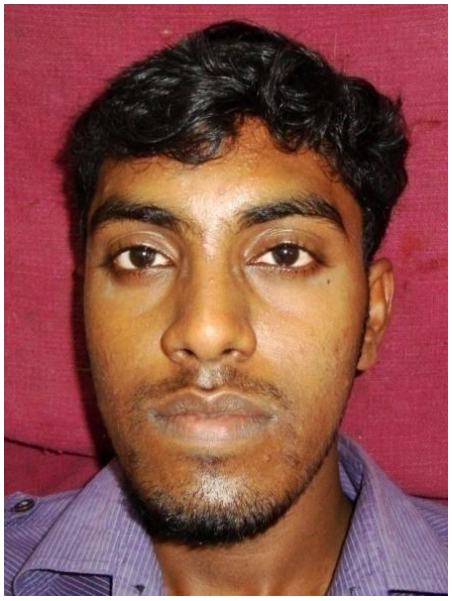
iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN : MANDIBLE SETBACK - EVRO

MAXILLARY ADVANCEMENT - LEFORT I OSTEOTOMY

PRE-OPERATIVE



POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

CASE-7

Name : Mr. Janakiraman O.P.No : 106532

Age : 25 yrs Sex : Male

Postal address : NO.40, Collector Office Road, Kanchipuram.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

1.PHYSICAL STATUS:

Built : Mesomorphic Height : 160 cms

Weight : 60 kgs Gait : Normal Body Type: Athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Dolicocephalic
Facial Form	:	Leptoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent

Mentolabial sulcus : Shallow

Nasolabial angle : Obtuse

Clinical FMA : High

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 4 mm

During smile 6 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Overjet (mm) Reverse- 2 mm

b) VERTICAL RELATIONSHIPS

Overbite edge to edge

DIAGNOSIS: This is a case of class III malocclusion with an Orthognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Orthognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

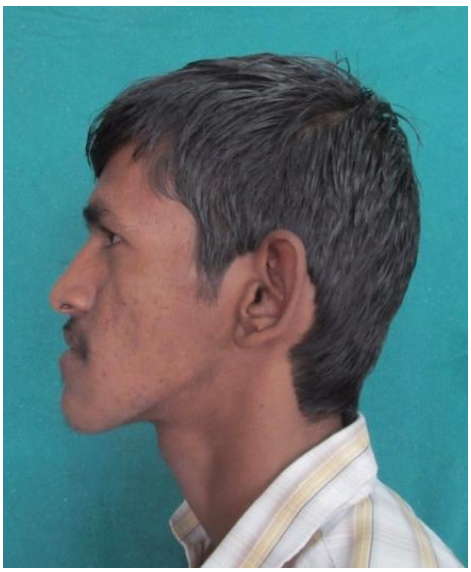
TREATMENT PLAN: MANDIBLE SETBACK – EVRO

Genioplasty if necessary

PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE



POST-OPERATIVE

PRE-OPERATIVE

POST -OPERATIVE

PRE-OPERATIVE

POST-OPERATIVE

CASE -8

Name : Mr.SUDHARSAN O.P.No : 836721

Age : 24 yrs Sex : Male

Postal address : N0.2/10, Lakshiamman Koil St, Shenoy Nagar, Aminjikarai, Chennai-56.

HISTORY

Presenting complaints: Forwardly placed lower anterior teeth

Parent's general and Dental conditions: Normal

Siblings General and Dental conditions: Normal

HABITS: None

PHYSICAL EXAMINATION RECORD

1.PHYSICAL STATUS:

Built : Mesomorphic Height : 163 cms

Weight : 70 kgs Gait : Normal Body Type: Athletic

Posture : erect Present health : well-built and apparently healthy

EXTRA ORAL EXAMINATION

Shape of the head	:	Mesocephalic
Facial Form	:	Mesoprosopic
Facial divergence	:	Anterior
Inter labial gap	:	0 mm
Upper lip	:	Normal
Lower lip	:	Normal
Relationship	:	Competent
Mentolabial sulcus	:	Shallow

Nasolabial angle : Obtuse

Clinical FMA : High

Chin : Protruded

Perioral Muscle activity : Normal

Amount of Incisor Exposure : During speech 3 mm

During smile 5 mm

INTER ARCH EXAMINATION

a) ANTEROPOSTERIOR EXAMINATION

First Molar Relation Right: Class III

Left : Class III

Canine Relation Right: Class III

Left : Class III

Overjet (mm) Reverse- 6mm

b) VERTICAL RELATIONSHIPS

Overbite edge to edge

DIAGNOSIS: This is a case of class III malocclusion with an Orthognathic maxilla and prognathic mandible with horizontal growth pattern.

