Association between the British Standards Institute's incisor classification of malocclusion and Angle's Classification of malocclusion-an analytical study

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Abstract

Objective: To analyse the association between the British standards institute’s incisor classification of malocclusion and the Angle’s classification of malocclusion. In addition to this, applicability of British standards institute’s incisor classification in orthodontic diagnosis and treatment planning was also explored.

Materials and Methods: The study was conducted at the Department of Orthodontics and dentofacial Orthopedics, Tamil Nadu Government Dental College and hospital, Tamilnadu, Chennai. Samples of randomly selected two hundred study models were divided into four groups based on British standards institute’s incisor classification and Angle’s classification. Cross-tabulation of both the classification was done and the data was statistically analysed using chi-square test.

Results: On the whole, statistically significant association (p< 0.001) exists between British incisor classification and Angle’s classification. Also, statistically significant association was found between British incisor classification and Angle’s classification in class I and class III groups (p< 0.001 and p< 0.05 respectively). However, there was no association in class II div I and class II div II groups (p=0.0990 and p=0.8348 respectively).

Conclusion: For complete diagnosis and treatment planning in orthodontics, both these classifications should be considered in describing malocclusion.

Introduction

Orthodontics is a specialty, admirably described as a “science of infinite variations”. This is nowhere more truly than in facial form and variations in occlusion. A system of classification is essential to embrace this field of enormous variation.

Classification of malocclusion is the principal step in turning the disorganised clinical concepts into the disciplined science of orthodontics. Primarily, classification aids in the diagnosis and treatment planning of malocclusions by orienting the clinician to the type and the magnitude of the problems, possible mechanical solutions to the problems and also facilitates communication between specialists, and in this regard it is imperative that orthodontists all speak the ‘same language’.

Running behind the pages of history of orthodontics we find contributions from Kingsley, Angle, Case, Dewey, Anderson, Hellman, Bennett, Simon, Ackerman and Proffit, Elsasser and many others on classification of malocclusion. By far, the most universally accepted classification that is in use today is Edward Angle’s method, which was developed a century ago.

Angle’s classification was based on the premise that the first permanent molars erupted into a constant position within the facial skeleton which could be used to assess the anteroposterior relationship of the arches. This critical reliance on first molar position is the major short coming of Angle’s classification. The classification is not justified in deciduous and mixed dentition for the same reason. Classifying cases with mesially drifted molars is also problematic. This classification cannot be applied if 1\(^\circ\) permanent molar is extracted or missing. These inadequacies in the classification have resulted in this particular approach being superseded by other classifications.

In 1964, Ballard and Wayman first described the Incisor classification. Angle’s terms are used and, in most cases, the classifications are concordant. This classification has enjoyed wide acceptance since its introduction and has superseded Angle’s classification in UK. Based on the works of Backland, it now forms the basis of British standard institute’s classification of malocclusion. The Incisor classification is simpler and more reliable than Angle’s classification. Patients are generally more aware of incisor rather than buccal segment relationship; thus its correction is a central concern of much orthodontic treatment.

No doubt the Angle’s classification still is universally used for its simplicity. But it is an enigma to the clinicians and epidemiologists to classify a malocclusion in certain conditions where there is no first permanent molar. In those conditions, the British Incisor classification can be used as an alternative to Angles if there exists an association between both these classifications.

Thus the purpose of this study is to analyse the association between the British Incisor classification and the Angle’s classification so as to classify a malocclusion where Angles classification is not applicable and to keep in pace with the soft

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tissue paradigm. This study has also attempted to find the possible reasons for the association.

**Subjects and methods**

This cross-sectional study included orthodontic patients who visited the Department of Orthodontics and dentofacial Orthopedics, Tamil Nadu Government Dental College and Hospital. Pre-treatment orthodontic records of 200 patients fulfilling the selection criteria were obtained and used for the study. Selected samples were generally typical and posed no difficulties in classifying malocclusion based on Angle’s or British Incisor classification.

