



Statement by the American Association of Oral and Maxillofacial Surgeons Concerning the Management of Selected Clinical Conditions and Associated Clinical Procedures

Distraction Osteogenesis

Section 1: Parameters of Care as the Basis for Clinical Practice

Introduction

This statement is intended to summarize the procedures used in the management of patients presenting for care by oral and maxillofacial surgeons. The definitive guide to the management of such patients is *Parameters of Care: AAOMS Clinical Practice Guidelines for Oral and Maxillofacial Surgery (AAOMS ParCare) Sixth Edition 2017*. Any references used in the development of this statement can be found in *AAOMS ParCare 2017*. This statement is not intended as a substitute for *AAOMS ParCare 2017*, but rather as a synopsis of the information contained in *AAOMS ParCare 2017*.

Section 2: Distraction Osteogenesis

Distraction osteogenesis (DO) is a surgical technique in which new bone formation is induced by gradual separation of bony segments by means of an appliance in conjunction with an osteotomy. The first description in the English literature of distraction osteogenesis for a maxillofacial application was by McCarthy in 1992. Since that time, a great deal of interest has been generated by the possibilities of this technique, and a growing number of clinicians advocate DO for the correction of facial skeletal deformities. While it is apparent that DO has enormous potential for correction of maxillofacial problems, especially some of the major craniofacial syndromes, no extensive long-term data exists to document its precise role in more routine maxillofacial deformities. With this in mind, the American Association of Oral and Maxillofacial Surgeons believes a statement is indicated relative to the role of distraction osteogenesis in oral and maxillofacial surgery.

Ilizarov's "law of tension stress" states that if steady traction is applied to bone segments after an osteotomy, the bone can then be lengthened with formation of new bone

at the surgical site. It is the healing callus that actually gives rise to the regenerate bone.

The steps and the basic technique of distraction osteogenesis are:

- Osteotomy phase. An osteotomy or corticotomy with placement of a device either internally or externally across the bony segment.
- Latency phase. This is a period of time in which the healing process is initiated and callus formation begins. In most applications, the latency phase is five to seven days – although there are some maxillofacial situations in which distraction is begun immediately.
- Distraction phase. At this time, the device is activated to create tension across the surgical site. As the segments are distracted, bone formations begin within the callus. The attendant tissues tend to adapt well to change, and there is an increase in size of the soft-tissue envelope. This process is termed distraction histogenesis.
- Consolidation phase. This is the period in which the segments are stabilized in order to allow for complete maturation of the regenerate bone. There is no activation during this phase.
- Remodeling phase. This phase has been recently described in the literature and, as more long-term results have been studied, it is apparent that the soft tissues and bone undergo continuing change over time.

Indications for Distraction of Facial Bones

The obvious indication for distraction osteogenesis is a situation in which this technique would be more efficient or effective than other available treatment modalities. From that perspective, distraction would be indicated when:

- A degree of improvement unavailable with other techniques would be produced (i.e., a superior result).

- It would produce a similar result in a more cost-effective way. Cost should be considered in a very broad sense, including burden of treatment for the patient and economic factors.

With this in mind, it is apparent that at this time the indications for distraction involving the jaws are limited to conditions in which this technique may be uniquely able to produce significant improvement over more traditional therapy. Examples of these situations are:

- Severe deficiency of either jaw with early correction indicated (e.g., an infant with Pierre Robin with mandibular deficiency so severe that tracheostomy is required and advancement of the mandible is the only way to correct an obstructive situation).
- Severe mandibular deficiency requiring lengthening of the mandible of greater than 10 mm. Growth modification via orthodontics generally produces no more than 5 mm differential growth, and conventional orthognathic procedures become more difficult and less predictable when greater than 8 to 10 mm advancement is needed.
- Need for lengthening of a short mandibular ramus. The nature of distraction osteogenesis is well-suited for stretching of the pterygomasseteric sling, which is not easily overcome by conventional procedures.
- Widening of the maxilla in an adult. Surgically assisted palatal expansion, which is analogous to distraction osteogenesis, has been utilized to overcome this problem for decades with very desirable and stable results.
- Narrow mandible that must be widened. There has been little success in widening the mandible with conventional surgery prior to the advent of distraction. Distraction techniques offer a better way to address this problem.
- Alveolar deficiency. The literature describes grafting techniques for augmenting the alveolar ridge. This is becoming especially popular as an adjunct to implant reconstruction. However, vertical augmentation is often difficult and distraction osteogenesis techniques may offer a means for augmentation of the bony ridge with an increase in soft tissue volume as well.

Distraction osteogenesis has been utilized in orthopedic

surgery since originally described by Ilizarov and is no longer considered an experimental technique. While these procedures have only recently found applicability in the correction of facial skeletal deformities, the principles and techniques are the same as those already accepted in orthopedics and also should not be considered experimental. It is nevertheless important that detailed basic research in this area be continued, and long-term data be collected and published. As with any procedure, distraction osteogenesis should be utilized primarily when superior results can be achieved compared to conventional techniques.

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