PROBLEM LIST: i) Orthognathic maxilla

ii) Prognathic mandible

iii) Reverse over jet

iv) Class III molar and canine relation

TREATMENT PLAN: MANDIBLE SETBACK – EVRO

PRE-OPERATIVE

POST-OPERATIVE

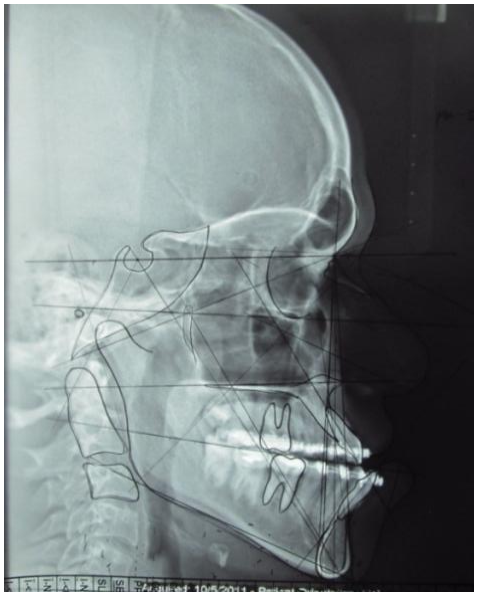
PRE-OPERATIVE

POST-OPERATIVE

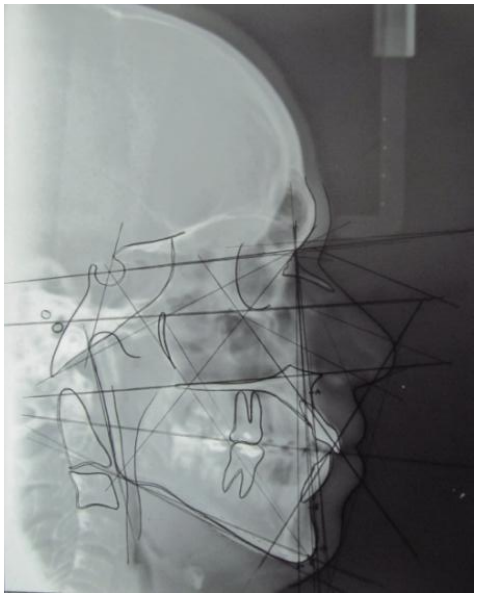
PRE-OPERATIVE

POST-OPERATIVE

PRE-OPERATIVE



POST-OPERATIVE



OBSERVATION & RESULTS

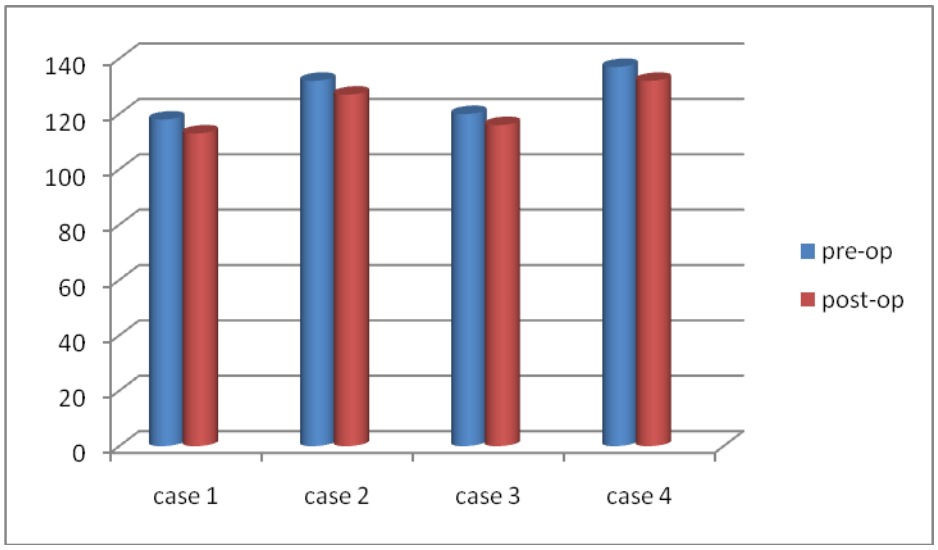
OBSERVATION AND RESULTS

In this prospective study of "Changes in the Gonial Angle Following Bilateral Sagittal Split Osteotomy and Extra Oral Vertical Ramus Osteotomy for Mandibular Excess" Eight patients with mandibular prognathism were included . That 8 patients (5 male and 3 female) were divided into two groups . In group I, 4 patients with mandibular prognathism were treated by Bilateral