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# Evaluation of Elastomeric Impression in Fixed Partial Denture-A Retrospective Analysis of Patient Records

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**Abstract:** The aim of this study is to evaluate defects in the impressions made for fixed partial denture prosthesis. For this, patient records of those who underwent replacement of missing teeth with fixed partial denture were collected. A total of 50 fixed partial denture impressions were evaluated. The data collection was done considering the following parameters - impression technique, number of prepared units, defect in the facial margin , defect or cut through finish lines, defect onto the axial wall, defect in material polymerisation, exposure of heavy body through wash material, retraction cord embedded in impression, air bubbles and voids, type of tray used, number of cords preferred. The collected data was tabulated in excel sheet. Statistical analysis was done in SPSS software. This study shows that 90% were double wash impressions, 10% were single wash impressions. About 36% showed defects on the facial margin, 62% showed defective cuts through the 360 degree flash, 38% defect on the axial wall, 38% showed air bubbles and voids. Majority of the impressions were made after packing two cords. Within the limit of the present study it is concluded that double wash impression technique is the most preferred. The voids and bubbles were the majority of the defects that were present than any other defects.

**Keywords:** Evolution, retrospective, patients, records.

## INTRODUCTION

The fixed partial denture is one of the most commonly preferred definitive treatment options for a single missing teeth.For many years fixed partial denture were considered to be the best treatment options for replacing a single missing tooth(Subhashini, Abirami and Jain, 2018)Replacement of missing teeth represents the largest category among the patients in the clinic who are looking for better esthetic and functional teeth.Optimal managements includes replacement with removable partial denture,fixed partial denture or dental implant(Al-Quran, Al-Ghalayini and Al-Zu'bi, 2011)Fixed prosthodontics treatment can range from the restoration of a single tooth to full mouth rehabilitation(Sumeet et al., 2014)Fixed prosthodontic treatment involves the replacement and restoration of the teeth by the artificial substitutes that are not readily removable from the mouth(Sharma, Tiwari and Singh, 2018)Secondly to tooth preparation Dental impression making is a challenging procedure for students due to the potential defects that could arise , in turn adversely affecting the precision of indirect restoration(Chee, Donovan and Kahn, 1991)

Over the past four decades tremendous progress has been made in the procedures for making impression for fixed prosthodontics.The quality of fit of dental restoration is mainly influenced by the accuracy of the dental impression.There are various methods for making fixed partial denture impression(Messing, 1965; Shrestha, Poudel and Shrestha, 2015)These includes single copper band technique,monophase technique,single step and double step technique.The methods and the effectiveness of fixed partial denture impression system includes the matrix impression system in relation to the registration of the finish lines and sulci of the tooth preparation,very less importance was given to the accuracy of the occlusal plane and impression technique(Haim et al., 2009)

The putty reline method have become more popular among the dentists because of the ease of handling when compared to the custom tray technique.defects can arise due to improper seating of the tray and compressibility of the putty material leading to the variations in the interocclusal relations registration within the impression(Shillingburg and Sather, 2012)The bite registration method is commonly used to record and transfer

the occlusal relations to the articulator. Minor variations in the occlusal plane due the faulty impression procedure are often unnoticed. This results in a variation in the occlusal contact while doing the clinical trials although it appears to be acceptable in the articulator.(Livaditis, 1998)

An accurate impression that provides precise marginal detail is not only required for good fit but also for optimal esthetic result.Management of the gingival tissues while making an impression is one of the most challenging aspects of the crowns and bridges.(Grossmann and Sadan, 2005),(Ranganathan, Ganapathy and Jain, 2017)This requires the use of various tissue retraction technique which is expensive, time consuming and experience and skill of the dentist(Al Hamad et al., 2008)(Jain and Dhanraj, 2016)Gingival margins exposure during tooth preparation before impression making is one of the most technique-sensitive procedures for the dentist to perform.Gingival displacement requires the gingival margin to move far from the tooth surface which provides adequate space between the finish line and gingiva(Ganapathy and Visalakshi, 2019)This can be achieved by using cord or cordless impression methods.Cordless impression techniques eliminate the use of retraction cords,where in cords of different sizes are used in retraction cord technique.(Phatale et al., 2010)

Various impression techniques for making impression of subgingivally prepared margins have been described.That includes relining preliminary impression,beading a cold cure acrylic resin tray,correcting an unacceptable final impression and making an impression in a aluminium shell(Dabas et al., 2018))

