

## Use of magnification loupes among 3<sup>rd</sup> BDS students for cavity preparations.

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**Abstract:** Magnification in dentistry has amplified the scope of restorative dentistry with amended ergonomics. The aim of the present study was to evaluate the cavity preparations by 3<sup>rd</sup> BDS students during their clinical postings with and without using magnification loupes.

22 3<sup>rd</sup> BDS students performed Class I restorations on patients with at least 2 carious mandibular molars (36 /37 /46/47) in need of Class I restorations using modified split mouth design with and without loupes in two separate dental visits. The preparations were assessed by two observers using rating scale for quality evaluation of cavity preparations. Student feedback was obtained after complete procedures. The collected data was analysed statistically using chi-square test.

**Results** The results revealed that tooth preparations were better under magnifying loupes as compared to those without it with statistically significant difference with Kappa value 0.32 for samples with loupes and 0.58 for without loupes. Participants expressed their improvement in quality of cavity preparations with magnifying loupes but difficult to practice.

**Conclusions:** Magnification in undergraduate dental students can significantly improve their quality of cavity preparations and ergonomics. However they need to be practiced with loupes in their preclinical classes.

**Keywords:** Magnification Loupes, Ergonomics, psychomotor skills, cavity preparations

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### I. Introduction

The great philosopher Tielhard de Chardin described human as a cerebro-manual creature. Nevertheless, it is imperative to appreciate that the hands can not treat what the eyes don't see. It is thus predicted that the use of magnification in dentistry not only improves the quality of care provided to patients, but also inflates the assortment of treatments that can be offered. Magnification in dentistry is accomplished with either surgical loupes or dental microscopes. Magnifying utilities can increase the working efficiency of clinicians by improving posture & vision.<sup>1,2,3</sup>

Dentistry gives an idyllic surrounding for the use of loupes and microscopes, because operative managements are executed and accomplished in a small and constricted environment. Nevertheless, the inkling that magnification maneuvers should be used as standard devices in dentistry is comparatively new.<sup>2</sup>

Magnification loupes escalate the size from  $\times 2$  to  $\times 5$ , however, intensification of  $\times 2.5$  to  $\times 4$  is usually utilized for the restorative techniques. The awareness and use of loupes among the dental experts and students seems to be developing. Thus, suitable use of visual augmentation must be deliberated for all the dental experts to make the practice of dentistry more specific, stress-free, more gratifying; thus minimizing the peril of musculoskeletal glitches.<sup>2,3,4</sup>

There is limited literature documentation regarding studies reporting use of magnification loupes by the undergraduates in dental education. Hence, the present study was undertaken to evaluate the cavity preparations by 3<sup>rd</sup> BDS students during their clinical postings with and without using magnification loupes.

### II. Materials and Method

All patients reporting to OPD of the Department of Conservative Dentistry and Endodontics, VSPM'S DCRC were screened for at least 2 mandibular molars (36 /37 /46/47) with caries in need of Class I restorations. Informed written consent was obtained from 22 such patients who volunteered to be a part of the study. Amongst 98 students of 3<sup>rd</sup> BDS, 22 willing students having no major visual defects were selected.

All the students were given demonstration for Class I cavity with and without using magnifying loupes (Magnification Loupe: Product of ACTS Medical, Mississauga, Canada. STAC 3.5x – 420). Each student was then randomly allotted one patient in need of two Class I cavities on mandibular molar of the same side. They were instructed to perform one cavity with conventional method and the other using magnification loupes

in two separate appointments. Entire procedure was supervised and evaluated by two observers (without visual defect), to eliminate bias, using rating scale (Table 1) for the assessment of the cavity preparations.<sup>6</sup>Feedback was taken from the students after completing both the procedures.

The data collected by both the observers was subjected for statistical analysis with Chi Square test using Cohen Kappa value SPSS software (version20.0).

### III. Results

All the cavity preparations (N= 44) were evaluated by 2 observers(n=22 for Group A & Group B each).Table 2demonstrates the observers reliability of assessing cavity preparation which favoredcavity preparations done under loupes(kappa value=0.26).It was observed that more satisfactory cavity preparations were seen with Group B i.e. 86% contrary to Group A (Table 3 & Table 4).The observers found that the ergonomics was practiced much better with magnifying loupes compared to without loupes. (Fig: 1)

**Table 2:** Inter-examiner reliability to assess cavity preparation

OBSERVER 1 and OBSERVER 2	Cohen Kappa value
Group A(Without Loupes)	0.58
Group B(With Loupes)	0.32

