Classification of Malocclusion*

HAROLD J. NOYES, B.S., D.D.S., M.D.
Chicago, Illinois

CLASSIFICATION of the abnormalities with which the orthodontist is concerned is in no sense essential either to the practice or the science of orthodontics. Properly conceived it should be a time-saving device and a contribution to orderly thinking. Like the laws of social and natural sciences, it follows in the wake of pioneering knowledge and it attempts to arrange into groups or classes facts having one or more common characteristics. Some symbol or descriptive term is utilized to designate the significant feature of the class. By this mechanism it is possible to associate a considerable volume of common knowledge with the item classified without resorting to the detailed description and exposition that would otherwise be necessary. It is essential that the criteria characterizing the class be distinctive and concise, that the useful significance of the common characteristics of the class prevail in the light of new facts and changing complexion of old concepts. We have gradually become aware of the inadequacy of our contemporary classifications of malocclusion when viewed in the light of advancing orthodontic knowledge.

In other words, the science has again stepped beyond the confines imposed by organization of previously assimilated knowledge. Having nothing better than the old classifications, we persist in their application with obstinate loyalty. In attempting to reconcile what we were taught with what we have learned, we have remodeled and modernized our classifications with modifying phrases, new classes and subdivisions and mental reservations until the essential purpose of classification, i.e., to convey a specific body of common knowledge related to the item classified, has been defeated. The Angle classification of Strange is not the Angle classification of Brodie and neither, I suspect, is now the classification in the mind of its author when it was published. All classifications contain elements which are in basic harmony with newer concepts. It is essential if we are to retain what value there is in classification to preserve that which is fundamental and useful and do so without destroying the universal application of criteria which rests upon common knowledge and understanding.

As we orient and assimilate our new knowledge of the relationship of teeth, dental arches, facial and cranial bony framework with one another and the forces which affect inharmonies in their arrangement we will dispose of many immature impressions which at present seem to be incompatible with previously accepted beliefs. At the same time we will revise and expand our expression of the items classified and the classes into which they are placed. In the interest of progress in this direction, it is important to first examine the foundations available for useful classification of malocclusion.

Simon has said, "A classification must have a very positive aim and pur-

* Read before the Chicago Association of Orthodontists, 1912.

pose."[1] We may classify malocclusion according to etiology; we may do so with respect to treatment, dentitional age, race, or nature of the abnormality. All may be useful. Yet with the alteration of the purpose of classification, there follows a change in the groups selected and the criteria determining qualification for inclusion in a particular group. In the interest of that fundamental attribute of classification, simplicity, it is hazardous to attempt to combine the aims of classification.

Not only must the aim of the classification be definite, but the items classified and the criteria or characteristics which differentiate the classes clearly recognized and stated. In a classification of dento-facial abnormalities with which this discussion is primarily concerned, we are dealing with form and relationship of anatomical structures. By definition the relationships must be abnormal. If the relationship is abnormal, this pre-supposes a relation which may be considered normal and here we are led into the first of our difficulties which will be considered at greater length subsequently.

The structural units which in the appraisement of orthodontic experience seem to be most useful in classification are hard tissues of the face and cranium. They may be divided roughly as follows, (1) the teeth, (2) the jaws, and (3) the cranial base. All have been given attention from the time that classification of malocclusion was first attempted. While the soft tissues are intimately concerned with anatomical form and relationships, they are unsuited for use in determining classification because of the difficulty in accurate appraisement and measurement on the one hand, and their dependence upon the hard tissues to maintain structural outline on the other. In a classification from the standpoint of etiology they have their place, but as precise criteria upon which to catalogue malocclusion they are impractical.

Within each of the hard tissue divisions mentioned a vast number of anatomical units or landmarks are available for determination of the significant and distinguishing features of abnormality. Considering the strictly dental division, various relationships have been found noteworthy, the most useful of which include: the relation of one tooth to others in the same dental arch, the relation of groups of teeth in the same dental arch and to the complementary arch, the relation of groups of teeth or the entire dental arch to the jaw which holds them, and the relation of groups of teeth or the whole dental arch to facial and cranial base landmarks. These relations, simple as they seem, are in reality extremely difficult to ascertain. For example, an upper lateral incisor which lies to the lingual of its fellows may be said to be in lingual occlusion with respect to the upper incisor arch segment. Yet the anterior displacement of that segment of the upper arch may mean the lateral is in normal relation to the premaxillary portion of the upper jaw which in its turn may occupy a posterior relationship to cranial base structures. It appears as Downs pointed out in 1940[2] that the relation of a dental unit to all of these structures is of moment, and if there is to be understanding among the orthodontists, an accurate statement of what is related to what is imperative. From a theoretical point of view a

[1] *Fundamental Principles of a Systematic Diagnosis of Dental Anomalies.* Paul W. Simon. P. 5. The Stratford Company, Boston, 1926.

