MANDIBULAR PROGNATHISM: 
SAGITTAL SPLIT RAMUS OSTEOTOMY

INTRODUCTION:
Dentofacial deformities affect approx. 20% of the population. Patients with dentofacial deformities may demonstrate various degrees of functional and esthetic compromise. Such malformation may be isolated to one jaw or they may extend to multiple craniofacial structures. They may occur unilaterally or bilaterally and may be expressed to varying degrees in the vertical, horizontal and transverse facial planes. Many patients with dentofacial deformities can benefit from corrective orthognathic treatment.

“Orthognathic surgery is the art and science of diagnosis, treatment planning and execution of treatment by consisting orthodontics and oral and maxillofacial surgery to correct musculoskeletal, dento-osseous and soft tissues deformities of the jaws and associated structures”.

Successful orthognathic surgery demands the understanding and co-operation of the team members - oral and maxillofacial surgery, orthodontics and general dentist. Sometimes support from other dental and medical professional may be necessary to provide the optimal functional and esthetic outcome that results in-patient satisfaction.

HISTORY:
The development of mandibular osteotomies for correction of dentofacial deformities closely parallels the advancement of oral and maxillofacial surgery as a specialty more than in 1849 when Obwegesser first described a modalities osteotomy, in a original paper in German.

Hullihen corrected a patient with anterior open bite and mandibular dentoalveolar protrusion with an intra-oral osteotomy. His efforts were then simulated 50 years later by Angle, who described body osteotomy done by V.P. Blair for mandibular horizontal excess. Since then only efforts were done to preserve vital structures and using an intra-oral approach.

Blair populated horizontal osteotomy of vertical ramus done via extra-oral route. The intra-oral approach for same was then described by Ernst.

The subcondylar osteotomy, a form of which was first described by Limberg as an extra-oral approach. Then the subcondylar osteotomy was used to describe the condylar neck osteotomies of Kostecka and of Moose. Letterman and Caldwell described a vertical osteotomy of mandibular ramus. The terms vertical subsigmoid osteotomy (VSO) and vertical ramus osteotomy (VRO) are used interchanging, but primarily this osteotomy type was designed for correction of mandibular horizontal excess of asymmetries.

The modification of inverted-L osteotomy by Caldwell and colleagues, describing horizontal cut above the inferior border created a new design - ‘C’ osteotomy, which avoided use of graft since it had more bony contact.

The greater developments in ramus osteotomy were done by Obwegesser and Trauner.

The refinement of osteotomy cuts were given by DalPont, which was further modified by Hunsuck, to decrease trauma to overlying soft tissues.

DIAGNOSIS:
In order for patients to receive state-of-the-art care when correcting their deformities, the orthognathic team must be able to:
1. Correctly diagnose existing deformities.
2. Establish an appropriate treatment plan.
3. Execute the recommended treatment.

Quantitative assessment of the antero-posterior position of the mandible and the degree of mandibular horizontal dysplasia is useful in planning:

- Anterior mandibular horizontal advancement or reduction.
- Total mandibular horizontal advancement or reduction.

Radiographic Evaluation:

The lateral and PA cephalometric radiographs are among the most important tools in the diagnosis of jaw deformities. They are used to analyze skeletal, dentoalveolar, and soft tissue relationships in the anteroposterior (AP), transverse, and vertical dimensions.

There are numerous cephalometric analyses available to evaluate lateral cephalometric radiographs. When a significant difference occurs, the clinical evaluation is far more important for treatment planning. Cephalometric analysis is only and aid to clinical assessment and should not be used as the sole diagnostic tool.
UNDERSTANDING THE RELATIONSHIP OF HARD & SOFT TISSUE CHANGES WILL LEAD TO BETTER PREDICTABILITY

Dental model analysis:
Dental model analysis is important in establishing proper diagnosis and treatment goals, particularly in reference to orthodontics. Proper dental model analysis improves the understanding and development of the presurgical orthodontic goals.
The sagittal split ramus osteotomy: (SSRO)
Devised by Hugo Obwegesser, is one of the most common orthognathic procedure used.
Access: Intra oral approach along anterior border of ramus
Technique:
Trauner and Obwegesser - 1955, Horizontal cut on medial side of mandibular ramus through med cortex above mandibular foramen. A vertical cut taken down the anterior border of ramus.