**Selection criteria:**
- Stable centric occlusion using squash bite
- No voids or blebs in the orthodontic study models
- No fractures on the teeth on the study models
- No previous orthodontic treatment taken
- Models displaying full permanent dentition (with the exception of third molars)

**Exclusion criteria:**
- Mixed or deciduous dentition
- Missing molar
- Cleft palate cases
- Open bite
- Posterior cross bite
- Premolar impaction
- Missing incisors
- Casts with restorations altering occlusal morphology

Samples were divided into 4 groups based on British standard institute Incisor classification and Angles classification of malocclusion--class I, class II div I, class II div II, and class III. Frequency distribution of the samples based on the British incisor and Angles classification is depicted as bar chart in figure 1

Cross tabulation of British standards institute incisor classification with Angles classification of malocclusion was done. All data were recorded in Microsoft excel 2007 spread sheet and analysed using SPSS version 11.5. The overall association between British standards institute Incisor classification and Angle’s classification, and association between each group of Incisor classification and the Angle’s classification were assessed using chi-squares test. P value less than 0.05 were taken as statistically significant.

**Results**

Two hundred samples were grouped into 4 groups based on British incisor classification and Angle’s classification. The results were cross tabulated and overall association between British and Angle’s classification and, Association between British and Angle’s classification in each group (class I, class II div I class II div II, class III) was analysed using chi-square test. P-value less than 0.05 was taken as statistically significant.

Overall association between British Incisor and Angle’s classification were found using Chi-square test (table 1). p value was found to be 0.00 (which is less than 0.05). Hence there was statistically significant association between the two classifications.

Of 84 samples in British class I malocclusion, 60 (71.4%) samples belonged to Angle’s class I while remaining 14 (16.7%) samples belonged to Angle’s class II div I. Chi-square test was done to find the association between Angle’s and British type of classification (table 2). p value was found to be 0.0090 (which is greater than 0.005). Hence, no statistically significant association existed between the two classifications in class II div I group

Out of 72 samples of British class II div I malocclusion 29 (40.3%) samples belonged to Angle’s class I while remaining 43 (59.7%) belonged to Angle’s class II div I. Chi-square test was done to find the association between Angle’s and British type of classification (table 3). p value was found to be 0.8348 (which is greater than 0.05). It was found that no statistically significant association existed between the two classifications.

Out of 23 samples of British class II div II malocclusion, 11 (47.8%) belonged to Angle’s class I while remaining 12 (52.2%) belonged to Angle’s class II div II. Chi-square test was done to find the association between Angle’s and British type of classification (table 4). p value was found to be 0.8348 (which is greater than 0.05). It was found that no statistically significant association existed between the two classifications.

Thus 14.3% of British class III malocclusion belonged to Angle’s class I while remaining 85.7% belonged to Angle’s class III. Chi-square test was done to find the association between Angle and British type of classification (table 5). p value was found to be 0.011 (which is less than 0.05). It was found that a statistically significant association existed between the two classification in class III group.

**Discussion**

Angle’s critical reliance on first molars is the main drawback of the classification. The dynamic nature of the position of the first molar in the mixed dentition which changes as the occlusion matures into the permanent dentition (because of jaw growth and second deciduous molar leeway space considerations) makes a molar-defined classification not applicable in young patients. Calvin Case 4 slated the Angle’s classification for its total disregard of the relationship of the teeth to the face.

It is recognized that malocclusions having the same Angle classification may, indeed, be only analogous malocclusions (having only the same occlusal relationships) and not necessarily homologous (having all characteristics in common). Graber 5 pointed out that Angle’s classification fails to distinguish between malocclusions with analogous anteroposterior relationships, which require different treatment plans. Singh, Du and Rinchuse 6, Katz 7 and Pair 8 criticised Angle’s classification for its lack of a numerical quantification of the degree of Class II or Class III.
Thus the Angle’s classification is a system of discrete classes measuring a continuous variable. In addition, E H Angle himself admitted that his classification system does not address all possible malocclusion types, such as the case where one side is Class II and the other is Class III. Gravely and Johnson demonstrated poor inter-examiner and intra-examiner reliability for Angle’s classification. Several other investigators Ast et al, Brash, Katz, Baumrind et al, Du et al, and Brin et al, also questioned the reliability of Angle’s classification.

### British Incisor Classification System

British incisor classification is simpler and more relevant than Angle’s classification. It is becoming increasingly used clinically now days in cases where molar classification cannot be applied in situations like missing molars, mixed and deciduous dentition. Also since Angle’s and British incisor classification is based on the antero-posterior relation of the upper and lower arch, it is used analogously in various epidemiological studies.

Rinchuse et al found that British incisor classification was more reliable than Angle’s classification. As there is a “mathematical-statistical” advantage towards the British, on reliability comparisons with lesser number of categories than Angles. British system is far less confusing than Angle in regard to operational definitions of each of the categories. Angle was vague in his description of his “classes.

