ORIGINAL ARTICLE

COMPARISON OF IATROGENIC PROXIMAL SURFACE DAMAGE DURING ABUTMENT PREPARATION BY DIFFERENT GROUPS OF PRACTITIONERS

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ABSTRACT

To find out and compare the iatrogenic damage of proximal surfaces adjacent to tooth preparation by different groups of practitioners

120 casts from different laboratories of Peshawar were examined under naked eye and magnifying glass by two different examiners from September 2017 to October 2018. Casts having one tooth anteriorly or posteriorly, undamaged, prepared for fixed partial dentures or crowns and cases with complete laboratory request form were included in the study. Data was recorded on pre-structured Proforma and was analyzed by using SPSS (version 22)

Out of 71% damage of proximal surfaces, 39% was visible by magnifying glass and 11% by naked eye. Highest degree, type and extent of damage was recorded for house officers. There was a significant difference regarding study parameters between all the different groups of practitioners (p=0.000).

Maximum damage during preparation is done by House officers due to lack of their experiences.

Key words: *Abutment preparation, damage, practice experiences*

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INTRODUCTION

Preservation of oral soft and hard tissue is the basic principal for all procedures carried out intra-orally. However at times this might prove difficult during many occlusal-proximal cavity preparations, orthodontic stripping and especially for the abutment preparations for crowns and fixed dental prostheses [1-6]. This unwanted enamel nicking may compromise the health of the adjacent affected tooth if left untreated, which can lead to caries, sensitivity to hot and cold sensation and in more severe cases to periodontal health changes [7]. Keeping in mind the caries susceptibility of posterior teeth at contact point, it can be assumed that nicking of the adjacent tooth may increase the chances of caries more at this point because of plaque accumulation[8].

Literature reveals that most of the documented studies are about proximal cavity preparation and orthodontic stripping, however, there is little data available for iatrogenic tooth damage during tooth preparation. However the fewer studies available reveals high incidence of damage[9] . Crown and fixed dental prostheses have a high chance of nicking the adjacent tooth damage[10]. A study has observed 100 % damage to such teeth in tooth preparation exercise[9]. They also observed that such incidence of tooth nicking was more in maxillary arch and more in posterior teeth as compared to anterior teeth. Another study conducted by Abdulwahid has a similar finding of incidence and observed 98% tooth damage of adjacent teeth,[10].

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Despite the advocacy of using matrix bands, however, such preventive measures are seldom adopted[11,12]. A more recent study carried out in Karachi (Pakistan) also observed a high frequency of 78% of such damage and concluded that middle third of the proximal surface of adjacent tooth is more prone to damage during tooth preparation[13].

Practical experience has more relevance to this type of practices. For example it has been observed that students are more likely to touch the adjacent teeth despite of being warned to take care of this issue. Smith observed this as a more common practice[14]. A study has observed more significant association between clinical experience of the practitioners and proximal damage of the adjacent teeth[13].

To decrease the future financial burden and time of patient for such unwanted and undesirable consequences of tooth damage during such procedures it is imperative to collect the data in this regard and present the current clinical scenario of practices by different categories of practitioners. The aim of this study was to assess the proximal damage in terms of type, location and extent.

MATERIALS AND METHODS

This cross sectional study was conducted in Peshawar, from September 2017 to October 2018. Practitioners were grouped in four categories based on their experience. These included house officers, graduate dental practitioners, post graduate residents and prosthodontists. A total of 120 casts were included in the study which fulfilled the inclusion criteria. These casts were selected from teaching hospital and private dental laboratories as non probability convenience sampling technique.

Those casts were included for with at least one tooth present anteriorly or posteriorly with no caries or restoration at adjacent proximal surfaces. Adjacent teeth having proximal caries or restorations were excluded. Mishandled casts or cast with manipulative defects such as having porosities were also excluded. Casts were examined with naked eye and magnifying glass. It was made sure that no manipulation or changes were made to the cast to ascertain that any damage to adjacent teeth was due to accidental touching with the burs, to precisely measure the defects. Size of defects was measured with digital Vernier caliper, Following Moopnar and Faulkner[(6)]criteria proximal surfaces of teeth were divided in three areas i.e. occlusal, middle and cervical thirds. Extent of damage was grouped as no damage, less than 50% and more than this. The data was recorded on pre-structured Proforma regarding practitioners groups, area, location and extent of damage. The data regarding dental groups were obtained from the record of sent to the lab by the practitioners laboratory request form.

