

RETROSPECTIVE ANALYSIS ON FREQUENTLY DISPLACED DIRECT POSTERIOR CLASS II RESTORATIONS - A TIME DEPENDENT DATA ANALYSIS

¹Sharon Keziah.V, ^{2*}Dr Sankeerthana Kolli, ³Dr Adimulapu Hima Sandeep

¹*Undergraduate, Saveetha Dental College and Hospital Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077 Email ID: 151701069.sdc@saveetha.com*

^{2*}*Senior Lecturer, Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077. Email ID: sankeerthanak.sdc@saveetha.com*

³*Reader, Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 600077 Email ID: himas.sdc@saveetha.com*

ABSTRACT

Aim: This study analysed the frequently displaced class 2 restorations in the posterior teeth .

Materials and method: A total of 1568 patients who have undergone class 2 composite restorations from June 2020- March 2021 were evaluated. Patient details like age, gender, teeth no , surfaces involved , cause for replacement were included. The prevalence of frequently displaced class 2 restorations was determined. The collected Data was analysed using SPSS .

Results: Of the 1568 patients that were analysed 44.25% were in the age group 31–45 yrs . There were 53% men and 47% women included in the study The majority of the displaced restorations were class 2 mesio occlusal (MO) with 85% followed by 8.32% MOD and 5.81% Disto- occlusal. Over 50% of the study population had dislodged upper molar restorations followed by 28.93% lower molar restorations. The association between the type of restorations and survival rate was found to be highly significant, $p= 0.001$.

Conclusions: The present study reported a high incidence of displacement in the restoration in the mesio occlusal surfaces, especially on the molars . The most common cause of dislodgement was found to be fracture and secondary caries. This study demonstrated that a wide variation of risk factors on the practice, patient, and tooth levels influences the survival of class II restorations. To provide personalized dental care, it is important to identify and record potential risk factors. Therefore, we recommend further clinical studies to include these patient risk factors in data collection and analysis.

Keywords: Tooth, Dental composite, Restoration, Dental innovation

Introduction

Direct restorations have a limited life span and the longevity depends on various factors. Displacement or dislodgement of the direct restorations is a frequently seen incidence in clinical practice(1) . The replacement of failed restorations due to secondary caries or dislodgement constitutes a major part of all operative work in dental practice (2). However the replacement

of the dislodged restoration or secondary caries leads to an increase in cavity size (3), more loss of the tooth structure and eventually to the destruction requiring an endodontic intervention or even extraction – a ‘death spiral’ (4). Therefore it is better to reduce the failure rate of restorations than to increase the chances of destruction which is a vital part in dentistry (4,5).

Previous literature has reported a greater longevity of amalgam restorations than resin composite . (6)As the restorations with resin composite require a more sensitive technique than amalgam , it often leads to the accumulation of more plaque,which further leads to the development of secondary caries (2,7). However ,there is very limited use of amalgam in operative dentistry in recent times and in India and most of the world , the majority of the restorations are done with composite rather than amalgam(8) . Certain other studies have shown comparable longevity of both composite and amalgam with good skills in placing the restorations . Literature and clinical studies published in the 1990’s showed poorer amalgam and composite longevity compared with studies published recently(9) . This could be because of the introduction of better materials and new methods of cavity preparation and not merely the improved skills among dentists in handling composites(10) . Conventionally, Class II cavity preparations are made with mechanical retention based on Black’s principles (11). After the recent introduction of adhesive materials, there is more focus (10)on minimal intervention and techniques to preserve tooth structure, such as saucer-shaped or box-shaped preparations(11,12).

Previous studies have observed a shorter longevity in restorations that have a larger cavity but however very little studies are there on the preparation techniques and its impact on the longevity of the restoration (13). Multiple surface restorations have shown poorer longevity comparatively (13). Although there are many studies done on the longevity of restorations, very few had separate results for class II restorations. Therefore , there is still a need for long-time studies on Class II composites placed in operative dentistry(14). More studies need to be done giving more attention to material used preparation techniques, cavity size, and to patient-related factors(14,15). The current study aimed to analyze the frequently displaced direct posterior class II restorations.

Our team has extensive knowledge and research experience that has translate into high quality publications(16–18)(19–27)(28–36).

Materials and method

Study designs

The current study was designed as a retrospective cross clinical study conducted among patients who underwent class 2 composite restoration due to dislodgement .

Study setting

This study was conducted in Saveetha Dental College and Hospitals, Chennai, India. Therefore the availability of the data is of patients from the same geographic location having similar ethnicity. The digital case records of the patients who reported to the hospital were analysed and studied. Ethical clearance was obtained from the scientific review board of the hospital.

