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Amount of Tooth Reduction in Fixed Partial Denture

Tasleem Abitha S[1], Dhanraj Ganapathy[2], Geo Mani[3]

[1]Research Associate, Dental Research Cell, [2]H.O.D and Professor, Department of Prosthodontics, [3]Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Saveetha Dental College and Hospitals, , Saveetha Institute Of Medical and Technical Science (SIMATS) Saveetha University, Chennai 77

Abstract

Fixed Partial Denture is a restoration that is used or otherwise securely retained to natural teeth, tooth roots and dental implants abutments to furnish the primary support for the prosthesis. Tooth preparation for fixed dental prosthesis is a common procedure in clinical practice among general dentists should perform correctly. The aim of this present study was to evaluate the trends in the amount of tooth structure reduction in fixed partial denture done by dental students.Three thirteen patients were examined for the study. Each patient's prepared teeth were noted under certain parameters. Data collection was taken from DIAS, a dental archive. Three thirteen patients' details of fixed partial denture were taken and the collected datas statistically analysed by a software SPSS. The Parameters observed were over reduction,under reduction, rough surfaces ,pulpal damage and finish lines..Over reduction during tooth preparation was the most common error followed by pulpal damage ,rough surfaces and under reduction.However there was no statistically significant differences between undergraduate and postgraduate students with respect to all the above mentioned parameters.

Keywords: *Fixed partial denture, Tooth preparation, Pulpal damage, Undercuts, Finish line.*

Introduction

Tooth preparation for fixed partial prosthesis is a common procedure in clinical practice, which all general dentists should perform correctly [1]. However, it could be difficult to always obtain a predictable result, especially for dental students or young doctors, they could make mistakes in their learning curve leading to inadequate results [2,3]. Unlike other human substances, dental tissue doesn't have regenerative capacity [4]. Therefore the removal of dental biological material should be planned and executed with maximum attention [5].

Corresponding Author
Dhanraj Ganapathy
Department of Prosthodontics
Saveetha Dental College and Hospitals,
Saveetha Institute Of Medical and Technical Science (SIMATS) Saveetha University, Chennai 77
Tamil Nadu, India, Email : dhanraj@saveetha.com
Telephone number : +91 98415 04523

The purpose of a fixed prosthodontic therapy may vary from the restoration of a single tooth to the rehabilitation of the complete occlusion [6]. A single tooth can be fully restored both functionally and aesthetically [7]. A missing tooth can be replaced by a fixed prosthesis, increasing patient masticatory competence and maintaining or improving dental arches function, often elevating a patient's self-image [8,9]. Tooth preparation should have specific geometrical characteristics to provide necessary retention and resistance to the vertical and lateral forces acting on the restoration [10]. The most important element of retention is the presence of two opposing vertical surfaces [11]. The axial walls of the preparation should taper slightly to allow the cementation of the artificial crown. The more parallel are the axial walls the greater is the retention [12]. However, it is impossible to obtain parallel surfaces without producing undercuts.The longer is the preparation the greater is the retention [13]. Teeth with larger diameter need a greater length to prevent dislodgement [14]. Proper occlusal and axial reductions are essentials to provide enough space, allowing a good functional morphology and structural durability [15]. Moreover, no more than

necessary dental tissues should be removed in order not to jeopardize tooth structure and retention of the restoration [16]. However, it could be difficult to obtain always predictable results, especially for dental students or young doctors, they could make mistakes in their learning curve leading to inadequate results. The various factors to be considered while tooth preparation depends on the type of restoration, type of luting cement used, optimal aesthetic requirement, retention and resistance form, position of the margins, and tooth alignment [17]. In-depth knowledge and an understanding of the various criteria is a prerequisite to the development of optimum tooth preparation. This enables a clinician to find a best combination of compromises among the applicable biological, mechanical, and esthetic considerations.

