
A Retrospective Evaluation Of Type Of Impression Technique Used In Complete Denture Fabrication By Dental Students

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Abstract: Purpose: The aim of this study was to retrospectively evaluate the type of impression technique used in complete denture fabrication among dental students.

Materials And Method: A total of 510 data entries were taken, duplicate and missing entries were omitted. So a total of 484 entries were evaluated. The data was collected from patient records in Saveetha Dental College, over a period of one year. The evaluation was based on the technique used in primary impression by the dental students for complete denture fabrication.

Statistical Analysis: The results of the study were subjected to statistical analysis. Data analysis was done using SPSS software version 23.0. Frequency evaluation and Chi-square test was done to evaluate the most frequently used technique used to fabricate complete denture.

Results: It was found that about 47.2% was using mucocompressive technique, 37.5% was using mucostatic impression technique and 15.3% was using selective pressure technique.

Conclusion: The present study concluded that most of the dental students have preferred to use mucocompressive technique for denture fabrication.

Keywords: denture fabrication, impression technique

INTRODUCTION

Good impressions are the basic and utmost important method in the fabrication of a well fitting complete denture. "Ideal impression must be in the mind of the dentist before it is in the hand. He must literally make the impression rather than take it" [(DeVan, 1952)]. Due to healthy aging, an increase in edentulous geriatric patients have increased gradually. Complete dentures (conventional) is the most commonly used treatment modality for replacing the teeth. It will overall improve the esthetic appearance of the patient. Conventional denture fabrication involves a sequence of steps, making a primary impression, pouring primary cast, fabricating a custom tray, border moulding and final/secondary impression, pouring master cast, occlusal rim fabrication, jaw relation, teeth setting on an articulator, try in and then the final prosthesis is fabricated. Because of the multiple step process, inaccuracies in the final prosthesis will have a higher chance of occurring. To overcome these consequences, multiple reports have been published to improve the success of complete denture by using different techniques and materials [(Drago, 2003)], [(Makzoum , 2004)], [(McCord and Grant, 2000)], [(Boucher, 2004)]. Teeth arrangement is done according to the extraoral and intraoral anatomical landmarks [(Ariga et al., 2018)].

The reasons for tooth loss may be of different causes - periodontal, pulpal, trauma. It can also be due to wear of teeth like attrition, abrasion, abfraction - which also acts as a cause for tooth loss, which is an endpoint for the above mentioned reasons [(Hujuel, 2004)]. To measure the overall health status of a population tooth loss is seen as a reliable indicator. Loss of masticatory function [(Hung, Colditz and Joshipura, 2005)], loss of self-esteem due to appearance impact, change in phonetics, restricted diet due to less chewing ability [(Nowjack-Raymer and Sheiham, 2007)]. Combining all these will lead to reduction in quality of life, associated with oral health-related quality of life in institutionalized elderly [(Mack et al., 2003; Hassel et al., 2006)]. It can be prevented by maintaining good oral hygiene. It is difficult to maintain oral hygiene during old age and in pregnant women due to hormonal imbalances during that period [(Basha, Ganapathy and Venugopalan, 2018)]. Etiology of tooth loss can also be due to carious lesions; which might form periapical abscess then to cellulitis by spreading to all the spaces. Patients might need immediate care and it can turn to a life threatening situation

due to obstruction of airflow [(Vijayalakshmi and Ganapathy, 2016; Basha, Ganapathy and Venugopalan, 2018)].

Maximum amount of tissues within the limits of the health and functions of the tissues should be recorded while taking the impression. It has to record the intimate details of the soft tissues, which help in understanding the gross structures underlying, which help in proper fit of dentures without any discomfort under normal function. Advanced treatment options are available apart from complete dentures, they are BPS dentures, implant supported Fixed denture, Hybrid dentures. The number of sore spots in BPS dentures was less compared than the conventional dentures and the masticatory efficiency was also better in BPS. The main problem in the implants is the microgap at the implant abutment interface. Less microgap is seen when original abutments are used than non original abutments [(Vijayalakshmi and Ganapathy, 2016; Basha, Ganapathy and Venugopalan, 2018; Duraisamy et al., 2019)]. Screw loosening and framework fitting problems are other complications which will occur very commonly. To overcome this Cresco method can be used to treat edentulous maxilla. Recent studies have used powdered coatings to minimize the screw loosening but they have concluded that non coated screws are as equally good as coated screws [(Ganapathy, Kannan and Venugopalan, 2017)]. If there is adequate inter arch height cement retained restorations can be given. Main problem with the cement retained crowns comes if the excess cement is not removed after luting it. Surface modifications are also given the crowns to improve the fatigue loads of the crowns [(Ajay et al., 2017; Ganapathy, Kannan and Venugopalan, 2017)].

