



Research Article

PRACTICES OF DENTAL SURGEONS IN MANAGEMENT OF DEEP CARIOUS LESION IN PERMANENT TEETH. FINDINGS FROM A SURVEY BASED STUDY

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ABSTRACT

Objective: The objective of the study was to assess the practices of the dental surgeons in management of deep carious lesion attending Dental Hospitals in Karachi. **Methods:** The present survey was carried out from July 2018 – January 2019. The study participants included were dental Practitioners from private and government dental colleges. The study was approved by the Ethical Board Review (ERB), Baqai Dental College. The sample size was calculated by taking 35% prevalence rate using open epi version 3.03a at 95% confidence level with 5% marginal error. Sample size calculated was 350. A pretested questionnaire was developed consisted of 14 questions in 3 sections. Data was analyzed for frequency and percentages in percentages, by using IBM SPSS Version 22. **Results:** A total of 350 dental practitioners took part in the survey and only 251 filled the questionnaires completely giving a response rate of 71.7%. Regarding academic qualifications, General dental practitioners 73.3% (n=184), postgraduates: FCPS 15.9% (n=40), MSc 8% (n=20), MDS 2.4% (n=6) and MCPS 0.4 % (n=1). 58.2% dental surgeons preferred complete carious removal when there is no pain and no risk of exposure and 22.3% preferred stepwise excavation. **Conclusion:** The present study concluded that majority of the Dental Surgeons opted complete caries removal with no pain and no risk of exposure than stepwise excavation. Partial caries removal was the least opted technique by the dental surgeons.

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INTRODUCTION

Dental caries is considered to be a global public health problem (Bagramian R *et al* 2009). It is considered as chronic, diet based infectious disease (Fontana M *et al* 2010) and when left untreated could have serious negative impact on oral and general health (Casamassimo P *et al* 2009, Kassebaum *et al* 2015). Dental surgeons frequently treat the deep caries which if removed completely may cause pulp exposure (Schwendicke F *et al* 2013). Various techniques are employed in order to preserve pulp vitality which includes stepwise excavation, indirect and direct pulp cap and pulpotomy (Kidd E 2004, Kidd E *et al* 2008). The traditional restorative approach was elimination of all soft carious dentin prior to restoration to prevent further cariogenic activity and provide a well-mineralized base for restoration (Kidd E *et al* 2008, Thompson V *et al* 2008).

However, this biological approach was questionable because structure of the tooth and pulp could be severely affected (Thompson V *et al* 2008, Orhan *et al* 2010). The literature review recommended different operative procedures for deep caries removal (Ricketts D *et al* 2006).

Removal of deep caries performed in multiple visits from weeks to months is termed as stepwise excavation technique (Ricketts D *et al* 2006). Partial caries is when there is incomplete removal of caries and leaving remaining caries under the permanent restoration (Ricketts D *et al* 2013). Stepwise excavation is done with re-entry including final total carious dentine removal (Bjorndal L *et al* 1997) and indirect pulp cap is done without re-entry, leaving carious dentine under the permanent restoration (Fitzgerald M *et al* 1991). This need of re-entry has recently been challenged (Kidd E 2004, Maltz M *et al* 2011). Worldwide most of the Dental surgeons in their daily practices recommended stepwise caries excavation that would help in decrease the number of pulp exposures and enhance the possibilities for the treatment of deep caries. (Oen K *et al* 2007, Weber C *et al* 2011).

Although there is a very limited data available on how dental surgeons treat deep caries, it can be assumed that complete elimination of all affected biomass is common (Oen K *et al* 2007, Weber C *et al* 2011) as generations of dental surgeons have been trained in complete removal of deep caries. However, there is still an increasing number of clinical trials (Leksell E *et al*, Lula E *et al* 2009 and Bjorndal L *et al* 2010) that reported few no of pulpal exposures and complications when deep caries lesion was not completely removed, but

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partially remained under a restoration. These remaining microbes are deprived of nutrition which leads to alteration of the normal flora with subsequent caries arrest and re-hardening of formerly soft dentin. (Bjorndal L 1997, Maltz M *et al* 2002). A Cochrane review (Ricketts D *et al* 2006) showed that only two clinical trials compared stepwise excavation and complete excavation with respect to pulp exposure. (Magnusson *et al* 1977) reported that only 15% of the pulps were exposed compared with 53% after complete excavation. The rationale of the study was to assess the frequency of the dental surgeons in management deep caries. The objective of the study was to assess the practices of the dental surgeons in management of deep carious lesion attending Dental Hospitals in Karachi.