Various osteotomy procedures for correction of mandibular deformities that can be performed
1) Ramus Osteotomies:
   - Condylotomy
   - Subcondylar osteotomy
   - Vertical sub-sigmoid osteotomy E/o and I/o approaches
   - The sagittal split and its modification
   - Inverted “L” and “C” osteotomies
2) Osteotomies of body of mandible including symphysis.
3) Segmental procedures
4) Genioplasty.
correlations were found between the amount of setback and the amount
relapse 4 years postoperatively in the horizontal growers. Significant
after mandibular setback surgery, whereas there was an 18% sagittal
orientation and lead to relapse. In the post-operative period, the muscles tend to shift
operatively, this violates the physiologic harmony of the
proximal segment is inadvertently rotated in a clock-wise direction intra-
which was found to contribute to the amount of skeletal relapse. If the
minimize vertical changes during IMF. Amount of setback to be
the most likely cause of relapse after a mandibular setback.
believed that relapse had multiple causes. The tongue was believed to be
Obwegesser believed that the broader areas of bony contact would
devolved to avoid complications associated with the vertical oblique
DISCUSSION:
Severe asymmetries.
Severe ramus hypoplasia
Severe asymmetries.
CONTRAINDICATIONS: SSRO
Severe decreased posterior mandibular body height.
Thin medial - lateral width of ramus.
Severe ramus hypoplasia
Severe asymmetries.
DISCUSSION:
The sagittal split mandibular ramus osteotomy (SSRO) was developed to avoid complications associated with the vertical oblique ramus osteotomy in the correction of mandibular deformities. Obwegesser believed that the broader areas of bony contact would maximize bony union and prevent some skeletal relapse, although he believed that relapse had multiple causes. The tongue was believed to be the most likely cause of relapse after a mandibular setback.
Although skeletal fixation did not prevent sagittal relapse, it did minimize vertical changes during IMF. Amount of setback to be correlated significantly with the amount of proximal segment rotation, which was found to contribute to the amount of skeletal relapse. If the proximal segment is inadvertently rotated in a clock-wise direction intra-operatively, this violates the physiologic harmony of the pterygomaxillary sling and results in the muscles of mastication becoming loaded. In the post-operative period, the muscles tend to shift the mandible anteriorly to regain the original proximal segment orientation and lead to relapse.
Vertical growers showed no horizontal relapse in ANB in the 5 years after mandibular setback surgery, whereas there was an 18% sagittal relapse 4 years postoperatively in the horizontal growers. Significant correlations were found between the amount of setback and the amount of relapse and between intra-operative lateral movement and

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<td>N-Pg: Indicates prominence of Chin.</td>
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<td>- Any large or small value obtained.</td>
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<td>• Compare with N-Br or B-Pc.</td>
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<td>• Indications if the discrepancy is in:</td>
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<td>• Alveolar process</td>
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<td>• The chin</td>
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<td>• Mandible proper.</td>
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<td>These measurements help in deciding:</td>
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<td>• Gemioplasty procedures.</td>
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<td>• Anterior mandibular horizontal advancement or reduction.</td>
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<td>• Total mandibular advancement or reduction.</td>
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\[ \text{ANS-GN: Indicates the lower facial height.} \]

\[ \text{MP-HP: Shows the divergence of mandible posteriorly.} \]

\[ \text{Requiring:} \]

- Mandibular ramus rotation
- Ramus height reduction.

\[ \text{Ar-Go: Quantitates the length of mandibular ramus.} \]

\[ \text{Go-PG: Length of mandibular body.} \]

\[ \text{Assessing variation in ramus height that} \]

\[ \text{Length of body - skeletal open or deep bite.} \]

\[ \text{Ar-Go-Gn: Acute / Obtuse - Closed / Open bite.} \]

\[ \text{B-Pg: Prominence of chin related to mandibular denture base.} \]

**Indications**: SSRO
- Mandibular advancement
- Mandibular setback
- Control the occlusion
- Correction of mandibular asymmetry.

An oblique cut through lateral cortex towards angle of jaw.
Satisfactory for prognathism but very little bone contact in mandibular
retusion.
Dalpont (1961) modified:
- Advanced the oblique cut towards molar region and made it vertical
through the lateral cortex.
Hunsuck (1968):
- Shortened the cut through the medial cortex taking is only as far as the
mandibular foramen.
Bell schendel (1977) and Epker (1978):
- Hunsuck technique is adopted but on the lateral aspect the vertical cut is
taken downwards from an oblique line through outer cortex to lower
border where the lower border is sectioned.

**Advantages**:
- Healing is good because of good bony interface.
- Mandible can be advanced or set back
- Rigid fixation can be used.
- Maintain the angle of mandible in original position even in large
advancements
- Major muscles of mastication remain in original spatial position.

**Contraindications**: SSRO
- Severe decreased posterior mandibular body height.
- Thin medial - lateral width of ramus.
- Severe ramus hypoplasia
- Severe asymmetries.

**SUMMARY**:
Skeletal relapse after mandibular setbacks using sagittal osteotomies thus appears to be quite variable, with relapse figures ranging from 2.3% to 43.7%. Although clockwise proximal segment rotation appears to be the only universally accepted causative factor, other factors postulated included the age of the patient, condylar growth, lateral movement of the mandible during surgery, amount of setback, and facial morphology.
Orthognathic surgery is still the treatment of choice for patients in whom growth is complete or for those who have a severe skeletal discrepancy. It should be noted, however, that the results of surgery with regard to stability and skeletal and occlusal relapse are highly variable. Relapse is acknowledged to be multifactorial, and much more work must be done to understand this phenomenon as a physiologic adaptation to orthognathic surgery.

**REFERENCES**:
3. Bruce N. Epker - Craniofacial deformity - Surgical and Orthodontic correction.
4. Dolwick - Orthognathic surgery.