Sampling:

A total of 1568 patients were reviewed. All the patients who have undergone class 2 composite restorations from June 2020- March 2021 were evaluated. The records with Incomplete medical documentation, replication of results in different time periods with improper clinical photographs or diagnosis were excluded from the study. Simple random sampling method was carried out. Cross verification was done by additional reviewers and by photographic evaluation.

Data collection

Patient details like age, gender, teeth no, surfaces involved, cause for replacement were included. The prevalence of frequently displaced class 2 restorations was determined. The collected Data was described as frequency distribution and percentile. All obtained data were tabulated into Microsoft excel documents.

Statistical analysis

The collected Data was described as frequency distribution and percentile. Statistical analysis was performed using Statistical Package for the Social Sciences, version 22 (SPSS). Descriptive analysis were based on quantitative variables and frequencies for categorical variables. A Chi square test was applied to determine the significance between groups. p value < 0.05 was considered to be statistically significant with a confidence interval of 95%.

Results

A total of 1568 patients were included in the present study among which 44.25% were in the age group 31–45 yrs (Fig 1). There were 53% men and 47% women included in the study (Fig 2). The majority of the displaced restorations were class 2 mesio occlusal (MO) with 85% followed by 8.32% MOD and 5.81% Disto- occlusal (Fig 3). Over 50% of the study population had dislodged upper molar restorations followed by 28.93% lower molar restorations (Fig 4). Conservative cavity design was the frequently used cavity preparation with 69% followed by conventional with 20% and box preparation with 7.79% (Fig 5). 61% of the restorations had more than 4 yrs of survival rate (Fig 6). The most common cause for the displaced restorations was fracture and secondary caries with 35.67% each followed by para functional habits with 28.67% (Fig 7). The association between cavity design and survival rate was done and 43.59% of the conventional cavities had a survival rate of more than 4 years. The p value was 0.03 ($p < 0.05$) which was statistically significant (Fig 8). The association between the type of restorations and survival rate was found to be highly significant, $p = 0.001$ (Fig 9). The cause

of dislodgement and age group was associated and p value was found to be 0.02 which was statistically significantly (Fig 10).

Discussion

In this present study , fracture of the restoration and Secondary caries was the most common reason for displaced restorations . Secondary caries are the presence of lesions at the margins of existing restoration (10). The presence or recurrence of secondary caries is most commonly associated with the marginal areas of the restoration, and it has been stated in previous literature that 80% to 90% of secondary caries can be found at the gingival margin such as in the case of class II(37,38) . The recurrence of these lesions is attributed to the accumulation of plaque and especially in susceptible individuals who have and to the overall difficulty in cleaning it, especially in the interproximal margin(39). Our study restorations were grouped by patients(37).

This study showed that conservative cavity preparation has a higher recurrence of secondary caries . In a previous literature , correlation between cavity preparation techniques like the traditional Class II Saucer-shaped restorations and their survival rates was observed(40) . The Impact of cavity design on the longevity of composite restorations was recorded. Traditional class II preparations had a better longevity than saucer-shaped restorations(40,41).

A comparative study done previously observed that the majority of the patients choice of restorative material was composite. In the previous study, resin-composite restorations failed more than amalgam restorations. JOKSTAD et al in his study found the longevity of amalgam restoration to be 12–14 yr compared to 7–8 yr for composite-resin restorations. More studies observed better survival rate of amalgam restorations(42–44).

Studies conducted in the 1990's on the longevity of dental restorations had similar results to the present study . It was observed that secondary caries was the reason for replacement in 33–65% of failed resin-composite restorations. Studies published later reported similar rates: 25% , 38% , 52%, 58%, and 88%(45). The lack of standardized diagnostic criteria for marginal failure could cause over-registration of secondary caries(46). The current study shows the association of age and survival rate of restorations to be significant . Lower survival rates were seen in the younger age group . Similar results were seen in the study conducted by Hawthorne and Smales indicated that lower survival rates occurred when the restorations were placed in patients younger than 20 yr of age compared with those 21–40 yr of age(47,48) (47) reported that approximal lesions progress through the enamel more slowly in young adults than in adolescents, and according to CARLOS & GITTELSON (47–49), caries-attack rates may reach a peak from 2 to 4 yr following eruption. Longevity of dental restorations (50).

Resin composite was and still is after the minute use of amalgam, the dominant material of choice for Class II restorations . For resin-composite restorations, secondary caries was the

most common reason for replacement, and longevity was significantly greater in older patients (46,50–55). Resin composites performed better with traditional Class II preparations than with saucer-shaped restorations, and the risk of failure was higher in medium/deep cavities compared with shallow cavities (56,57). Limitations of the present study are assessing the shorter sample population, with no proper preoperative data. Future studies can assess using a prospective standardized controlled trial.