MATERIALS AND METHODS

The present survey was carried out from July 2018 – January 2019. The study participants included were dental Practitioners from private and government dental colleges. The study was approved by the Ethical Board Review (ERB), Baqai Dental College. The sample size was calculated by taking 35% prevalence rate using open epi version 3.03a at 95% confidence level with 5% marginal error. Sample size calculated was 350. A pretested questionnaire (Schwendicke F *et al* 2013, Oen K *et al* 2007, Weber *et al* 2011, Alnahwi T *et al* 2018 and Stangvaltaite L *et al* 2013) was developed which consisted of 14 questions in 3 sections. Section 1 was about the demographic data of the participants including gender and academic qualifications. Section 2 comprised of 4 different clinical cases about techniques of caries removal in a permanent molar with or without pain, no risk exposure and risk of exposure, pain on provocation with no risk of exposure and with no pain on provocation with risk of exposure. Third section was about concerns of dental practitioners about risk of exposure, risk of post-operative pain, risk of treatment failure, risk of progression of caries and longevity of the restoration. The fourth section included assessment of two years survival rates (>80%, 50-80%, 20-50% and <20%).

Data was collected by distributing the questionnaire to the concerned Dental College and were asked to fill in the questionnaires completely in a given time period. The filled questionnaires will then be collected on the same day. Data was analyzed for frequency and percentages in percentages, by using IBM SPSS Version 22.

RESULTS

A total of 350 dental practitioners took part in the survey and only 251 filled the questionnaires completely giving a response rate of 71.7%. Participants included males 36.7% (n=92), Female 63.3% (n=159) dental practitioners. Regarding academic qualifications, General dental practitioners 73.3% (n=184), postgraduates: FCPS 15.9% (n=40), MSc 8% (n=20), MDS 2.4% (n=6) and MCPS 0.4% (n=1).

Table 1 Demographic profile of the participants

Gender	n (%)
Male	92(36.7%)
Female	159(63.3%)
Academic Qualification	
General Dental Practitioners (GDP)	184(73.3%)
Postgraduates	
FCPS	40(15.9%)
MSc	20(8%)
MDS	6(2.4%)
MCPS	1(0.4%)

Table 1 58.2% dental surgeons preferred complete carious removal when there is no pain and no risk of exposure and 22.3% preferred stepwise excavation technique when there is no pain but risk of exposure is present in molars with class 1 deep caries. 32.3% performed stepwise excavation and 29.1% of them preferred partial caries removal in permanent molars with class 1 carious lesion close to the pulp with no pain but there is risk of exposure. 47.0% of dental practitioners had been doing complete caries removal and in permanent molars with class 1 caries lesion close to the pulp with no pain on provocation and no risk of Exposure. 37.5% of the Dental practitioners preferred stepwise excavation in permanent molar with no pain but there is risk of exposure. Table 2

Table 2 Concern of dental practitioners about different techniques of caries removal in different clinical situations

Questions	Options			
	Complete Caries Removal	Partial Caries Removal	Root Canal Treatment	Stepwise Excavation
A permanent molar with class 1 deep caries (close to pulp) with no pain and no risk of exposure	146(58.2)	30(12.0)	19(7.6)	56(22.3)
A permanent molar with class 1 deep caries (close to pulp) with no pain BUT there is risk of exposure	33(13.1)	73(29.1)	64(25.5)	81(32.3)
A permanent molar with class 1 caries close to the pulp) with pain on provocation and no risk of exposure	118(47.0)	56(22.3)	34(13.5)	43(17.1)
A permanent molar with class 1 deep caries (close to the pulp) with no pain on provocation but there is risk of exposure	34(13.5)	38(15.1)	85(33.9)	94(37.5)

