Polygonic Interpretation of Cephalometric Findings[1]

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When a new method or discovery is thrust upon a group, it is only natural that resistance is encountered due to man's inherent dislike for radical changes that tend to complicate his life. The situation was similiar when cephalometry was introduced into the orthodontic field. Of course the impact of cephalometry was felt at first but only a relatively small group had faith in its future. The problem at its inception was one of putting across the result and the future potentialities of the discovery. The next step was one of making practical application of the method. The general acceptance of the potentialities of Downs' analysis or comparable cross-sectional or serial studies are well known today. These studies in turn presented us with a new problem. The difficulty of developing a suitable mental picture picture from a sizeable table of figures is a tremendous obstacle to encounter. (Table 1)

When considering mathematics, an exact science, as differentiated from biological sciences, it is only natural that integers derived from biometrical measurements be expressed geometrically in order to help simplify a complex science. Therefore, graphs afford a most effective means of comparing values and expressing mathematical relations. Everyone who utilizes cephalometric analysis is aware that much time is lost arbitrating the angular readings from a mathematical standpoint. By the time a reading or two has been consummated, earlier quotations are partially forgotten. This quandary often necessitates another review and much valuable time is wasted. This dilemma served as the impetus to devise a method that would make more graphic cephalometric readings and do so in such a manner that they would make sense collectively.

In 1937, Hellman[1] introduced the "wiggle", to express a large group of anthropometric readings graphically. He represented the readings as a polygon. As a basis, he used anthropometric measurements of 62 males with normal occlusion. The vertical center line through the polygon represented the average normal size and everything to the left of the polygon was below average, or subnormal and eveything to the right was above average, or supranormal. The polygon part or variation range was constructed from the standard deviation. Thus the graphic principle that Hellman introduced served as the basis of the cephalometric polygon. However, the principle difference is that Hellmann's "wiggle" served the purpose of gauging the dimensions of the face in three planes of space from different anatomical locations whereas the cephalometric polygon concerns itself with the lateral aspect of the face and its classification of facial variations.

After recalling Hellman's work to mind, it was thought feasible to try his geometrical pattern. After record-

[1] From the Department of Orthodontia, Indiana University.

