MBT™ BRACKET PLACEMENT TECHNIQUE
Traditionally, it has been recommended that pre-adjusted appliance brackets be placed with the twin bracket wings straddling, in a parallel fashion, the vertical long axis of the clinical crown, and that the center of the bracket slot be placed on the center of the clinical crown. Potential errors or potential deviations from this desired position can occur as follows:

**Horizontal errors**

Brackets can be placed to the mesial or distal of the vertical long axis of the clinical crown, leading to improper tooth rotation (fig. 1). Elimination of such errors can be best achieved by visualizing the vertical long axis of the crown directly from the facial surface, as well as from the incisal or occlusal surface with a mouth mirror. Some orthodontists even consider drawing a line through the vertical long axis of the clinical crown for more accurate visualization.

**Axial or paralleling errors**

Brackets can be rotated off the vertical long axis of the clinical crown if the bracket wings do not straddle the long axis of the crown in a parallel manner (fig. 2). Such errors lead to improper crown tip and can also be avoided by viewing the crown directly from the facial surface, as well as from the incisal or occlusal surface. Such errors can be eliminated by using the same techniques described for the elimination of horizontal errors.
Vertical errors

Such errors occur when the bracket is placed gingival or incisal/occlusal to the center of the clinical crown. Such errors lead to extrusion or intrusion of teeth, as well as potential torque and in/out errors. The human eye is quite accurate at bisecting and locating the center of a given object such as a crown, (as Andrews stated). Therefore, brackets can be placed accurately using direct visualization on fully erupted and anatomically normal teeth. However, in the following clinical situations (which occur quite frequently), direct visualization is more difficult.

1. Partially erupted teeth. It is difficult to locate the center of the clinical crown on partially erupted teeth when treating young patients. The apparent clinical crown is foreshortened, and the tendency is to place the bracket too incisally or occlusally, especially with bicuspid and lower second molars.
2. Gingival inflammation. Gingival inflammation causes foreshortening, with the tendency to place the bracket too occlusally or incisally.

Gingival Concerns

Thick errors

Such errors can occur if excessive adhesive is left underneath one portion of the bracket base, or if the contour of the tooth does not correspond accurately to the contour of the base of the bracket. Such errors can cause improper tooth torque or rotation, and can be eliminated by pressing the bracket against the tooth at placement, so that excess adhesive flows from beneath the bracket, or by contouring the bracket base to more accurately fit the tooth surface.

Vertical errors

Vertical bracket placement errors occur when the bracket is placed gingival or incisal/occlusal to the center of the clinical crown. Such errors lead to extrusion or intrusion of teeth, as well as potential torque and in/out errors. The human eye is quite accurate at bisecting and locating the center of a given object such as a crown, (as Andrews stated). Therefore, brackets can be placed accurately using direct visualization on fully erupted and anatomically normal teeth. However, in the following clinical situations (which occur quite frequently), direct visualization is more difficult.

Gingival inflammation causes foreshortening, effectively reducing the length of the clinical crowns. Top: Healthy gingivae. Bottom: The same case with inflamed gingivae in the upper right quadrant.
3. **Teeth with palatally or lingually displaced roots.** With such teeth, gingival tissue covers a greater portion of the clinical crown than normal, producing a shorter clinical crown. The tendency is to place the bracket too incisally or occlusally (fig. 7).

4. **Teeth with facially displaced roots.** Such teeth tend to show a lengthened clinical crown, creating a tendency to place the bracket too gingivally (fig. 8). This is a common occurrence with cuspids.

**Incisal or Occlusal Concerns**

1. **Incisal or occlusal crown fractures or tooth wear.** With such teeth (fig. 9) it is difficult to visualize the center of the clinical crown since the apparent clinical crown is foreshortened. Correction of this problem can be made by either restoring the crown to its appropriate length, or by estimating how long the crown was before fracture or wear.

2. **Crowns with long tapered buccal cusps.** Occasionally a crown on a tooth such as a cuspid or bicuspid will show an unusually long and tapered buccal cusp (fig. 10). If the bracket is placed in the center of the clinical crown, adjacent marginal ridges will not be properly aligned. This situation can be corrected by selectively reducing the height of the cusp prior to bracket placement.

**Proportionally long or short clinical crowns**

1. **Proportionally long clinical crowns.** When individual clinical crowns are proportionally longer than the mean for the individual's dentition (frequently seen with the upper central incisors), an inherent esthetic and occlusal error will be created if the brackets are placed in the centers of the clinical crowns. Esthetically, these crowns will be too long, and functionally they will create an interference with the opposing dentition. In
this situation, it is necessary to place brackets slightly incisal to the center of the clinical crowns of the oversize teeth. While this adjustment may produce a minor error in the torque relationship and thickness relationship of these teeth, the problem is normally minimal, and if necessary must be corrected in the finishing stages of treatment with archwire bends.