Various studies were done in our department on different fields like determination of correlation of width of maxillary anterior teeth(Jain, Nallaswamy and Ariga, 2019),periodontal health status in groups wearing temporary partial denture(Jyothi et al., 2017),study on implants(Kannan and Others, 2017; Duraisamy et al., 2019),studies on microorganisms(Selvan and Ganapathy, 2016; Vijayalakshmi and Ganapathy, 2016),effect of resin bonded luting cement(Ganapathy, 2016),cervical incisal marginal discrepancy(Ajay et al., 2017; Ranganathan, Ganapathy and Jain, 2017).The other studies are done on the natural products like aloe vera(Subasree, Murthykumar and Dhanraj, 2016).Various studies are also done on awareness about all ceramic restoration in rural population(Ashok and Suvitha, 2016),review on retraction cords(Kannan and Venugopalan, 2018).oral hygiene status in pregnant women(Basha, Ganapathy and Venugopalan, 2018),studies on impressions for lip bumper prosthesis(Ashok et al., 2014),facial prosthesis(Venugopalan et al., 2014). Our department is passionate about research we have published numerous high quality articles in this domain over the past years ( (Kavitha et al., 2014) , (Praveen et al., 2001),(Devi and Gnanavel, 2014), (Putchala et al., 2013), (Vijayakumar et al., 2010), (Lekha et al., 2014a, 2014b) (Danda, 2010) (Danda, 2010) (Parthasarathy et al., 2016) (Gopalakannan, Senthilvelan and Ranganathan, 2012), (Rajendran et al., 2019), (Govindaraju, Neelakantan and Gutmann, 2017), (P. Neelakantan et al., 2015), (PradeepKumar et al., 2016), (Sajan et al., 2011), (Lekha et al., 2014a), (Neelakantan, Grotra and Sharma, 2013), (Patil et al., 2017), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab et al., 2017), (Eapen, Baig and Avinash, 2017), (Menon et al., 2018), (Wahab et al., 2018), (Vishnu Prasad et al., 2018), (Uthrakumar et al., 2010), (Ashok, Ajith and Sivanesan, 2017), (Prasanna Neelakantan et al., 2015). The aim of this study is to evaluate defects in the impressions made for fixed partial denture prosthesis.

## MATERIALS AND METHODS

### Study Setting

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

### Study Design

The study was designed to include patients who underwent fixed prosthodontics. The patients who did not fall under this inclusion criteria were excluded. All the cases were reviewed priorly and included.

### Data Collection and Tabulation

Data collection was done using the patient database with the timeframe work of 1st June 2019 to 30th April 2020.A total of 50 fixed partial denture master impressions made of poly vinyl siloxane were reviewed and those fitting under the inclusion criteria were included. Cross verification of data was done by a reviewer. The collected data was tabulated based on the following parameters:impression techniques used, defect in the facial margin, defect cuts through the finish line, defect onto the axial wall, number of prepared units, defect in material polymerisation, exposure of heavy body material through wash material, retraction cord embedded in impression, air bubbles and voids, tray used and number of cords used.

### Statistical Analysis

The variables were coded and the data was imported to SPSS. Using SPSS Version 20.0 categorical variables were expressed in terms of frequency and percentage and bar graphs were plotted.The statistical significance of the associations were tested using the Chi-square test.

## RESULT AND DISCUSSION

A total of 50 fixed partial denture impressions were evaluated in this study. It shows about 90% were double wash impressions,10% were single wash impressions. 36% of impressions showed defects on the facial margin, 62% showed defective cuts through the 360 degree flash, 38% defect on the axial wall, 38% had air bubbles and voids. The majority of the impressions were made with double cord technique. The association between impression technique and air bubbles showed a P value of 0.012(<0.05) which is statistically significant.

This study provides information on the evaluation of the impression in the fixed partial denture.The science of occlusion encompasses more than mere interrelationship of the teeth.It involves the stomatognathic system in health and diseases (Malone, Tylman and Koth, 1989)Failure to restore tooth anatomy can lead to the disturbed occlusal function and painful muscles of the restoration is to fit precisely the die on which it is made must be accurate which requires an acceptable impression (Marshak, Assif and Pilo, 1990)

All prosthetic rehabilitation are characterised by a sequence of well structured clinical and laboratory steps during which different kind of impression are required.The success of the prosthesis depends on the accuracy and the dimensional stability of the impression materials used and the impression technique utilized.The exposure of the preparation margin in the gingival sulcus is a prerequisite for a perfect impression thereby improving the quality of indirectly fabricated restoration(LaForgia, 1967). This study showed about 90% of the participants made double wash impressions while the other 10% made single putty wash impressions (Figure 1). About only 36% of the impression showed defect in the facial margin and 64% showed no defect in the impression (Figure 2).Defect cuts through the finish line (Figure 3) and defect on the axial wall (Figure 4) were seen only in 38% of the impression while the others 62% were without any defect.