When asked about the criteria they use to assess sufficient caries removal, as mentioned 65.3 % dentist went on to select hardness while 57.0% selected colour, 14.3% chose moisture , 23.9% die staining and 5.6 % weren't sure about the criteria. Figure 1 Regarding the major points of concern for complete caries removal are as follows; 75.3% dental practitioners were concerned about risk of exposure, while 41.4% were concerned about risk of post-operative pain, while 28.7% were concerned about risk of treatment failure , 21.1% for risk of progression of caries , and 24.7% showed there concern for longevity of the restoration. In a given case of partial caries removal, 58.2% dentists selected risk of progression of caries, 41.8 % were concerned about risk of treatment failure, 41.0 % about risk of post-operative pain and 26.7% about risk of exposure and 18.3% dental practitioners were worried about longevity of the restoration. Table 3

Dental practitioners were also asked to share their own experience about the success rate after 2 years of caries removal with step-wise caries excavation and complete and partial caries removal techniques. 57.0% dentists had experienced more than 80% success rate for complete caries removal whereas 59.4% dentists had 50-80% success when they did step-wise excavation technique. Also 43.0% dentists

had experienced success rate between 50-80% when used partial caries removal technique. Table 4

Table 3 Major concerns of dental practitioners about different techniques of caries removal

	Risk of exposure		Risk of post operative pain		Risk of treatment failure		Risk of progression of caries		Longevity of the restoration	
	yes	no	yes	no	yes	no	yes	no	yes	no
In case of complete caries removal, what is/are your major point/s of concern?(you can choose more than one option)	189(75.3)	61(24.3)	104(41.4)	147(58.6)	72(28.7)	179(71.3)	53(21.1)	198(78.9)	62(24.7)	189(75.3)
In case of partial caries removal what is/are your major point/s of concern? (you can choose more than one option)	67(26.7)	184(73.3)	103(41.0)	148(59.0)	105(41.8)	146(58.2)	146(58.2)	105(41.8)	46(18.3)	205(81.7)

Table 4 Percentage of dental practitioners who assessed two years survival rates

Questions	Options			
	> 80%	50-80%	20-50%	<20%
What success rate do you expect of the following treatment options after 2 years? complete caries removal	143(57.0)	94(37.5)	13(5.2)	1(0.4)
Stepwise caries excavation technique	59(23.5)	149(59.4)	40(15.9)	3(1.2)
Partial caries removal technique	33(13.1)	108(43.0)	82(32.7)	28(11.2)

In contrast, Gallardo I *et al* 2018 in a study reported dissimilar results that most of the respondents (81.5%) considered complete removal of all carious dentine in patient with no pain but with a risk of pulp exposure. A study done by Alnahwi T *et al* 2018 in Saudi Arabia also reported dissimilar results. Weber *et al* 16 in a study reported that in Southern Brazil 71.1% of the dental surgeons were in a favour of removing caries completely and 17.6% chose stepwise excavation. Bjorndal *et al* 2010 in a study reported that stepwise excavation had a significant higher proportion of success of 74.1% as compared to complete excavation.

International Caries Consensus Collaboration (ICCC) group recommended a criteria to assess dentin hardness and to determine the clinical consequences of the disease and how far should be removal of carious dentine done (Schwendicke F *et al* 2013). Regarding the criteria followed to confirm that dental caries had been completely removed, Gallardo I *et al* 2018 in a study reported that 98% of the dental surgeons chose the criteria of dentin hardness, 65% of the dental surgeons used the criteria that the floor of the cavity feels hard and 3.2% chose the criteria of soft dentin. Schwendicke F *et al* 2013 in a study reported that 76% of the dental practitioners used the criterion of hardness, 21% chose leathery and 1% chose soft dentin. Koopaei M *et al* 2017 in a study reported that 90% of the General Dentists, 88% endodontists and 72% of the pediatric dentists chose the criterion of floor of the cavity feels hard. The present study reported that 65.3% of the dental practitioners chose hardness as criteria to assess removal of deep carious lesion.

Regarding the dentin colour, Gallardo I *et al* 2018 in a study reported that 49.6% of the dental practitioners did not value the colour of the dentin during caries removal, 65% did not value the moisture of the dentin. Koopaei M *et al* 2017 in a study reported that 61% of the General dentists, 56% of Pedodontists and 55% of endodontists did not value colour. 51% of the endodontists, 40% pediatric dentists and 36% of the General Dentists did not influence moisture.