sagittal split osteotomy with rigid fixation and MMF for 4 weeks. In group II, 4 patients with mandibular prognathism were treated by Extra oral vertical ramus osteotomy without rigid fixation and MMF for 6 weeks. Gonial angle is measured for all 8 patients in group I and group II , both pre operatively and post operatively using lateral cephalogram.

Gonial angle change in group I (BSSRO) patients:

CASES	PRE-OPERATIVE GONIAL ANGLE (In degree)	POST-OPERATIVE GONIAL ANGLE (In degree)
CASE 1	118	113
CASE 2	132	127
CASE 3	120	116
CASE 4	137	132

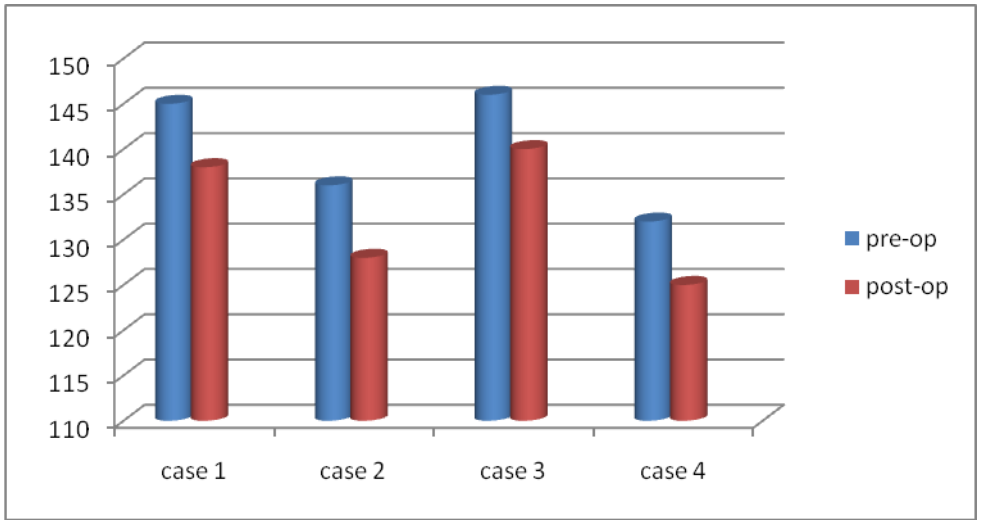
Gonial angle change in group I (BSSRO) patients:



Gonial angle change in group II (EVRO) patients:

CASES	PRE-OPERATIVE GONIAL ANGLE (In degree)	POST-OPERATIVE GONIAL ANGLE (In degree)
CASE 1	145	138
CASE 2	136	128
CASE 3	146	140
CASE 4	132	125