Tooth preparation produces depth-orientation grooves on the vestibular and incisal surfaces, with a round-end tapered diamond as reference for removing tooth structure [18].The occlusal reduction is performed by removing the tooth portions between the orientation groves with the same bur. After the functional cusp bevel is made, a no. 17L bur is used to smooth the planes of the occlusal reduction [19]. Three vertical groves are performed in the vestibular surface with a flat-end tapered diamond. All tissues between the depth-orientation channels are removed. The proximal reduction is performed with a needle narrow diamond, avoiding damage to the adjacent teeth. The lingual and proximal surfaces are then cut with a torpedo diamond. Different finishing lines may be created. A chamfer is considered the preferred choice for veneer metal restoration. Several Authors have shown how this finishing line exhibits the least stress, with the lowest failure rates. A shoulder finishing line is used for all-ceramic crowns, minimizing stresses with its width and preventing the possibility of the porcelain fracture [20]. However, it is the more destructive finishing line for the tooth tissues. On the other hand, the knife-edge is the more conservative finishing line, but it may result in an over-contoured restoration [21,22]. The most demanding challenges for prosthodontists are the control of depth and direction of tissue removal. Hence, the aim of this present study was to evaluate the trends in the amount of tooth structure reduction in fixed partial dentures done by dental students.

Materials and Methods

This study is a retrospective cross sectional study. This study was conducted among patients who have undergone fixed partial denture procedure in Saveetha Dental hospital, chennai. It included demographic data of the patients of each individual.

Data Collection - The data collection was done by reviewing the patients record for tooth preparations done for fixed partial dentures and analysed the data of 86000 patients between June 2019 and March 2020. The fixed partial denture data collected was classified according to age, gender, pulpal damage, rough surface, over reduction ,under reduction and year of graduation .

A customised examination was used to collect data and a specific table for collected data records was prepared. All the general examination and the clinical examination of patients are correlated and the data relevant to the topic and collected and tabulated. The data was then analysed using spss software, inference of the study is given below.

Results and Discussion

Pulpal damage during tooth preparation

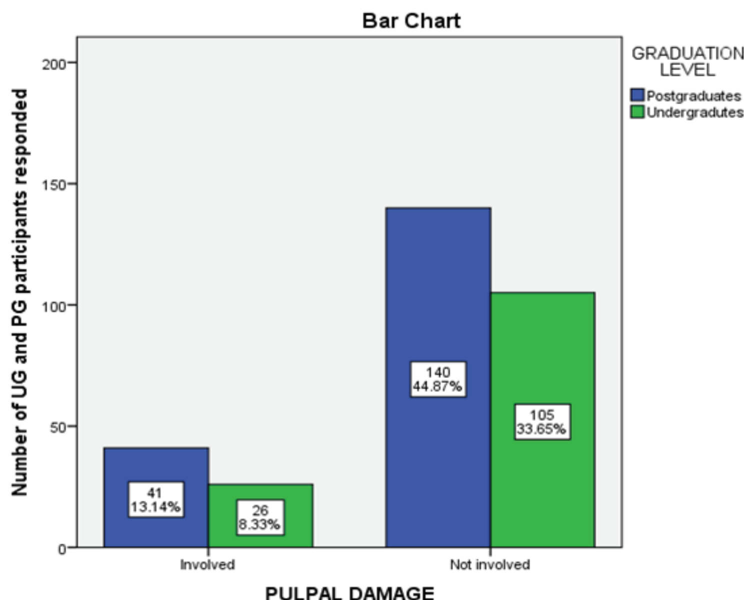

Figure 1 - The bar graph shows the association of UG and PG students with respect to pulpal damage to the tooth and X axis represents frequency of pulpal damage and Y axis represents the number of UG and PG participants responded (Blue - Postgraduates) and (Green - Undergraduates). 140 postgraduates and 106 undergraduates perceived to have no involvement of pulp during tooth preparation. Chi square test was done P value was found to be 0.552 (p value > 0.05, statistically not significant).