Conventional dentures are given in maxillofacial prosthesis cases. Modifications of obturators include fabrication of an hollow bulb obturator, which is light in weight and gives great comfort to the patient. To improve the esthetics of the patient appliances like lip bumper can also be given [(Ashok et al., 2014)] and for patients who severely lost most of their facial structures to improve the esthetics magnetically retained silicone prosthesis and magnetically retained dentures can also be given. [(Venugopalan et al., 2014)]

In the middle of the 18th century, for impression making dyes and ivory were used. Dyes are painted on to the ridge and the ivory is pressed against the dyes. Areas of contact were scraped away for the best fit. In 1728 - Pierre Fauchard made dentures by cutting bone to proper shape after taking measurements intraorally with a compass. In 1957, Chester and Boles described a semi static balanced impression. In 1963, Tench's concept of neuromuscular was used. In 1971, modified impression technique for hyperplastic alveolar ridges was described [(Filler, 1971; Venugopalan et al., 2014)]. In 1972, for combination syndrome patients who are acquiring maxillary complete denture, plaster impression technique was given [(Filler, 1971; Vig and Smith, 1972; Venugopalan et al., 2014)].

The objectives of the impression is to provide retention, stability, support, esthetics and to maintain health. A single particular impression technique or material can not be applied to all the different cases. Various philosophies and techniques of impression making have been given.

The debate concentrated on the amount of pressure applied to the tissues, degree of tissue detail that is captured, type of impression material selected, type of impression tray used, open mouth or closed mouth impression, peripheral borders - functionally border molded or located arbitrarily. Impression can be classified as open/closed mouth impression and pressure, pressure less and selective pressure technique. Various concepts of impression making are Mucostatic theory, Muco-compressive theory and Selective pressure theory.

Mucocompressive impression theory was initiated by Green brothers [(Vig and Smith, 1972)]. It records the mucosa in its functional form. Better retention is the main objective of this technique. Resorption of underlying bone is seen due to continuous pressure on the bone and the denture won't be closely adapted to the tissue when the patient is in rest, it is due to tissue rebound. Mucostatic impression theory was proposed by Richardson and popularized by Harry L Page in 1938. In this the tissue will be recorded in a static and undisturbed form. Interfacial surface tension is considered as an important factor in this one. Addison in 1944 also proposed a similar kind of impression technique. Page proposed this theory based on Pascal's law of hydrodynamics. Oversized impression tray and low viscosity impression materials are used. The main advantage of this technique is preservation of the tissue's health. Selective pressure theory was advocated by Boucher in 1950 and is the most widely accepted theory. It combines both pressure and minimal pressure techniques. In this some tissues are recorded under pressure and some at rest. It is because of the difference in withstanding loads by different tissues. An equilibrium between the two different tissues is achieved.

Various materials used in making primary impressions are alginate, impression compound, impression plaster. Recent advances include scanning the soft tissues by intraoral scanner.

Many studies which involved case reports [(Ashok et al., 2014)], surveys [(Ashok and Suvitha, 2016)], systematic reviews [(Ganapathy, Kannan and Venugopalan, 2017)], [(Ganapathy, Kannan and Venugopalan, 2017; Ariga et al., 2018)], [(Kannan and Venugopalan, 2018)], literature reviews [(Venugopalan et al., 2014)], [(Vijayalakshmi and Ganapathy, 2016)], [(Subasree, Murthykumar and Dhanraj, 2016; Vijayalakshmi and Ganapathy, 2016)], [(Selvan and Ganapathy, 2016)]. In Vivo studies, [(Jyothi et al., 2017)], [(Jain, Ranganathan and Ganapathy, 2017)], [(Duraisamy et al., 2019)]. In vitro studies [(Ganapathy et al., 2016)], [(Ajay et al., 2017)] and retrospective studies [(Basha, Ganapathy and Venugopalan, 2018)] were carried out by our team previously. We are currently focusing on epidemiological studies by the dental clinicians in an institutional

setting. The main aim of the study is to evaluate the type of impression technique used among undergraduates and postgraduate students while fabricating a conventional complete denture. Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J et al., 2018; Menon et al., 2018; Prabakar et al., 2018; Rajeshkumar et al., 2018, 2019; Vishnu Prasad et al., 2018; Wahab et al., 2018; Dua et al., 2019; Duraisamy et al., 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma et al., 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi et al., 2020; Samuel, Acharya and Rao, 2020)

MATERIAL AND METHODOLOGY :-

Sample Collection

This retrospective study has been conducted in a university set up . After an extensive search of the patient database, a total number of 510 sample data was chosen from the patients who visited saveetha dental college over a year. Duplicate and missing entries were omitted. So a total of 484 entries were evaluated. The data is arranged and checked for the frequency of different impression making techniques used.

