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Cranial Strains and Malocclusion:
VI: Side-Bend - Part 2: Treatment

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There are specific criteria for treatment of a side-bend strain. These apply whether the side-bend is the only strain present or is found in combination with another strain. As the first part of this article on the side-bend strain was published in the previous *IJO*[1] issue, the characteristics of a side-bend strain are therefore reviewed. A left side-bend is shown (Figures 1a, b).

A conventional approach to treatment might be to distalize the maxillary left posterior teeth by an appliance such as a pendulum fixed type appliance[2]. If crowding is present a unilateral extraction such as the left first bicuspid, or perhaps three bicuspids, might be considered, leaving the molars in a Class II relationship on the side-bend side. These treatment objectives are designed for correction of the dentition only and fall short of addressing the primary etiology of the problem. This leaves the craniofacial displacement untreated or worsened in the process of reconfiguring teeth.

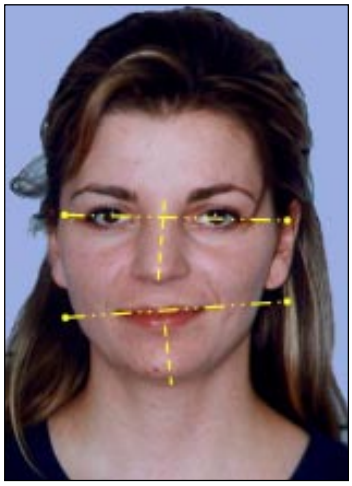

Fig. 1a - Facial view of Left Sidebend patient H.P. Note convergence of ocular and occlusal plane on the left. Chin deviates to the left, nose deviates to the right.

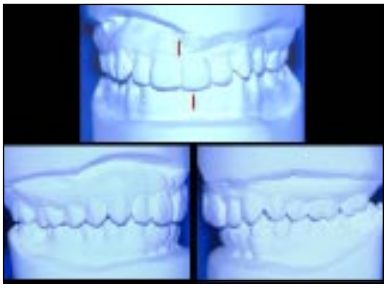

Fig. 1b - Left Sidebend, models of patient H.P. Note asymmetric midlines, Class I on the right, Class II on the left.

The relationship between asymmetric malocclusion and a side-bend strain has always co-existed. To our knowledge there has not been a satisfactory explanation in dental literature as to how it arises. The cranial configuration underlying the malocclusion was described in detail in the previous article.[1] As we emphasized in that article, a necessary step in recognizing how a side-bend strain affects the dentition is to mount the models on an articulator using a face bow and a functionally generated occlusal registration.

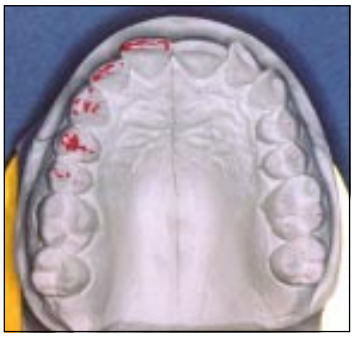

Fig. 2 - Articulating paper marks show interference of central and lateral incisors, cuspid and first bicuspid restricting mandibular position in side-bend.

In a left side-bend strain the following characteristics are identifiable:

1. The entire maxilla is rotated to the right, reflecting the rotation of the greater wings of the sphenoid.
2. The mandible is rotated to the left as the temporal bone follows the occipital bone distally.
3. The maxilla must be seen as two individual halves. The side-bend side is normally internally rotated (closer to the palatal mid-line). The contra-lateral side is externally rotated (further from the palatal mid-line). This feature is not invariable, but is usually present.
4. The maxilla cants up to the left.
5. The mandible during closure and prior to any tooth contact shows a self-correcting tendency toward the mid-line. The initial contact is in the area of the right first bicuspid, cuspid and lateral incisor (Figure 2). Wear facets are often visible on these teeth and on the models.
6. With the models mounted in a functionally generated registration, there is a significant disharmony between the posterior segments in a lateral plane (Figure 3).

With disarticulation of the teeth, the mandible is no longer influenced by the primary dental interferences. Under the influence of the musculature, the mandible can align itself toward the facial midline. There is still a Class II relationship of the posterior segments on the left and Class I on the right.

Fig. 3 - Teeth in discluded position demonstrating the resultant disharmony in the buccal segments, i.e. Class II on the left, Class I on the right.