Rough surfaces during tooth preparation

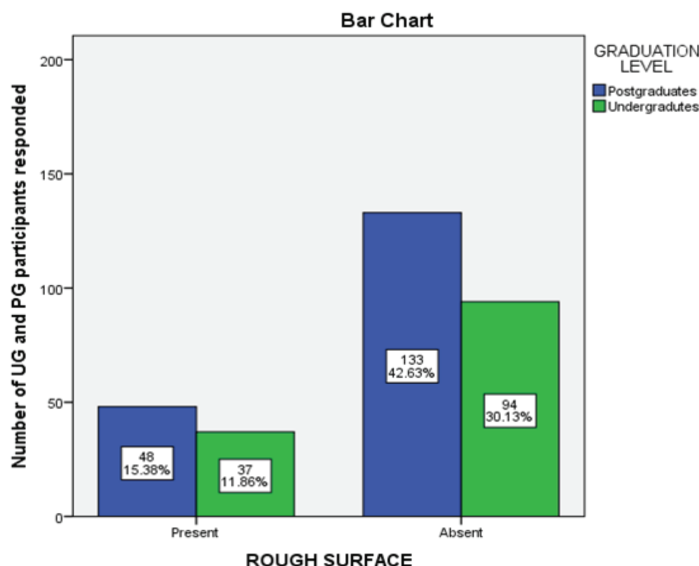

Figure 2 - The bar graph shows the association of UG and PG students with respect to the rough and irregular surfaced tooth preparation. X axis represents frequency of rough and irregular surfaced tooth preparations and Y axis represents the number of UG and PG participants responded (Blue - Postgraduates) and (Green - Undergraduates). Preparations done by postgraduates appear to have less irregular and rough surfaces than the undergraduates,however statistically significant differences were not observed.(Pearson Chi square test;P=0.736,P>0.05).

