Case Reports

Dr. Robert H. W. Strang of Bridgeport, Conn., reports the following case to emphasize the importance of and satisfaction derived from the use of the Bonwill method, as modified by the late Charles Hawley, for arch-form determination and adapted by Drs. Steiner, Chucks, Lasher, Furby and Waldron to act as a guide in making the ideal edgewise arch. The technical steps of forming the maxillary and mandibular archwire are also given in detail as they have not been previously published. This technic has been evolved partly from the writings of the men just mentioned and partly as a result of personal experimentation. This technic is of inestimable value to the student of orthodontia and will also be found helpful to the experienced practitioner.

A Bonwill-Hawley chart was made for this case according to the usual method of procedure which is given in detail in Dr. Chuck's article, "Ideal Arch Form," *Angle Orthodontist,* October, 1934, p. 318. The mandibular archwire is formed over this chart while the maxillary archwire is formed over a drawing made one-tenth inch larger than the original drawing, Fig. 2.

Formation of the Ideal Archwires

Taking the Measurements for the Maxillary Archwire

With a pair of calipers the following measurements are taken to obtain the proper length of archwire material: Fig. 1.

1. The mesio-distal diameter of the central incisors. If there is inharmony in any two corresponding teeth to be measured, the average size is used as the measurement. Transfer this amount to the record card. All measurements are to be duplicated on the record on each side of a median line point.

2. The mesio-distal diameter of the lateral incisors. This measurement should be separated from the distal mark of the central measurement 1/16 inch and both mesial and distal points of the calipers should be pressed into the paper.

3. The mesio-distal diameter of the canine. This measurement is also separated from the distal-lateral point by 1/16 inch and both mesial and distal canine marks reproduced on the record.

4. The distance from the mesial surface of the first premolar to its buccal ridge. This is transferred directly to the chart without any additional measurement.

5. The distance from the buccal ridge of the first premolar to the buccal ridge on the mesio-buccal cusp of the first molar tooth. Transfer this to the record card without additional measurements.

6. The distance from the buccal ridge of the mesio-buccal cusp of the first molar to the mesial surface of the second molar or where this should be if present. Transfer this to the record.

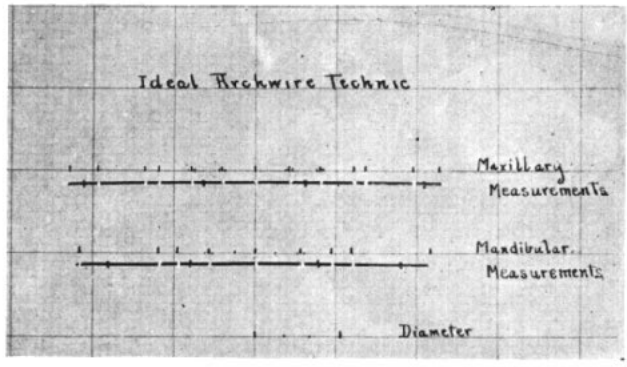

Figure 1
Measurements transferred to the archwires.

Marking the Archwire

The proper length of archwire material having been cut off according to the previous measurements, this is scratch-marked on its broad surface at the following points: Fig. 1.

(a) The median line between the two centrals.

(b) The half-way point between the distal-central and the mesial-lateral marks.

(c) The half-way point between the distal-lateral and the mesial-canine marks.

(d) The distal canine mark.

(e) The buccal ridge of the first premolar and the buccal ridge of the mesio-buccal cusp of the first molar.

Technic of Bending the Archwire to the Diagram

1. The archwire is now conformed to the inner side of a Bonwill-Hawley diagram enlarged 1/10 of an inch over the actual size determined for the denture under consideration. This drawing should be made on graph paper ruled to 1/10th inches.

2. The first modification from this primary form of the archwire has to do with the lateral incisor areas. Grasp the archwire with pliers No. 142 overlying the scratch-mark between the central and lateral incisors and bend the *mesial* section of the achwire *lingually* until the end of the archwire on the side that is being modified lies 3/10 inches inside the maxillary arch diagram when the unmodified side is placed in harmony with the drawing.