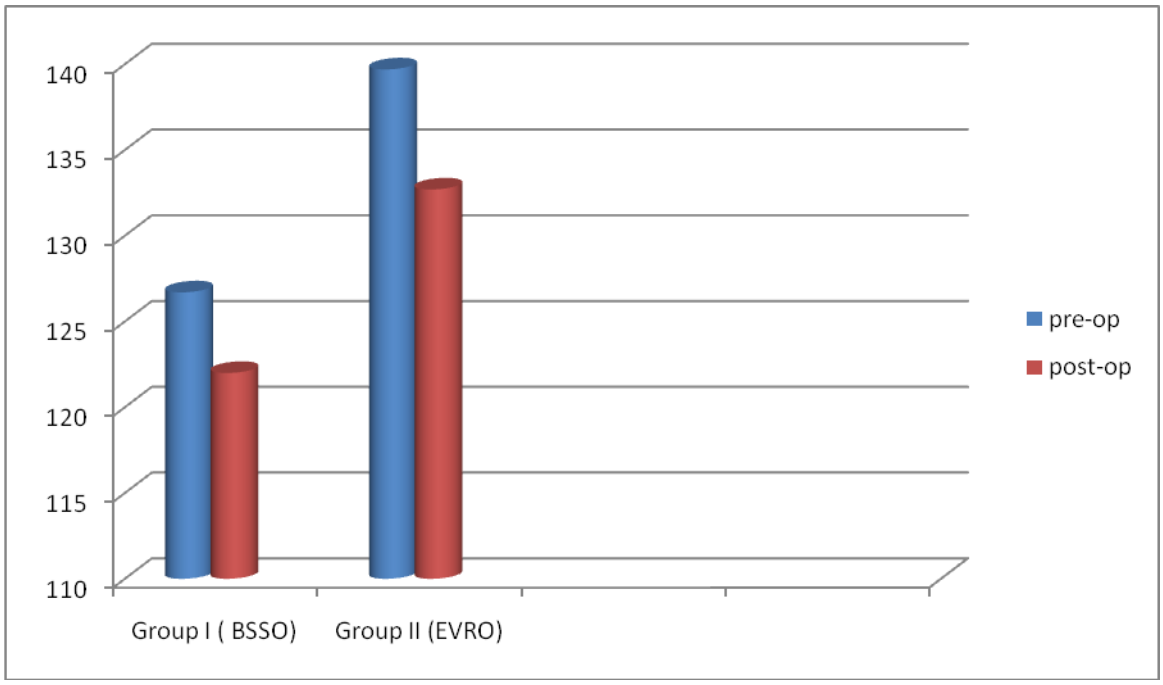
Gonial angle change in group II (EVRO) patients:



Change in the gonial angle between pre-operative examination and post-operative examination between Group I And Group II:

	PRE OPERATIVE (In degree)	**POST OPERATIVE** (In degree)	**DIFFERENCE** (In degree)
GROUP I(BSSO) MEAN	**126.7**	**122**	**4.7**
GROUP II(EVRO) MEAN	**139.7**	**132.7**	**7.0**

Change in the gonial angle between pre-operative examination and post-operative examination between Group I And Group II:



The average decrease in gonial angle in the first group was 4.7 degree and in second group was 7 degree .

DISCUSSION

DISCUSSION

Since ages human race have been genuinely concerned about their facial appearance. Persons who have been unfortunate enough to have been born with congenital facial abnormalities have the desire to have it corrected under any cost[71]. Deformity in common terms refers to distortion of any part of the body. Dentofacial deformities refer to the conditions in which the abnormalities exist in either upper or lower jaws or both , they could be relatively out of proportion in comparison with the face and head[79]. These deformities apart from resulting in aesthetic concerns also affect the normal functional abilities of an individual viz., chewing/mastication, speech and disturbing psychological problem[68].

The face is a complex and dynamic structure that requires a careful evaluation before any attempt surgically. In the process of treating such dentofacial deformities a joint multidisciplinary approach has to be followed, which primarily involves an Oral and Maxillofacial Surgeon and an orthodontist. A consensus has to be reached by the above mentioned specialties relating to the diagnosis, treatment plan and the final execution of the desired treatment plan. In order to restore the facial harmony aesthetically and functionally, an Oral and Maxillofacial Surgeon prefers to perform a jaw (orthognathic) surgery to realign the faultered jaws, which eventually results in the patient achieving ideal occlusion. Orthognathic surgery has become a routine procedure over the last three decades for the correction of facial deformity.

