

An Investigation of General Dental Practitioners’ Understanding and Perceptions of Minimally Invasive Dentistry.

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Abstract:

Objectives- This study investigated General Dental Practitioners’ (GDPs) understanding and perceptions of Minimally Invasive Dentistry (MID) with a questionnaire based survey looking at GDPs currently practicing in the UK.

Methods- Questionnaires were distributed to 170 GDPs. The questionnaire enquired about their: demographic details, postgraduate training in MID, number of years in clinical practice, working environment, perceptions of the methods and rationale for choice of restorative materials in clinical practice, and knowledge of MID.

Results-87.6% (n=149) questionnaires were completed and returned. The results showed that only 28% of the participants responded to all the basic MID knowledge questions correctly, illustrating a general lack of basic contemporary understanding of MID amongst the GDPs. Logistic regression analysis of the data revealed a true correlation between knowledge of MID and the perception of knowing the subject. The analysis also showed that there was a statistically significant association between the respondents' knowledge of MID, application of GV Black's concepts and changes in MID approach since qualification, ($p < 0.05$).

There were no significant relationships between the knowledge score on studied scenarios and country of education, working environment, caries risk assessment, effect of caries risk assessment on treatment planning, effect of caries risk assessment on choice of restorative material, dietary assessment or fluoride usage.

Conclusions- This study demonstrated that knowledge of MID amongst the cohort of UK GDPs in this study was generally poor. There is a need for further education in the field of MID.

Introduction

The practice of restorative dentistry has changed and evolved during recent decades due to development and advancement of adhesive restorative materials, increased knowledge about the caries process and improved education¹. Dental caries as a disease should be prevented, where possible, in the first instance and treated conservatively, with irreversible procedures as a last resort².

GV Black's traditional restorative approach included removal of the carious portion of the tooth and extension of the cavity for prevention into areas that were presumed likely to become carious³. The original GV Black concept of extension for prevention has been superseded by prevention of extension⁴. Today's focus in dentistry is more on prevention and detection of caries at an early stage. This has created the concept of Minimally Invasive Dentistry (MID)⁵. The term MID is a relatively new concept for the dental profession that suggests a change in the principles of operative dentistry, as it has been proven that the invasive approach is destructive, ineffective and maximally interventionist⁶. For the purpose of this study and questionnaire, MID was defined as:

“The contemporary ultraconservative operative management of cavitated lesions, requiring surgical intervention”⁷. Whilst this study reflects the balance between the ideal set of information to be collected from prospective participants and the risk of respondent fatigue and drop out, we recognise that there are alternative definitions.

The concept of Minimally Invasive Dentistry is based on caries risk assessment, prevention and control of further disease by reducing the cariogenic bacteria, early caries detection, remineralization of early carious lesions, repair of defective restorations rather than replacement, and minimum intervention and cavity design when restoration is necessary⁶.

This study investigated both the understanding and perceptions of MID amongst a cohort of UK General Dental Practitioners (GDPs) by reviewing: i) their overall knowledge of MID, ii) factors affecting their knowledge, iii) whether there was a similar understanding and perceptions of MID amongst the cohort and iv) the level of implication of the concept of MID.

Materials and Methods

This was an observational, cross-sectional investigation. The study design was based on a paper-based questionnaire, created specifically for this study. A total of 170 questionnaires were distributed amongst the participants of the British Dental Association (BDA) conference in May 2016 (163) and a Continuing Professional Development (CPD) course on Basic Life Support ⁷, in June 2016.

The research tool was a pre-tested, paper based questionnaire survey consisting of 19 questions. The questionnaire was pre-tested using twelve GDPs who were willing to complete it and give feedback relating to the questionnaire design, its content and its suitability; no changes were made to the questionnaire following this. The target population for this study was General Dental Practitioners currently practising in the UK. The inclusion criteria required participants to be dentists, registered with the General Dental Council (GDC) and currently practising in the UK. Non-GDC registrants, retired GDC dentists and practitioners on GDC specialist lists were excluded from the study.

Participants in this study were assured that their responses to the questionnaire would be treated with strict confidence and anonymised. As a service evaluation this study did not require ethics committee approval.