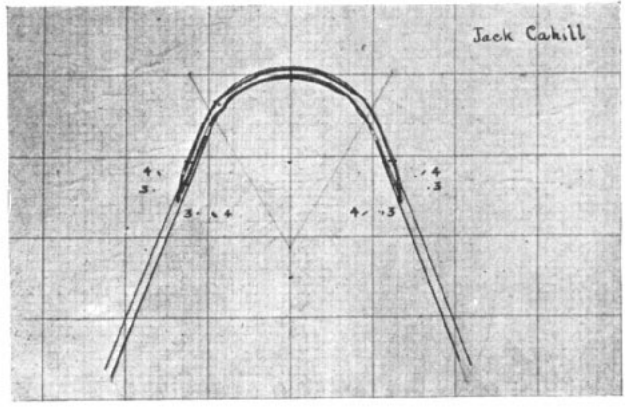

Figure 2

Archwires formed on the Bonwill-Hawley diagram. That for the maxillary archwires is 1/10 inch larger than the original drawing.

3. Place a mark on the drawing to indicate the location of the modified end of the wire. This should be 3/10 inch lingually to the maxillary archwire drawing.

4. Count off an equal number of squares on the unmodified side and place a dot to indicate the degree of change required in the archwire on this side.

5. Transfer the pliers to the opposite lateral-central scratch-mark and again bend the mesial section of the archwire, lingually, an amount equal to the bend on the previously modified side. The correct amount of this bend can be accurately determined by bringing the end of the archwire into harmony with the dot marked on the graph paper.

6. Replace the pliers on one of the central-lateral scratch-marks and bend the *distal* section of the archwire *buccally* an equal degree to the previous bend made mesial to the pliers. The proper amount will be indicated by placing the archwire on the graph paper and adjusting the uncorrected

end to harmonize with the dot on the graph paper and bending the opposite end so that it lies *parallel* to the lines of the drawing and separated from this diagram just the width of the lateral instep bend. Make the same readjustment on the opposite side of the archwire.

7. Transfer the pliers to the lateral-canine scratch-mark and bend the mesial section of the wire *labially* until the end on the side being modified lies 3/10 inches buccally to the maxillary archwire diagram.

8. Indicate the position of this deflected end with a dot on the graph paper. Place a dot on the opposite side of the graph paper in a duplicate position to this location. Make the proper modification on the opposite side of the archwire to bring that end in harmony with the guiding dot on the graph paper.

9. Replace the pliers on the canine-lateral scratch-mark and bend the *distal* section of the archwire *lingually* one-half the amount necessary to bring the end back to the diagram. Transfer the pliers distally, the width of their beaks and again bend the distal end of the archwire lingually until it *overlies* the corresponding section of the maxillary arch diagram. Do the same on the opposite side of the archwire.

10. Transfer the pliers so that their distal edge is in harmony with the scratch-mark indicating the location of the buccal ridge of the mesial buccal cusp of the first molar. Bend the mesial section of the archwire lingually an amount that will bring the end of the archwire in contact with the *original* Bonwill-Hawley chart drawing when the archwire is placed in harmony with the enlarged Bonwill-Hawley outline. Do the same on the opposite side.

After making each one of these bends the archwire should be tested on a flat piece of glass to see that there is no deflection from the horizontal plane at any point.

The Mandibular Archwire Markings

The following measurements are taken to obtain the proper length of archwire material: Fig. 1.

1. The mesio-distal width of the central incisor tooth. Indicate this on the record sheet on both sides of a median line and all future markings are to be made on both sides of this central point.

2. The mesio-distal width of the lateral incisor tooth. Indicate this on the chart in direct contact with the central incisor width.

3. Next take the mesio-distal width of the canine tooth. Place this measurement on the record chart *separated* from the distal-lateral mark by 1/16 inch and register both points of the dividers.