Conclusion

The present study reported a high incidence of displacement in the restoration in the mesio occlusal surfaces, especially on the molars. The most common cause of dislodgement was found to be fracture and secondary caries. This study demonstrated that a wide variation of risk factors on the practice, patient, and tooth levels influences the survival of class II restorations. To provide personalized dental care, it is important to identify and record potential risk factors. Therefore, we recommend further clinical studies to include these patient risk factors in data collection and analysis.

Acknowledgements:

This research was done under the supervision of the Department of Endodontics, Saveetha Dental College and Hospital. We sincerely show gratitude to the corresponding guide who provided insight and expertise that greatly assisted the research.

Conflict Of Interest:

There was no potential conflict of interest.

Source of Funding:

- Saveetha Dental College & Hospitals
- Saveetha Institute of Medical and Technical Sciences
- Saveetha University
- Kumar Automobiles, Chennai.

References

- Qvist J, Qvist V, Mjör IA. Placement and longevity of amalgam restorations in Denmark [Internet]. Vol. 48, Acta Odontologica Scandinavica. 1990. p. 297–303. Available from: <http://dx.doi.org/10.3109/00016359009033620>
- AlNegrish AS. Reasons for placement and replacement of amalgam restorations in Jordan [Internet]. Vol. 51, International Dental Journal. 2001. p. 109–15. Available from: <http://dx.doi.org/10.1002/j.1875-595x.2001.tb00831.x>
- Qvist V, Qvist J, Mjör IA. Placement and longevity of tooth-colored restorations in Denmark [Internet]. Vol. 48, Acta Odontologica Scandinavica. 1990. p. 305–11. Available from: <http://dx.doi.org/10.3109/00016359009033621>

- Castillo J, Sasso L, Svendsen WE. Self-Assembled Peptide Nanostructures: Advances and Applications in Nanobiotechnology. CRC Press; 2012. 324 p.
- Banerjee A. Minimal intervention dentistry: part 7. Minimally invasive operative caries management: rationale and techniques [Internet]. Vol. 214, British Dental Journal. 2013. p. 107–11. Available from: <http://dx.doi.org/10.1038/sj.bdj.2013.106>
- Ekuni D, Battino M, Tomofuji T, Putnins EE. Studies on Periodontal Disease. Springer Science & Business Media; 2014. 370 p.
- Frencken JE, Holmgren CJ. Atraumatic Restorative Treatment (ART) for Dental Caries. 1999. 99 p.
- Jokstad A, Mjör IA, Qvist V. The age of restorations in situ [Internet]. Vol. 52, Acta Odontologica Scandinavica. 1994. p. 234–42. Available from: <http://dx.doi.org/10.3109/00016359409029052>
- Forss H, Widström E. Reasons for restorative therapy and the longevity of restorations in adults [Internet]. Vol. 62, Acta Odontologica Scandinavica. 2004. p. 82–6. Available from: <http://dx.doi.org/10.1080/00016350310008733>
- Naimi-Akbar A. Review for “Removal of dental amalgam restorations in patients with health complaints attributed to amalgam: A prospective cohort study” [Internet]. 2020. Available from: <http://dx.doi.org/10.1111/joor.13080/v1/review1>
- Byrnes RR. Operative Restoration of the Teeth In Relation to Adjacent Tissues**Read before the Section on Operative Dentistry at the Midwinter Clinic of the Chicago Dental Society, Jan. 19, 1932 [Internet]. Vol. 19, The Journal of the American Dental Association (1922). 1932. p. 1189–96. Available from: <http://dx.doi.org/10.14219/jada.archive.1932.0099>
- Elderton RJ. Positive Dental Prevention: The Prevention in Childhood of Dental Disease in Adult Life. Butterworth-Heinemann; 1987. 146 p.
- Vallittu P, Özcan M. Clinical Guide to Principles of Fiber-Reinforced Composites in Dentistry. Woodhead Publishing; 2017. 252 p.
- Craig RG. Craig’s Restorative Dental Materials. Mosby; 2006. 632 p.
- Youngson C. Summary of: The survival of Class V restorations in general dental practice. Part 2, early failure [Internet]. Vol. 210, British Dental Journal. 2011. p. 530–1. Available from: <http://dx.doi.org/10.1038/sj.bdj.2011.460>
- Li B, Moriarty TF, Webster T, Xing M. Racing for the Surface: Antimicrobial and Interface Tissue Engineering. Springer Nature; 2020. 809 p.
- PradeepKumar AR, Shemesh H, Nivedhitha MS, Mohamed Jubair Hashir M, Arockiam S, Maheswari TNU, et al. Diagnosis of Vertical Root Fractures by Cone-beam Computed Tomography in Root-filled Teeth with Confirmation by Direct Visualization: A Systematic Review and Meta-Analysis [Internet]. Vol. 47, Journal of Endodontics. 2021. p. 1198–214. Available from: <http://dx.doi.org/10.1016/j.joen.2021.04.022>
- Lichtfouse E, Schwarzbauer J, Robert D. Environmental Chemistry for a Sustainable World: Volume 2: Remediation of Air and Water Pollution. Springer Science & Business

Media; 2011. 541 p.