Over reduction during tooth preparation

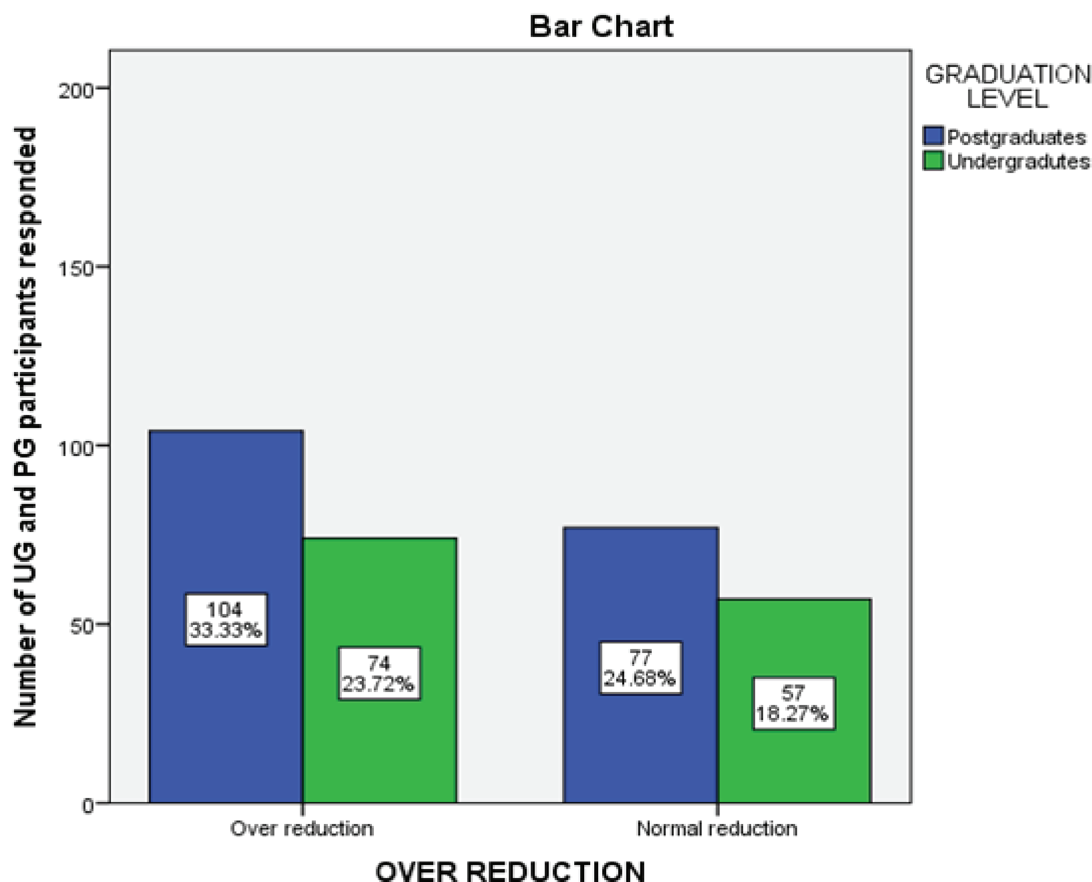

Figure 3 - The bar graph shows association of UG and PG students with respect to the over reduction during tooth preparation. X axis represents frequency of over reduced and normal reduced tooth preparations and Y axis represents the number of UG and PG participants responded (Blue - Postgraduates) and (Green - Undergraduates). 104 postgraduates and 74 undergraduates are perceived to have over reduction than normal reduction. Chi square analysis was done and P value was found to be 0.864 (p value > 0.05, statistically not significant).

From the current study postgraduates have participated more than undergraduates. According to the study [23], done by Karlsen et al, it was found that the margin of restoration should be located near the gingiva, which doesn't correlate with the current study. Most restorations have margins in the gingival crevice, and permanent tissue damage is common. The relationship between periodontal health and the restoration of teeth is intimate and inseparable. Although it is widely accepted that the best restorative margin is one that is placed coronal to marginal tissue.

An adequate reduction of teeth will provide proper retention and resistance for the bridge to adapate [24]. First phase in reduction technique includes : Axial and Occlusal reduction depth which is achieved by placing N°1 bur along the vestibular and oral gingival margin of the tooth. The round and flat stopping surface of the bur doesn't allow it to go beyond a depth of 1 mm.

The second phase is Actual reduction. Actual reduction of anterior teeth is done between the grooves with the N° 3 bur. The third phase is finishing line preparation. The N° 4 bur is utilized to plan the wrapping up line. The smooth proximal portion of the bur permits to utilize the axial surfaces of the cast to direct the dental

practitioner within the arrangement and the fourth phase is Tooth surface refining. The N° 5 bur refines the tooth surface. It is used to round the line angle of the stump and eliminates any undercut.

It is also proven that, non involvement of the pulp are the majority in the studies and it is good for better retention [25]. Involvement of pulp during tooth preparation may lead to several complications during and after treatment, whereas anticipated exposures of abutment teeth pulp during tooth preparation is included in a patient's treatment strategy regardless of whether or not teeth present with pulpal pathology, unanticipated exposure may create delays in treatment and necessitate reassessment of the treatment plan by the dentist and the patient.

According to the studies [18,26], it says that tooth occlusal convergence is an essential criteria to be considered in tooth preparation. It shows the benefits of the control of depth and direction of tooth tissue removal as well as better definition of tooth finishing line.According to the studies [19,20], Renggli H and Valderhaung they suggested that pocket depth and loss of attachment are one of the main reasons for the failure of fixed partial dentures. Several studies indicated that poor marginal adaptation, subgingival margin placement, and over-contoured crowns can contribute to localized periodontal inflammation [27].

According to the studies [28], it was proven that presence of rough surface in the prepared teeth may provide better resistance and retention for the teeth, which is contradictory to the current study [29]. Failure of tooth preparation leads to damage or rough surface of the teeth. Rough margins reduce adaptation.

According to the study done by Syu JZ et al [30], it was seen that fit of the patients depends upon the finish line that is given to the prepared teeth. In our current study, the majority of the students have obtained shoulder finish line, which helps in stress concentration lesser than classical shoulder [31]. Shoulder finish line provides less distortion of crown margins, adequate bulk, good crown contours, and can attain good esthetics. Shoulder with bevel is given to get proper marginal adaptation and the bulk of the material border.

Conclusion

Within the limits of present study, over reduction during tooth preparation was the most common error followed by pulpal damage ,rough surfaces and under reduction. However there were no statistically significant differences between undergraduate and postgraduate students with respect to all the above mentioned parameters.

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Conflict of Interest : The authors declare that there were no conflicts of interest in the present study.

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