5.2 Orthognathic surgery versus distraction osteogenesis

Orthognathic surgery (osteotomies, positioning, and fixation) has been used for decades to treat patients with skeletal discrepancies. In contrast, distraction osteogenesis is a relatively new technique that has gained popularity in the treatment of skeletal discrepancies in the maxillofacial complex. While some authors suggest that distraction may replace routine orthognathic procedures, it should be viewed as an alternative technique that can be used to correct discrepancies in the maxilla and mandible. Both distraction and orthognathic surgery have strengths and weaknesses, and points where one is indicated over the other. Orthognathic surgical techniques are much more versatile and precise. A maxilla may be canted, rotated, advanced, setback, impacted, brought down, or segmented after a Le Fort I osteotomy. In contrast, with distraction a maxilla is often advanced, brought down, and with some difficulty it can be simultaneously widened. The surgeon is much more dependent on the patient's compliance when doing distraction and it frequently requires more office visits to see the patient than with orthognathic surgery. Orthognathic surgery is much more predictable than distraction. For instance, moving a maxilla or mandible forward five or six millimeters into exact interdigitation of the teeth with the opposite jaw is very predictable with a Le Fort I osteotomy of the maxilla or a bilateral sagittal split of the mandible. However, when it is necessary to advance the maxilla or mandible extensively, orthognathic surgery is difficult to perform and less stable, especially when the patient has had previous surgeries. In contrast, with distraction it is possible to advance the maxilla or mandible great distances with confidence, but precise interdigitation of the teeth can be problematic. Finally, distraction offers the possibility of creating inter-arch space through the use of interdental osteotomies and gradual expansion.

5.3 Stability

An important consideration in treatment planning is the concept of stability of the planned surgical moves. Stability of the surgical procedure is dependent on multiple factors including the direction of the move, the fixation technique, and the procedures chosen. It could be shown that stability of surgical moves can be grouped into four categories:

Most stable	Maxillary impaction, mandibular advancement less than 10 mm and clockwise rotation
Stable	Maxillary advancements less than 10 mm
Less stable	Mandibular setbacks
Least stable	Downward rotation of the maxilla, widening of the maxilla

The surgical moves in the most stable category have a less than 10% chance of significant post-treatment change. Stable procedures have a less than 20% chance of significant post-treatment change.

The most stable surgical procedure is the superior repositioning of the maxilla followed by mandibular advancement. Both of these moves have more than a 90% chance of less than 2 mm change of landmarks. Mandibular advancement, especially with moderate moves and rigid internal fixation in patients with short or normal facial height and less than 10 mm of advancement, has an excellent record of stability. Maxillary advancement falls into the second category of a stable move. With advancements of up to 8 mm there is an 80% chance of less than 2 mm change of landmarks. Two-jaw surgeries with the maxilla up and the mandible forward, or the maxilla forward and the mandible back, are less stable than the above moves. These surgeries and the correction of asymmetry are stable only if rigid internal fixation is used. Less stable procedures have a 20-40% chance and least stable procedures a chance of 50% and more of two to four millimeters postsurgical change. These include moving the mandible back, the maxilla down, and widening of the maxilla.

By understanding the stability of surgical moves, the surgeon and orthodontist may be able to alter the treatment plan to include the possibility of more stable and predictable moves. Alternatively, if the treatment cannot be altered to include more stable moves the surgeon and the orthodontist should be aware of the potential problems and the patient should be informed.

5.4 Treatment

As discussed in the previous chapter, the patient's diagnosis and treatment is established from the clinical examination, dental model exam, and cephalometric evaluation. **Table 7.1-2** oversimplifies the treatment planning process but will give the novice a good starting point.

How much the maxilla or mandible are moved is based on the clinical examination, cephalometric x-ray evaluation, model surgery, and orthodontic planning aspects. Models are mounted on a semi-adjustable articulator and are moved so that they interdigitate with the opposing arch. Measurements are made in the laboratory from the model surgery. A splint is fabricated from the interdigitated models to be used to accurately position the maxilla or mandible. For 2-jaw surgery typically two splints are made, one for intermediate and one for final positioning.

Diagnosis	Treatment
Vertical maxillary excess	Maxillary impaction
Vertical maxillary deficiency	Maxillary downgraft
Maxillary constriction	Widening of the maxilla (Le fort I in segments or surgically assisted rapid palatal expansion)
Mandibular constriction	Mandibular widening (distraction osteogenesis)
Apertognathia	Differential maxillary impaction or mandible osteotomies
Maxillary retrognathia	Maxillary advancement
Mandibular retrognathia	Mandibular advancement
Mandibular prognathism	Mandibular setback or maxillary advancement in mild forms
Microgenia	Advancement genioplasty
Macrogenia	Reduction genioplasty

Table 7.1-2 Simplified treatment planning process.

5.5 Morbidity of surgical procedures

Every orthognathic procedure has potential complications and pitfalls (chapter 7.6 Complications and pitfalls). Especially when small skeletal discrepancies are treated, a procedure with less specific complications may be used if there are alternatives. For instance a mandibular prognathism with mild skeletal discrepancy may be treated with a Le Fort I advancement instead of a bilateral sagittal split osteotomy (BSSO) to avoid inferior alveolar nerve damage.