Mandibular prognathism in simple terms refers to a forwardly positioned lower jaw which results in potential disfigurement of the face. It is a genetic disorder where in the growth of the lower jaw exceeds the upper jaw, often resulting in an protruded chin and malocclusion[68]. Mandibular prognathism is clinically heterogeneous and can be associated with interactions between genetic and

environmental factors, involving the dental and skeletal components[104].Mandibular prognathism (MP) or skeletal Class III malocclusion with a prognathic mandible is one of the most severe maxillofacial deformities.

Patient with mandibular prognathism usually seeks for surgery mainly for aesthetic and functional improvement. Mostly patient are between 17-35 years (mean age 24.3 years) and female to male ratio is 2.4:1.[79]

Correction of dentofacial deformities are carried out through

1. Mandibular ramus osteotomies(BSSRO and VRO)
2. Lefort I osteotomy
3. Genioplasty

An American, General Surgeon **Simon Hullihen** pioneered the art of corrective jaw surgery by performing the same without anesthesia in the mid-19th century for correction of mandibular deformities[71]. **Trauner and Obwegeser** in 1957 introduced BSSRO. Since then, bilateral sagittal split ramus osteotomy has become one of the most frequently performed surgical procedure to correct mandibular prognathism.

The BSSRO mainly indicated for correction of mandibular prognathism after the eruption of mandibular second molars in symmetric cases and mild to moderate asymmetric cases. It is contraindicated in the following cases

1) Of unerupted mandibular second molars

2) A severely reduced anteroposterior or mediolateral dimension of the ramus with absence of medullary bone between the buccal and lingual cortices of mandible [76].

Advantages of the BSSRO with Rigid Fixation for correction of mandibular prognathism over EVRO.

1) Better bony interface between the proximal and distal segments.
2) Ease of application of Rigid Fixation.
3) A larger bony interface and rigid fixation between the segments results in improved healing.
4) Enhanced patient comfort due to early mobilization of jaws thus resulting in better nutrition.
5) Precise control of condylar position.
6) Improved speech during the healing phase.
7) Better oral hygiene.
8) Efficient airway management[76].

Complications of the SSRO for mandibular setback include:

1) Inferior alveolar nerve injury.
2) Lingual nerve injury.
3) Displacement of the condyle resulting in an undesired postsurgical shift in the occlusion.
4) An unfavorable split.
5) Infection[76].

FOR SEVERE mandibular prognathism cases vertical ramus osteotomy is the treatment of choice. VRO can be done either intra orally or extra orally. As a result of ease of approach, access, and surgical visibility many surgeons prefer "EVRO" for correction of mandibular prognathism .EVRO was first introduced by **Caldwell & Letterman in 1954** [40]. It was first reported by **Robinson in 1956 and Hinds, 1957**.

Extra oral vertical ramus osteotomy has been advocated for larger mandibular setbacks of greater than 7 mm and difficult asymmetries. Except for the risk of scar, the risks of this extra oral technique have been reported as comparable with intra oral technique.

Advantages of EVRO technique compared to BSSRO are:

1. Less neurological damage.
2. Less incidence of unfavourable osteotomy.
3. Ability to reposition the condyle if necessary.
4. Decreased level of complexity.
5. Decreased operating time[28].

Disadvantages of EVRO are:

1. Need for MMF.
2. Risk of scar[28].

Gonial angle is the angle formed between the tangential line along the lower border of body of mandible and another along the posterior border of ramus of mandible[24 , 68]. A jaw with a mesial occlusion is often associated with a large gonial angle, as well as with a small one. The size of the gonial angle is also related to the association between facial height and ramus height[24]. With a relatively greater facial height the gonial angle is more obtuse; conversely, with a relatively smaller facial height it is more acute. One of the characteristic features of mandibular prognathism is obtuse gonial angle. Surgical treatment of the mandibular prognathism will improve this gonial angle. Different surgical procedures for mandibular rami effects gonial angle in different ways depending on the amount of mandibular setback[25].

Aim of the study is to evaluate the change in the gonial angle following Bilateral sagittal split osteotomy versus Extra oral vertical ramus osteotomy for mandibular excess . The decrease in the gonial angle was observed in the present study following mandibular setback by BSSRO and EVRO.

