Is There a Difference in Stability or Neurosensory Function Between Bilateral Sagittal Split Ramus Osteotomy and Intraoral Vertical Ramus Osteotomy for Mandibular Setback?

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Purpose: Bilateral sagittal split ramus osteotomy (BSSO) and intraoral vertical ramus osteotomy (IVRO) are used for mandibular setbacks. The purpose of this study was to determine differences in skeletal stability and neurosensory disturbance (NSD) of the mental nerve after mandibular setback using these operations.

Materials and Methods: A systematic review and meta-analysis on these topics was performed. An electronic search of several databases with specific keywords, a reference search, and a manual search from database inception to December 2014 was performed with inclusion criteria of clinical human studies, randomized controlled trials (RCTs), controlled clinical trials (CCTs), and retrospective studies, with the predictor variable being BSSO or IVRO after mandibular setback surgery. The outcome variables of horizontal and vertical relapse using cephalometrics and NSD using trigeminal somatosensory-evoked potential and subjective tests were statistically analyzed.

Results: The initial PubMed search identified 716 studies of which 13 met the inclusion criteria—4 RCTs, 3 CCTs, and 6 retrospective studies. No statistically significant difference was found between the 2 groups regarding horizontal skeletal stability, but the BSSO group had more stability in the vertical dimension ($P = .02$). There was a statistically significant difference between BSSO and IVRO with regard to NSD of the inferior alveolar nerve (IAN; $P = .001$).

Conclusion: The results of this meta-analysis suggest that BSSO and IVRO have good stability when used to set back the mandible. Furthermore, the results showed that IVRO statistically decreased the incidence of NSD of the IAN after mandibular setback surgery compared with BSSO.

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The most common surgical procedures for correction of mandibular deformities are bilateral sagittal split ramus osteotomy (BSSO) and intraoral vertical ramus osteotomy (IVRO). BSSO was described by Schuchardt[1] in 1942 and later modified by Trauner and Obwegeser[2] in 1957. Since then, various modifications[3-5] have been added to ensure good bone healing, avoid unfavorable fracture, eliminate the need for postoperative intermaxillary fixation (IMF), and decrease the incidence of neurosensory disturbance (NSD). Compared with BSSO, IVRO (including modified condylotomy) has been reported to result in a lower

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incidence of inferior alveolar nerve (IAN) damage,[6,7] requires a shorter operation time,[8] and frequently affords a favorable relation between the condyle and articular disc.[8-16] Some believe that the most advantageous characteristic of IVRO is its "condylotomy effect," whereby anteroinferior repositioning of the condyle results in an increase in the articular space and an improvement in the relation between the articular disc and the condyle, with a decrease in load on the glenoid fossa.[8-16] These changes can alleviate adverse temporomandibular joint (TMJ) symptoms. Therefore, some investigators consider IVRO a therapeutic procedure for the treatment of TMJ symptoms in patients with mandibular prognathism.[8-16]

Perhaps the greatest advantage of IVRO over BSSO is the lower incidence of injury to the IAN.[17] In contrast, the major advantages of BSSO over IVRO or the inverted-L osteotomy are an excellent bony interface, easy application of stable internal fixation, the promotion of primary bone healing, an accurate control of the condylar position, and the benefits of no postoperative IMF.[17]

Although the advantages and disadvantages of BSSO and IVRO for mandibular setback have been discussed frequently,[8,17] the magnitude of postoperative relapse that is associated with the amount of setback using the BSSO remains controversial.[18-21] In the same context, IVRO has been shown to be followed by 0.2 to 1.2 mm of posterior instability,[21-25] but studies or systematic reviews to compare postoperative skeletal stability and trigeminal nerve dysfunction between the 2 techniques are absent. Thus, the purpose of this study was to test the hypothesis that there is no difference in skeletal stability and NSD of the IAN after mandibular setback using BSSO or IVRO. The specific aims were to *1)* compare the stability of the mandible after setback using BSSO and IVRO according to standard cephalometric analyses and *2)* compare neurosensory function of the mental nerve using trigeminal somatosensory-evoked potentials (TSEP) and subjective neurosensory testing after setback using BSSO and IVRO.

Materials and Methods

STUDY DESIGN AND SAMPLE

A systematic review and meta-analysis was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-E 2012 checklist.[26] Articles were sought that included the following population: patients 13 to 50 years old with a hyperplastic mandible (prognathic mandible) with an Angle Class III malocclusion with or without facial asymmetry requiring setback of the mandible using BSSO or IVRO to obtain a Class I relation.

An electronic search of the PubMed, Ovid MEDLINE, and Cochrane CENTRAL online databases was conducted from their respective dates of inception to December 2014. Free text words and Medical Subject Heading terms were used. The Medical Subject Heading terms were *mandibular setback*, *bilateral sagittal split osteotomies*, and *intraoral vertical ramus osteotomy* in combination with *skeletal stability* and *inferior alveolar nerve*.

The low yield led to the use of another search term omitting the reference to BSSO versus IVRO for setback of the prognathic mandible: (*bilateral sagittal split ramus osteotomy*) AND (*prognathic mandible* OR *mandibular hyperplasia* OR *mandibular setback surgery or skeletal Class III malocclusion*) AND (*neurosensory disturbance* OR *relapse* OR *skeletal stability* OR *lingual* OR *mandibular plane angle* OR *B point* OR *prognathism* OR *long face*) AND (limit to OR *clinical trial* OR *randomized controlled trial*). The abstracts of yielded results were reviewed and the full text of those with apparent relevance was obtained. The references of identified articles were cross-checked for unidentified articles and the individual databases of key subject journals were searched using the same terms listed earlier. These journals were the *Journal of Oral and Maxillofacial Surgery*, the *International Journal of Oral and Maxillofacial Surgery*, the *Journal of Oral Surgery*, and the *British Journal of Oral and Maxillofacial Surgery*. The searches were limited to articles published in English. An attempt was made to identify unpublished material or to contact authors of published studies for further information. To complete the search, the references of each selected publication on BSSO versus IVRO for the prognathic mandible were manually searched.

The PICOS criteria for the study are presented in Table 1. The following exclusion criteria were applied: *1)* case reports, *2)* technical reports, *3)* animal or in vitro studies, *4)* review articles, *5)* uncontrolled clinical studies, *6)* studies that did not report data (mean and standard deviation) required to perform a meta-analysis, and *7)* publications in which the same data were published by the same groups of researchers.

The authors carefully assessed the eligibility of all studies retrieved from the databases. From the included studies in the final analysis, the following data were extracted: authors, year of publication, study design, gender (male, female), mean age in years, number of patients in the groups, follow-up period, types of outcome, how the outcome was measured, and fixations methods.

The selected articles were used to compare the primary outcome variables, skeletal stability (using cephalometrics) and trigeminal nerve hypoesthesia (using TSEP and subjective analyses), between BSSO and IVRO (predictor variables) for mandibular setback surgery.