Treatment:

The primary goal in the cranial approach is to correct the craniofacial distortion as much as possible using the teeth as a means to achieve this, then develop the mandibular position and stabilize the occlusion.

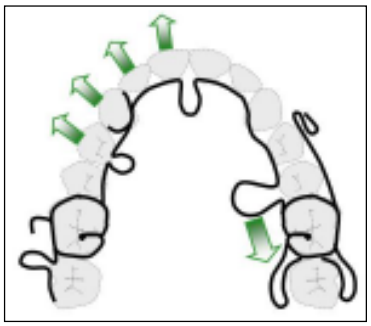

Fig. 4 - Maxillary A.L.F. initial appliance for sidebend correction.

Phase I:

The aim is to develop symmetry of the maxilla. The diagram in Figure 4 shows the appropriate direction of initial force applications. Movement of the right lateral incisor, cuspid and first bicuspid is needed in a buccolabial aspect. Distal movement of the maxillary left molars is also required. With the appropriate appliance design (Fig 4) an effective reciprocal force can achieve both of these objectives. This is best accomplished by using an Advanced Lightwire Functional (A.L.F.) appliance. This type of correction cannot be achieved with either removable or conventional full bracketed appliances and preformed arches. The appliance is activated by expanding the arch at the loops in the right anterior segment and on the left posterior segment. Lateral development of the arch can also be accomplished if the overall arch form is deficient or incongruent.

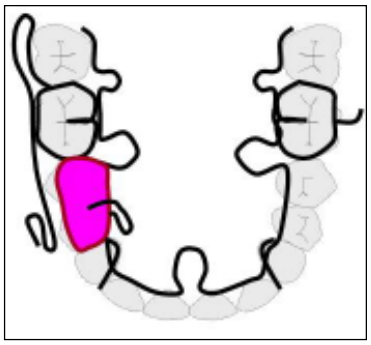

Fig. 5 - Mandibular A.L.F. initial appliance for sidebend correction.

In the mandible an A.L.F. appliance is also used (Figure 5). A pad is placed over the bicuspid teeth on the right. The pad provides a point of initial contact and allows the mandible to move toward the centerline. It also helps to reduce the maxillary cant by introducing a subtle intrusive direction to the maxillary posterior quadrant. This encourages the opposite, higher side of the maxilla to drop downwards.

Figure 6 is a diagram of the treatment sequence in phase one. A very light force through-the-bite elastic is applied on the right side to prevent expansion of the posterior teeth on the right. The net expansile effect of the appliance is therefore on the anterior right segment and the left buccal segment. The effect of the elastic is to act as a brake. This is an important concept since cranial correction is achieved by employing a very light constant force to take advantage of the flexibility inherent in the craniofacial structures. In this case, the light force is being used to achieve a true orthopedic movement, i.e. the buccal expansion of the left (internally rotated) half of the maxilla.

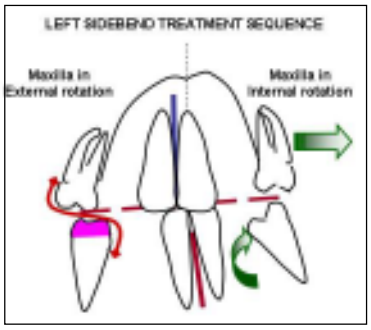

Fig. 6 - Anterior view of molar occlusion in left sidebend. Left maxilla is internally rotated, lower left molar is lingually inclined. Occlusal plane is canted upward on the left. Note through-the-bite elastic on the right side to effect correction of the left maxillary internal rotation. Acrylic pad over lower right bicuspids is used to correct the maxillary cant. A.L.F. appliances used to effect upper internal rotation and elevate the lingually depressed lower left molars and bicuspids.

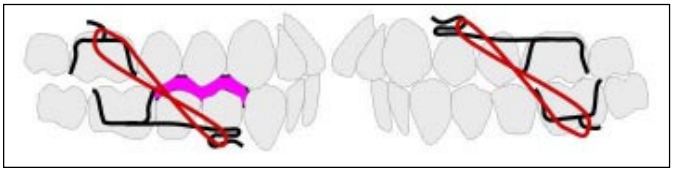

Fig. 7 - Phase II treatment. Elastics to rotate the maxilla toward the left. Class III elastic on the right, Class II elastic on the left.