The questionnaire consisted of three sections. The first section enquired about the participants' demographic information, such as age, gender, information about qualification (country, university and year of qualification), years of clinical practice, number of days per week providing direct patient care, type of working environment and any previous postgraduate training in Minimally Invasive Dentistry.

The second section used Likert scale-based questions to evaluate the respondents' level of agreement with regards to: caries risk assessment, treatment planning and choice of material affected by caries risk assessment, dietary habits assessment, use of fluoride, application of GV Black's concept of extension for prevention and use of adhesive restorative materials and amalgam in clinical practice.

In the third section, the participant's knowledge of MID was evaluated via three scenario-based questions.

Statistical Analysis- All the questionnaires were reviewed and subsequently submitted for data entry on an Excel spreadsheet and descriptive analysis by using SPSS (IBM Statistics for Windows Version 22), statistics data editor. Comparisons between groups were carried out using Chi-Square Tests, Fisher's exact Test for categorical data and non-parametric Kruskal-Wallis Test for non-normally distributed continuous data. Spearman's correlation was used to examine the association between ordinal variables. Finally, in order to distinguish between the confounding predictor variables a Multivariate Logistic Regression analysis was performed to evaluate the contribution of these variables in the presence of the other significant predictors. A p-value of less than 0.05 was used for statistical significance.

Sample size calculations were based on the three scenario questions using the following formula: (<http://epitools.ausvet.com.au/content.php?page=SampleSize>)

$$n = (Z^2 \times P(1 - P))/e^2$$

In this study assuming an infinite population, we expected that 80% of the respondents would score the three scenario questions correctly. This figure was based on the expert panel opinion, who designed the questionnaire and a 95% confidence interval of +/- 7.5% desired precision was adopted. After the calculation, the required sample size number was 110.

Results

A total number of 149 (87.6%) dentists returned completed questionnaires from the 170 distributed.

The statistical data for the demographic characteristics of the respondents is shown in Table 1. The median year of qualification was 2014 and the median number of years in clinical dental practice was 1.39. This indicated that the majority of those completing the questionnaire were young, newly qualified GDPs.

Table 1. Demography of samples.

Although 58% reported having some knowledge of MID, only 11% reported knowing a great deal (See Figure 2). Regarding caries risk assessment, 70% (n=104) of the respondents answered that they always undertook a caries risk assessment. In response to the question about how often would caries risk assessment influence their treatment planning, only 48% of the participants answered always. The results on the question about the application of GV Black's extension for prevention concept, showed that 36% (53) never apply this concept.

Table 2. Knowledge and clinical practice.

The results for the participants' knowledge of the scenario based questions are presented in Table 3. Scenario 1a asked the participants if they would treat and restore an interproximal lesion with a radiographic radiolucency confined to enamel in a vital, asymptomatic, lower first molar in a low caries risk patient aged 25; only 44% (n=66) answered that they would never invasively treat this scenario. In scenario 1b, referring to the same patient as Scenario 1a but with a high caries risk, 69% answered they would keep the lesion under observation and would apply preventative measures. Following consultation with experts in restorative dentistry, the correct answers to the scenarios were outlined.

Scenario 2 asked the participants what they would do when restoring a vital, asymptomatic lower first molar where bitewing radiographs showed a radiolucent lesion well into the dentine and in close proximity to the pulp; 59% answered partial removal of soft dentine and restoration of the tooth, followed by re-opening after a period of time to excavate the remaining caries and re-restoration of the tooth.

Overall only 28% of respondents of our sample scored all three scenarios correctly.

Table 3. Knowledge of scenario based questions.

Bivariate analysis was conducted for the purpose of exploring the association between the knowledge score and potential predictor variables. (See Table 4).

Table 4. Comparison of knowledge score by groups.

Statistically significant relationships ($P = 0.011$) were found between knowledge of MID (how much do the participants think they know about the concept of Minimally Invasive Dentistry) and knowledge scores of scenario based questions. The respondents who answered the three scenario based questions correctly, conveyed that they knew about the concept of MID.

