

## Evaluation of Extra Coronal Axial Wall Taper Angle Preparation among Dental Students (Taibah University)

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### Original Research Article

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**Abstract:** The research report is used as a simple and precise method/ procedure of measuring and determining the convergence angle of final constructed dies. A random samples selection of 30 dies from School of Dentistry Taibah University students was taken. All the 30 preparations were accomplished by 3rd, 4th and 5th-year dental student under standard and regular clinic situations and at the lab. A variety of 4 to 10 degrees of convergence is recommended as optimal. The average taper of groups in this study, measured were substantially greater or more than those recommended. Many of the recently published research on the subject agree with outcomes and the values obtained in our analysis.

**Keywords:** Coronal, Dental, Taibah University

### INTRODUCTION

Ideal tooth preparation is important for effective fixed partial denture work, while retention of the crown is affected mainly by the geometric relationship of opposing walls (degree of convergence angle) [1]. The axial reduction, taper, finishing line, undercuts in axial walls and occlusion reduction affects the excellence of prepared extra coronal restoration [2].

The proper convergence angle for acceptable resistance & retention of cast crowns at all times remained a substance of exploration/ research and conversation.

The retention and resistance is improved by parallel opposing walls; On the other hand, making the parallel walls in the patient's mouth without undercuts is not a simple job to achieve [3].

Moreover, nearly degrees of convergence appear to be essential to reward the expected inaccuracies of the fabrication process and allow more advantageous seating of restorations [4]. However, the suggested standards of axial inclination of preparations are supposed to vary dramatically. A range of 4 to 10 degrees of convergence is recommended as optimal [5, 6]. While these angles are considered ideal for optimal retention, they are difficult to achieve clinically [7].

Some procedures have been labeled for assessing and calculating convergence angles of

preparations. Strategies, for instance, photocopy/xerox machines [8], overhead projectors [9], goniometric microscopes [7], 3-D laser scanners [10] and diamond rotary cutting instruments [11] have been used to measure the convergence angle of working dies.

Ohm and Silness [12] examined stone dies prepared by dental students and reported mean tapers of 19.2 degrees mesio distally (M-D) and 23.0 degrees bucco lingually (B-L) on vital teeth. In non-vital teeth, mean M-D and B-L tapers were found to be 12.8 degrees and 22.5 degrees, respectively. Noonan and Goldfogel [8] described the full gold crown preparation was prepared by 909 students, and an overall mean taper of 19.2 degrees was surveyed in this study.

The main purpose of this research was directed to evaluate the convergence angles of full veneer crown preparations, made by 3rd, 4th and 5th-year dental scholars (Taibah University) under the supervision of an instructor in a dental school clinic.

**Ethical Consideration**

This study is vitro study and was submitted to the ethical comity at Taibah University. This study was exempted from the reviewed because the samples are not a human subject. It is done at final constructed dies after the crown is delivered to the patients, so no need to take of any specific or general information's from the patients.

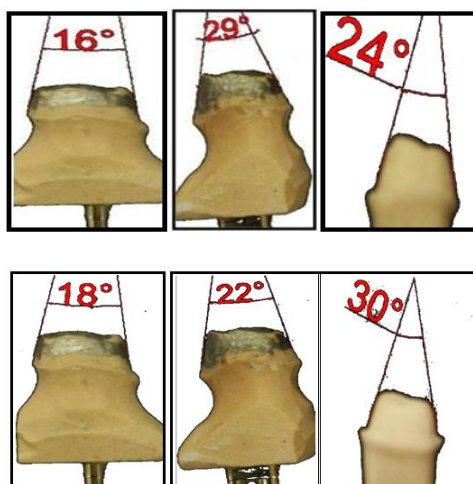
**MATERIALS AND METHODS**

The proposed study was grounded on amounts of convergence angles of tooth preparations done by dental students at three levels i.e. (3rd, 4th and 5th year) for complete crowns, at the department of fixed prosthodontics, college of dentistry, Taibah university (each level no more than thirteen students). All three different levels were taken because they are allowed to working tooth preparation. 30 randomly selected samples will be separated into three groups according to student's academic level (10 for each academic year). Collecting final constructed dies from 4th& 5th years and prepared acrylic teeth from 3rd year.

The principle for collection includes the following: a Single metal ceramic unit of the tooth prepared on molar teeth. Additionally, no exceptional or additional instructions were delivered to the mentor or the undergraduate dental student that would show that the preparations were to be assessed for taper. The exclusion criteria were mainly excluding left handed students and homemade preparation. By using professional digital camera, (Nikon 300c) the die placed on straight surface and far from lances 30cm two images were obtained from

Sample each one with the die placed bucco lingually, and one mesio distally. Utilizing Auto CAD 14 (Autodesk Inc, San Rafael, CA), parallel lines were drawn to either the traced axial walls in the gingival 1/3rd of the buccal & lingual surfaces, or all proximal surfaces. These lines were then prolonged till they meet to form an angle above the image.

Convergence angles were measured using the software tools (Auto CAD). Measurement reliability estimated by two different investigators, i.e. (the researcher and the engineer who used the Auto CAD system) creates the reference lines and measure the resultant convergence angles. The records were evaluated for variances in means amongst examiners and different tooth positions using analysis of another technique.



