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Practicing with the Evidence

Dr. Turpin noted that for much of his practice life, his treatment philosophy came directly from his training as a resident – treat difficult orthodontic problems early. He summarized his long-standing philosophy as:

The early treatment of children will allow the practitioner to intercept developing malocclusions, reducing treatment time, the need for extractions, and other complications, such as surgery. In general, outcomes will be better when problems are corrected early.

In light of more recent published evidence, this statement is no longer supportable. The University of North Carolina randomized clinical trial (Tulloch, et al.) showed that two-phase treatment for skeletal class II cases does not reduce treatment time, the need for extractions, the need for jaw surgery, and does not lead to better outcomes. The conclusions of this study include:

1. Early treatment for skeletal class II patients is only justified if other problems are improved.
2. Special indications for early treatment may include psychosocial stress, accident potential of the child, or general convenience of the family.
   Tulloch, JFC, Proffit, WR, and Phillips, C. Outcomes in a 2-phase randomized clinical trial of early Class II treatment. Am. J. Orthod. Dentofacial Orthop. 2004;125:657-67.

Dr. Turpin presented a recent study from Brazil that supports the findings of Tulloch et al. The study looked at treatment outcomes from two cohorts: One cohort was treated with 2-phase treatment. The other cohort was treated with 1 phase of fixed edgewise appliances only. The results showed no significant difference in occlusal outcomes for the two cohorts.

Dr. Turpin pointed out that a cohort study is not as reliable as a randomized clinical trial, largely because the cohorts are likely not identical samples. He reviewed the hierarchy of research experiments in descending order of reliability: *Meta-analysis > systematic review >prospective randomized clinical trial > cohort study > case control study > retrospective case series > case report*.

Dr. Turpin pointed out that in many scientific circles, evidence showing the ineffectiveness of particular treatments or protocols are often ignored. He cited two examples:

1. The use of glucosamine/chondroitin applied topically as a cure for arthritis.
2. The low-fat diet regimen as a means of losing weight.

Dr. Turpin then presented 5 cases treated with a 2-phase approach and discussed the evidence available in support of the treatment for each.

Case #1 was a 10 year-old male with a class II division 1 malocclusion, treated with 12 months of headgear therapy during the late-mixed dentition, immediately followed by 18 months of fixed

edgewise therapy. The result was very good – all treatment objectives were obtained. Favorable growth during treatment played an important role in the treatment outcome. However, if this patient had presented 2 years earlier (age 8), it is likely his phase 1 treatment would have initiated then, and overall care would have extended 5 years. Would this have led to a better result? Dr. Turpin feels probably not, with the additional consideration that longer treatments bring a greater incidence of associated problems with cooperation, root resorption, and enamel decalcification.

Furthermore, could peak mandibular growth have been predicted for this individual? In other words, is there evidence that we can know, with certainty, the best time to treat an individual with a skeletal class II? No! Dr. Turpin cited a recent manuscript in which the authors used the Burlington Growth Study to conclude that the prediction of peak mandibular growth velocity by the use of hand-wrist films is not reliable. Hunter, WS. Amer. J. Orthod. Dentofacial Orthop. (in press).

Case #2 was a class II division 2 pattern treated similarly to case #1 in 2 phases. However, due to poor patient cooperation, phase 1 treatment objectives were not met. This underscores the consideration of the patient in addition to the evidence available to provide his/her treatment.

Case #3 was a 6.5 year old female with a posterior crossbite associated with a functional mandibular shift. Treatment involved early correction of the crossbite by maxillary expansion (6 months), followed by observation until age 11.5 years when 16 months of fixed edgewise appliance therapy was initiated. Treatment results were very good. However, what evidence exists for the early correction of posterior crossbites?

One *systematic review* suggested that the most appropriate method for elimination of posterior crossbites was selective grinding of deciduous tooth premature contacts involved in the functional mandibular shift. If this method fails, the use of a removable maxillary expansion plate is advised. *Harrison, JE and Ashby D. Othodontic treatment for posterior crossbites. Cochrane Database Syst. Rev. (1):CD000979.*

A second *systematic review* failed to differentiate which types of fixed expansion modalities were the most effective in achieving crossbite correction. The conclusions were:

1. Only two randomized clinical trials (RCT) of early treatment of crossbite have been performed, and these two studies support grinding as treatment in the primary dentition.
2. The treatment strategies QH, expansion plates, and RME are effective in the early mixed dentition at a high success rate. However, there is no scientific evidence available that shows which of the treatment modalities, grinding, QH, expansion plates, or RME, is the most effective. Consequently, no conclusions could be drawn regarding stability in the long term, especially because the follow-up time varied substantially among the studies.
3. Most of the studies have serious problems of lack of power because of small sample size, bias, and confounding variables, lack of method error analysis, blinding in measurements, and deficient or lack of statistical methods. Thus, the studies did not reach a quality level sufficient enough to draw any evidence-based conclusions.
4. To obtain reliable scientific evidence, better-controlled RCTs with sufficient sample sizes are needed to determine which treatment is the most effective for early correction of unilateral posterior crossbite. Future studies should also include assessments of long-term stability as well as analysis of costs and side effects of the interventions. *Petrén S, Bondemark L, Söderfeldt B. A Systematic Review Concerning Early Orthodontic Treatment of Unilateral Posterior Crossbite, Angle Orthod 2003; 73; 588–596.*