Phase II:

As the maxillary arch is developed the mandible continues to move toward the centerline. At this point, the centerlines are not yet corrected to each other or to the face. Phase II therefore involves the use of Class II

Fig. 8a - Facial and lateral view of Left Sidebend patient combined with Class I Div. 1 malocclusion (Inferior vertical strain). Patient P.S.

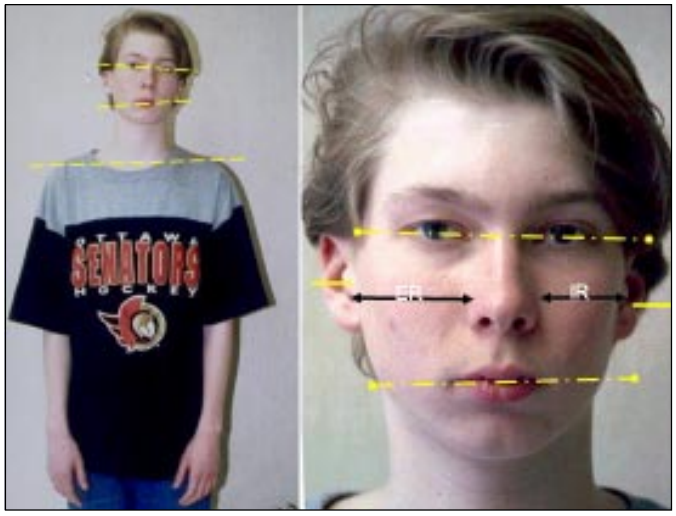

Fig. 8b - Facial view of Left Sidebend patient P.S. demonstrating facial and postural asymmetry of cranial sidebending. Note converging lines of ocular and occlusal planes. Note internal rotation of facial dimension and lower ear on the sidebend side - patient's left. Head tilt is corrected in facial photo to demonstrate planes.

elastics on the side-bend side and Class III elastics on the non side-bend side (Figure 7). This rotates the maxilla toward the left, thus bringing the maxillary centerline into alignment with the facial mid-line. As the entire maxilla is being moved, nasal deviation will often show some degree of correction. The effect of the elastics on the mandible is to help centre it as well. The pad on the right segment serves to orient the mandibular position toward the facial centerline as well as protect the right temporomandibular joint from being compressed by the Class III elastic.

Phase III:

Where the side-bend strain is the only strain, conventional fixed appliances are normally placed at this point. The need to avoid suppressing the natural

Fig. 8c - Left Sidebend patient P.S. Class I molar relationship on right and Class II molar relationship on patient's left with maxillary occlusal plane elevated on the left. Note centerline discrepancy.

Fig. 8d - Three months into treatment with A.L.F. appliances in place. Note acrylic pad over right bicuspids (outlined). Buccal arm on upper left to bring the "high" left maxillary quadrant down.

movement of the craniofacial structures is a constant requirement. Self-ligating brackets with Copper-Nitinol archwires offer a more suitable level of force. If there is another strain present (usually an inferior vertical strain), the correction of the centerlines which has now been achieved will result in an increased overjet. This has to be addressed with some form of anteroposterior correction, such as a MARA[3] combined with fixed appliances for final detailing.

Patient P. S. demonstrates the entire treatment sequence. A left side-bend is present combined with an inferior vertical strain. (Figures 8a, b, c, d, e, f, g, h, i, j).

Differential Diagnosis:

It is the responsibility of the clinician to decide whether an asymmetry has a cranial aetiology. Careful evaluation of patient's facial features, radiographs and the models mounted on an articulator are essential. The records for Patient D. K. demonstrate this. The models (Figure 9a) show a Class II molar and cuspid

relationship on the right and a Class I on the left. The malocclusion is essentially an asymmetrical Class II, division ii in Angle terms. The dentition resembles a right side-bend strain combined with a hyperflexion. When the full face is examined (Figure 9b), it can be seen that the ocular and occlusal planes are parallel. They both cant up to the left. This facial feature suggests a torsion strain,[4] not a side-bend strain. When the models are placed on the articulator a quite different picture emerges (Figure 9c). The mandibular centerline deviation is no longer evident and the posterior occlusion is now a full unit Class II on the left and a unit and half on the right. In other words, the interferences introduced by the retroclined maxillary incisors have created a severe functional shift of the mandible to the right, thereby distorting the dentition to become asymmetrical when in full intercuspation. This individual does not have a side-bend, but rather a left torsion combined with a severe hyperflexion. We are actually dealing with a symmetrical problem in the anteroposterior plane and not an asymmetrical one. Treatment planning has to address this.

