

## The Implementation of the Minimal Intervention Dentistry in the Undergraduate Dental Clinical Teaching: A Retrospective Audit

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Received: February 15, 2022  
Accepted for publication: May 25, 2022

### ABSTRACT

**Objectives:** *This study aims to assess the prevalence of minimal intervention dentistry (MID) treatment planned during the undergraduate clinical teaching.* **Materials and Methods:** *In this retrospective audit, clinical records from 108 dental students were collected and categorized into three cohorts; 2009/2014, 2010/2015, and 2011/2016. The number of direct restorations [amalgam restorations (AR) and composite restorations (CR)], fixed partial dental prostheses [conventional bridges (CB) and resin-bonded-bridges (RBB)] and single tooth indirect restorations (crowns and onlays) prescribed clinically by the undergraduate clinicians were retrieved.* **Results:** *Among the three cohorts, a trend was observed in the decrease of AR and the increase of CR prescribed by the dental students. The highest AR (9.6%) was performed by Cohort 2009/2014 and the highest CR (97.7%) was performed by Cohort 2011/2016. For fixed partial dental prostheses, RBB (67.6%) was the main treatment of choice, as compared to CB (32.4%). The cohort 2011/2016 prescribed the highest number of RBB as compared to earlier cohorts. In cases where teeth required cuspal protection, crowns (91.4%) dominated the treatment modality compared to onlays (8.6%).* **Conclusion:** *This study showed the dental undergraduates in UiTM endorsed the MID approach as recommended in the contemporary restorative dentistry.*

**Keywords:** *Clinical teaching, Minimal Intervention Dentistry, Undergraduate.*

## INTRODUCTION

Over the past century, the concept of 'extension for prevention', which was introduced by GV Black, was adopted for conventional dental caries management. This concept requires a geometric precision of the cavity preparation and removal of demineralized tooth structure as a pre-requisite (Mount, 2009). Mechanical interlock principles such as converge walls and dovetail 'S' shaped are important features for retention of the restoration. Thus, the GV Black technique leads to a large cavity preparation with removal of healthy tooth structure to achieve an adequate retention and resistance form of an amalgam restoration (AR) and to provide self-cleansing area for the restoration. With the development of the adhesive dentistry, dental materials, better understanding of the carious process, and the role of the fluoride ion in demineralization-remineralization cycle, there was an urgent need to re-evaluate the traditional cavity preparation (Mount and Hume, 1998).

In 1998, Mount & Hume introduced a new classification and management of carious lesion which implied the concept of Minimally Intervention Dentistry (MID). Their objective was to allow the clinicians to define the extent and complexity of a cavity, and at the same time advocated conservative approach to preserve the natural tooth structure (Walsh and Brostek, 2013). MID concept negates the mechanical retentive features in withstanding the restoration on the tooth. Wolff and Allen (2007) stated that MID concept not only applied to the types of material or treatment provided, but it also included the early detection of potential caries risk factor, minimized caries risk factor, remineralised incipient lesion, and with minimal tooth preparation.

Other than the direct restorative treatment, MID approach has become increasingly feasible in indirect restorations due to the introduction of the modern adhesive technique and the restorative materials. Mechanical retention of the tooth preparation for the fixed prostheses is less critical with the use of modern adhesive technique. Therefore, a more conservative approach of tooth preparation in prosthodontics including inlay, onlay, partial crown, and resin bonded bridge (RBB) is gaining their popularity today, as compared to the more aggressive tooth preparation in full coverage crown and conventional bridge (CB). Studies showed that onlays and RBBs presented with good overall survival rates (Hopp and Land, 2013; King *et al.*, 2017; Abuzar *et al.*, 2018). Therefore, whenever possible, MID approach should be introduced in undergraduate clinical teaching.

In Malaysia, the Faculty of Dentistry, Universiti Teknologi MARA (UiTM) has incorporated the MID caries classification and concept by Mount and Hume (1998) in the clinical and didactic curriculum since 2007. In 2013, the International Caries Classification and Management System (ICDAS), which is a simple and evidence-based system to detect and advocate the minimally intervention caries management was adopted by the school. Some studies showed that although dental practitioners have the knowledge of MID, their clinical attitude were still lacking especially on caries detection (Shah *et al.*, 2016; Rayapudi and Usha, 2018). Therefore, the incorporation of MID concept in clinical teaching among dental students should be evaluated. The objective of this study was to assess the implementation of MID approach in clinical teaching among the undergraduate dental students in UiTM.