The data was analyzed by SPSS (version 23). Frequencies and percentages were calculated for various groups of practitioners and cases done by each group and damage. Chi square test was applied for inter group comparison for extent of damage of adjacent proximal surfaces at 95% Confidence level and p less than 0.05.

RESULTS

A total of 120 included casts were assessed by two different prosthodontists for iatrogenic damage of adjacent teeth during tooth preparation for crown and bridge work. These casts related to the overall work done by practitioners with specific tagging of the cast to relate it to the relevant practitioner.

TABLE 1: PERCENTAGES OF CASES AND DEGREE OF DAMAGES

Practitioners	degree of damage			
	no damage	visible by magnifying glass	slight damage visible to naked eye	obvious damage
House Officer (27%)	2	8	7	15
	5.7%	17.0%	53.8%	60.0%
General Practitioners (45%)	14	16	5	10
	40.0%	34.0%	38.5%	40.0%
Postgraduate Students (PGs) (14%)	3	13	1	0
	8.6%	27.7%	7.7%	.0%
Specialist (21%)	16	10	0	0
	45.7%	21.3%	.0%	.0%
Total	34	47	13	25
	100.0%	100.0%	100.0%	100.0%

(p= 0.000)

TABLE 2: TYPE OF DAMAGE

academic year	type of damage			
	Abrasion	Nicks	both	no damage
House Officer	18	7	5	2
	29.0%	46.7%	50.0%	6.1%
GPs	20	8	5	12
	32.3%	53.3%	50.0%	36.4%
PGs	14	0	0	3
	22.6%	.0%	.0%	9.1%
Specialist	10	0	0	16
	16.1%	.0%	.0%	48.5%
Total	62(52%)	15(13%)	10(8%)	34(28%)
	100.0%	100.0%	100.0%	100.0%

(p=0.000)
GPs=General Practitioners
PGs= Postgraduate Students

TABLE 3: EXTENT OF DAMAGE

academic year	extent of damage area			Total
	no damage	less than 50%	more than 50%	
House Officer	2	17	13	32
	5.9%	27.0%	56.5%	26.7%
GPs	13	22	10	45
	38.2%	34.9%	43.5%	37.5%
PGs	3	14	0	17
	8.8%	22.2%	.0%	14.2%
Specialist	16	10	0	26
	47.1%	15.9%	.0%	21.7%
Total	34	63	23	120
	100.0%	100.0%	100.0%	100.0%

(p=0.000)
PGs=Postgraduate Students
GPs= General Practitioners

The degree of damage made to adjacent tooth by various cadres is highlighted in table-1. Highest numbers of cases performed were by general practitioners (GPs) (37 %) followed by house officers (26.7%), specialists (21%) and postgraduate students(PGs) (14%) as shown in table1. %). Majority of these cases included fixed partial denture (43%) while rest of them were crowns (56%). Degree of damage that was "visible by magnifying glass" is observed as highly frequent i.e. 47 (39.2%) in comparison to "slight damage visible to naked eye" which is observed as least frequent as 13 (10.8). Study of the casts revealed that (71%) of cases had damaged surfaces of adjacent teeth while rest of them had no damaged surfaces. Obvious damage was made by house officers 15(60%) while mostly specialist showed no damage 16(45.7%) to adjacent tooth while preparing tooth for prosthesis. There was a significant difference among the various groups regarding the degree of damage (p=0.000).

The most frequent type of damage was abrasion 62(52%) followed by nicks15 (12%) as shown in table-2. When type of damage of adjacent tooth was analyzed it was revealed that abrasion were made by HO as 18 (29.0 %), general dental practitioners 20 (32.3 %) and PGs 14 (22%). Interestingly specialist too contributed in making abrasions of adjacent tooth 10 (16%). Nicks and combinations (Nicks and Abrasions) was made in higher percentages by HO 7 (46.7 %), 5 (50 %) and general practitioners 8 (53.3 %), 5 (50.0 %) respectively.