A *meta-analysis* to examine the stability of transverse maxillary expansion located only 12 studies meeting the inclusion criteria, with a mean patient age of 10 years, 8 months. The results showed that, on average, the maxillary inter-molar expansion changed from 6 mm. (immediate post-expansion) to 4.9 mm (immediate post-retention) to 2.4 mm (long term post-retention). These data were not sufficient to conclude that expansion, beyond what is expected with normal growth, is maintained long-term. *Schiffman, PH, Tuncay, OC. Maxillary expansion: A meta-analysis. Clin Orthod Res 2001;4:86-96. Marshall SD, Dawson D, Southard KA, Lee AN, Casko JS, Southard TE. Transverse molar movements during growth, Am J Orthod Dentofacial Orthop. 2003;124:615-624. Hesby R, Marshall SD, Dawson D, Southard KA, Casko JS, Franciscus, RG, Southard TE. Transverse skeletal and dentoalveolar changes during growth. Am J Orthod Dentofacial Orthop.2006 (in press).*

Case #4 presented at age 6y 9m with class III characteristics. Phase 1 treatment involved maxillary protraction to a banded acrylic plate, without maxillary expansion, 18 hours per day for 6 months followed by nighttime wear until all maxillary incisors were erupted. At age 12y 5m phase 2 fixed edgewise therapy began and was successfully completed in 32 months. Is there evidence-based information to support this treatment? And, is maxillary protraction more effective with or without simultaneous maxillary expansion?

A *meta-analysis* of 14 studies involving 527 patients concluded that:

1. No distinct differences in maxillary protraction were seen between expansion and non-expansion groups.
2. Maxillary protraction was effective for growing patients, but less effective after 10 years of age.

Kim JH, Viana, MA, Graber, TM, Omerza, FF, BeGole, EA. The effectiveness of protraction face-mask therapy: A meta-analysis. Am J Orthod Dentofacial Orthop. 1999;115:675-85

A prospective randomized clinical trial of 46 patients grouped by facemask treatment with maxillary expansion, facemask treatment without expansion, or observed with no treatment, gave the following results:

1. Early facemask therapy is an effective treatment for skeletal class III malocclusions.
2. Outcomes of facemask therapy with or without maxillary expansion were not different.

Vaughn, GA, Mason B, Moon, HB, Turley, PK. The effects of maxillary protraction therapy with or without rapid palatal expansion. Am. J. Orthod. Dentofacial Orthop. 2005;128:299-309.

Case #5 exemplifies a successful treatment approach not strongly supported as evidence-based in the literature. A 14 year old female presented with a class I malocclusion and severe mandibular deficiency (ANB = 14^{o}) secondary to rheumatoid arthritis affecting the mandibular condyles. Treatment involved extraction of lower first bicuspids, mandibular advancement surgery with proplast chin implant. 16 years after treatment, results are stable with some mandibular relapse secondary to continued condylar changes and changes in the proplast implant. However, to date the best evidence for this type of treatment comes largely from *case series* reports as it is too difficult to design a prospective randomized clinical trial for this type of orthodontic problem.

Dr. Turpin discussed that the evidence-based results presented today for Class II therapy, maxillary expansion, and facemask therapy have been duplicated by Dr. Moschos A. Papadopoulos' evaluation of 98 meta-analyses (manuscript in press).

He also cited another manuscript by Dr. Thomas Katona at Indiana University School of Dentistry that underscores the importance of scientific method in orthodontics. The results of

Dr. Katona's study shows that periapical radiography is not suitable for evaluating root resorption in orthodontic patients.

Dr. Turpin summarized his presentation by stating that orthodontics has evolved from the age of "professionalism", through the age of "science" to currently the age of "evidence". Evidence-based practice is available today and a desired goal for all orthodontic practictioners.

The remaining portion of Dr. Turpin's presentation focused on the American Journal of Orthodontics and Dentofacial Orthopedics. The results of an outcome study by the publisher, Elseiver, held the journal in highest esteem among dental and orthodontic journals around the world – (Thanks to Dr. Turpin!)

Some interesting facts:

- The journal has 16,000 subscribers around the world
- The journal receives 700 papers/year and rejects 60%
- The journal refuses guests editorials, review articles, or letters to the editor, from authors with financial interest in the subject
- The journal has an "online only" track for publication which publishes faster and allows 40 new articles per month to be viewed online
- The participants that take advantage of online viewing are from countries (in decreasing order of "hits"): USA > Germany > Brazil > UK > Japan > Mexico