[2] "A Study in Dental Arch Length," William B. Downs. ANGLE ORTHODONTIST. 10:78. Apr. 1940.

single tooth can occupy seven positions of malocclusion as Angle pointed out in 1899.[3] If one is to relate this tooth to the "line of occlusion" as did Angle, it becomes a very complex problem bordering upon the intangible. Using Angle's definition, of the line of occlusion "the line with which, in form and position according to type, the teeth must be in harmony if in normal occlusion."[4] The teeth must be related to this imaginary arch form in the following respects: teeth to their own arch, each arch to the complementary arch, both to their bases and the bases to the cranium and all reconciled to type. The opportunities for disagreement among men of experience are great in the absence of specific criteria upon which to base the normal configuration and relationship of the units considered.

It would seem to be practical from the standpoint of accuracy of measurement and in the interest of common understanding that a single tooth be related to the units within its own arch segment, irrespective of the malrelation of that unit to other structures.

The relationship of the dental arches one to another is less confusing and when the interdigitation of teeth utilizing the first permanent molars and canines as Angle originally suggested[5] is followed, this method can be said to meet all requirements of classification for abnormalities of dental arch relationship, as is attested by its useful service in the profession for these many years. Of all relationships with which malocclusion is concerned, this is by far the most significant, not only because the orthodontist is largely limited to dental manipulation nor because of the significance of this relationship in the establishment of normal function, but as well because of the relative constancy of the apical portions of the molars and canines to other structural units.

Strictly speaking, classification of malocclusion *of the teeth* might be said to be solved by a classification such as Angle's. (It is of secondary consequence whether his designations of numerals or that utilizing descriptive terms are employed.) With the recent interest which has sprung from more accurate and detailed studies of the nature of growth and the configuration of facial deformities, as well as a renewed concern over the instability of dental relationship, our attention is being directed to the supporting structure of the dental arches. I suspect that it was something of this sort that Case had in mind when he opposed the Angle classification. We have reached the time when consideration of the relationship of the dental arches to their respective jaws must receive attention. Yet we have not discovered the key or significant criteria by which to relate the two units in the dental mechanism. There seems to be reasonable evidence (Elman[6] and Baldridge[7]) that the first permanent molar is relatively constant and Atkinson years ago pointed out the relative constancy between the maxillary first molar and the buttress of the zygoma which he called the "key ridge." Still the position of

[3] "Classification of Malocclusion," Edward H. Angle. *Dental Cosmos*, 41:248, Mar. 1899.

[4] *Malocclusion of the Teeth*. Edward H. Angle. P. 22, 7th Ed. S. S. White Dental Manufacturing Co., Philadelphia, 1907.

[5] Same as footnote 3.

[6] "Studies on the Relationship of the Lower Six-Year Molar to the Mandible," Earl S. Elman ANGLE ORTHODONTIST, 10:24-32, Jan. 1940.

[7] "A Study of the Relation of the Maxillary First Permanent Molars to the Face in Class I and Class II Malocclusions," John P. Baldridge ANGLE ORTHODONTIST, 11:100-109, Apr. 1941.

the molars to their respective jaw as shown by Elman and Baldridge and Atkinson's relation of the maxillary molars to the "key ridge" as questioned by Broadbent lack the nicety of precise measurement furnished by tooth relationship between the dental arches. Moreover, the classification for which we are searching demands criteria which permit the fixing of relationship at the anterior extremities of the arches, and as well in breadth and height of the bones. I wish I were in possession of knowledge that would make classification of this relationship possible. But though I am not, I cannot acquiesce to stretching a classification which pertains to the teeth and their dental arch relationship in which it serves with excellence to a function for which it must in the shadow of our present knowledge be so oriented and qualified as to defy common understanding and acceptance. From an academic point of view we may describe this relationship under the heading of case analysis. With understanding we will simplify these detailed descriptions by classification.

For basically the same reasons, our dilemma pursues us when we attempt to relate either the dental arches or jaws to the cranial base. As Broadbent has shown,[8] the landmarks which he selected are relatively stable and particularly so in the later ages of facial growth. The dental arches which furnish anatomical advantages for accurate observation are supported by intermediary structures, the means for whose appraisement we have yet to learn. The harmony and stability which we find in normal representatives of facial types may lie in a proportionality between these three groups of structural units. From this picture we may find that soft tissues cannot be entirely excluded. In our search for a common denominator between facial types, we may be led to discover a proportionality expressed in the form and position of dental arches, facial bones and cranial base revealed by the measurement of spaces and angles established by anatomical landmarks. It would appear that there must be a relationship determined by balance in the dynamic forces upon the entire face akin to that which surrounds the limited region of the dentition.

This discussion of the foundation of a serviceable classification may serve as basis for previously conceived mechanisms and stimulate studies that will contribute the material for their further evolution.