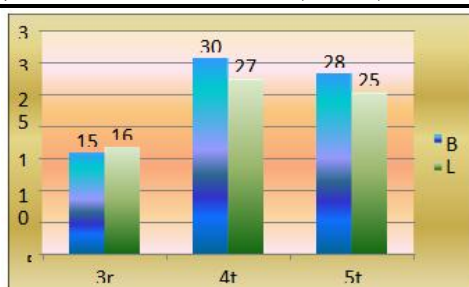
**RESULTS**

The convergence angles of all sets, i.e. (The highest value, lowest value, mean value and standard

deviation) of opposing surfaces for each group of dental scholars are recorded at Table (1) and illustrated at figure (1).

**Table-1: highest, lowest, mean values and standard deviation of the convergence angles of all sets of opposing surfaces for each group of dental scholars**

Group	variable	N	highest	lowest	mean	St. d
3 <sup>rd</sup> year	B-L	10	30°	7°	15.8°	8.84
	M-D	10	28°	6°	16.7°	7.58
4 <sup>th</sup> year	B-L	10	52°	18°	30.6°	12.11
	M-D	10	53°	17°	27.4°	10.63
5 <sup>th</sup> year	B-L	10	43°	11°	28.2°	9.40
	M-D	10	36°	11°	25.3°	8.22



**Fig-1: highest, lowest, mean values and standard deviation of the convergence angles of all sets of opposing surfaces for each group of dental scholars**

The highest mean convergence angle was recorded in mesio distal walls for 4th-year students ( $27.4 \pm 10.63$ ), while the lowest mean convergence angle was recorded in bucco lingual walls for 3rd-year students ( $15.8 \pm 8.84$ ) with statistically significant difference  $P < 0.05$ .

For 4th and 5th groups, the mean convergence angle of bucco lingual walls was higher than that of mesio distal walls, but for 3rd-year group, the mean convergence angle of mesio distal walls was higher than that of bucco lingual walls.

Concerning bucco lingual walls, the mean convergence angle for 3rd-year students ( $15.8 \pm 8.84$ ) was lower than that for 4th and 5th years students ( $16.7 \pm 12.11$ ) and ( $28.2 \pm 9.40$ ) respectively with statistically significant difference while there is no statistically significant difference between 4th and 5th-year students

Concerning mesio distal walls, the mean convergence angle for 3rd-year students ( $15.8 \pm 7.58$ ) was lower than that for 4th and 5th years students ( $27.4 \pm 10.63$ ) and ( $25.3 \pm 8.22$ ) respectively with a statistical significant difference while there is no statistically significant difference between 4th and 5th-year students.

## DISCUSSIONS

The quantity of convergence essential for proper retention and resistance to displacement for a cast crown is faithfully related to the form of the preparation and reasons such as diameter and length of the preparation affect the amount of convergence important for any given preparation.

According to the results obtained in the current investigation, the convergence angles that were recently proposed by Shillingburg *et al.* were far more clinically possible matched to the ideal range of 4 -10 degrees reported in former studies [8,9]. Although statistical analysis showed significant differences between some of the measured angles and the recommended values, the angles were in the suggested range in many other aspects.

The normal taper of groups surveyed in this study/research were significantly more than mentioned.

Many similar studies have confirmed these results [13-16]. In this study, the mean clinical bucco lingual convergence angle was higher than that of mesio distal [11, 17-19] Though other studies suggest that MD was greater than BL [19-21].

Both crown and fixed partial denture preparations were included in the research as one inspected sample this will give a clear assessment or important of any changes in preparation of a tooth as a single restoration or fixed partial denture as an abutment [9].

In preclinical group (3rd-year students), the results were better than that in a clinical situation in both mesio distal and bucco lingual convergence angles. The fact that, the students of 4th and 5th year have minor mistakes in visual valuation, least experience in clinical fixed prosthodontics, the reasons of less than perfect preparations [16-19].

Limitation of the study was mainly the lab had too many cases to finish, the students had to wait. And I had to wait until the students finished their cases to take final constructed dies.

## CONCLUSIONS

In this research within the limitations, it may be decided that the taper accomplished by the dental scholars was extra than that was suggested in the dental works.

- No extra features to advance retention in spite of the increase in the taper. An axial preparation was watched as suitable when related with the perfect.
- The findings of the present study indicate that clinical experience leads to a decrease in convergence angles of preparations.
- The good sample size was taken because of the number of students at each different year, not more than thirteen students.
- I recommended doing the research earlier as possible to be easier for collecting samples. Because the researcher needs to wait until crown delivered to the patients, to take the final constructed dies.

**Conflict of interest**

**The authors declared no conflicts of interest**

**Note:** This work was carried out in collaboration between all authors. Dr. Abdullah Omar Yousef Yousef the first author and designed the study, Dr. Ahmed A. Alnazzawi wrote the protocol, and wrote the first draft of the manuscript. Dr. Adel Abd El Sttar Mohamed EL Badawy performed the statistical analysis; Dr. Wamiq Musheer Fareed managed the analyses of the study and correspondence. Dr. Wael Hussain Rafie managed the literature searches. All authors read and approved the final manuscript.

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