- Bhavikatti SK, Karobari MI, Zainuddin SLA, Marya A, Nadaf SJ, Sawant VJ, et al. Investigating the Antioxidant and Cytocompatibility of Linn Extract over Human Gingival Fibroblast Cells. *Int J Environ Res Public Health* [Internet]. 2021 Jul 4;18(13). Available from: <http://dx.doi.org/10.3390/ijerph18137162>
- Karobari MI, Basheer SN, Sayed FR, Shaikh S, Agwan MAS, Marya A, et al. An In Vitro Stereomicroscopic Evaluation of Bioactivity between Neo MTA Plus, Pro Root MTA, BIODENTINE & Glass Ionomer Cement Using Dye Penetration Method [Internet]. Vol. 14, *Materials*. 2021. p. 3159. Available from: <http://dx.doi.org/10.3390/ma14123159>
- Rohit Singh T, Ezhilarasan D. Ethanolic Extract of (L.) Pers., Induces Apoptosis and Cell Cycle Arrest in HepG2 Cells. *Nutr Cancer*. 2020;72(1):146–56.
- Shukla AK. *Nanoparticles and their Biomedical Applications*. Springer; 2021. 286 p.
- Romera A, Peredpaya S, Shparyk Y, Bondarenko I, Mendonça Bariani G, Abdalla KC, et al. Bevacizumab biosimilar BEVZ92 versus reference bevacizumab in combination with FOLFOX or FOLFIRI as first-line treatment for metastatic colorectal cancer: a multicentre, open-label, randomised controlled trial. *Lancet Gastroenterol Hepatol*. 2018 Dec;3(12):845–55.
- R KR, Kathiswar RR, Ezhilarasan D, Rajeshkumar S. β -Sitosterol-assisted silver nanoparticles activates Nrf2 and triggers mitochondrial apoptosis via oxidative stress in human hepatocellular cancer cell line [Internet]. Vol. 108, *Journal of Biomedical Materials Research Part A*. 2020. p. 1899–908. Available from: <http://dx.doi.org/10.1002/jbm.a.36953>
- Priyadharsini JV. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens [Internet]. Vol. 90, *Journal of Periodontology*. 2019. p. 1441–8. Available from: <http://dx.doi.org/10.1002/jper.18-0673>
- Maheswari TNU, Nivedhitha MS, Ramani P. Expression profile of salivary micro RNA-21 and 31 in oral potentially malignant disorders [Internet]. Vol. 34, *Brazilian Oral Research*. 2020. Available from: <http://dx.doi.org/10.1590/1807-3107bor-2020.vol34.0002>
- Chaturvedula BB, Muthukrishnan A, Bhuvanaraghan A, Sandler J, Thiruvenkatachari B. Dens invaginatus: a review and orthodontic implications [Internet]. Vol. 230, *British Dental Journal*. 2021. p. 345–50. Available from: <http://dx.doi.org/10.1038/s41415-021-2721-9>
- Bhavikatti SK, Karobari MI, Zainuddin SLA, Marya A, Nadaf SJ, Sawant VJ, et al. Investigating the Antioxidant and Cytocompatibility of Linn Extract over Human Gingival Fibroblast Cells. *Int J Environ Res Public Health* [Internet]. 2021 Jul 4;18(13). Available from: <http://dx.doi.org/10.3390/ijerph18137162>
- Karobari MI, Basheer SN, Sayed FR, Shaikh S, Agwan MAS, Marya A, et al. An In Vitro Stereomicroscopic Evaluation of Bioactivity between Neo MTA Plus, Pro Root MTA, BIODENTINE & Glass Ionomer Cement Using Dye Penetration Method [Internet]. Vol. 14, *Materials*. 2021. p. 3159. Available from: <http://dx.doi.org/10.3390/ma14123159>