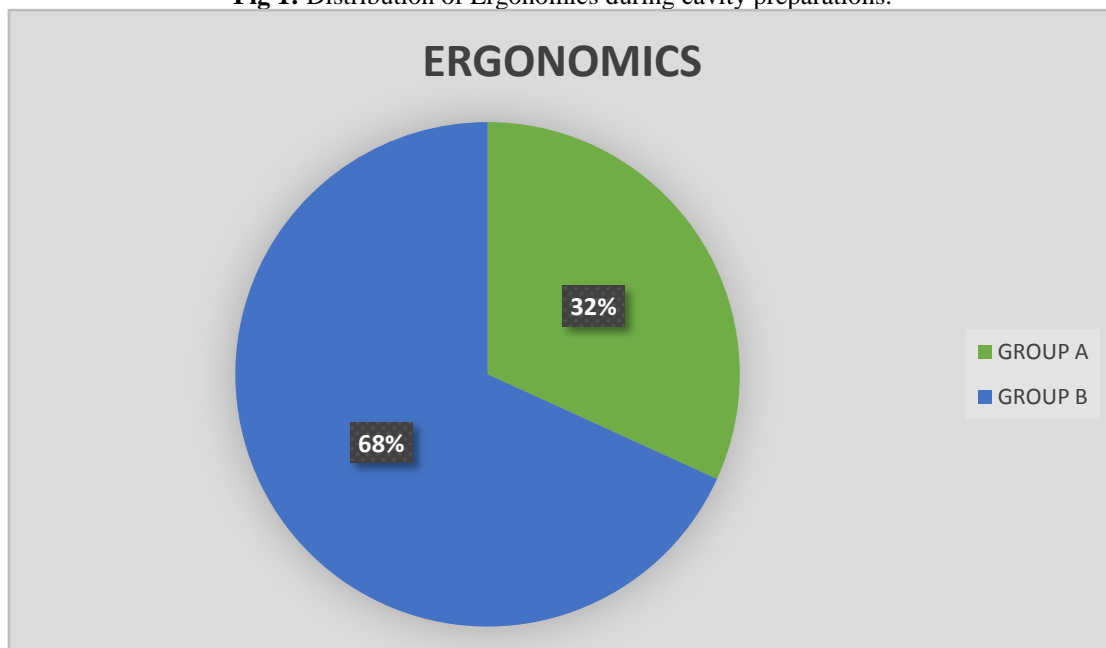
**Table 3:**Satisfactory or Non-satisfactory cavity preparation Group A (without using loupes)

Score	Satisfactory	Non-satisfactory
R / S / M	17	
T / V		5
Mean %	77%	23%
	Score 3 / > 3 = Satisfactory Score < 3 = Non-satisfactory	

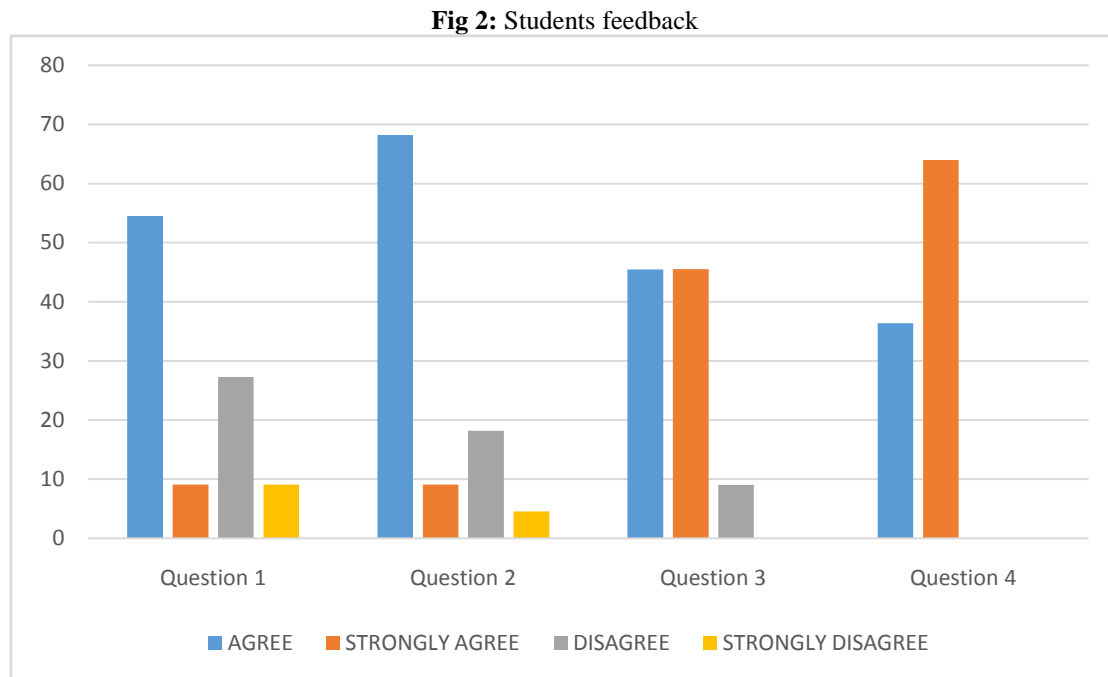
**Table 4:**Satisfactory or Non-satisfactory cavity preparation Group B(using loupes)

Score	Satisfactory	Non-satisfactory
R / S / M	19	
T / V		3
Mean %	86%	14%
	Score 3 / > 3 = Satisfactory Score < 3 = Non-satisfactory	

**Fig 1:** Distribution of Ergonomics during cavity preparations.



In Students feedback they preferred to use magnifying loupes for restorative procedures. (Fig 2)



#### IV. Discussion

Dentistry is an amalgamation of art and science and quality of dental work depends on experience, training and manual dexterity. This results in upbringing good dental practitioners thus raising the quality of dental care. Magnification in dentistry has enhanced and refined the scope of restorative dentistry. It not only allows for more visualization and illumination but increases proficiency due to improved ergonomics. It is recommended to test perceptual and visual abilities of dental students in early dental education to estimate small depth and distances.

