Richard McLaughlin (RM): Initial communication between the orthodontist and surgeon is critical with combined surgical orthodontic cases. Diagnosis and treatment planning of the patient must include four areas of evaluation: the joints and musculature, the airway, the face, and the dentition and periodontal status. Surgeons and orthodontists need to share information in these four areas, and agree on an appropriate diagnosis and treatment plan. That plan may involve surgery in the mandible only, the maxilla only, or both the maxilla and mandible.

TM: What would be your criteria for mandibular surgery only?

RM: The maxilla must be in an ideal or at least an acceptable position in three planes of space. Transversely, the maxilla must be wide enough to accommodate the advancing mandible. A high percentage of Class II cases are narrow in the maxilla relative to the proposed corrected mandibular position. As with most cases, the Curve of Wilson needs to be leveled in the upper arch, which may uncover an even more significant transverse discrepancy and can often be a primary contra-indication for mandibular surgery only. The mandible can be narrowed slightly at surgery, but only a limited amount. Also, cants in the maxilla must be minimal, or at least acceptable to the patient for successful mandibular only advancement surgery.

Horizontally, the upper incisors should be located in an acceptable position, or be movable to that position orthodontically. My goal is 110° to 115° to the palatal plane, and 55° to 59° to the maxillary occlusal plane. Ideally, with normal lip thickness, I like to see the upper central incisors positioned approximately 9mm behind the true vertical line (a vertical line through sub-nasion perpendicular to the floor with the patient in natural head position). When lips are thin, the incisors can be positioned slightly more anteriorly, and with thick lips, slightly more posteriorly. Crowding can be managed either with interproximal reduction or extractions to achieve a corrected upper incisor horizontal position. Spaces distal to the lateral incisors may be needed (along with lower incisor stripping) to assure proper overbite and overjet in the corrected Class I position.

Vertically, the maxillary dentition should be relatively flat. When vertical “steps” are present, surgical leveling...
Model grading requirements serve as excellent guidelines for upper and lower tooth alignment in these cases. The ABO offers several retention devices, including bone grafting procedures. Short lower facial heights can be managed with chin lengthening and bone grafting procedures. When the mandible is retrognathic, more incisor uprighting is helpful to allow the maxillary arch to receive the mandible. When the chin is prominent, slight incisal protrusion is beneficial to minimize the prominence of the chin. Arch length deficiencies can be managed either with interproximal reduction or extractions to facilitate tooth alignment and the desired lower incisor position. (See diagram.)

Vertically, mandibular curve of Spee leveling is controversial in surgical cases. Some prefer not to level the lower arch pre-surgically, contending that increased lower facial height can be achieved with post-surgical leveling. However, a number of negatives go hand in hand with not leveling the lower curve of Spee before surgery. Anterior tooth fit is hard to judge because space to be occupied by the lower dentition post-surgical leveling is uncertain. Also, surgical positioning of the mandible is more of an estimation on the part of the surgeon, rather than a set target with posterior teeth placed in an ideal Class I position. Most importantly, a surgical splint is necessary when the lower arch has not been leveled prior to surgery, and after removal of the splint, the occlusion is rarely correct, requiring significant orthodontic movement to adequately complete the treatment. When the teeth are totally aligned presurgery, including curve of Spee leveling, the occlusion acts as an excellent splint, and very little orthodontic tooth movement is required post-surgically. Short lower facial heights can be managed with chin lengthening and bone grafting procedures.

For upper and lower tooth alignment in these cases, the ABO model grading requirements serve as excellent guidelines for the orthodontist. Concerning mandibular surgical technique, there is significant controversy among oral surgeons concerning fixation screws versus mini-plates. My experience has been that the use of mini-plates allows for more accurate condylar positioning, resulting in fewer post-surgical TMD symptoms, than does the use of fixation screws.

**TM: What are your indications and requirements for Class II maxillary surgery only?**

RM: When surgery is to be limited to the maxilla only, the mandible must be properly located in the face. Since the mandible is often times retrognathic in Class II cases, very few of these cases are candidates for surgery-limited to the upper jaw only. Moving the maxilla back to accommodate a short mandible can result in very poor facial esthetics and could compromise the airway. Asymmetries in the mandible also eliminate the alternative of maxillary surgery only. Finally, the occlusal plane cannot be altered in such cases, as the rotated mandibular position dictates the occlusal plane. The indications for maxillary surgery only are limited—but there are a few cases where it is appropriate. The most common are those with normal mandibular length and acceptable mandibular symmetry. This may occur in cases with vertical maxillary excess and an anterior open bite. Segmental maxillary surgery is often required in these cases because of the vertical “two-step” occlusion in the maxilla, as well as transverse maxillary discrepancies. Segmental maxillary surgery will be discussed below under two-jaw surgery. If maxillary surgical positioning and the resultant mandibular rotation produces a good occlusion and a satisfactory facial result, but does not produce an adequate airway, then two-jaw surgery is indicated. Pre-surgical orthodontic tooth alignment can be carried out in a manner similar to mandibular advancement cases, as described above.

