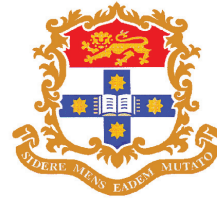
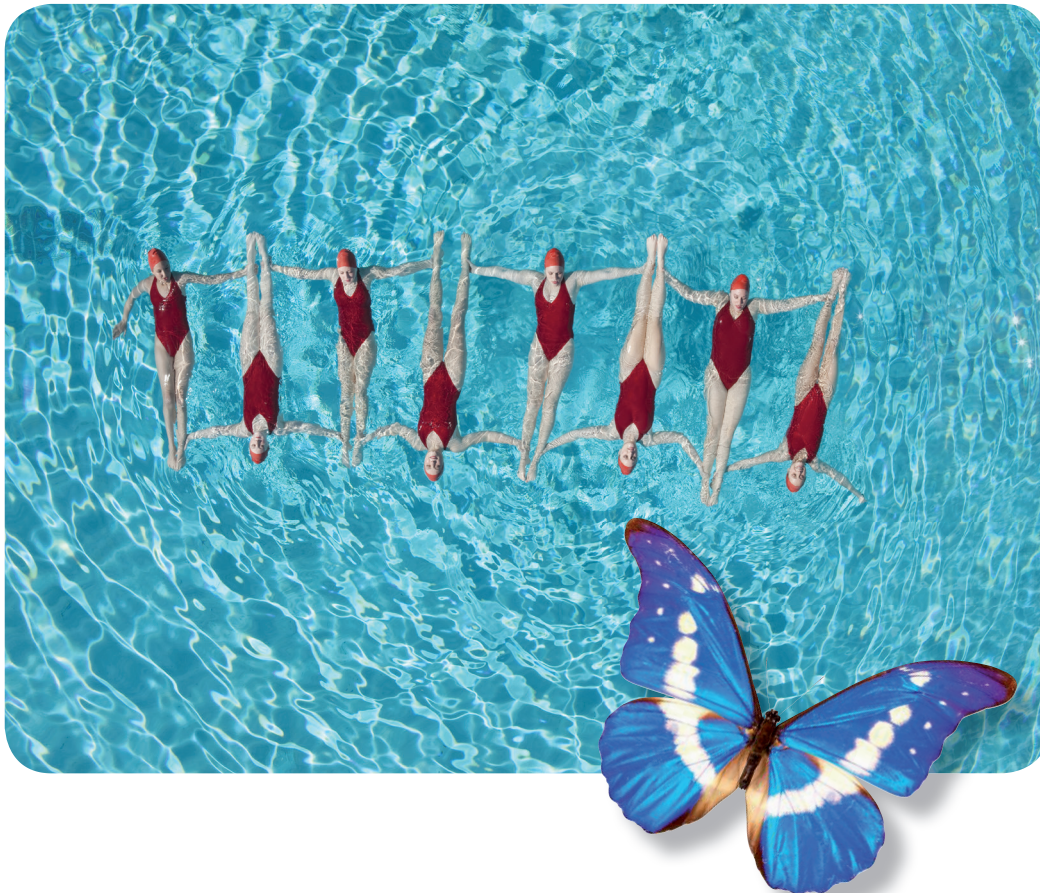


Australian Society  
of Orthodontists



University of Sydney



## The Transverse Dimension

*Creating **B**righter Futures*

# The Transverse Dimension

The Transverse Dimension refers to the 'widths' and also the coordination between the upper and lower jaws from the frontal view when in occlusion. The most obvious clinical manifestation of a transverse problem is a crossbite. The incidence of transverse problems varies, with posterior crossbites reported in 7-30% of the US population<sup>1,2</sup>. If left uncorrected they may result in accelerated dental wear, TMD symptoms, periodontal issues and permanent facial asymmetry<sup>21,22</sup>. This edition of 'Brighter Futures' will examine the problem mainly from the perspective of a narrow upper dental arch producing a lingual crossbite.

## Diagnosis of Transverse Issues

Although the origin and treatment of such discrepancies can be straightforward, it is not always so. Clinical, photographic, study models (plaster or digital) and radiographic examination enables accurate assessment of transverse discrepancies and their origin<sup>3</sup>.

Before discussing the diagnosis and treatment of lingual crossbites it should be noted that not all such crossbites are as a result of a transverse discrepancy, some can be related to an antero-posterior malrelationship. For example in a significant Skeletal II patient, there may be no posterior crossbite in centric occlusion, however, once the mandible is postured forward, either clinically or with study models, into a Skeletal I position, a lingual crossbite is observed. Conversely, in a Skeletal III patient, where there is no compensatory lingual tipping of lower posterior teeth or buccal tipping of upper posterior teeth, a posterior lingual crossbite may be evident in centric occlusion, however, once the study models are positioned into Class I the apparent transverse discrepancy is no longer evident. If however there is compensatory tipping of posterior teeth, even if no transverse discrepancy is evident on positioning models into Class I, there is actually a transverse discrepancy still present being masked by the compensatory tipping; hence the need for a thorough and careful assessment.