Inclusion criteria

Completely edentulous patients and Patients with informed concern are included in the study.

Exclusion criteria

Partially edentulous cases and patients with systemic diseases which affect mouth opening and oral mucosa were excluded from the study.

Statistical Analysis

Data analysis was done using SPSS software. Frequency evaluation and Chi-square test was done to evaluate the most frequently used technique used to fabricate complete denture.

Dependable variables include the type of practitioner and the type of soft tissue on the ridge.

Independent variables include the age and gender of the patient.

RESULTS :-

In this retrospective study, a total of 484 data has been reported, out of 425 is from undergraduate and 59 is from postgraduate students.(Figure 1). The highest frequency of impression technique used is mucocompressive with a frequency of 229 followed by mucostatic impression technique with a frequency of 181 and least practiced impression technique was selective pressure impression technique with a count of 74 (Figure 2) and highest percentage was mucostatic impression (47.31%),mucocompressive impression (37.40%) and least was selective pressure impression (15.29%) (Figure 3).

Among undergraduates,the highest frequency of impression technique used is mucocompressive impression with a count of 215, mucostatic impression with a count of 140 and selective pressure with a count of 70 and among postgraduates most frequently used impression technique is mucostatic impression with a frequency of 41 followed by mucocompressive impression technique with a count of 14 and least was selective pressure impression technique with account of 4. Association between the different impression techniques and various students was done using Chi square test (Pearson Chi-Square value - 29.589, and p value < .001) and found to be statistically significant. A p-value less than 0.05 (typically ≤ 0.05) is statistically significant (Figure 4).

DISCUSSION :-

The objectives of an impression are to provide retention support and stability for the denture [(Basker and Davenport, 2009)]. Various techniques and materials have been proposed to make a good impression for fabricating a complete denture. The most commonly used preliminary impression material in this survey was impression compound (78%); irreversible hydrocolloid was used by only 20% [(Kakatkar, 2012)]. Another survey of four major Indian cities showed that a majority (71%) use alginate for preliminary impressions [(Gambhir et al., 2018)].

Similar findings have been reported in a survey of practitioners in the United Kingdom [(Hyde, Paul Hyde and Fraser McCord, 1999)]. A study of previous surveys of U.S dental schools also shows that the use of alginate as the primary impression material of choice has increased over the years.The most commonly used material for preliminary impression was impression compound in a stock metal tray.(Dr.rupal J shah)

The most prevalent impression philosophy being taught by dental schools 71% is the selective-pressure technique (71%). This technique attempts to place stress on those areas of the maxilla and the mandible that can best resist functional forces of the denture bases [(McGuckin, 1989)].Levin and Sauer in a 1969 survey found that 58% of dental schools surveyed taught the selective-pressure technique.[(Levin and Sauer, 1969)].The second-most used technique is the mucostatic (minimal-pressure) technique, used by 20% of the

schools.exclusively.In 1963, Tench's neuromuscular concept was used for making complete denture impressions. It involves the function of sucking and swallowing to develop.

Chester and Boles in 1957 described balanced semi static impression procedure technique, in which the primary stress bearing area instead of alveolar ridge is the anterior and lateral walls of the palate as it is always remodeled after loss of teeth while the palate is maintained the same from birth with no changes after loss of teeth. It is considered for a normal healthy edentulous maxilla and can be used with any other technique. It is indicated especially for roofless/closed palate dentures [(Frankewicz and Gobby, 1951)].

In 1952, alginate impression technique was described which is a non pressure type. Dentures made from this type of impression were compared with dentures made from impression compound.This study conducted for 2 years showed that inflamed areas and hypertrophied tissues were seen with pressure impressions, while dentures with alginate impression had no tissue breakdown even when duplication was necessary after 2 years [(Denen, 1952)]. 1966, two techniques were described - Impression by use of sub atmospheric pressure/ vacuostatic technique. It obtains an accurate vertical and lateral record of the tissues through the application of controlled pressure [(Kubalek and Buffington, 1966)]. Flange technique involves making an impression of the soft structures adjacent to buccal, labial, lingual and palatal surfaces of dentures and incorporating the resulting extensions into denture construction.it increases the area of intimate contact of the denture with the oral structures thus improving stability,function, comfort and appearance.