## MATERIALS AND METHODS

Ethical clearance was obtained from the Research Ethics Committee of UiTM, Malaysia (600-IRMI-(5/1/6) REC/311/16). A retrospective search of the clinical records of 108 undergraduate dental students was performed. All the clinical data from the three cohorts were retrieved. The cohorts were 2009/2014 (n = 17), 2010/2015 (n = 40), and 2011/2016 (n = 51).

The clinical records comprised of the treatment provided during the three clinical-year training, and the following data were collected and tabulated:

1. The type of direct restorative treatment for carious teeth: amalgam restorations (AR) or composite resin restorations (CR).
2. The type of fixed partial dental prosthesis: resin-bonded bridges (RBB) or conventional bridges (CB)
3. The type of single tooth indirect restoration: full coverage crown or onlay.
4. The material selected for the single tooth indirect restoration: porcelain-fused to metal (PFM), all ceramic, or full metal.

CR, RBB, and onlay were identified as a MID approach due to their nature of treatment that conserved more healthy tooth structure. The descriptive analysis was used to analyse the data.

## RESULT

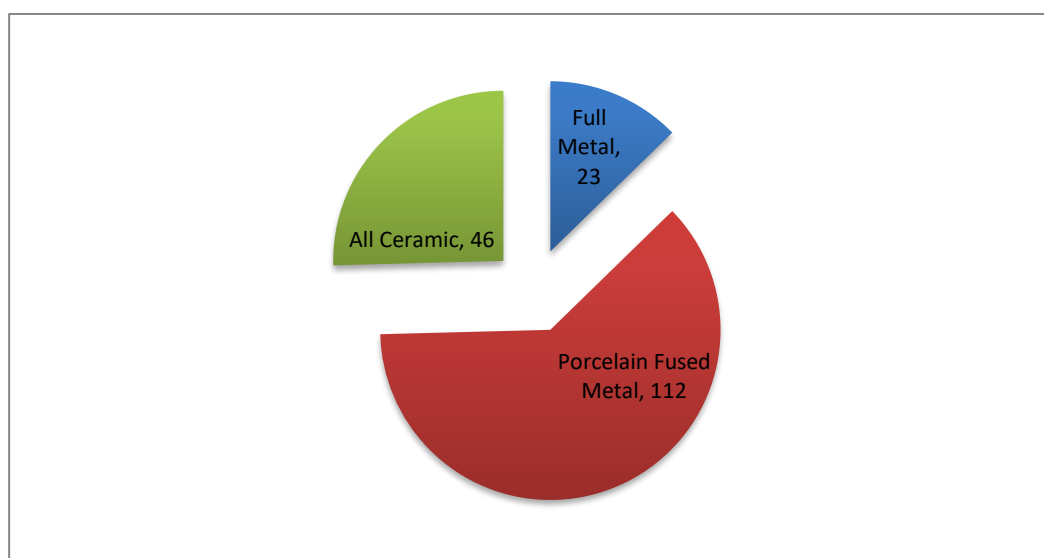
Among these, a total of 3,927 direct restorations were provided by the three cohorts with 5.3% (n = 207) of AR and 94.7% (n = 3720) of CR were prescribed as shown in Table 1. Generally, a decrease trend in AR and an increase of CR were observed with the highest AR (9.60%) provided by the earliest cohort (cohort 2009/2014), followed by cohort 2010/2015 (7%) and 2011/2016 (2.3%). While the highest CR (97.7%) were provided by the latest cohort (cohort 2011/2016) and the lowest was cohort 2009/2014 (90.4%). Based on the clinical records, 24 (42.6%) students did not perform AR throughout their clinical training.

**Table 1: Types of treatment treated by three cohorts of students.**

	<b>COHORT 1</b>	<b>COHORT 2</b>	<b>COHORT 3</b>	<b>TOTAL</b>
	<b>2009/2014</b>	<b>2010/2015</b>	<b>2011/2016</b>	<b>n (%)</b>
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	
<b>Amalgam restoration</b>	84 (9.60)	78 (6.96)	45 (2.33)	207 (5.27)
<b>Composite resins restoration</b>	792 (90.40)	1042 (93.04)	1886 (97.67)	3720 (94.73)
<b>Conventional bridge</b>	11 (29.73)	26 (40.63)	44 (29.53)	81 (32.40)
<b>Resin-bonded bridge</b>	26 (70.27)	38 (59.37)	105 (70.47)	169 (67.60)
<b>Crown</b>	29 (87.88)	70 (93.33)	82 (91.11)	181 (91.41)
<b>Onlay</b>	4 (12.12)	5 (6.67)	8 (8.89)	17 (8.59)

For fixed partial dental prostheses, 32.4% of CB and 67.6% of RBB were prescribed. There was an increase of RBB treatment from 59.4% (n = 38) by cohort 2010/2015 to 70.5% (n = 105) by Cohort 2011/2016. Whereas for single tooth indirect restoration, crown (91.4%) was still the main choice of treatment as compared to onlay (8.6%).