**TM: Please discuss your ideas on the challenging two-jaw Class II surgical cases.**

RM: The contra-indications for Class II single jaw surgery were described above. When these limitations present themselves, two-jaw surgery is indicated. Such cases require great attention and skill, but they do allow for the greatest amount of flexibility and, hence, the best possible facial, airway and occlusal results. More specifically, the corrected occlusion can be properly placed between the airway posteriorly and the face anteriorly. This is greatly aided by setting the occlusal plane in an ideal position, which is frequently not reached by the orthodontist. In Class II cases, the prominence of the chin. Arch length deficiencies can be managed either with interproximal reduction or extractions to facilitate tooth alignment and the desired lower incisor position. (See diagram.)

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possible with single jaw surgeries. Pre-surgical orthodontic alignment considerations in the mandible were described above in the discussion on mandibular surgical cases only, and apply similarly in two-jaw surgeries. The maxillary surgical portion of the treatment can be completed with a single piece LeForte procedure if there are no vertical or transverse discrepancies in the maxilla. Segmental maxillary surgery, and therefore segmented archwires, is required in cases that have a “two-step” occlusion vertically in the maxilla. The vertical step usually occurs (about 90% of the time) between the lateral incisors and cuspids and therefore the arch wire needs to segmented between these teeth pre-surgically. The step may also occur between the cuspids and first bicuspids requiring sectioning in this location. Archwire segments can be properly shaped by first coordinating the upper and lower archwires, and then sectioning the upper archwire in the appropriate locations. This allows the positioned maxillary segments to correctly align with the lower arch during surgery.

When there is a transverse discrepancy in the maxilla, (constriction), a significant surgical decision is required. Many surgeons are uncomfortable with large segmental expansions (5mm to 10mm) in the maxilla because of the tendency for transverse relapse with this degree of expansion. Therefore, some prefer to do a SARPE procedure first to correct the transverse discrepancy in the maxilla, and then complete a second surgery for vertical and horizontal positioning of the arches after orthodontic alignment. A second surgery is not popular with patients, which has led to improved surgical techniques allowing for a stable result to be gained with a single surgical procedure. In particular, rather than single sectioning in the mid-palatal suture area, two cuts can be made, one on either side of the suture. This divides the amount of widening into two areas, thereby increasing the chances for stability.

Final surgical splints are also not required in these two-jaw cases if the orthodontic alignment is satisfactory, and the upper arch segments are connected during surgery using acrylic across the upper surgical sites. This method forms a stable upper arch because of the formation of very solid single archwire. Most surgeons complete upper jaw surgery first in these cases, using the original mandibular position with an interim surgical splint as a baseline for maxillary positioning. Others complete mandibular surgery first, contending that, no matter how much care is taken, there are frequently discrepancies between a seated condyle mandibular position in patients that are awake, versus patients that are anesthetized. This can result in a mandible that is seated too far distally. Thus, the more retrusive anesthetized mandibular reference position and interim splint set the maxilla more distally than desired. While completing mandibular surgery first requires great accuracy, the argument for this approach is valid and compelling. Post-surgical orthodontic ideas will be discussed in the next issue on Class III surgeries.

Dr. McLaughlin completed his orthodontic training at the University of Southern California in 1976. Since then he has practiced orthodontics full-time in San Diego, California. He has lectured extensively in the United States as well as internationally. He is a Diplomate of the American Board of Orthodontics, a member and Component Director of the Southern California Component of the Edward H. Angle Society and was the 2009 American Board of Orthodontics recipient of the Dale Wade Award. In addition, Dr. McLaughlin is a clinical professor in the Department of Orthodontics at the University of Southern California, and an associate professor at St. Louis University, Department of Orthodontics.

EDITOR’S NOTE:
The recent interview with Dr. Vince Kokich generated several requests for more information on the details of the surgical procedure for exposing lingually impacted maxillary canines. The answers from Drs. Kokich and Mathews (the periodontist Dr. Kokich uses to expose the tooth) are as follows:

1. What is the barricade material that is used?
From Dr. Mathews: “The material is Barricade, a light cure dressing, rubbery in consistency.”

2. What about the odor of the barrier material if left in for an extended period of time?
Again from Dr. Mathews: “My patients don’t complain of odor any more that any other surgical procedure. It can be changed if that is a problem. Remember, I don’t use it on every case, only the deep ones that I feel may cover over.”

Editor’s comments: Readers are reminded that Dr. Kokich stated in his interview that a full flap is reflected for access to the impacted tooth and bone is removed down to level of the CEJ, a bracket or cleat is bonded to the tooth to assist in retaining the barricade material, the flap is then sutured back in place and an opening is created through the flap over the impacted tooth and if need be, as pointed out by Dr. Mathews, the barricade material is placed. Any additional questions can be addressed to Dr. Kokich at vgkokich@u.washington.edu or Dr. Mathews at dmathews44@gmail.com.