Plaster impression technique for maxillary complete denture in cases of combination syndrome wherein the soft tissue of anterior part of the maxillary ridge is soft and movable was developed in 1972 [(Kubalek and Buffington, 1966; Vig and Smith, 1972)]. To minimize the incidence of overextension, Dr. Joseph Massad in 2008 described an impression technique which involves the layering method, which maintains the integrity between layers of the impression materials of varying viscosities and controls the path of insertion thus minimizing the incidence of overextension [(Massad, 2012)].

By seeing the results most of the students have used mucocompressive/definitive pressure technique to record the impressions. As the impression compound material is readily available and in most colleges they are using impression compound as the primary impression material.the advantages include good retention during function and the disadvantages include continuous pressure to the supporting bone,dislodging pressure against the denture, mucosal tissue reaction is seen. May be they can shift to recent advances like using different viscosities alginate and digital impressions. Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh et al., 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Mathew et al., 2020)

Conclusion :-

Various impression techniques have been mentioned in the literature for recording the impression of edentulous ridges. These techniques have been classified by different authors as functional, mucostatic, mucocompressive, selective pressure, minimal pressure etc. Within the limitations of the study it can be concluded that mucocompressive type of impression recording technique was the most frequently used among the clinicians and we also found that the majority of Undergraduate students used more mucocompressive impression technique than Postgraduate students.

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Author contributions

M.Sai Teja Reddy carried out the study by collecting the raw data handwriting the manuscript with the necessary statistical analysis. Dr Nabeel Ahmed and Dr Keerthi Sashanka helped in guiding the study and supervised the statistics.

Conflict of interest

There was no conflict of interest among the authors.

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LIST OF CHARTS AND TABLES

Figure 1:- The bar diagram showing the frequency of both undergraduate and postgraduate students.

Figure 2 :- The bar diagram showing the frequency different impression techniques used by both undergraduate and postgraduate students.

Figure 3 :- The pie diagram showing the percentage of different impression techniques used.

Figure 4:- The bar diagram showing comparison of different impression techniques used by undergraduate and postgraduate students

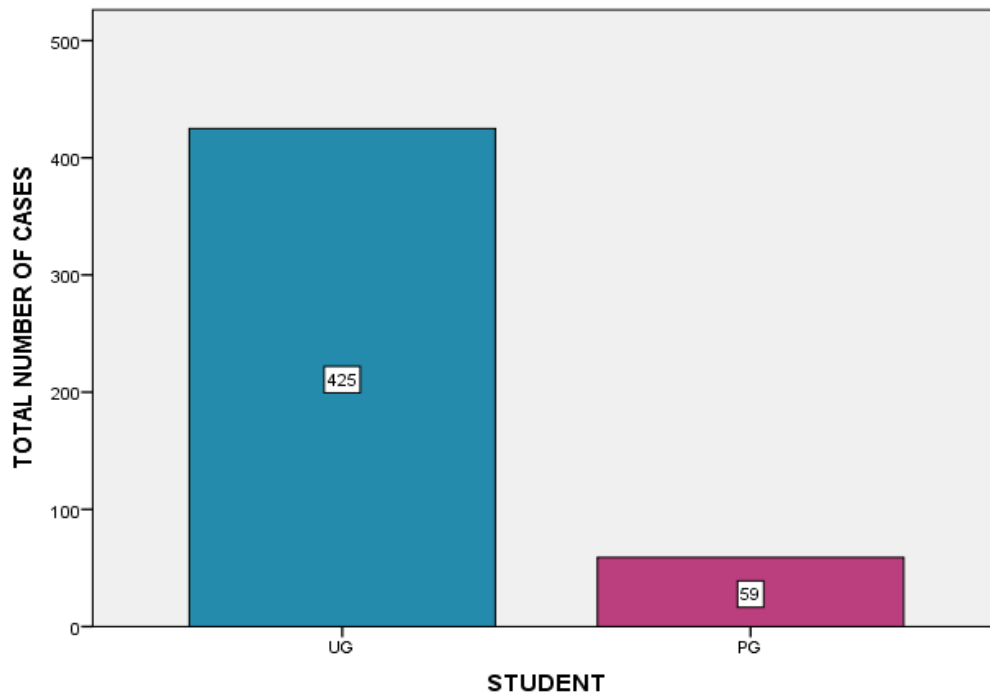


Fig.1:-The bar diagram showing the frequency of both undergraduate and postgraduate students. X axis represents undergraduate and postgraduate students and Y axis represents the frequency of complete denture patients