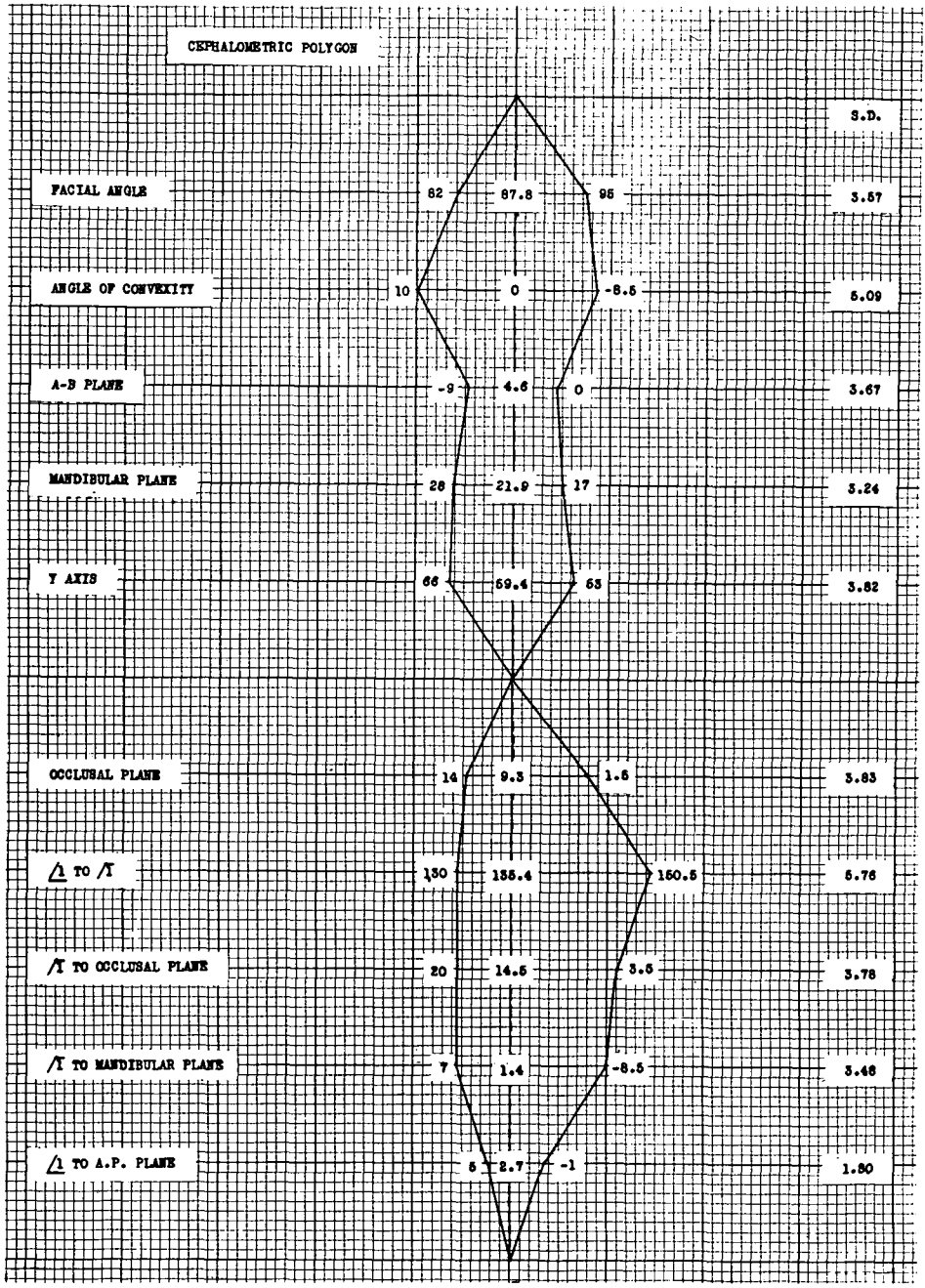

Fig. 1.The cephalometric polygon, a graphic portrayal of the Downs analysis. Means are arrayed on the vertical dotted line, with the extremes corresponding with Class II tendencies bounding the polygon on the left and the opposite tendencies providing the boundary on the right. Each scale division is one angular degree, or one millimeter, as the case may be. The upper of the polygon represents skeletal pattern, the lower half denture pattern. The mean for "A-B Plane" should be preceded by a minus sign, to read "—4.6" instead of "4.6".

ing Downs' analytical readings on graph paper in the manner in which they first appeared in his article[2] from minimum to maximum, it was found after plotting the first case that it zig-zagged on both sides of the vertical mean. By reversing some of the minimums and maximums, it was possible to have all of the readings that might indicate a Class II trend or condition on the left side. It can generally be stated that those readings that fall on the left side indicate a Class II facial trend and those on the right a Class III inclination. However, at this time it must be emphasized and pointed out that this is not absolute and that only after careful consideration and evaluation may a correct analysis be made. The various types of patterns that certain malocclusions have will be introduced in a later article.

The Downs readings are divided into two polygons on the graphs with the skeletal pattern on the top half of the paper and denture polygon on the lower half of the sheet. (Fig. 1) The vertical center broken line represents the mean of normal and the solid-lined polygons represent variation, as expressed by the extremes. The figures representing the minimum and maximum are appropriately located at each angle formed by the polygon and the mean integers on the same horizontal line adjacent to the vertical broken lines. The quantitative value of each square is one degree or one millimeter. The standard deviation has been added by Downs on the right of the polygons.

Conclusions

1. Experience has shown that the cephalometric polygon offers a more efficient method to illustrate qualitatively a static cephalometric analysis.
2. Individual readings as well as the integral features of biometric study may be studied not only qualitatively but quantitatively.
3. The value of serial study and interpretation is more apparent with this method to determine trends. (Fig. 2)
4. The polygon graph may be mass produced by modern reproduction methods and thus does not present a constant construction problem.
5. The cephalometric polygon has also proved to be a great aid in case presentation because the parents may more adequately understand a graphical description which is generally more comprehensive and impressive than a verbal description.

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TABLE I

	Mean	Min.	Max	7-27-49	3-5-51
Facial Angle	87.8	82	95	82.4	82.0
Angle of Convexity	0	—8.5	10	+6.1	+4.6
AB to Facial	—4.6	—9	0	—7.6	—6.3
Mandibular Plane	21.9	17	28	32.4	31.7
Y Axis	59.4	53	66	62.7	63.3
Occlusal Plane	9.3	1.5	14	13.1	14
U-1 to L-1	135.4	130	150	115	108.4
L-1 to Occlusal Plane	14.5	3.5	20	24	31.5
L-1 to Mandibular Plane	1.4	—8.5	7	5.3	14
U-1 to AP Plane	2.7mm	—1 mm	5 mm	10 mm	10 mm

Literature Cited

[1] Hellman, Milo. 1937. Some Biologic Aspects: Their Implications and Application in Orthodontic Practice. Int. J. Orth. and Oral Surg. 23:8, 761-785.