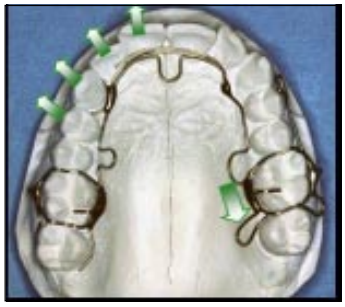

Fig. 8e - Appliance dedicated to asymmetrical development of the arch. Activation designed to procline anterior right segment with reciprocal action distalizing left molars.

Fig. 8f - Significant cranio-facial correction now in progress. Upper right segment developed buccally. Mandible still deviated to the left. Straight wire bracket system and light archwire in place in combination with A.L.F. appliance.

Fig. 8g - Phase II. Mandible postured into Class 1 position. Using Class II elastic on the left and Class III elastic on the right to rotate maxilla. Indexed composite over lower right bicuspids.

Clinical implications:

The clinical implications of the side-bend strain extend far beyond the dental picture. The asymmetrical position of the occiput directly affects the position of the temporal bones. On the side-bend side the temporal bone is externally rotated. On the contra-lateral side, the temporal bone is internally rotated. Sutherland[5] called the temporal bones "the trouble makers," and Magoun[6] has demonstrated how their displacement can cause many problems. For example, there is uneven loading of the temporo-mandibular joints. In particular, the mandibular condyle on the side-bend side is driven upward and distally, predisposing to joint dysfunction. The mandible itself is off center and there is considerable myofascial involvement as the musculature adapts to the asymmetry.

Rotation of the occiput around a vertical axis leads

Fig. 8h - Centerline corrected. Occlusion stabilized with Rickinator pad added to maxillary A.L.F. plus bilateral Class II elastics to advance mandible and correct Inferior Vertical Strain.

Fig. 8i - Finished occlusion. Patient continued retainer wear for six months.

Fig. 8j - Full face comparison demonstrating sidebend correction.

Fig. 9a - Models of patient D.K. in full intercuspation. Dental relationship is Class II on the right and Class I on the left.

to adaptation of the C1 and C2 vertebrae to compensate for this. This in turn can affect the whole spine. The displacement of the temporal bones can cause undue pressure on the cranial nerves, nine of which exit through or close to the temporal bones. Compression from the bone displacement can affect any of these nerves. This accounts for some of the more remote symptoms that accompany temporomandibular joint dysfunction.

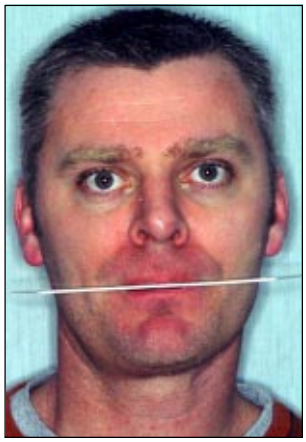

Fig. 9b - Asymmetry patient D.K. Facial features resemble a Torsion strain rather than Sidebend.

An assessment of the temporomandibular joints has to be seen against a background of cranial and postural factors as well as the dental configurations. This embraces the idea that temporomandibular joint dysfunction is as much a response to influences extrinsic to the joint as to disturbances within the joint. One potential source of these extrinsic factors can be a cranial side-bend strain. With an understanding of the characteristics of each cranial strain and especially a side-bend strain the clinician has a broader, more comprehensive grasp of temporomandibular dysfunction.

Fig. 9c - Models of patient D.K. mounted on articulator using a functional occlusal registration. Discluded position of mandible shows Class II molar relationship on right and left, centerlines are coincident.

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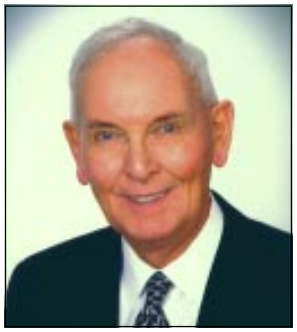

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Dr. Strokon is a general dentist in Ottawa, Ontario. He received his dental degree from the University of Western Ontario in 1972. For the past twenty-five years he has taken an interst in treating symptomatic patients using both restorative and orthodontic techniques in his practice. Dr. Strokon and Dr. James lecture on the philosophy, treatment concepts and design of the ALF appliance.