The results of the bivariate analysis in Table 5, showed that there were no statistically significant relationships between the knowledge scores of the scenario based questions and caries risk assessment, effect of caries risk assessment on treatment planning, caries risk assessment on choice of restorative material, assessment of patient's dietary habits, frequency of fluoride usage as a re-mineralizing agent, frequency of adhesive restorative material usage and frequency of amalgam usage. However, significant statistical associations ($P = 0.028$) were found between the application of GV Black's concept and knowledge scores of the scenario based questions, showing that none of

the respondents with full knowledge of MID, reported that they always apply GV Black's concepts.

Table 5. Comparison of knowledge score.

The result presented in Table 6, shows that, 28% (n=42) of respondents of our sample size scored all three of the scenario based questions correctly, 31% (n=46) of the respondents scored two scenario based questions correctly, 26% (n=38) scored one scenario based question correctly and 15% (n=23) of the respondents scored, none of the scenario based questions correctly.

Table 6. Knowledge score of scenario based questions.

Significant statistical associations (P=0.017) were found between the year of qualification and the knowledge scores of the scenario based questions The median year of qualification for those who correctly answered all three of the scenario based questions was 2015 (2013, 2015).

In order to distinguish between the confounding predictor variables a Multivariate Logistic Regression analysis was performed showing that the remaining significant predictor variables are knowledge of MID, application of GV Black's concepts and change in MID approach since qualification.

Discussion

The Minimally Invasive Dentistry concept for caries management is a new approach that is based on a medical model ⁷. This new concept prioritizes caries risk assessment, prevention and control of further disease by reducing the cariogenic bacteria, early caries detection, remineralization of early carious lesions, conservative cavity preparation, repair of defective restorations rather than replacement, and minimum surgical intervention and cavity designs when a restoration is necessary to increase tooth longevity. In modern dentistry the MID approach should be fully adopted by both the oral physician and the wider dental team in order to sustain the long term oral health of patients through preventative measures. The dental profession should educate patients to understand that caries is a lifestyle related disease and that patients

should take more responsibility for their oral health. All members of the dental team should be involved in providing preventative care ⁸.

Gaskin et al (2006) showed that knowledge of, attitude to and behaviour relating to Minimal Intervention Dentistry of federal service dentists was greater than that of civilian dentists, indicating a need for further teaching for civilian dentists. The results of Gaskin's study also indicated that younger dentists and dentists who had completed postgraduate training applied the MID philosophy more than older dentists ⁹. This indicates that age alone did not affect the knowledge score of the scenario based questions. The findings of this study do not concur with Gaskin's study, which reported that federal (military) dentists exhibited more knowledge of MID than their civilian counterparts; federal dentists re-mineralised non-cavitated lesions more and had a better overall understanding of the use of MID techniques ¹⁰. To our knowledge, there are no studies that have examined UK GPs' understanding of perceptions of MID. This current study demonstrated that less than one third of the participants had knowledge of MID.

The poor knowledge of MID demonstrated by this study might be due to deficiencies in knowledge, understanding or training. This is despite the fact that the majority of participants in this study were younger and more recently qualified. Dentists need to be provided with the necessary knowledge and training to be able to apply MID techniques as part of a modern approach to a population with ever changing needs and demands relating to oral health. Postgraduate and CPD training is of utmost importance to ensure that the older generation of dentists also have the required knowledge and confidence to apply the principles of MID in practice. Given the young age of the respondents to the questionnaire in this study, it would be interesting to further investigate the teaching of cariology, prevention and conservative dentistry at the undergraduate level and how this influences clinical practice.

Limitations of the study include: the risk of bias with the sampling and the inherent limitations of only using a questionnaire to elicit data.

In addition, the questionnaire did not ask the participants whether they had received any undergraduate training in MID. It would be interesting to know whether the year

of qualification and where the GDPs qualified influenced their MID training. Further investigation of variations between salaried dentists (e.g. community, hospital or military services) and self-employed GDPs may also be of interest.

Improvements in restorative materials , changes in clinical approaches and the development of better equipment to facilitate MID, make knowledge of this field of dentistry one that is constantly in need of update ¹¹.

Conclusions

This questionnaire based study demonstrated that knowledge of MID amongst UK GDPs is generally poor and they could benefit from further training. This study showed that obsolete methods of managing caries such as the GV Black concepts, are still in use today and only 40% of the participants with full knowledge of MID never apply GV Black's concepts in their clinical practice.

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