Gu et al (2003)[87] did a study on 62 patients of mandibular prognathism to assess the change in the gonial angle following BSSRO. He found that 2.6 degree reduction in the gonial angle following bilateral sagittal split osteotomy for mandibular setback.

JONSSON ET AL (1981)[25] did a similar study and found that gonial angle is increased in BSSRO for mandibular setback and decrease in gonial angle following oblique sub condylar osteotomy. In contrary to this study, the present study showed decrease in gonial angle following mandibular setback by both BSSRO AND EVRO. The difference in this change in gonial angle may be due to difference in IMF period and use of elastic traction after IMF release, other possible reasons may be different sample size and follow up period.

Two different reasons for this increase in gonial angle following mandibular setback by BSSRO done by **Johnson et al** were 1)as proximal fragments were secured by circumferential wires there is a tendency for fragment to rotate forward 2)resorption in gonial angle region due to ischemia of the proximal fragment.

Jafarian M et al (2005)[44] concluded that decrease in the gonial angle (-5.9 degree) following mandibular setback by BSSRO.

Kahraman Gungor et al (2007)[57] assessed the change in gonial angle over time in ancient Anatolian populations with the present to demonstrate the symmetry of the gonial angle in the jaws .they compared the gonial angle of right and left side of the jaw and found that there is no difference .

In present study the decrease in gonial angle was observed following mandibular setback surgery by BSSRO and EVRO. Pre-operative and post-operative gonial angle was measured using lateral cephalograms .The average decrease in gonial angle in the BSSRO group was 4.7 degree and in EVRO group was 7 degree .

SUMMARY

&

CONCLUSION

SUMMARY AND CONCLUSION

Orthognathic surgery is the surgery that is performed on jaw bones to correct their defective positions. The main aim of an orthognathic surgery / corrective jaw surgery is to restore normal functional and aesthetics that have been affected due to underlying jaw deformities. Orthognathic surgery is usually the treatment solution in patients where in the occlusal defect is so severe that just orthodontic treatment alone will be insufficient to address the above mentioned problem.

Orthognathic surgery is nothing but a corrective facial surgery to correct jaw deformities. The most rewarding aspect of any orthognathic surgery is immediately enhanced beauty and self confidence. Mandibular prognathism (MP) or skeletal Class III malocclusion is a prognathic mandible, which in turn is one of the most severe and inherited maxillofacial deformities[104,91]. The two most commonly employed surgical procedures to address Mandibular Prognathism defect are Sagittal split ramus osteotomy (SSRO) and Extraoral vertical ramus osteotomy(EVRO). Both the above mentioned surgical procedures are suitable for cases in whom an ideal , desirable functional occlusal relationship can be obtained with a setback of the mandible, and each of the above procedures has its own advantages and disadvantages.

In 1957 , Trauner and Obwegeser first introduced mandibular sagittal split ramus osteotomy for correction of mandibular prognathism.since that time BSSRO has become the most popular procedure for correction of mandibular deformities. It has an advantage of providing good bony interface,promote the primary bone healing, no MMF, accurate control of condylar position makes it superior procedure to EVRO[76].

In cases of extreme mandibular prognathism (>7mm) EVRO become the most popular procedure after it is first introduced by the Caldwell and Lettermen . some of the advantage of this EVRO procedure is that ,technical simplicity(safer,faster,cheaper),lower incidence of inferior alveolar nerve injury, reduced operating time,ability to reposition the condyle if necessary[28].

Gonial region in the mandible coincided with the harmonious face.GONIAL ANGLE determines the esthetic harmanious facial profile and increase in gonial angle makes the patient appear older[46].One of the characteristic feature of mandibular prognathism is obtuse gonial angle . surgical procedures for this dentofacial deformity results in improved gonial angle with better esthetic facial profile. Different surgical procedures for mandibular prognathism effect the gonial angle in different way[25].In the present study decrease in gonial angle was observed in mandibular setback by both BSSRO and EVRO cases.This decrease in gonial angle was more in EVRO cases.By this study we conclude that in patients with increased gonial angle it is better to use EVRO technique as it results in better esthetic face, better occlusion, less incidence of inferior alveolar nerve injury and inconspicuous scar. The mandibular setback by BSSRO also give a better esthetic and occlusion, but it may results in increased incidence of neurosensory disturbence and unfavourable split.