TABLE 4: AREA OF DAMAGE

academic year	area of damage						Total
	occlusal third	middle third	cervical third	buccal third	lingual side	no damage	
House Officer	4	10	11	3	2	2	32
	44.4%	41.7%	28.9%	50.0%	22.2%	5.9%	26.7%
GPs	4	10	10	3	5	13	45
	44.4%	41.7%	26.3%	50.0%	55.6%	38.2%	37.5%
PGs	1	4	9	0	0	3	17
	11.1%	16.7%	23.7%	.0%	.0%	8.8%	14.2%
Specialist	0	0	8	0	2	16	26
	.0%	.0%	21.1%	.0%	22.2%	47.1%	21.7%
Total	9	24	38	6	9	34	120
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(p=0.002)

Such variations were highly significant with p value (0.000) table 2.

Table-3 shows extent of the damage of the adjacent tooth, "more than 50 %" made highly by HO 13 (56.5 %) while "less than 50 % damage" was contributed highly by dentist 22 (34.9 %) and "no damage" was highly observed in specialist 16(47.1%) followed by GPs 13 (38.2%). Such reported differences were statically significant (0.000).

Table-4 explains the areas of the adjacent tooth damaged by different categories. The HO damaged buccal third 3 (50 %) whereas Dentist made lingual side damage 5(55.6%) more frequently and TMO's damaged cervical third 9(23.7%) significantly higher of the adjacent tooth. Specialists were mostly found in "no damage" criteria of adjacent tooth 16(47.1%), but 9(22.2%) Specialists do contributed to cause damage to lingual side o f adjacent tooth. Again differences among different categories were significantly higher with the P-value (0.000).

DISCUSSION

Keeping in mind that all procedures should cause no harm to oral soft and hard structures, other than necessary, it is obligatory from ethical point of view that practitioners should cause no damage to neighboring teeth during abutment preparation for fixed prosthodontics. The current study aimed at this important aspect of dental clinical procedure which provides prevalence of adjacent proximal surfaces damage.

Clinical experience of practitioners is important factor to avoid nicking the approximal surfaces as the manual dexterity and control of instruments increase with time [17]. This suggests that interns or house officers might do more approximal harm than experienced practitioners like consultants with postgraduate experience. Almost 66% of cases recorded damage to adjacent teeth surfaces of varying degrees. This finding in our study is accordance with observations of other studies [6, 10, 18], in which the observed damage was as high as 73%. This difference in observation may account for the more clinical experience of consultant prosthodontics over time. However a study observed an opposite finding regarding this issue in which more experienced practitioners were found to have caused more damage to neighboring teeth surfaces [19]. Interestingly this finding is still high despite the fact that literature is full of evidences to adopt measures to avoid happening of this kind [20].

The pattern of damage may change in form. Touching of approximal surfaces with high speed air turbines is at times inevitable and may vary in extent, depth and type. Most frequently damaged areas are middle and cervical third of proximal surfaces. Our study found that cervical area (32%) was the most frequently damaged area. However damage at multiple sites recorded was high as 50% which is somehow in agreement with study carried out by Moopnar and Faulkner 20% [6]. The most frequent type of damage observed in this study was abrasion of adjacent tooth. It counted for almost 50% of cases. Similar finding was found in earlier study by Long and Smith[9] However another study found nicks and grooves to be more prevalent type of damage[10] . This can be attributed to the control of instruments more effectively during clinical procedures.

The extent of damage is variable. Sometimes damage may go un-noticed being so small to be seen with the naked eyes. However to avoid perpetuating of such damage to future caries, care should be taken

to make sure for polishing it and make it smooth. In such circumstances dental loupes or magnifying glass may be helpful to rule out such minor damage. Our study found that 39% of cases were those that were visible with the aid of magnifying glass. Studies have advocated use of such magnification devices to improve the relevant outcome [20] and better management of patients. Minor scratches can be dealt with polishing of the affected surfaces, and more treatment options can be considered for more affected surfaces.

Although this study focused on the damaging effects of clinical procedures like tooth preparation on adjacent teeth, however, it was noticed that almost 29% of cases observed no such damage at all. This can be attributed to the clinical skills of the practitioners. One of the limitations of this study was that affected sites were not followed up for any consequences.

CONCLUSION

Within the limitation of this study it can be concluded that our study showed maximum contribution to damage of adjacent tooth during tooth preparation for prostheses (crown or Bridge) by house officers whereas Specialists were playing minimum role in causing adjacent tooth damage. Dentists and post graduate students played interchangeably different levels of roles in causing tooth damage of adjacent tooth.

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