2. **Proportionally short clinical crowns.** When clinical crowns are proportionally shorter than the mean for the individual’s dentition (sometimes seen with the upper lateral incisors) (fig. 11), an inherent esthetic and occlusal error is also created if the brackets are placed in the centers of the clinical crowns. Esthetically, these crowns will be too short, and functionally they will be out of contact with the opposing dentition. In this situation, it is necessary to place brackets slightly gingival to the center of the clinical crown. While this adjustment may also produce a minor error in the torque relationship and thickness relationship of these teeth, the problem is normally minimal, and if necessary must be corrected in the finishing stages of treatment with archwire bends.

In an attempt to reduce the errors inherent in using only a direct visualization method of bracket placement, a study was carried out to provide a method that could serve as a supplement to the direct visualization technique. This study was published in May 1995 in the Journal of Clinical Orthodontics. The result of this study was the development of a bracket placement chart which aided in the location of the center of the clinical crown for each individual patient. This in turn allowed for more accurate vertical bracket placement in the above clinical situations. The bracket placement chart is shown in Table 1.
Table 1. Highlighted figures represent the three minor maxillary arch changes and the three minor mandibular arch changes that were made from the initial Bracket Placement Chart. These changes were based on evaluations of the American Board-Angle Society case measurements and cases measured at the debanding appointment.
The technique that has been developed for bracket placement with this method is as follows:

**Step one**

Dividers and a millimeter ruler are used to measure the clinical crown heights on as many fully erupted teeth as possible on the patient's study models.

**Step two**

These figures are recorded, divided in half and rounded to the nearest .5 mm to obtain measurements for the distance from the incisal or occlusal surfaces to the center of the clinical crowns.

**Step three**

The row on the bracket placement chart that contains the greatest number of recorded figures is selected for bracket placement.

DISCUSSION

Use of the Bracket Placement Chart (table 1) eliminates potential gingival errors because measurements are made from the occlusal or incisal edge of the teeth. This alone is a major advantage, since the majority of vertical bracket placement errors that do occur are the result of inability to accurately visualize the gingival half of the clinical crown. It also eliminates the difficulty presented with proportionally large or small teeth within the dentition. When these teeth are present, it is necessary to place the bracket slightly off of the center of the clinical crown in order to avoid occlusal interferences, lack of occlusal contact, and esthetic height problems. The Bracket Placement Chart allows for this adjustment. The only potential errors that cannot be avoided are on crowns with incisal or occlusal fractures or wear, or on crowns with unusually long tapered facial cusps. When these situations occur, an appropriate millimeter adjustment needs to be made to allow the crown to be properly positioned.
Step five

A. Because of the possible presence of proportionately large teeth (i.e. upper central incisors) or small teeth (i.e. upper lateral incisors) some recorded figures will be larger or smaller than the numbers in the selected column and in turn in the numbers used for bracket placement on these teeth.

B. As stated above, when crowns show incisal or occlusal wear or fracture, or excessively long tapered cusps, an appropriate millimeter adjustment must be made to assure correct position of these crowns.

Step four

At the time of banding and bonding, brackets are placed by visualizing the vertical long axis of clinical crowns (buccal groove on the molars) as a vertical reference and the estimated center of the clinical crown as a horizontal reference.

With the placement of any bracket on the lower arch, there is always the potential for interferences with the upper dentition. When this situation occurs in the molar region, it is generally due to lingually inclined crowns which elevate the position of the bracket on the buccal surface. When this occurs the choices are to allow the interference to occur until crown uprighting occurs, to place an upper anterior bite plate and eliminate the interference, to place the effected bracket more gingivally and place a step bend to avoid extrusion of the tooth, or to place all brackets proportionately more gingival on the lower arch.

When the interference occurs in the incisor region, it is normally due to the presence of a deep overbite. The choices in this situation are to leave brackets off of the lower incisors until bite opening occurs, to allow the interference to occur until bite opening is achieved, or to place an anterior bite plate until bite opening occurs. The specific decision to be made in each case is dependent on the clinical situation.

The authors have tested this method of bracket placement on a variety of cases for over three years and have found that it has improved treatment efficiency during leveling and aligning, with fewer cases requiring bracket repositioning due to vertical placement errors.

It has also been most helpful in the repositioning procedures required on cases bonded and banded prior to the development of the Bracket Placement Chart.
SUMMARY AND CONCLUSIONS

Direct visualization of the center of the clinical crown is a satisfactory method of locating this point on fully erupted and anatomically normal teeth. However, in situations in which there are gingival variations, differences in tooth size within the dentition, or incisal or occlusal variations, this direct visualization technique becomes more difficult. Such situations do occur quite frequently in an orthodontic practice.

A bracket placement chart was developed that allows the orthodontist to select a set of numbers representing the average center of the clinical crown for a given patient. Measurement gauges can then be used to check bracket positions after visual placement. The technique has been used in the practices of the authors for several months and has dramatically reduced the need for bracket repositioning due to incorrect visualization of the center of the clinical crown.

REFERENCES