Lingual crossbites can be of dental, skeletal or functional origins or often a combination of origins. If maxillary posterior teeth are palatally inclined or displaced, and/or mandibular posterior teeth are buccally inclined or displaced, the crossbite may be of dental origin only. A posterior crossbite of normally inclined and positioned teeth implies

a relative maxillary skeletal deficiency. The severity of the crossbite may also provide a clue to whether the crossbite is of dental or skeletal origin. Those involving one or a few teeth are more likely mainly dental, however those involving multiple teeth, entire quadrants or bilaterally are more commonly skeletal (Figure 1).



Figure 1A: Bilateral posterior crossbite of skeletal origin



Figure 1B: Limited posterior crossbite of dental origin

Palatal vault size and shape may also indicate aetiology of the problem. If high and narrow, a skeletal maxillary width deficiency is more likely<sup>3</sup>, while a normal palatal vault is more indicative of a dental problem.

Check carefully for a 'functional shift' or 'slide' which occurs when there is a dental interference causing the mandible to deviate on closing into centric occlusion resulting in a posterior crossbite. (Figure 2) A functional shift can be caused by an ectopic tooth but is more commonly produced by a relative (skeletal) constriction of the maxillary arch.

## Colgate CARE COLUMN

### The Global Alliance for a Cavity Free Future launched an Australian Chapter in Nov 2013.

The ultimate goal of the Alliance is that:

Every child born in 2026 and beyond will remain cavity free for their lifetime.

The Alliance Australian Chapter ran a forum in Sydney in October featuring speakers; A/Prof Richard Widmer from Westmead Hospital, Christine Morris Director of Health Promotion for the South Australian Dental Service, and Lindy Sank a Dietician from Sydney Dental Hospital. Those attending the forum were from professions including nursing, aged care, dietetics and nutrition, health promotion and oral health/dentistry.

The overarching theme for the day was the incorporation of oral health messages into general health settings. To assist with this the Community Grants Program was also launched to support projects that will help to make improvements in the caries experience of communities. The projects that are successful in being awarded grants this year will be published on the ACFF Australian site at [AllianceforaCavityFreeFuture.com.au](http://AllianceforaCavityFreeFuture.com.au)



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You may wish to share this issue of Brighter Futures with your hygienists and other staff members.





Figure 2: A lateral functional shift resulting from occlusal instability on closure. Initial contact (top) and maximum intercuspation (bottom).

### How Do Transverse Problems Develop?

Transverse problems can develop from both genetic and environmental influences. A number of people have an inherited difference in jaw sizes and this can result in a transverse discrepancy<sup>2</sup>. Similarly a number of syndromes are associated with jaw size discrepancies or developmental abnormalities which can lead to transverse discrepancies.

Environmentally, habits such as 'digit sucking' will produce an alteration of intra-oral forces, changing the equilibrium position of the teeth leading to a relative constriction of the maxillary arch and a posterior crossbite. The severity of the effect will depend on the habit frequency and duration<sup>2</sup>.

Long-term alterations in mouth opening and mandibular positioning, such as in chronic mouth breathing, have also been implicated. Whether due to habit or compensatory due to nasal airway space insufficiency, the soft tissue pressure changes from mandibular posturing may alter the transverse relationship of teeth over time<sup>4,5</sup>.

Trauma to the developing facial skeleton, especially the condyles or condylar necks can lead to asymmetries. If timely and appropriate treatment is not received then permanent skeletal asymmetry can remain resulting in dental crossbites.

Children born with facial deformities, such as cleft lip and/or palate, often require multiple surgeries in the midfacial region prior to the completion of growth. The soft tissue scarring generated by these surgeries can alter facial skeletal development, commonly resulting in maxillary constriction<sup>2</sup>.

Iatrogenic crossbites may also be encountered due to misdiagnosis, poor treatment planning or inappropriate biomechanics.

As previously mentioned, dental interferences between opposing teeth may deflect the closing mandible resulting in a functional shift and the development of a cross bite. Such interferences can arise from crowding, ectopic or over-eruption of teeth, and of course from genetic and environmental factors. Such functional crossbites are usually best treated in the mixed dentition, before they produce a permanent facial asymmetry.

### When and How are Transverse Problems Treated?

Treatment of transverse problem relies on correct diagnosis of type and aetiology. Treatment will vary depending upon the dental, skeletal or functional nature of the condition as well as patient's age.

The correction of a posterior crossbite, where possible and practical, should be undertaken relatively early rather than waiting until growth has been completed. The mixed dentition (when all the permanent incisors and first molars have erupted) is often the most practical time to commence treatment. If functional crossbites are left untreated until growth has completed, they may lead to permanent asymmetries. In primary teeth, treatment may be as simple as selective grinding (odontoplasty) to remove minor tooth contacts<sup>8</sup>, through to extraction of the offending tooth. However, active appliance therapy is often not practical in the deciduous dentition, because crossbites may spontaneously correct as the patient transitions from the deciduous to the mixed dentition. In addition, waiting until the first permanent molars erupt makes appliance construction and patient management more efficient and practical.

