

# THE EDITOR'S CORNER

## Calculating Crowding

**D**ental crowding is a tooth-size/arch-length discrepancy. Specifically, dental crowding is defined as the difference between the mesio-distal widths of the permanent teeth and the space available in the denture. Do you still remember the Tanaka-Johnston mixed-dentition analysis that was taught in dental school? In today's era of non-extraction treatment, orthodontists appear to have forgotten the fundamentals of how to treat crowding in the anterior segments, much less in the posterior segments.

Post-treatment cephalometric analysis will show whether anterior crowding has been resolved. Ideally, the mandibular-incisor inclination in relation to the inferior border of the mandible should be approximately 90°. This number, referred to as IMPA (mandibular-incisor to mandibular-plane angle), is the foundation of Charles Tweed's diagnostic facial triangle, which is a simple way to determine the denture's anterior limit. A higher-than-average IMPA indicates incisor instability.

Part of the problem is the erroneous belief that all anterior crowding can be addressed by Phase I rapid maxillary expansion, which will also "unlock mandibular growth." Let's take a closer look at the numbers: 30 turns of a jackscrew equal 7.5mm of expansion, or 5.25mm of maxillary-arch perimeter gained, which is about the width of a mandibular incisor—that's all! In other words, rapid maxillary expansion provides only 5-6mm of space; any additional crowding must be resolved with incisor proclination.

If Tweed was best known for his work on the denture's anterior limits, his prize student, Lavern Merrifield, was best known for his work on its posterior limits. Merrifield expanded Tweed's concepts and later introduced the Tweed-Merrifield diagnostic and treatment philosophy to orthodontics. The basic principle of this philosophy is to recognize and treat within the dimensions of the denture to achieve optimum facial harmony and balance.

Dental crowding is difficult to predict in the

posterior denture, however, because of mandibular growth. Merrifield postulated a 1.5mm increase in posterior arch length until age 14 for girls and 16 for boys. Unresolved posterior crowding is revealed on a panoramic radiograph by mandibular second molars that are mesio-angular or vertically impacted under the anterior ramus. When posterior crowding is corrected, the mandibular second molars will be upright and fully erupted into the arch.

Unfortunately, orthodontists tend to overlook posterior crowding. If a second-molar impaction is detected during treatment, they assume that the problem can be easily resolved by referring the patient to an oral surgeon to excise the opercula and extract the third molars. These surgeries do not add space to the posterior denture, though, and the tissues over the second molars will eventually grow back. As a result, unresolved posterior crowding can cause recurrent second-molar pericoronitis. Many of these patients end up having their second molars extracted during retention.

With respect to the diagnosis and treatment of dental crowding, I teach the "Rule of 10" that another Tweed orthodontist, Jack Dale, taught me. This rule states that "10mm-wide central incisors or 10mm of crowding will require premolar extractions." Simply put, premolar extractions in the middle of the arch may be needed to retract the incisors or protract the molars into the denture. I recommend extractions in about 25% of my adolescent patients—which coincides with the pattern of most European orthodontists.

The denture has both anterior and posterior limits. Orthodontists today seem to push teeth beyond these limits too readily, accepting incisor proclination and second-molar impaction to avoid extracting premolars. I can only assume that the final radiographs are rarely scrutinized. Recommending extractions is not an easy decision for orthodontists, but in some cases, it is the appropriate answer to ensure a healthy and stable result. In the end, dental crowding is simply a math problem.

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