4. Take the measurement from the mesial edge of the first premolar to its buccal ridge. Record this on the chart *separated* from the distal-canine 1/16 inch, but register only the buccal ridge point of the premolar.

5. Measure from the buccal ridge of the first premolar to the mesial surface of the second molar or where this would be if present, and record this measurement on the record chart directly in apposition to the buccal-ridge-mark of the first premolar.

Marking the Mandibular Archwire

Cut off the proper length of archwire material as indicated by these measurements and mark, on its broad surface, with scratch-marks, as follows: Fig. 1.

The mid-central-point; mid-point between distal lateral and mesial canine mark; the distal-canine-point; and the buccal-ridge-point of the first premolar.

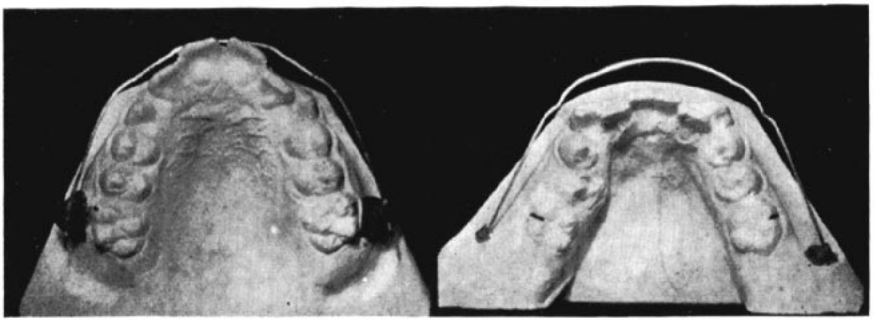

Figure 3
The relationship which the ideal archwires bore to the dentures before treatment.

Formation of the Mandibular Archwire

1. Bend the mandibular archwire to harmonize with the inner edge of the *original* Bonwill-Hawley drawing, the inner one on the chart.

2. Grasp the archwire with pliers No. 142 on the mesial side of the distal lateral, mesial-canine mark and give the distal section of the wire a buccal bend of sufficient degree to cause the end of the wire to deviate 4/10 inch from the outline drawing of the mandibular archwire. Mark the location of the archwire end with a dot on the graph paper.

3. Make a dot on the opposite side of the graph paper in a duplicate location and grasping the archwire with the pliers mesial to the distal-lateral, mesial-canine mark of the unchanged side, make a buccal bend in the distal section of the archwire which will cause the end of the wire to harmonize with the dot on the graph paper.

4. With pliers No. 142 as the grasping instrument and placed with the mesial side of the beak at the distal-lateral, mesial-canine mark, and using the fingers to make the bends, gradually curve the canine area of the archwire by bending the distal end of the wire lingually and sliding the pliers toward the distal canine mark after each consecutive bend, making at least six bends in this area, until the end of the wire reaches a point 4/10 inch lingual to the outline drawing for the mandibular archwire. Mark this location with a dot and duplicate this dot on the other side. Perform the same technic on the opposite side of the archwire.

5. Place the pliers distally to the distal canine mark and bend the mesial section of the archwire *labially* until the end of the archwire on the side being modified is in harmony with the previously made dot (4/10 inch buccally to inner drawing). Do the same on the other side of the archwire.

6. Gradually curve the archwire distal to the distal canine mark and in the area between this mark and the buccal ridge mark of the first pre-