Hence this study was undertaken to evaluate the cavity preparations using conventional techniques and magnifying loupes by 3<sup>rd</sup> BDS students. In present scenario undergraduate curriculum does not expose the students to procedures using magnification. Literature reveals that intervention of magnification in early clinical training will enhance their interest in learning as magnification and illumination allows them for better visualization<sup>7,8,9</sup>. In addition it can sensitize them towards current concepts of practice. In our study we modified the Split mouth design to eliminate the error of skillful cavity preparations. Each student prepared cavities #36/#46 without using loupes in first visit whereas in second visit cavity preparation was done with loupes on #37/#47. It was observed that 86% satisfactory cavity preparations were with loupes (Kappa value=0.32) compared to 77% satisfactory preparations without loupes (Kappa value=0.58)(Table 2,3,4). The results of our study are in agreement with Narula K et al.<sup>1</sup> They reported statistically significant difference of kappa value of 0.64 with loupes and 0.76 without loupes. Burke F et al<sup>10</sup> in their study reported that the most frequent causes of premature retirement in dental profession was musculoskeletal disorders (MSDs) (29.5%). Dental professionals are prone to unique muscle imbalances and require special exercise and ergonomic interventions to maintain optimal health during the course of their career for ergonomics the observers noted the position of spine, shoulders and neck of students while performing cavity preparations for Group A & Group B. It was found that 68% ergonomics was maintained with magnifying loupes contrary to without loupes i.e. 32% (Figure 1). These findings are in accordance with the study of Dable RA et al where they stressed to acclimatize good habits at the inception of the course, to prevent MSDs later in life.<sup>11,12</sup>

On analysis of student feedback it was concluded that almost all students agreed that there was improvement in their quality of work with cavity preparation and less fatigue (ergonomics) (Figure 3). Almost 77.27% students preferred use of magnifying loupes in future clinical work. Interestingly it also revealed that only 9% of the students work comfortable while handling magnifying loupes and 54.4% students were partially comfortable and rest were uncomfortable. They requested more practice sessions for more acclimatization with loupes to enhance comfort (Figure 1 & 2).

### V. Conclusion

Magnification in restorative procedures for undergraduate students can significantly enhance their quality of cavity preparations with improved ergonomics and sensitize them to modern restorative dentistry. However, more practice sessions are needed with magnifying loupes to decrease the learning curve.

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**Table 1: Rating System for Quality Evaluation of Prepared Cavities**

Rating	Operational explanation
R Meets all standards of Excellence	The prepared cavity is of excellent quality in its biological and mechanical design factors
S Satisfactory with minor correction (s)	The prepared cavity is of serviceable quality. Minor correction of one or more features which deviate from ideal conditions will enhance quality
M Satisfactory with moderate correction (s)	The prepared cavity is of serviceable quality. Moderate correction of one or more features which deviate from ideal conditions will enhance quality
T Major correction Required	The prepared cavity is not of acceptable quality. Damage to the tooth tissues has now occurred, or failure of restorative procedure is inevitable
V Fundamental concepts are not demonstrated	The prepared cavity is not of acceptable quality. Damage to tooth tissues has now occurred, or failure of restorative procedure is inevitable

**Table No. 5:** Student's Feedback form

<p>Student's Feedback form</p> <p>1) How do you feel working with magnifying loupes? (a)Difficult (b) partially difficult (c) <u>Partially</u> comfortable (d) Comfortable</p> <p>2) In future, would you prefer to work using magnifying loupes for restorative procedures? (a) Agree (b) Strongly Agree (c) Disagree (d) Strongly Disagree</p> <p>3) Do you feel that the quality of cavity preparations is better using magnifying loupes? (a) Agree (b) Strongly Agree (c) Disagree (d) Strongly Disagree</p> <p>4) Do you find this tool (Magnifying loupes) useful in maintaining desired ergonomics? (a) Agree (b) Strongly Agree (c) <u>Disagree</u> (d) Strongly Disagree</p> <p>(5) Any <u>Suggestions</u> :</p> <p>(i).....</p> <p>(ii).....</p> <p>Thank you for your valuable participation and support....</p>
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**Figure 3:** Ergonomics while Working (Group A &B)



GROUP A – Without Loupes

GROUP B – With Loupes

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