#### Dental Crossbites:

Dental crossbite correction depends on the number of teeth and severity. If only a single tooth is involved, appliance choice, design and fabrication may be simpler, using for example cross-elastics, orthodontic arch wires or removable appliances. Where more teeth are involved an upper Hawley appliance with a screw (Figure 3) can assist, especially if unilateral correction is required. If there is no functional slide associated with the crossbite, or no other harm or damage occurring, this correction may be delayed until the early permanent dentition if it is more practical to do so.

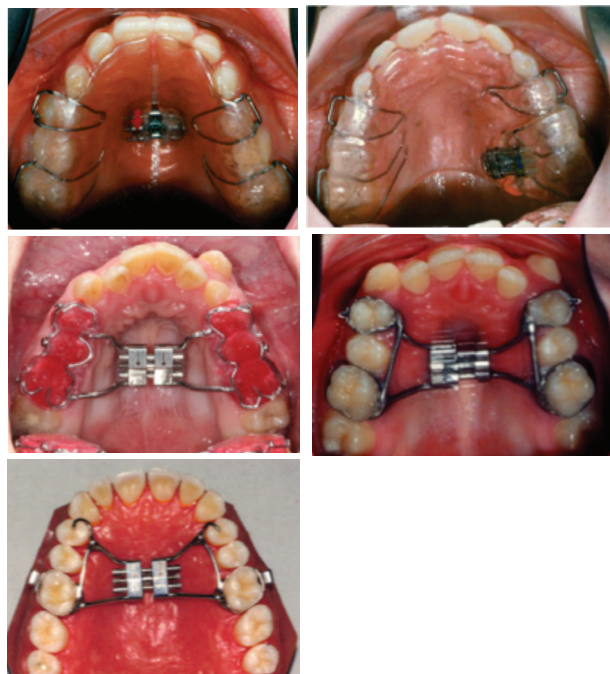


Figure 3 Top row: Upper removable appliances for dental expansion. Bottom rows: Bonded and banded Rapid Maxillary Expanders (RME) for skeletal expansion

# BRIGHTER FUTURES

is published by the Australian Society of Orthodontists (NSW Branch) Inc. in conjunction with the Orthodontic Discipline at the University of Sydney.

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*The statements made and opinions expressed in this publication are those of the authors and are not official policy of, and do not imply endorsement by, the ASO (NSW Branch) Inc or the Sponsors.*

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## Skeletal Crossbites:

Skeletal crossbites arise from abnormalities in the size of one jaw or a combination of both. They frequently involve a constricted maxilla, thus expansion of the maxilla is commonly required. Each maxilla articulates with 10 other facial bones (including the contralateral maxilla)<sup>9</sup> and the bony sutures that circumscribe the union of the maxillae are known to ossify increasingly with age<sup>10</sup>. Maxillary expansion devices, which attach to the upper dentition (Figure 3), will provide an unavoidable combination of both dental and skeletal effects through their action. The amount and ratio of orthodontic and orthopaedic effects of expansion will depend on the patient's age, sex and growth status<sup>11-17</sup>.

Skeletal expansion is usually undertaken with a fixed expander, such as a Rapid Maxillary Expander (RME). It can be commenced in young children as early as they are able to cooperate; however once again, for practical reasons, typically this is done once the first permanent molars have erupted. The window for this treatment extends up to about 13-15 years of age<sup>18</sup> at which time the maxillary sutures should still be patent and compliance is good. The ossification timing of the circummaxillary sutures is highly variable between individuals<sup>19,20</sup> and this will dictate to what age 'non-invasive' expansion treatments are possible. More skeletal changes can be expected in younger patients prior to their peak adolescent skeletal growth<sup>21</sup>, hence the tendency to correct posterior crossbites in the mixed dentition. As skeletal maturity progresses, there will be an increasing amount of dental change relative to actual skeletal expansion. Once skeletal maturity has occurred, skeletal expansion is only achievable with the aid of surgical techniques that release the maxilla prior to the use of traditional fixed expanders (Figure 4)<sup>3</sup>.



Figure 4: Surgical release of the maxilla is needed to facilitate expansion after skeletal maturity<sup>3</sup>

## Conclusion

Transverse problems are a relatively common occurrence in the community. Correct identification of type and origin will facilitate treatment. Numerous choices exist for maxillary expansion, however the degree of skeletal and dental effects that these appliances produce will depend on the appliance used and the age of the patient. The degree of skeletal change decreases with increasing age, and the degree of relapse increases with increasing age at treatment. If you are unsure and concerned about one of your patients, it is advisable to seek the advice of a trusted orthodontist.

References available upon request