Schwendicke F *et al* 2013 in a study reported that 43% of the dental practitioners did not value colour and 12% did not value moisture. The present study reported that 43% of the dental practitioners did not value colour and 85.7% did not value moisture.

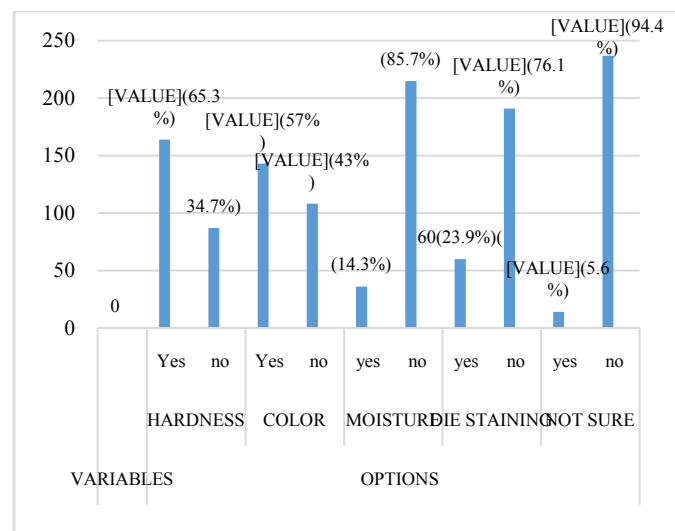


Figure 1 criteria to assess caries removal in deep carious lesion

DISCUSSION

The present study results reported that 251 Dental Practitioners participated with a response rate of 71.7%. The treatment of deep carious lesion progressing to the pulp is considered a challenge for the dental practitioners as there could be a high risk of accidental pulp exposure. (Ricketts D *et al* 2006, Leksell E *et al* 1996, Bjorndal *et al* 2010 and Magnusson *et al* 1977). When asked about the knowledge and the factors regarding excavation strategy, the present study reported that 58.2% of the dental practitioners preferred complete caries removal than stepwise excavation. Stangvaltaite *et al* 2013 in a study reported similar results.

About the use of dye solutions, although staining with caries detector dyes lack sufficient clinical validation (Schwendicke F *et al* 2014), 45% used the staining with caries indicator to assess carious tissue removal. This percentage is higher than those found in other European countries (Schwendicke F 2017) and in USA (Koopaei M *et al* 2017). The present study reported that 23.9% of the dental practitioners used dye staining to assess caries removal.

Preferences of dental surgeons for using various techniques varies differently, Schwendicke F *et al* 2013 surveyed amongst German dentists, 50% of them reported that they would prefer complete caries removal even with a risk of pulp exposure. Another study done by Oen *et al* 2007 showed that 62% of the dental surgeons from USA preferred to remove caries completely even with a risk of exposure. Alnahwi T *et al* 2018 in a study reported that 8.1%-12.4% of dentists removed complete caries even with a risk of exposure, while study done amongst Norwegian Dentists used stepwise excavation frequently (Stangvaltaite L *et al* 2013). The present study reported that 75.3% of the dentists removed caries completely with risk of exposure.

Bjorndal L *et al* 2010 in a study reported that stepwise excavation was opted by 74% of dentists than complete caries removal after 1 year follow up. Maltz *et al* 2012 reported higher success rate of partial caries removal than step wise excavation after 18 months of follow up. Alnahwi TH *et al* 2018 in a study reported that small percentage of dentists practiced partial caries removal which is similar to the study conducted by Weber *et al* 2011. The present study reported that 57% of the dentists opted complete caries removal than stepwise excavation after two years of follow up.

Limitations

The present study had limitations that majority of the dental practitioners failed to participate in the study. The second limitation was that majority of them practiced complete removal of carious dentin as compared to stepwise excavation as they had fear of leaving residual caries which can progress and involve pulp tissue.

CONCLUSION

The present study concluded that majority of the Dental Surgeons opted complete caries removal with no pain and no risk of exposure than stepwise excavation. Partial caries removal was the least opted technique by the dental surgeons.

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