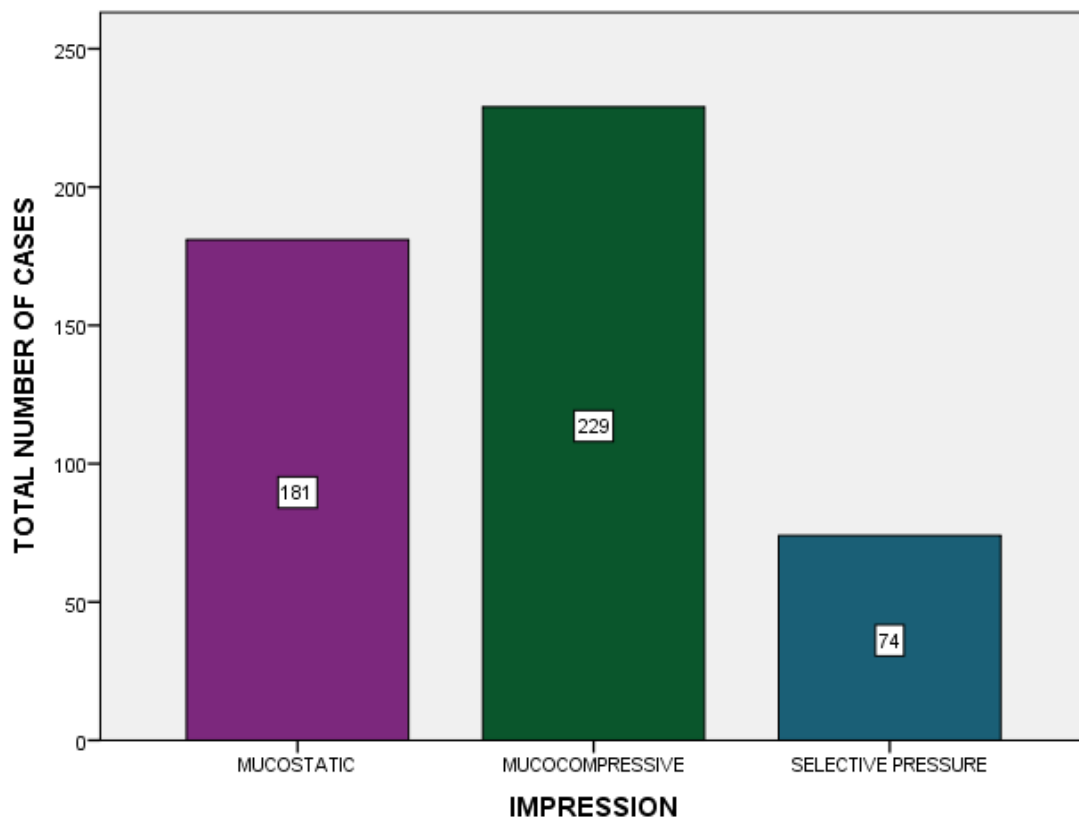


Fig.2 :- The bar diagram showing the frequency different impression techniques used by both undergraduate and postgraduate students. X axis represents different impression techniques and Y axis represents the frequency of complete denture patients