Early Classifications are of little more than historic interest. A few included recognition of facial architecture other than the teeth. They suffered in the main by lack of singleness of purpose and grouped etiology, function, morphology and treatment indiscriminately. Rather largely they were related to purely dental units, principally of the anterior teeth.

Kingsley contented himself with classifying according to etiology, as did many of his forebears. A simple division into developmental or accidental sufficed. However, his statement, "The fact seems to have been entirely ignored that the teeth and alveolar processes are superstructure of the jawbone, growing up on it, fulfilling their destiny, and passing away, without disturbing the foundation much more than an oak disturbs the planet upon which it has been sustained,"[9] has a most modern ring to it.

---

[8] Bolton Standards and Technique in Orthodontic Practice," B. Holly Broadbent. ANGLE ORTHODONTIST, 7:209-233, Oct. 1937.

[9] *Oral Deformities*. Norman W. Kingsley. P. 5. D. Appleton & Co. New York, 1880.

Calvin S. Case evolved a rather complicated classification in which the anatomical groups are selected from the standpoint of treatment. As his therapeutic aims which governed the grouping were based essentially upon the exigencies of mechanical devices that are for the most part obsolete, his classification might be disregarded if it were not for classes V and VI, Bimaxillary Protrusions and Bimaxillary Retrusions, in which he recognizes that discrepancy may exist between dental arches and their supporting bones notwithstanding normal tooth interdigitation. Case's discussion of bimaxillary protrusion is a previous episode of the philosophy of Tweed who himself called the author's attention to the writing. There is one distinction which is clearly stated in the first paragraph of Case's Chapter XXIII, Dento-Facial Harmony.[10] While the earlier author says, "In the diagnosis and treatment of all dental irregularities which produce inharmonies in the facial outlines a mental standard of comparison is imperative." He immediately qualifies the statement in the next sentence. "The ability to establish a mental standard of beauty should not be confined to a fixed idea of facial outlines of classic art as shown in that of the Apollo-Belvedere, but it should be one which may at times be adjusted in the mind's eye to the different types of Physiognomies which present for treatment. . . ." There is a difference between this concept and the statement of Tweed, "Though differences of type should of course be considered, my vision of the normal allows of no variations; it seems a piece of precision machinery."[11]

If Tweed is inclined to inflexibility in his ideal of facial outline, the Italian Muzj is an antidote, for he orients his orthodontic diagnosis and treatment upon a shifting classification of facial types.[12] The importance of type must, it seems to me, be given consideration. I question the wisdom of basing the criteria upon the profile delineated by soft tissue, for this must rest upon the underlying skeletal framework which is subject to more exact appraisement. The analysis of the basic proportions of facial type as revealed in the hard tissues will bring us the same answer, and at the same time provide us with the exactitude in keeping with the science as well as the art of orthodontics.

Before dismissing the subject of proportion, a word at least is warranted upon the rather ingenious combination of soft and hard tissue appraisement advocated by Lucien de Coster.[13] This author impressed by rules of proportion utilized by the artist has established both hard and soft tissue landmarks which when connected describe a net or grid. When these lines are drawn upon a lateral facial X-ray revealing the profile in subjects with normal relation of anatomical parts, a symmetry of the geometric pattern is apparent. Disturbances in the facial pattern produces deformation of the grid graphically demonstrated by comparison with the normal. The method is suggestive of an approach to our problem. Its shortcomings are those al-

---

[10] *Dental Orthopedia.* Calvin S. Case. R. R. Donnelley & Sons Co., Chicago, 1908.

[11] "The Application of the Principles of the Edgewise Arch in the Treatment of Malocclusions: II, "Charles H. Tweed. ANGLE ORTHODONTIST. 11:14, Jan. 1941.

[12] "The Method for Orthodontic Diagnosis Based Upon the Principles of Morphologic and Therapeutic Relativity," Edmondo Muzj. ANGLE ORTHODONTIST. 9:123, Oct. 1939.

[13] "The Network Method of Orthodontic Diagnosis." Lucien deCoster. ANGLE ORTHODONTIST. 9:3, Jan. 1939.

ready mentioned, the determination of the significant anatomical points upon which to build the net.

No discussion of contemporary classification methods would be complete without reference to that of Paul W. Simon.[14] A description of Simon's systematic diagnosis of dental anomalies is unnecessary before an orthodontic audience. If his concept was too enthusiastically received, it may become equally true that its merit fell too rapidly into oblivion. Simon was the first to be accorded any real success in bringing the profession to consider the teeth in relation to the supporting bony framework. This in itself was no mean achievement and through the teaching of his followers and the investigations of his opponents, a great advance has been made in the understanding of dento-facial deformities. His classification meets several of the rigid requirements we have stipulated, for relationships are clearly designated and are considered in three planes of space. The criteria is capable of common understanding and interpretation. The use of soft tissue landmarks is not a fundamental shortcoming, for this basic method may be applied to X-ray registration of the hard tissues. Under these circumstances it is subject to considerable accuracy of definition. Notwithstanding these merits, the classification fails to satisfy that basic requirement demanding designation of the relations or proportionality of the normal upon which to judge the abnormal, except of course with respect to the occlusal relation of the teeth in which restricted regard the author himself suggests the use of the Angle classification.