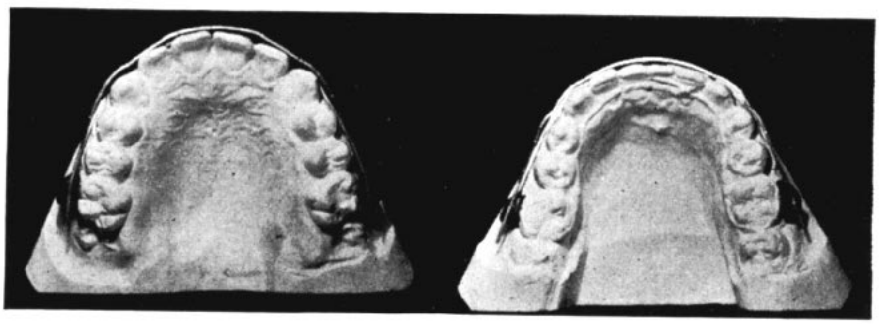

Figure 4
The dentures brought into harmony with the ideal archwires as a result of treatment. The archwires in Figs. 3 and 4 are exactly the same in size and form.

molar by slight lingual bends until the end of the archwire lies half-way between the inner and outer outline drawings.

7. Duplicate these bends on the opposite side of the archwire until this end is similarly located.

8. No lingual molar bends are made in the mandibular archwire unless the anchor bands are on the second permanent molar teeth. In the latter case the archwire end should be deflected slightly lingually at a mark corresponding to the buccal ridge of the *disto-buccal* cusp of the first permanent molar and not at the buccal ridge of the mesio-buccal cusp as previously done in our former technic.

When these two archwires are completed, the mandibular archwire should lie within the area of the maxillary archwire and the ends of the two archwires should cross each other at their extreme tips, Fig. 2.

Case History

Boy, nine years of age, with excellent physical development. He had had the usual children's diseases but not in exaggerated form and had had no other serious illness.

His mother's and father's occlusions were reasonably good.

He was a bottle-fed baby and his diet since infancy had been carefully checked.

He was a highstrung and nervous youngster, showing hypertonicity of the muscles associated with the oral cavity and considerable hypertrophy of the buccinator and mentales muscles. No operation for removal of adenoids or tonsils. Because of the malocclusion he was breathing through his mouth to quite an extent.

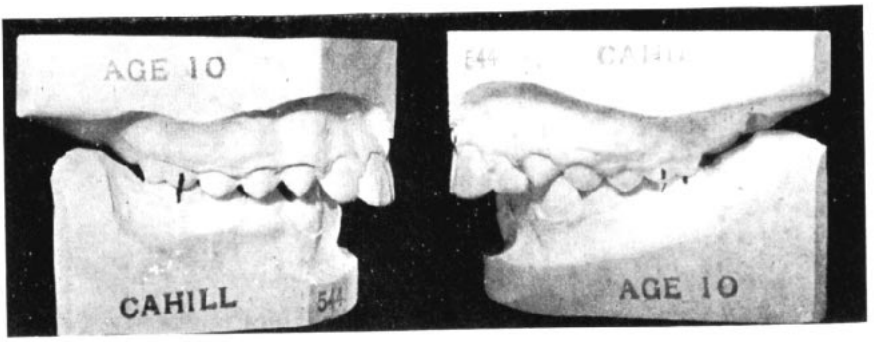

Figure 5
Models of case before treatment.

He gave a history of sucking the third and fourth fingers of the right hand until eight years of age and occasionally did it at the present age. He sucked the lower lip to an exaggerated degree when swallowing.

The frenum was quite large but an operation for removal was not considered necessary.

His saliva was ropy, sticky and quite copious.

Diagnosis—Malocclusion of the Teeth.

Classification—Class II, Division 1, complicated by a forward movement of the buccal segment of the mandibular denture on the right side. The bite was closed and the mandibular median line was displaced to the left by a shifting forward of the right condyle.

Etiology—The *primary* cause was attributed to some metabolic errors dating back to early babyhood whereby the mineral balance of the system was upset, causing irritation to the motor side of the nervous mechanism, thus starting in action the *secondary* causative factors which were the sucking habits, first of the fingers and then the lips. Further manifestations of this primary unbalance were the hypertoned and hypertrophied muscles and the high degree of nervousness manifested by the patient.

Prognosis—Quite unfavorable because of the etiology. A seventy-five to eighty-five per cent of normal was predicted as the ultimate result of treatment.