[2] Downs, William B. 1948. Variations in Facial Relationship Their Significance in Treatment, and Prognosis. Am. J. Ortho. 34:10, 812-840.

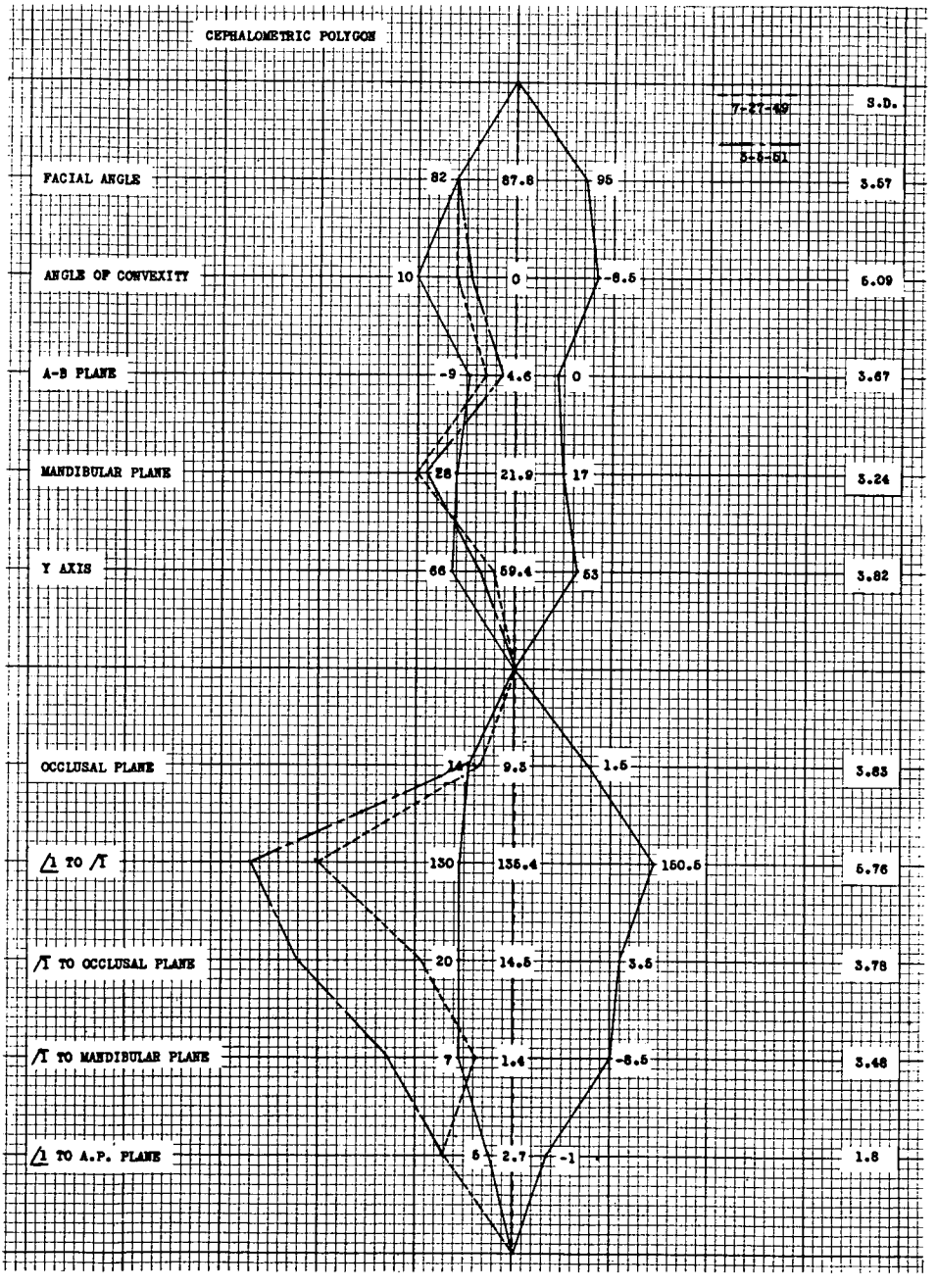

Fig. 2. This is a graphic portrayal of the same data recorded in Table I. In each place serial records of the same individual are given, but the tabular material fails to give the immediate impression afforded by the graph. The mean for "A-B Plane" should be preceded by a minus sign, to read "—4.6" instead of "4.6".