In other words, we must give Simon credit for appropriating and coining the most precise and meticulous descriptive terminology of deviations from the normal. We search in vain, however, for convincing evidence of the authenticity of the standards with which we are to utilize this terminology. With respect to anterior-posterior relationship we are given the orbital plane which is determined by one facial and one cranial landmark, either of which may be subject to deviation from the subject's normal pattern. Moreover the relation of orbital plane and dental landmarks vary with facial type as shown by Broadbent.[15] Irrespective of the accuracy of determination of this relationship, the orientation lacks significance. Similarly, one may by Simon's method determine the relative distance of dental units from the horizontal eye-ear plane, but, as the author explains in his discussion, the determination of departure from the normal is dependent upon the observer's appraisement of several anatomical features of maxillae, alveolar bone and teeth, the criteria for which are diverse and vague. The same criticism may be made of determinations in lateral relation to the sagittal plane. We are again forced to the realization in this as in other efforts to solve the equation that certain essential data are lacking. These data must be supplied before Simon's analysis and descriptive terminology may be applied. In reality this is not a useful and significant grouping or classification of dento-facial deformities, but a concise vocabulary which may be applied to such a classification when the anatomical relationships are discovered.

Frequent reference has previously been made to the classification of Edward H. Angle, which has been so ably presented and discussed and is so widely used that further exposition is made unnecessary. This grouping of

[14] Same as footnote[1].

dental abnormalities has met the essential requirements of simplicity and clinical significance. When restricted to dental and alveolar bone relationship, it permits clear and accurate interpretation. As pointed out by Case, Simon, and others, it does not carry adequate description of relationships between the teeth and the supporting bony framework of face and cranium. Before these relationships were much considered, this was of little consequence, and in that brief but euphoric period when many believed that the skeletal framework would conform itself to the dentition, it was not necessary, but in our present appreciation of the limitations imposed upon functional adjustment by heredity, disease, and age, the defect becomes of greater moment.

We have not been too successful in our attempts to extend this classification to include these broader relationships. Confusion follows the effort of Strang to utilize the classification to define the relation of teeth, arches and jaws to cranial anatomy. In so doing, too many units are included, each of which may be subject to individual variation. We can relate the teeth to dental arches and these to respective jaw, but this association bears a variable relation to the cranial base. The relation of any one to another does not impose invariable relations upon a third. When we begin a mental shifting of teeth from the positions which they occupy in the malocclusion, we are attempting to classify into positions from which they have been displaced in order to interpret arch and jaw relationships or arch, jaw and cranial base relationships, the element of individual judgment plays so great a part that simplicity, accuracy, and mutual understanding are sacrificed. From the resulting confusion, it would seem best to leave well enough alone and be content with the very real advantages which have been demonstrated in application of the classification to dental arch relationships.

Summary

The foundation of an ideal classification of malocclusion rests upon the aim or purpose for which it is designed, a useful and significant selection of the classes of which it is composed, the determination of exact criteria and characteristics for the differentiation of these classes, and a simple and concise description and terminology which permits common understanding. The multiplication of aims and purposes of classification create confusion and defeat their objective. The classification of malocclusion from the standpoint of etiology, morphology, or treatment may each be useful, but they should remain distinct with respect to purpose.

The classification of dento-facial deformities presupposes a knowledge of normal relation or proportion of anatomical parts of which in the present state of our knowledge we are lacking full understanding with the exception of the teeth within the dental arches and the arches to one another. An understanding of the dynamic forces which affect dento-facial structures and proportional relations between the structural units may supply data permitting the reconciliation of diverse facial types.

The classification of Angle is the most useful and effective mechanism when application is restricted to tooth and dental arch relationships. The classification of Simon is the most precise description of dento-facial abnormalities. Neither provides the criteria permitting concise and useful group-

ing of deformities of the supporting facial architecture, and its relation to the cranial base. The diagnostic method of de Coster offers a suggestion in principle for appreciation of proportional relations of facial structural units.

Because there are no units of the face and cranium which are immune to disturbance and the stability of all is relative, the solution of classification may lie in first discovering the fundamental proportional relations then, disregarding any fixed base as a constant to which other structures are related, from an appraisement of these parts that reveal proportional relationship reconstruct the defective anatomical units. Or to use a mathematical simile with the known factors in the equation, be they as they may, solve for the unknown.

55 East Washington Street