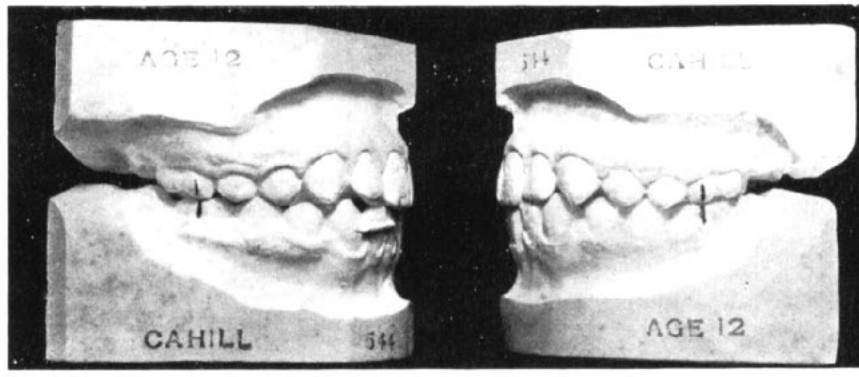

Figure 6
Models of case after treatment.

Case Analysis

A Class II, Division 1, case complicated by the forward migration of the buccal segment on the right side of the mandibular denture and a coincidental forward shifting of the condyle of the mandible on this side thus throwing the median line of the mandibular denture to the left, Fig. 7.

The closure of the bite was due to the effect of the muscle pressure which had forced the mandibular incisors into supraocclusion and greatly exaggerating the curve of Spee. There was no lack of vertical growth in the buccal segments of the denture, as is clearly shown by the photographs, Figs. 8 and 10.

Corrective Tooth Movements Indicated

Maxillary Denture:

1. Distal movement of the molars, premolars and canines.
2. Lingual movement of the incisors.

3. Rotation of the centrals and right canine.
4. Depression of incisors and elongation of molars.
5. General growth of denture to ideal form.

Mandibular Denture:

1. Distal movement of right molar, premolars and canine.
2. Labial movement of incisors.
3. Buccal movement of canine, premolars and molars.
4. Rotation of left central and left canine.
5. Depression of incisors and elevation of premolars and molars.
6. General growth of denture to ideal form.

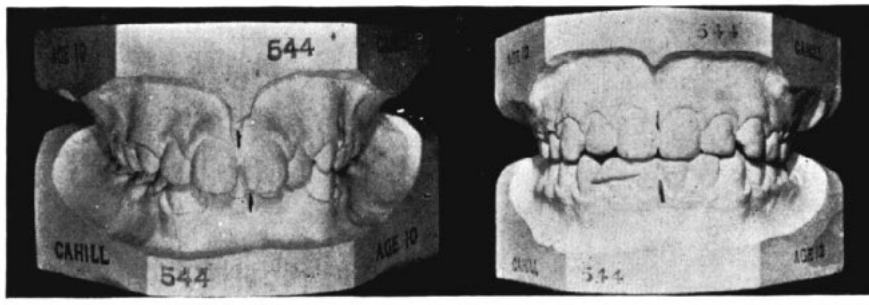

Figure 7
Front views of models, before and after treatment. Note the correction of the median line disharmony.

Manipulation of Mechanism to Produce These Movements

Edgewise Arch Mechanism adjusted as usual.

Maxillary Denture:

1. Round archwire with molar stop spurs to gain bracket engagement and some change toward better denture form.

2. Change to an edgewise archwire for stationary anchorage to use Class III elastics on right side to carry mandibular right buccal segment distally, thus reducing case to uncomplicated Class II, Division 1.

3. Apply intermaxillary hooks and use tip back bends to carry maxillary denture distally.

4. After this denture has been carried back into a slight Class III occlusion, gradually remove the tip back bends, continuing Class II elastic force, to bring the canine, premolar and molar roots back to correct axial relationship with their crowns.