- Rohit Singh T, Ezhilarasan D. Ethanolic Extract of (L.) Pers., Induces Apoptosis and Cell Cycle Arrest in HepG2 Cells. *Nutr Cancer*. 2020;72(1):146–56.
- Shukla AK. *Nanoparticles and their Biomedical Applications*. Springer; 2021. 286 p.
- Romera A, Peredpaya S, Shparyk Y, Bondarenko I, Mendonça Bariani G, Abdalla KC, et al. Bevacizumab biosimilar BEVZ92 versus reference bevacizumab in combination with FOLFOX or FOLFIRI as first-line treatment for metastatic colorectal cancer: a multicentre, open-label, randomised controlled trial. *Lancet Gastroenterol Hepatol*. 2018 Dec;3(12):845–55.
- R KR, Kathiswar RR, Ezhilarasan D, Rajeshkumar S. β -Sitosterol-assisted silver nanoparticles activates Nrf2 and triggers mitochondrial apoptosis via oxidative stress in human hepatocellular cancer cell line [Internet]. Vol. 108, *Journal of Biomedical Materials Research Part A*. 2020. p. 1899–908. Available from: <http://dx.doi.org/10.1002/jbm.a.36953>
- Priyadharsini JV. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens [Internet]. Vol. 90, *Journal of Periodontology*. 2019. p. 1441–8. Available from: <http://dx.doi.org/10.1002/jper.18-0673>
- Maheswari TNU, Nivedhitha MS, Ramani P. Expression profile of salivary micro RNA-21 and 31 in oral potentially malignant disorders [Internet]. Vol. 34, *Brazilian Oral Research*. 2020. Available from: <http://dx.doi.org/10.1590/1807-3107bor-2020.vol34.0002>
- Chaturvedula BB, Muthukrishnan A, Bhuvanaraghan A, Sandler J, Thiruvenkatachari B. Dens invaginatus: a review and orthodontic implications [Internet]. Vol. 230, *British Dental Journal*. 2021. p. 345–50. Available from: <http://dx.doi.org/10.1038/s41415-021-2721-9>
- Crabb HS. The survival of dental restorations in a teaching hospital [Internet]. Vol. 150, *British Dental Journal*. 1981. p. 315–8. Available from: <http://dx.doi.org/10.1038/sj.bdj.4804601>
- Summitt JB. *Fundamentals of Operative Dentistry: A Contemporary Approach*. Quintessence Publishing Company; 2006. 599 p.
- Radnaabaatar M, Kim Y, Go D, Jung Y, Jung J, Yoon S. Burden of dental caries and periodontal disease in South Korea: An analysis using the national health insurance claims database [Internet]. Vol. 47, *Community Dentistry and Oral Epidemiology*. 2019. p. 513–9. Available from: <http://dx.doi.org/10.1111/cdoe.12493>
- Pandis N. The evidence pyramid and introduction to randomized controlled trials [Internet]. Vol. 140, *American Journal of Orthodontics and Dentofacial Orthopedics*. 2011. p. 446–7. Available from: <http://dx.doi.org/10.1016/j.ajodo.2011.04.016>
- Ferri J, Hunziker E. *Preprosthetic and Maxillofacial Surgery: Biomaterials, Bone Grafting and Tissue Engineering*. Elsevier; 2011. 400 p.
- Li B, Moriarty TF, Webster T, Xing M. *Racing for the Surface: Antimicrobial and Interface Tissue Engineering*. Springer Nature; 2020. 809 p.
- Muthukrishnan L. Nanotechnology for cleaner leather production: a review [Internet]. Vol.