The material selection for crown as exhibited in Figure 1, PFM dominated the selection, followed by all ceramic and metal alloys.



**Figure 1: Material of choice for crown (n=181).**

## DISCUSSIONS

AR used to be the most frequently used direct restorative material in the past (Berthold, 2002). However, the use of AR faded out in some countries or schools and this trend can be seen in the present audit where the recent cohorts significantly showed downfall of the use of AR as the direct restorative material (Brennan and Spencer, 1993; Terada et al., 2014). More CR were prescribed by the undergraduate dental students and the number has increased throughout the years as in seen in Table 1. Kubo (2011) showed that at least 60% of CR survived more than 10 years when the material is properly used or applied. In addition, appropriate maintenance regime based on the MID concept could increase the longevity of CR, and this may improve the patients' general health condition. With these bases, a shift of the material used in direct restorative materials from AR to CR was observed in Faculty of Dentistry and Malaysia (Lim *et al.*, 2007). 42.6% of the students did not perform AR throughout their clinical training. Owing to the change to a more positive attitude towards the use of CR in most of the clinical situations, AR is no longer a clinical requirement for the dental undergraduates teaching. Nevertheless, for the teaching purpose, dental students were required to perform AR in preclinical training and passing the preclinical competency examination on AR remained mandatory.

In the present study, onlay was prescribed as a minimally invasive cuspal coverage prosthesis. However, the number of onlays provided by all the cohorts remained stable. Crown was still the most favorable cuspal coverage prosthesis prescribed across the cohorts. This could be due to crown was still a mandatory clinical requirement for the dental undergraduates teaching, whereas onlay was just an optional treatment modality. Hopp and Land (2013) reported that onlays have high survival rates up to 90% for 10 years and this finding is comparable to full coverage crown. Nevertheless, the number of onlays prescribed by undergraduate students were not comparable to the number of crowns. Therefore, there is a need to revise the clinical training for the dental undergraduates in the faculty.

The material selection of the crown will affect the design of the tooth preparation. Edelhoff and Sorensen (2002) have reported that the preparation for full ceramic crown required less aggressive preparation than PFM. Nonetheless, it was found in the present study that PFM was the material of choice by the dental undergraduates across the cohorts. Even though the PFM crown preparation is slightly more invasive than some other preparation designs, other considerations including the cost of

the treatment, the location of the tooth, the esthetics, and the preference of the patients played a part in the decision-making for the material selection. Regardless on the material used, the success rate of a crown would not be affected by the selected material (Motta *et al.*, 2007).

It is worth mentioning the fixed partial dental prostheses treatment is a compulsory clinical requirement for the dental students in UiTM. Despite a 30-40% of CB performed by all the 3 cohorts, there is still a trend showing that a more conservative options particularly RBB was chosen as the treatment of choice to replace the missing tooth. Studies have supported high survival rates for RBB (King *et al.*,2015; Abuzar *et al.*, 2018). Even though CB has been shown to have a higher success rate than RBB (Wyatt, 2007; Lim *et al.*,2022), it is important to reinforce that case selection, the cementation technique and material used, the principles of the design, and the effective laboratory communication are decisive factors for successful provision of RBBs (Lim *et al.*, 2014,2022)

There were some limitations found in the present study. Only three cohorts included in this study as compared to 5 cohorts which was initially planned, and this was due to the missing clinical record in the other two cohorts. This missing data has significantly reduced the number of samples in this audit, from 175 samples to 108 samples. This may potentially affect the result of this study. The safekeeping of the clinical record should be reinforced to avoid missing data that played a critical role in clinical audit and research.

## **CONCLUSION**

The prevalence of the implementation of MID concept in clinical teaching by the UiTM dental undergraduate curriculum were in-line with the current international trend of restorative dentistry.

## **DECLARATION OF FUNDING**

This research received no specific grant from any funding agency in the public, commercial, or not-for profit sectors

## **ACKNOWLEDGEMENTS**

We acknowledge Miss Sarah Afni Habibullah and Miss Siti Aishah Nujid from the Faculty of Dentistry, UiTM for the assistance in data collection and their contribution for this study.

## **CONFLICT OF INTEREST**

The author denies any conflicts of interest related to this study

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