And the exposure of the heavy body material through the wash material was seen only in 48% of the impressions (Figure 5). Retraction cord were seen embedded in 6% of the impression and the remaining 94% showed no cords embedded into the impression (Figure 6).The common defect air bubbles and voids were seen in 38% of the impressions and 62% impressions without voids (Figure 7).And majority of the operators used double cord and the other 14% used single cord while making impression (Figure 8). The association between impression technique and air bubbles showed a P value of 0.012(<0.05) which is statistically significant (Figure 9). Deformation of the gingival tissue during retraction and the impression procedures involves forces,retraction ,relapse,displacement and collapse.The aim of the gingival retraction is to atraumatically allow access for the impression material beyond the abutment margin and to create space to provide sufficient thickness of the impression material in the gingival sulcus region so that it can be better to withstand the heavy forces encountered during removal of the impression (Levartovsky et al., 2012) Previous study showed 50% voids,44% putty exposure through wash material ,40% with air bubbles at the finish line,38.3% shows pressure of the tray on the soft tissue,23.8% showed flow problem,23.8% retraction cord attached to the impression

## CONCLUSION

Within the limits of the present study it is concluded that the double wash technique and double cord were mostly used for making an impression. Minimal defects were noted on the facial margin, through the finish line and axial wall. The voids and bubbles were the defect that were present than any other parameters. The more critical evaluation of the impression on the part of the dentist is recommended.

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### Authors Contribution

G.Nithya Karpagam , Dr Visalakshi Ramanathan were the main contributors to the concept, design, literature analysis, workshop discussions, and drafting and revising manuscript.

Dr Visalakshi Ramanathan and Dr Dinesh Prabu contributed to drafting and revising manuscripts. All authors gave final approval of the version to be published.

### Conflicts of Interest

There were no conflicts of interest

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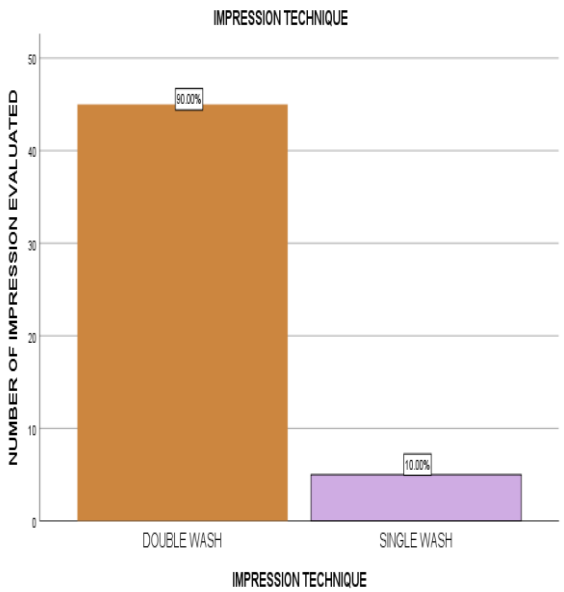


**Fig.1: This is a bar graph representing distribution of impression technique used to make an impression. X axis represents impression technique( single wash / double wash) ;Y axis represents number of impressions evaluated. 90% of the evaluated impressions were made by double wash technique (brown colour) and 10% single wash technique (lilac). Majority of the operators have chosen double wash putty impressions as the impression technique in making FPD impressions ( 90% ).**

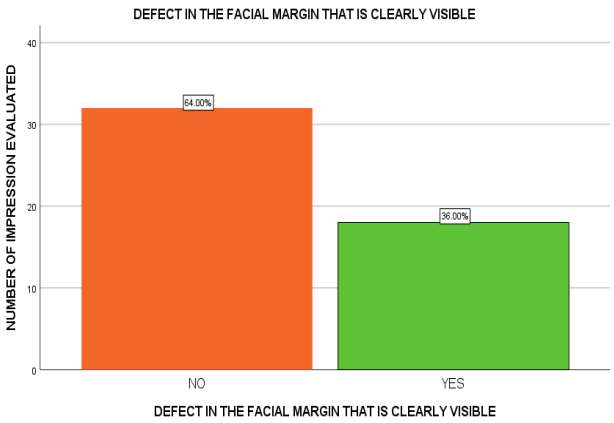


**Fig.2: shows the distribution of defects in the facial margin of the preparation. X axis represents the presence or absence of defect in the facial margins,Y axis represents the number of impressions evaluated. Only about 36% showed defects (green) while 64% were free of defects (orange).**