- 19, *Environmental Chemistry Letters*. 2021. p. 2527–49. Available from: <http://dx.doi.org/10.1007/s10311-020-01172-w>
- Teja KV, Ramesh S. Is a filled lateral canal – A sign of superiority? [Internet]. Vol. 15, *Journal of Dental Sciences*. 2020. p. 562–3. Available from: <http://dx.doi.org/10.1016/j.jds.2020.02.009>
 - Bhavikatti SK, Karobari MI, Zainuddin SLA, Marya A, Nadaf SJ, Sawant VJ, et al. Investigating the Antioxidant and Cytocompatibility of Linn Extract over Human Gingival Fibroblast Cells. *Int J Environ Res Public Health* [Internet]. 2021 Jul 4;18(13). Available from: <http://dx.doi.org/10.3390/ijerph18137162>
 - Rohit Singh T, Ezhilarasan D. Ethanolic Extract of (L.) Pers., Induces Apoptosis and Cell Cycle Arrest in HepG2 Cells. *Nutr Cancer*. 2020;72(1):146–56.
 - Ezhilarasan D. MicroRNA interplay between hepatic stellate cell quiescence and activation. *Eur J Pharmacol*. 2020 Oct 15;885:173507.
 - Smales M, Morris H, Savaglio M, Skouteris H, Green R. “I”m dealing with all these health issues that could have been addressed when I was younger”. Delivery of health services to Australian young people in out-of-home care: Lived experiences. *Health Soc Care Community* [Internet]. 2021 Aug 19; Available from: <http://dx.doi.org/10.1111/hsc.13548>
 - Alkoheji M, El-Daou H, Lee J, Carlos A, Di Mascio L, Amis AA. Acromioclavicular joint reconstruction implants have differing ability to restore horizontal and vertical plane stability. *Knee Surg Sports Traumatol Arthrosc* [Internet]. 2021 Aug 26; Available from: <http://dx.doi.org/10.1007/s00167-021-06700-x>
 - Romera A, Peredpaya S, Shparyk Y, Bondarenko I, Mendonça Bariani G, Abdalla KC, et al. Bevacizumab biosimilar BEVZ92 versus reference bevacizumab in combination with FOLFOX or FOLFIRI as first-line treatment for metastatic colorectal cancer: a multicentre, open-label, randomised controlled trial. *Lancet Gastroenterol Hepatol*. 2018 Dec;3(12):845–55.
 - Kharissova OV, Torres-Martínez LM, Kharisov BI. *Handbook of Nanomaterials and Nanocomposites for Energy and Environmental Applications*. Springer; 2021. 3728 p.
 - Chaturvedula BB, Muthukrishnan A, Bhuvanaraghan A, Sandler J, Thiruvengatachari B. Dens invaginatus: a review and orthodontic implications [Internet]. Vol. 230, *British Dental Journal*. 2021. p. 345–50. Available from: <http://dx.doi.org/10.1038/s41415-021-2721-9>
 - Gudipani RK, Alam MK, Patil SR, Karobari MI. Measurement of the Maximum Occlusal Bite Force and its Relation to the Caries Spectrum of First Permanent Molars in Early Permanent Dentition [Internet]. Vol. 44, *Journal of Clinical Pediatric Dentistry*. 2020. p. 423–8. Available from: <http://dx.doi.org/10.17796/1053-4625-44.6.6>
 - Alahari S. *MicroRNA in Cancer*. Springer Science & Business Media; 2012. 148 p.
 - Garcia-Conteras R, Wood TK, Tomás M. Quorum Network (Sensing/Quenching) in Multidrug-Resistant Pathogens. *Frontiers Media SA*; 2019.
 - R KR, Kathiswar RR, Ezhilarasan D, Rajeshkumar S. β -Sitosterol-assisted silver nanoparticles activates Nrf2 and triggers mitochondrial apoptosis via oxidative stress in

human hepatocellular cancer cell line [Internet]. Vol. 108, Journal of Biomedical Materials Research Part A. 2020. p. 1899–908. Available from: <http://dx.doi.org/10.1002/jbm.a.36953>

- Levy GA, Talbot PJ. Corona- and Related Viruses: Current Concepts in Molecular Biology and Pathogenesis. Springer Science & Business Media; 2012. 615 p.