Thus surgical technique for mandibular prognathism whether BSSRO or EVRO is always depend on surgeons preference and other individual factors.

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ANNEXURE

CASE REPORTS

GROUP II

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

கீழ்தாடை கோனியல் கோணத்தில் ஏற்படும் மாறுபாடுகளை இருபுற தாடைபிளவு அறுவை சிகிச்சை மற்றும் வெளிப்புற செங்குத்தான எலும்பு அறுவைசிகிச்சை முறைகளை கொண்டு கீழ்தாடை துருத்தமுடைய நோயாளிக்களுக்கு ஒப்பீடு செய்தல்

ஆராய்ச்சி நிலையம் : அரசு பல் மருத்துவக் கல்லூரி
சென்னை - 600 003

பங்கு பெறுபவரின் பெயர் :

பங்கு பெறுபவரின் எண் :

பங்கு பெறுவரின் பிறந்த தேதி : _____ / _____ /_____
தேதி மாதம் வருடம்

அறுவை சிகிச்சை சம்பந்தமாக நான் மேலே கூறப்பட்ட தகவல் படிவத்தை முழுமையாக படித்துப் பார்த்தேன் என்று உறுதி கூறுகிறேன்.

நான் இது தொடர்பான அனைத்து கேள்விகளுக்கும் நிறைவான பதில்கள் பெறப்பட்டேன்.

இந்த ஆய்வின் எனது பங்கு தன்னிச்சையானது என்றும் எந்த நேரத்திலும் இந்த ஆய்வில் இருந்து சட்ட உரிமைகள் பாதிக்கப்படாமல் விலகிக் கொள்ள சம்மதிக்கிறேன்.

மருத்துவ ஆய்வு அதிகாரிகள், எனது சிகிச்சை தொடர்பான பதிவேடுகளை பார்வையிடவும் எந்த நேரத்திலும், ஆய்வில் இருந்து நான் விலகினாலும் பார்வையிட சம்மதிக்கிறேன். எனது அடையாள குறிப்புகள் மூன்றாவது நபருக்கு தெரிவிக்கப்படமாட்டாது என்று புரிந்து கொண்டேன்.

இந்த ஆய்வு அறிக்கைகளை பயன்படுத்தவும், வெளியிடவும், நான் சம்மதிக்கிறேன். ஆய்வாளர் எனது மருத்துவக் குறிப்புகளை வெளியிட தடையாக இருக்கமாட்டேன் என உண்மையாக சம்மதிக்கிறேன்.

நான் இந்த ஆய்வுக்கு முன்னர் கூறிய மருத்துவ குறிப்புகளின்படியும் உண்மையாக சம்மதிக்கிறேன். மேலும் எனக்கு உடல் நிலை சரியில்லாத பட்சத்தில் ஆய்வாளர்களுக்கு தெரியப்படுத்த சம்மதிக்கிறேன்.

பொது மயக்க மருத்துவ முறையில் கீழ்தாடை கோனியல் கோணத்தில் ஏற்படும் மாறுபாடுகளை இருபுற தாடைபிளவு அறுவை சிகிச்சை மற்றும் வெளிப்புற செங்குத்தான எலும்பு அறுவைசிகிச்சை முறைகளை கொண்டு சிகிச்சை அளிக்கப்படுகிறது என்பதை நான் அறிந்து கொண்டேன். இந்த அறுவை சிகிச்சை முறையில் ஏற்படும் அனைத்து பக்கவிளைவுகளையும் மருத்துவர் மூலம் அறிந்து கொண்டு இந்த ஆய்விற்கு என்னை உட்படுத்திக் கொள்கிறேன்.

நான் எனது மருத்துவ குறிப்புகளை தரவும், மேலும் முழு உடல் பரிசோதனைக்கும் இரத்தம், சிறுநீர் மற்றும் உயிர் வேதியியல் நோய் அறிதல் சோதனைகளுக்கும் முழுஒப்புதல் அளிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம் ..... இடம்..... தேதி.....

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம் .....

ஆய்வாளரின் கையொப்பம் ..... இடம்..... தேதி.....

ஆய்வாளரின் பெயர் .....