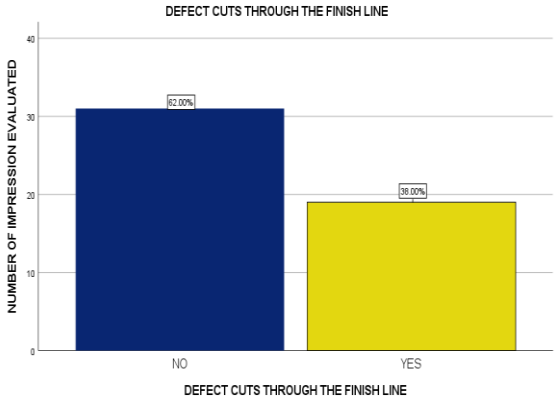


**Fig.3: is a bar graph representing the distribution of the cuts through the finish line of the preparation. X axis represents the presence or absence of cuts through the finish line Y axis represents the number of evaluated impressions. About 62% showed no defects(blue) and 38% were seen with defects(yellow)**

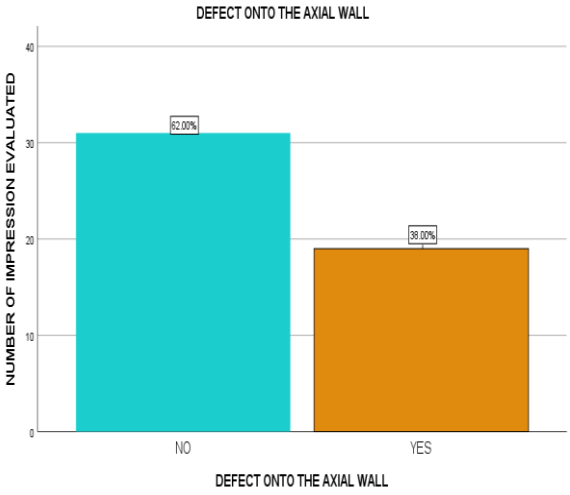


**Fig.4: is a bar graph representing the distribution of defects on the axial wall. X axis represents the presence or absence of defects on the axial wall;Y axis represents the number of evaluated impression. Only 38%showed defects on the axial wall (brown) and 62% were free of defects(blue).**

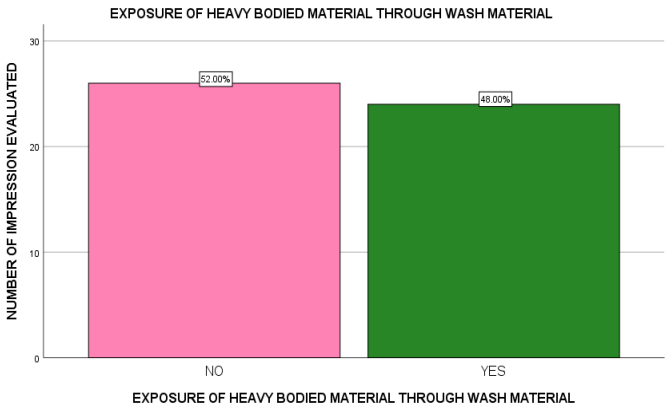


**Fig.5: is a bar graph illustrating exposure of heavy body material through the wash material. X axis represents the presence or absence of heavy body exposure through the wash material;Y axis represents the number of evaluated impressions. Heavy body was exposed in 48% of the impressions(green) and 52% did not (pink).**

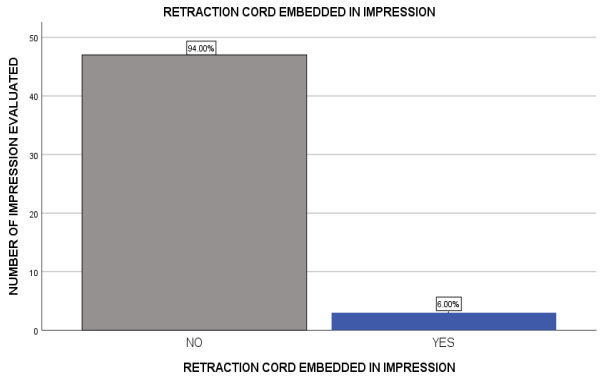


**Fig.6: is a bar graph representing the distribution of the retraction cord embedded in the impression. X axis: shows the presence or absence of retraction cord embedded in impression; Y axis: Shows the number of evaluated impression. Only 6% showed retraction cord embedded on the impression (blue) and 94% were devoid of retraction cord (grey).**