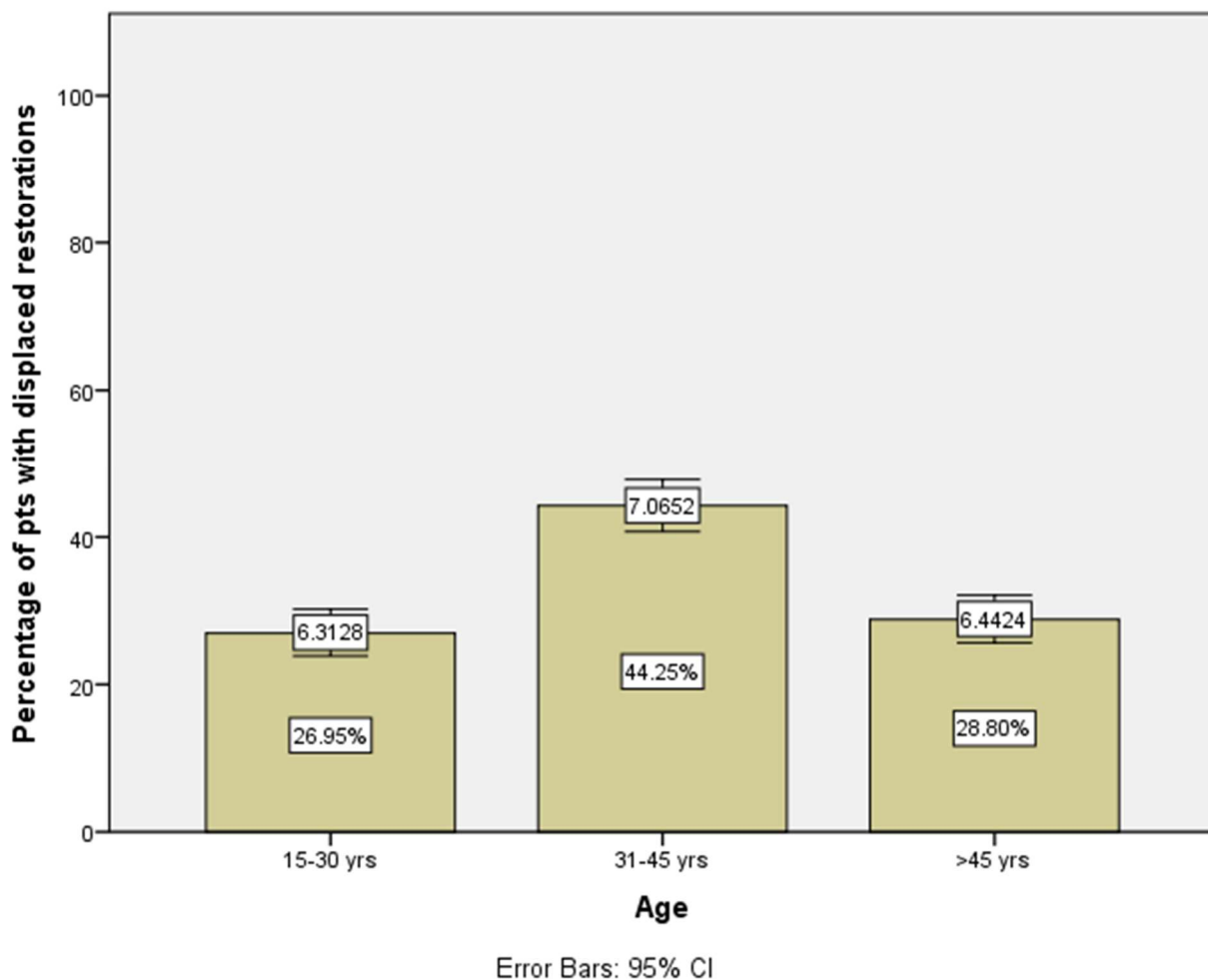


Fig 1 : Shows the distribution of the age group of patients with displaced restorations. The X axis depicts the age group and Y axis as the percentage of patients with displaced restorations . The majority of the patients were in the age group 31-45 yrs (44.25%)

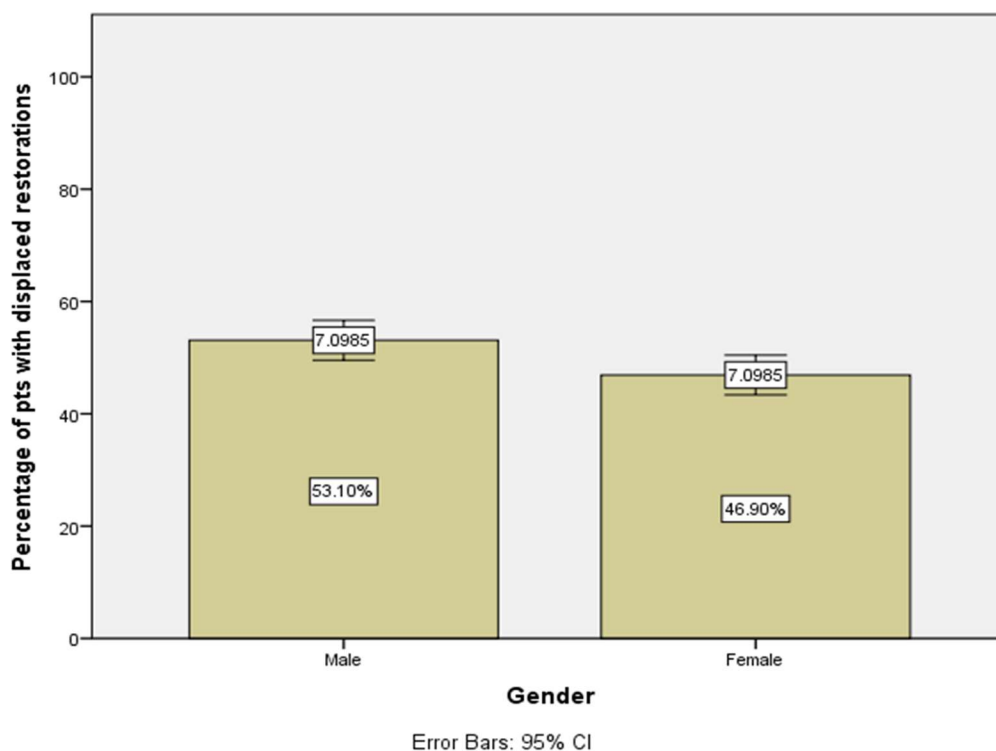


Fig 2 : Shows the distribution of the gender of patients with displaced restorations. The X axis depicts the gender and Y axis as the percentage of patients with displaced restorations . There were 53% males and 47% females included in the study