Though Angle’s classification faced lots of criticism Angle’s system can certainly not be replaced, and it is arrogant and naïve to assume it could be replaced or even modified in a major way that would be accepted universally. But there is a need for an alternate classification in situations where Angles is not possible (missing molars). An additional classification system based on anteriors should also be considered which would lead the clinician to a treatment plan that will maximise the dentofacial esthetic outcome. These factors call in for the British Incisor classification. Though there are few studies comparing the reliability of British incisor and Angle’s, there is no previous study done to find the association between these two classifications.

This study aimed to analyse the relationship between the two classification systems. There exists a statistically significant association between Angle’s system of classification and British incisor classification seen as a whole. There was statistically significant association found between the British and Angle’s class I & class III though there were very few cases (4 in British class I and 3 in British class III) which differed.

No significant association found between British class II div I and Angle’s class II div I. 29 out of 72 cases of British class II div I came under Angle’s class I. There can be several possible reasons for this. Class II incisor relation in these cases may be due to any environmental influences like habits, therefore though the molars may be in class I relation, incisors showed class II div I relation.

Another possible reason could be the Bolton’s tooth size discrepancy with maxillary excess in the anterior ratio. In these cases to accommodate the arch length discrepancy, incisors take a place in the arch of larger circle and procline, giving a class II incisor relation while the molar relation may not be perturbed in these conditions giving class I molars. Five of the cases with class II div I incisal relation and class I molar relation had constricted upper arch in transverse dimension. There was no significant association found between British class II div II and Angle’s class II div II. Class II div II incisor may be a result of hyper active upper lip.

### Conclusion

Although an overall association between Angle’s and British incisor classification was found, it is very difficult to establish a definitive association between them. Since this is the first study attempting to find an association between these two classifications further studies has to be done with a larger sample size. Atypical cast can be selected and results can be compared with those of this study. Other diagnostic aids like lateral cephalogram can be used for classification. Further skeletal relations can also be taken into account. Thus it is strongly recommended that British incisor classification may be used not just as an alternative to Angle but also as a classification complementing it.

### References


Fig 1: Bar chart showing the distribution of samples by Angles and British Incisor classification

Table 1: Cross tabulation of British Incisor classification And Angle's classification of malocclusion. Overall association between British Incisor classification And Angle's classification of malocclusion

<table>
<thead>
<tr>
<th>British Incisor classification</th>
<th>Angle’s classification</th>
<th>Total N= 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>Class II</td>
<td>Class II div I</td>
</tr>
<tr>
<td>Class II div I</td>
<td>29</td>
<td>43</td>
</tr>
<tr>
<td>Class II div II</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Class III</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

(p=0.00)
Table 2: Association between British incisors Class I and Angle’s class I malocclusion

<table>
<thead>
<tr>
<th>Angle Class</th>
<th>British Class I</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>80 (95.2%)</td>
<td>84 (100%)</td>
</tr>
<tr>
<td>Class II div I</td>
<td>4 (4.8%)</td>
<td></td>
</tr>
</tbody>
</table>

(p=0.00)

Table 3: Association between British class II div I and Angle’s class II div I malocclusion

<table>
<thead>
<tr>
<th>Angle Class</th>
<th>British Class II div I</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>29 (40.3%)</td>
<td>72 (100%)</td>
</tr>
<tr>
<td>Class II div I</td>
<td>43 (59.7%)</td>
<td></td>
</tr>
</tbody>
</table>

(p=0.0990)

Table 4: Association between British class II div II malocclusion angles class II div II

<table>
<thead>
<tr>
<th>Angle Class</th>
<th>British class II div II</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>11 (47.8)</td>
<td>23 (100%)</td>
</tr>
<tr>
<td>Class II div II</td>
<td>12 (52.2%)</td>
<td></td>
</tr>
</tbody>
</table>

(p=0.8348)

Table 5: Association between British class III and Angle’s class III malocclusion

<table>
<thead>
<tr>
<th>Angle Class</th>
<th>British Class III</th>
<th>Row total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I</td>
<td>3 (14.3%)</td>
<td>21 (100%)</td>
</tr>
<tr>
<td>Class III</td>
<td>18 (85.7%)</td>
<td></td>
</tr>
</tbody>
</table>

(p=0.011)

If you have much, give of your wealth; if you have little, give of your heart

Arab proverb