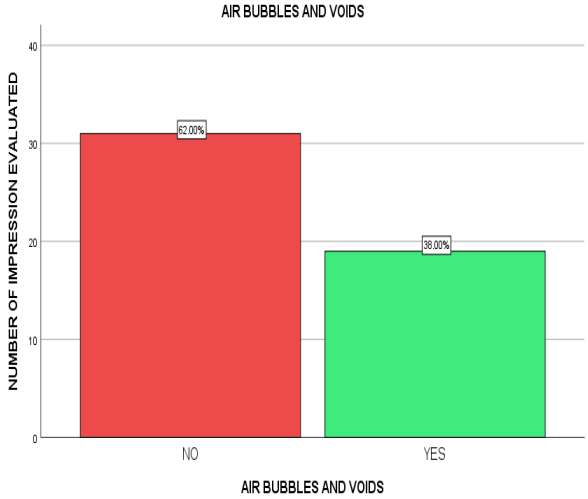


**Fig.7: is a bar graph showing presence or absence of air bubbles and voids in the impression. X axis represents presence of air bubbles and voids;Y axis represents the number of impression evaluated.Only minority of the impressions 38%(green) showed air bubbles and voids present while the other 62% were free of voids (red)**

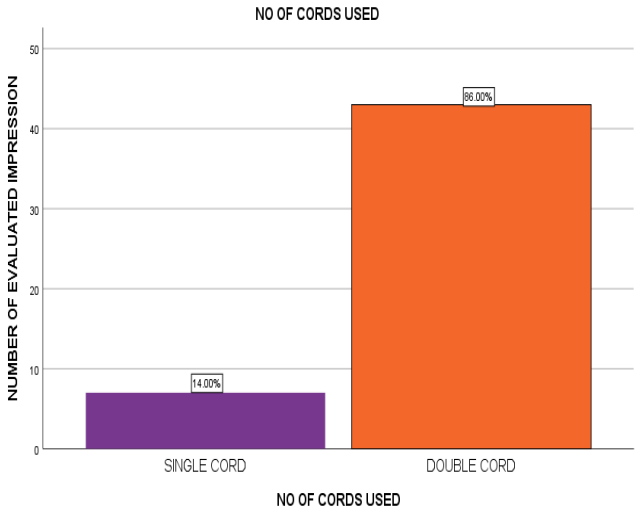


**Fig.8: is a bar graph representing the distribution of the number of cords used while making the impression.X axis: shows the number of cords used,Y axis represents number of impressions evaluated. Majority of the operators used double cord 86%(orange) and only 14% used single cord for making an impression(violet).**

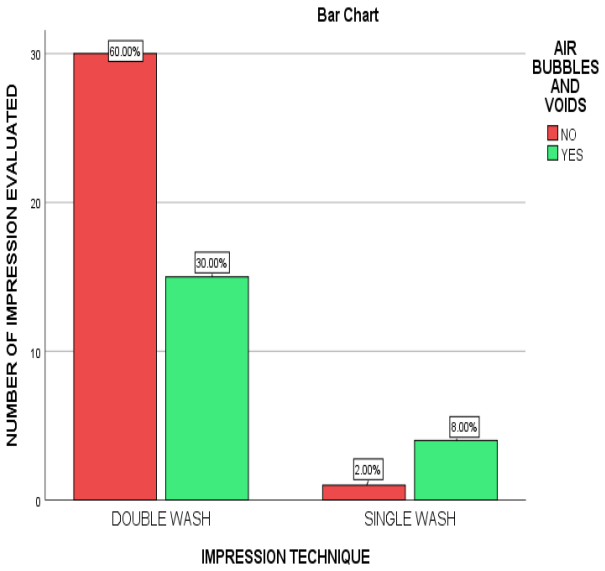


**Fig.9: Bar graph depicting the association between the impression technique and air bubbles. X axis represents the impression technique used to make an FPD impression and Y axis represents the number of impressions evaluated.The p Value of statistic is 0.12 which is greater than the chosen level of significance (>0.05)(chi square value 4.160 df 1). Hence impression technique and defects like voids and air bubbles are not independent of each other.**