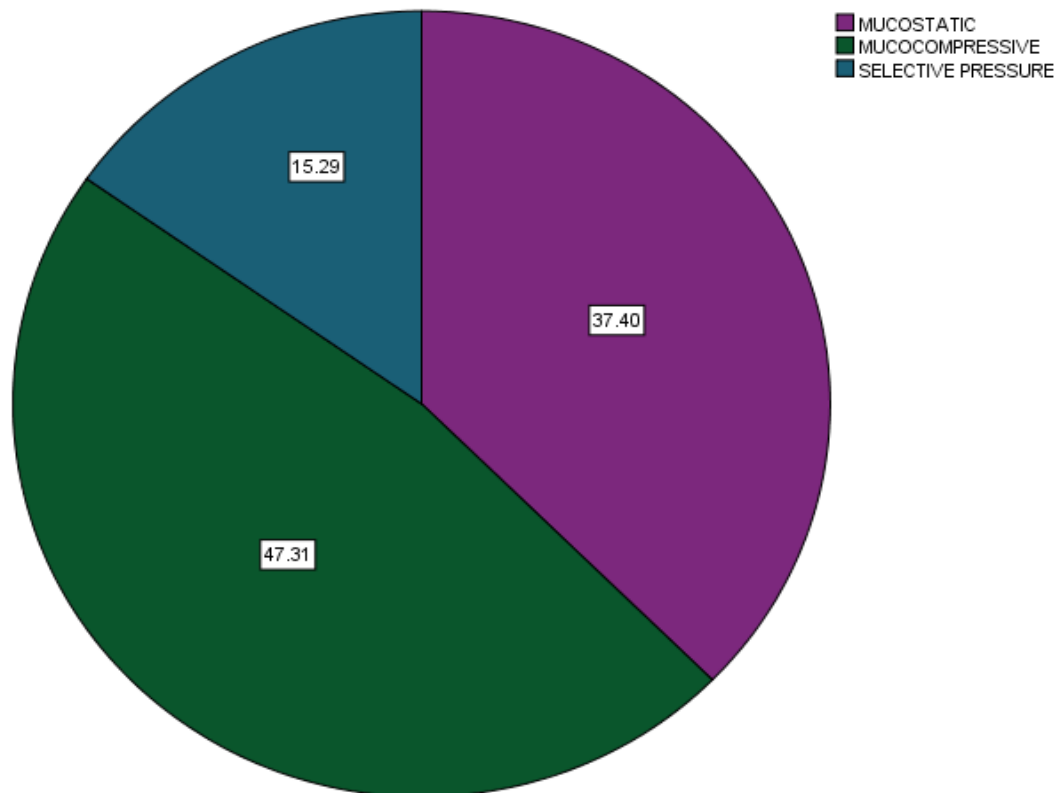


Fig.3:-

The pie diagram showing the percentage of different impression techniques used. Mucostatic impression was used by 38%, mucocompressive was used by 47% and selective pressure was used by 15%.

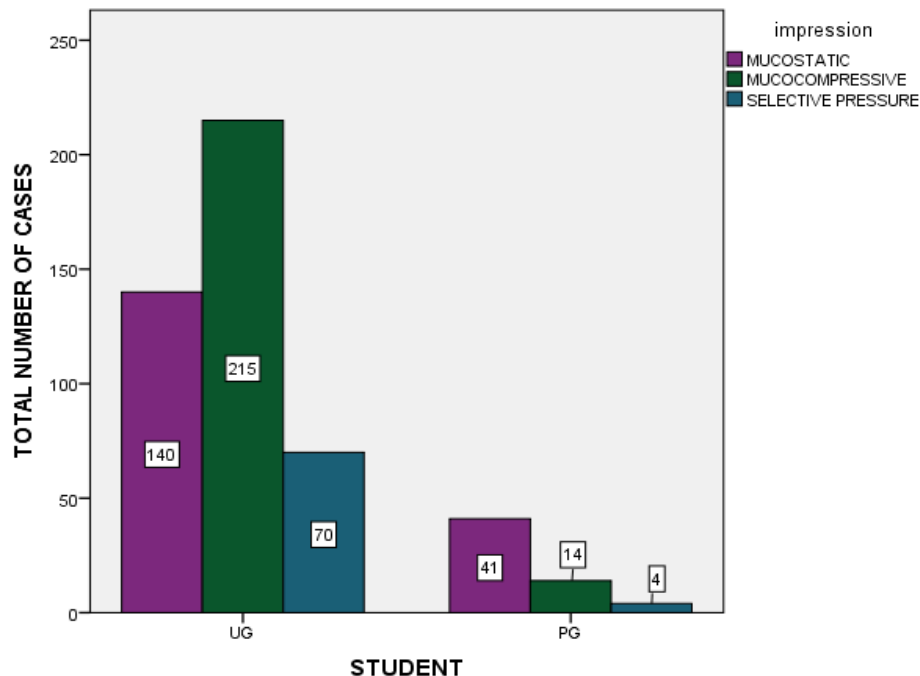


Fig.4:- The bar diagram showing the comparison of different impression techniques used by undergraduate and postgraduate students. X axis represents undergraduate and postgraduate students and Y axis represents the frequency of complete denture patients. Majority of the Undergraduate students used more mucocompressive impression technique than the Postgraduate students and the difference is also statistically significant ($p < 0.05$). (Pearson Chi-Square value - 29.589, and P value - .001(< 0.05))