Surgery First in Orthognathic Surgery: What Have We Learned? A Comprehensive Workflow Based on 45 Consecutive Cases

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Purpose: In some patients, "surgery first" (SF) may represent a reasonable approach for the expedited correction of a maxillofacial deformity. Based on the prospective evaluation of a large sample, this article provides a specific orthodontic and surgical protocol, discusses the benefits and limitations of this approach, and updates its indications.

Materials and Methods: Forty-five patients were managed with an SF approach. Selected cases presented symmetrical skeletal malocclusions with no need for extractions or surgically assisted rapid palatal expansion. Periodontal or temporomandibular joint problems and management by an orthodontist without experience in orthognathic surgery were considered exclusion criteria. Virtual treatment planning included a 3-dimensional orthodontic setup. Standard orthognathic osteotomies were followed by buccal interdental corticotomies to amplify the regional acceleratory phenomenon. Miniscrews were placed for postoperative skeletal stabilization. Orthodontic treatment began 2 weeks after surgery. Archwires were changed every 2 to 3 weeks. At 12-month follow-up, patient satisfaction and orthodontist satisfaction were evaluated on a visual analog scale of 1 to 10. Descriptive statistics were computed for all study variables.

Results: The studied sample consisted of 27 women and 18 men (mean age, 23.5 yr). The main motivation for treatment was the wish to improve facial esthetics. Bimaxillary surgery was the most common procedure. Mean duration of orthodontic treatment was 37.8 weeks, with an average of 22 orthodontic appointments. Mean patient and orthodontist satisfaction scores were 9.4 (range, 8 to 10) and 9.7 (range, 8 to 10), respectively.

Conclusions: The SF approach significantly shortens total treatment time and is very favorably valued by patients and orthodontists. Nevertheless, careful patient selection, precise treatment planning, and fluent bidirectional feedback between the surgeon and the orthodontist are mandatory.

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The conventional approach to orthognathic surgery requires a variable length of preoperative orthodontic preparation, the surgery, and a relatively stable period of postoperative orthodontics. The importance of preoperative orthodontics rests on the fact that optimal skeletal positioning during surgery may be limited by inappropriate dental alignment. However, orthodontic preparation lasts 15 to 24 months,[1-3] involves progressive deterioration of facial esthetics and dental function, and causes significant patient discomfort.[1,4-6]

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Table 1. AUTHORS' STANDARDIZED PROTOCOL FOR SURGERY-FIRST ORTHOGNATHIC PROCEDURES

Diagnostic work-up	Clinical evaluation by combined orthodontic-surgical team
	CBCT
	Intraoral scan
	Generation of augmented virtual skull model by file fusion
Preoperative planning	3D virtual orthodontic setup and planning of future dental movements
	3D virtual planning of skeletal movements
	CAD-CAM generation of intermediate splint
	Conventional fabrication of end splint
Preoperative orthodontic preparation	Bracket bonding 1 wk before surgery
	Placement of soft arch the day before surgery
Surgery	Placement of 4-8 2.0-mm miniscrews
	Minimally invasive orthognathic surgery
	Systematic performance of buccal interdental corticotomies with piezoelectric microsaw
	Elective bone augmentation with hydroxyapatite blocks in gaps >3 mm
	For maxillary segmental surgery, fixation of end splint to maxilla
Postoperative orthodontics	Initiation of orthodontic movements 2 wk after surgery
	Archwire change every 2-3 wk

Abbreviations: 3D, 3-dimensional; CAD, computer-assisted design; CAM, computer-assisted manufacturing; CBCT, cone-beam computed tomography.

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An alternative methodology is the "surgery-first" (SF) approach. Proposed by Nagasaka et al[7] in 2009, this method proceeds with orthognathic surgery without presurgical orthodontic preparation and is followed by regular postoperative dental alignments. Although minor orthodontic movements are occasionally performed before surgery, the concept implies that most of the orthodontic treatment is performed postoperatively.[8] Compared with the traditional approach, SF protocols lead to a significant decrease in total treatment time. This fact has a very positive influence on patients' global satisfaction with treatment. The high orthodontic efficiency observed in SF cases might respond to the combination of 2 factors. First, the starting point is the correction of the skeletal bases. In consequence, the complexity of orthodontic treatment is decreased, and soft tissue imbalances that might interfere with certain orthodontic movements are eliminated from the start.[9] Second, tooth movement is accelerated owing to the increased postoperative metabolic turnover.[5,9,10]

Based on the excellent clinical outcomes of monomaxillary cases treated with a SF approach,[7,9] in 2011 the authors published the first report of bimaxillary cases treated with this methodology.[5] The optimal esthetic and functional results, significant reduction in total treatment time, and high patient satisfaction led to the postulation that SF may represent a reasonable, cost-effective method to manage skeletal malocclusion in selected cases, and that it has the potential to become a standard approach to orthognathic surgery in the future.[5,7] After substantial investigation and technical refinement based on the prospective evaluation of a large sample, the aim of this study was to describe a specific orthodontic and surgical protocol for SF, discuss the benefits and limitations of this treatment concept, and update its indications.

Materials and Methods

STUDY DESIGN

Of a total of 230 orthognathic surgical procedures performed during a 2-year period (June 2010 to June 2012), 45 patients (19.6%) were managed with an SF approach. The Declaration of Helsinki guidelines on medical protocol and ethics were followed. Under institutional review board approval, a prospective evaluation of these SF cases was designed.

Patients were selected for an SF sequence based on the following inclusion criteria: *1)* skeletal malocclusion requiring combined orthodontic and surgical treatment without extractions; *2)* informed consent for this novel protocol; and *3)* orthodontic management by an officially qualified orthodontist with experience in orthognathic surgery. Exclusion criteria consisted of the following conditions: *1)* severe crowding requiring extractions; *2)* inexperienced orthodontist; *3)* transverse maxillary hypoplasia requiring previous surgically assisted rapid palatal expansion (SARPE); *4)* severe asymmetry with 3-dimensional (3D) dental compensations; *5)* Class II Division 2 malocclusion with overbite; *6)* acute periodontal problems; and *7)* underlying