Clinical Determination of Angle Convergence in a Tooth Preparation for a Complete Crown

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The relationship of the convergence angle (CA) to the height of the axial walls is the most important factor for providing retention and resistance in tooth preparation for a complete crown. Several studies have shown that the ideal CA is difficult to achieve in clinical practice. The technique described in this article allows for the determination of the CA during the tooth preparation procedure, based on an instrument developed and created by the authors. *Int J Prosthodont 2014;27:472–474. doi: 10.11607/ijp.3903*

The relationship of the convergence angle (CA) to the height of the axial walls is the most important factor for providing retention and resistance in a tooth preparation for a complete crown.[1] A large CA, in addition to the excessive destruction of tooth structure, is not suitable for retaining a crown. Conversely, a lack of convergence in the parallel or divergent axial walls in the occlusal direction does not properly allow for the placement and/or fitting of the crown over the prepared tooth. The limits of the CA are well known and have been verified mathematically but are not very easy to achieve clinically.[1,2] This is why, during the reduction process, it is important to know the CA in order to better estimate the quantity and quality of the retention and resistance forms. Few techniques are available to assist in the clinical procedure, such as using digital photos or scanners to show the CA after tooth preparation.[3] These techniques are difficult to implement in clinical practice because they are time consuming, expensive, and require special equipment, and their effectiveness has yet to be shown. This may explain why these techniques are used most often for academic purposes.[4,5] In clinical dental practice, professionals should develop skills to measure the CA by eye, supported by the angulation of rotary instruments.[3] To overcome these difficulties in clinical measurements, the following technique was developed.

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Technique

Measuring Instrument

An instrument was created and developed for this purpose. It comprises six stainless steel disks, with openings in the back to fit onto a dental mirror. Several lines are engraved into the polished surface of its face, and two of them are identical on all of the disks: a vertical diameter and a perpendicular secant line. The other four are distributed into two parallel groups, left and right of the vertical diameter. The angles formed between the two groups of lines are 0 degrees (two disks), 6 degrees, 10 degrees, 15 degrees, and 20 degrees (Fig 1).

Description of Technique

1. Mirror number 1 (0 degrees) should be placed lingual to the tooth preparation, aligning the vertical diameter line with the axis of the path of placement, and the secant line with the bases of the two axial walls (Fig 2).
2. The mirror should be moved slightly, aligning one of the lines with one of the axial walls. The secant line helps the clinician avoid any errors. If necessary, the mirror can be moved to check the opposite axial wall alignment.
3. These procedures should be repeated, increasing the CA progressively using the other disks, until the smallest difference between the lower and upper limits of the CA have been found (Fig 3).

Note: Both axial walls, mesial and distal, should be directly visualized with one eye at a distance of 30 cm, without shadow interference. In order to measure the buccolingual CA, the vision could also be directed toward the image reflected in the surface of the device (Fig 4). The mirror must be moved according to the

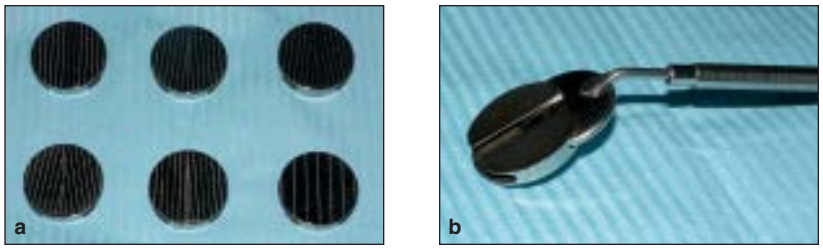

Fig 1 Measuring instrument: **(a)** polished face view containing engraved lines and **(b)** back view.

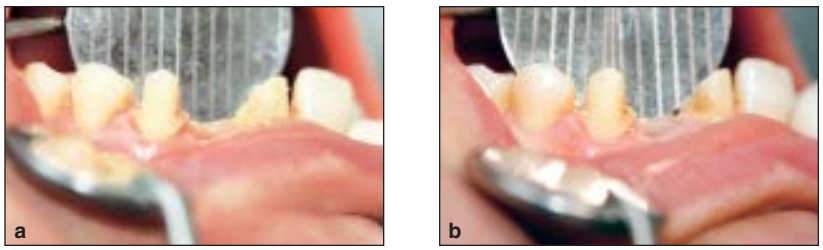

Fig 2 Mesiodistal view: **(a)** 0 degrees; **(b)** 6 degrees.