5. Correct rotations with local archwire modifications and ligature traction.

6. Continue force application until ideal form of denture is obtained.

Mandibular Denture:

1. Round archwire with stop spurs slightly forward of tubes on molars to control position of archwire in molar region. Gain bracket engagement. No band on the right canine at first.

2. Apply principle of horizontal loop in right canine area by placing an anchor spur mesial to right central bracket and a traction spur half-way between the two right premolar brackets.

Figure 8

Before treatment. Note the hypertrophied mentales muscles which cover up the deformity of the distally located mandible.

3. Place an intermaxillary elastic hook just mesial to the right canine area.

4. Take up on traction ligature running from traction spur to first premolar bracket, thus bowing out archwire in right canine area. Apply Class III elastics on right side and later increase distal force on right premolars and first molar by tip-back bends if necessary.

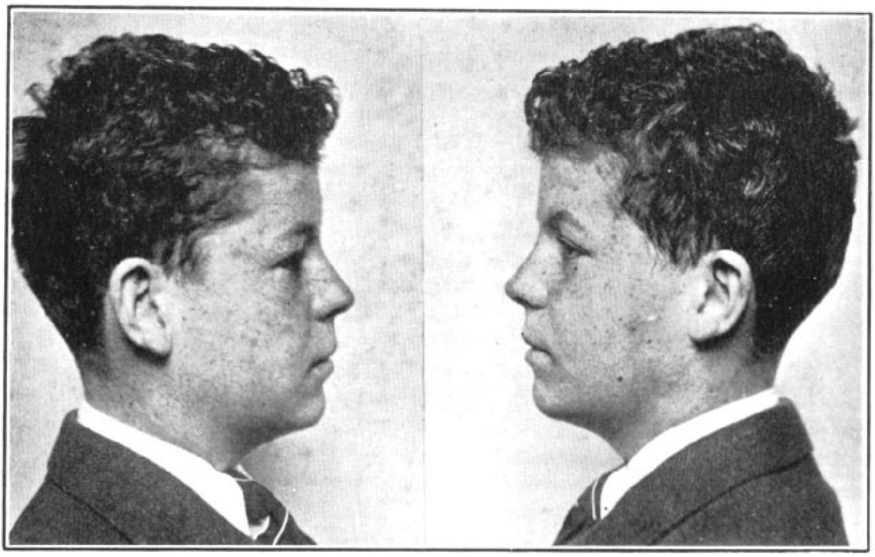

Figure 9
After treatment.

Figure 10
Front views of patient, before and after treatment. Note that the one on the left shows no lack of vertical growth below the nose, an important factor in determining the denture area at fault and the subsequent treatment of the overbite.

5. When space is obtained for right canine carry this distally with a vertical spring soldered to archwire. Then band this tooth and bring it into bracket engagement.

When this primary movement of the mandibular teeth is accomplished the case will be reduced to a simple Class II, Division 1 case and the treatment from this point on is routine for such a case.

6. Change the round archwire for an edgewise and gain bracket seating for all teeth.

7. Apply Class II elastics to move maxillary denture distally.

8. Depress incisors and elevate premolars and molars by gradually eliminating excessive curve of Spee from archwire.

9. Perform rotation of left central and canine with spring auxiliary and ligature traction.

10. Continue force application until ideal form of denture is obtained.

Myo-Functional and Corrective Therapy

Coincidental to these mechanical procedures, the patient was given the passive swallowing exercise; deep-breathing exercises; upper lip elongating exercises; and chewing exercises. These were also continued throughout the period of retention.

Retention Appliances

Maxillary Denture: A plate with a labial wire over the incisor teeth and an anatomical bite plane.

Mandibular Denture: A molar-to-molar, lingual wire with bands on the left central incisor and left canine teeth to maintain corrected rotations.

After wearing this fixed retainer for one year a plate should be substituted and this should be worn at night for an indefinite period governed by the rapidity and duration of the bodily growth and the success in overcoming the perverted sucking habits and general nervous tension.

The duration of active treatment was two years. The case is still under mechanical retention.

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