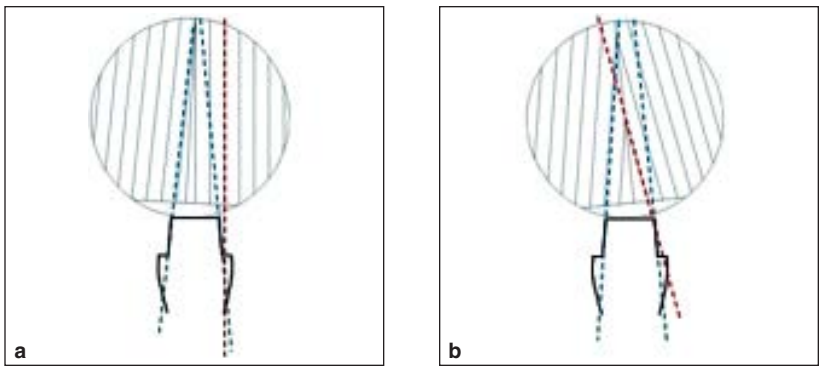

Fig 3 Measuring instrument: **(a)** lower limit; **(b)** upper limit.

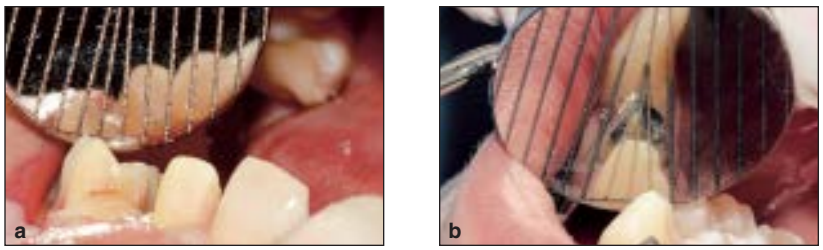

Fig 4 Buccolingual view: **(a)** 6 degrees (direct image); **(b)** 10 degrees (reflected image).

described methodology. The openings in the back of the devices permit the change inside, allowing for measurements in all quadrants of the dental arches (see Fig 1).

Discussion

The present technique can be implemented in daily practice to help the dentist in tooth reduction for a complete crown. By knowing the CA during this process, the dentist can better estimate the amount of retention and resistance form of the tooth preparation at this early stage.[3] The instrument created is easily built and applied onto dental mirrors. It is autoclavable, small, and provides fast viewing of the angulation of the axial walls during tooth preparation. However, it requires a short training period in order to be effective. It does not show the exact determination of the CA, but the interval in which it falls. However, this limitation is not clinically relevant in most situations.

Conclusions

The present technique, based on an instrument developed for this purpose, allows the determination of the approximated convergence angle (axial walls) during the tooth preparation for a complete crown.

Acknowledgments

The authors reported no conflicts of interest related to this study.

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Literature Abstract

Causes and timing of delayed bleeding after oral surgery

This retrospective study examined patients who were presented at a university hospital between 1998 and 2009 requiring hemostatic intervention for bleeding after oral surgery. From the data of 1,833 eligible patients, the authors investigated the reasons for postoperative bleeding, as well as the interval between surgery and onset of bleeding. The authors found that uncomplicated tooth extraction was the main cause of bleeding (95.3% of the patients), and 69.7% of the bleeding occurred in the molar region of both the maxilla and mandible. The authors attributed this to large open wounds after molar extraction, and the difficulties faced by the patient to correctly apply pressure in the posterior region. The authors found that 64.97% of bleeding occurred on the day of surgery; 20.96% in the first 3 days of surgery; and 9.18% between the fourth and seventh day after surgery. Hence, the authors recommended surgeries to be scheduled in the morning. In the study, 39.9% of the patients took anticoagulants (ie, 21.5% took phenprocoumon, 12.7% took acetylsalicylic acid, 1.8% took clopidogrel, and 0.9% took more than one anticoagulant) and 4.3% had a congenital blood disorder. Patients taking phenprocoumon, as well as those with a congenital blood disorder, had significantly longer bleeding intervals, and are identified by the authors as high risk and require intensified postoperative management.

Czembirek C, Poeschl WP, Eder-Czembirek C, Fischer MB, Perisanidis C, Jesch P, Schicho K, Dong A, Seemann R. *Clin Oral Investig* 2013 Nov 28 [Epub ahead of print]. **References:** 18. **Reprints:** C. Czembirek, University Clinic of Cranio-Maxillofacial and Oral Surgery, Medical University of Vienna, Waehringer Guertel 18–20, 1090 Vienna, Austria. Email: cornelia.czembirek@meduniwien.ac.at—*Simon Ng, Singapore*