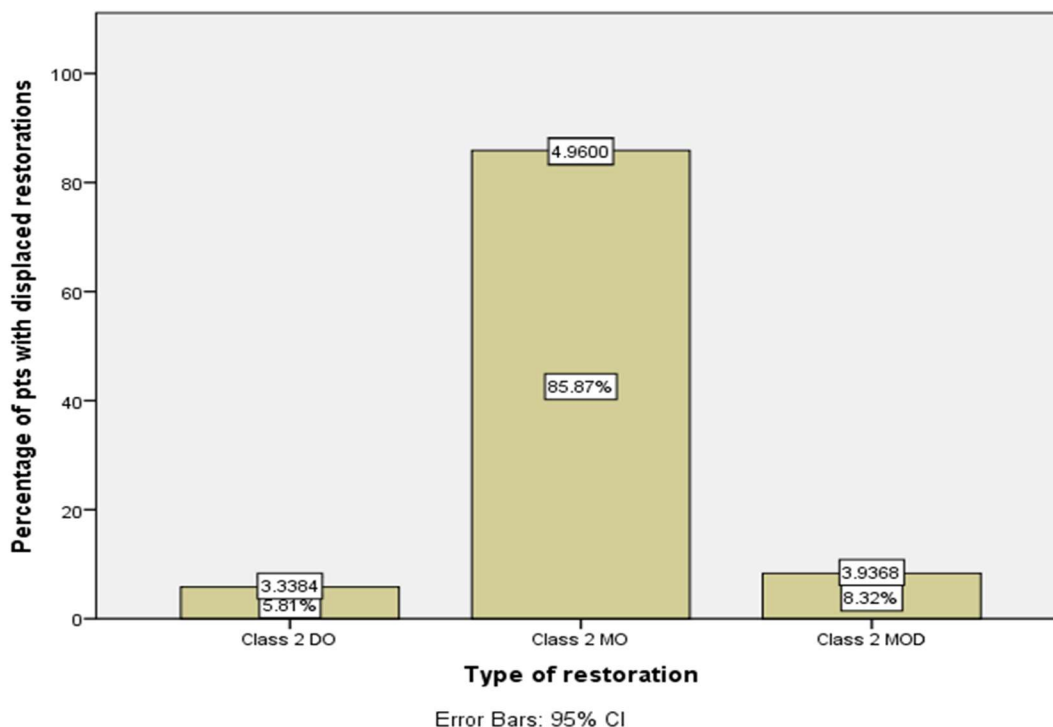


Fig 3 : Shows the distribution of the type of restoration . The X axis depicts the type of restorations as Class 2 DO, Class 2 MO and MOD and Y axis as the percentage of patients with displaced restorations . Most of the displaced restorations were class 2 MO with 85.87%.

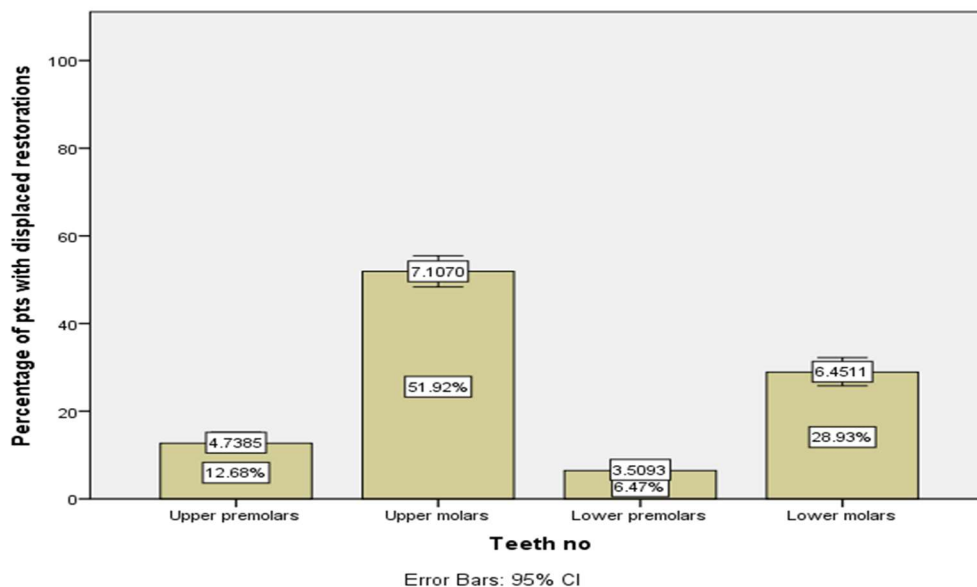


Fig 4 : Shows the distribution of the teeth affected . The X axis depicts the teeth as upper premolars, upper molars , lower premolars and lower molars and Y axis as the percentage of patients with displaced restorations . Most of the displaced restorations were seen in the molars with upper molars 51.92% and lower molars 28.93%.

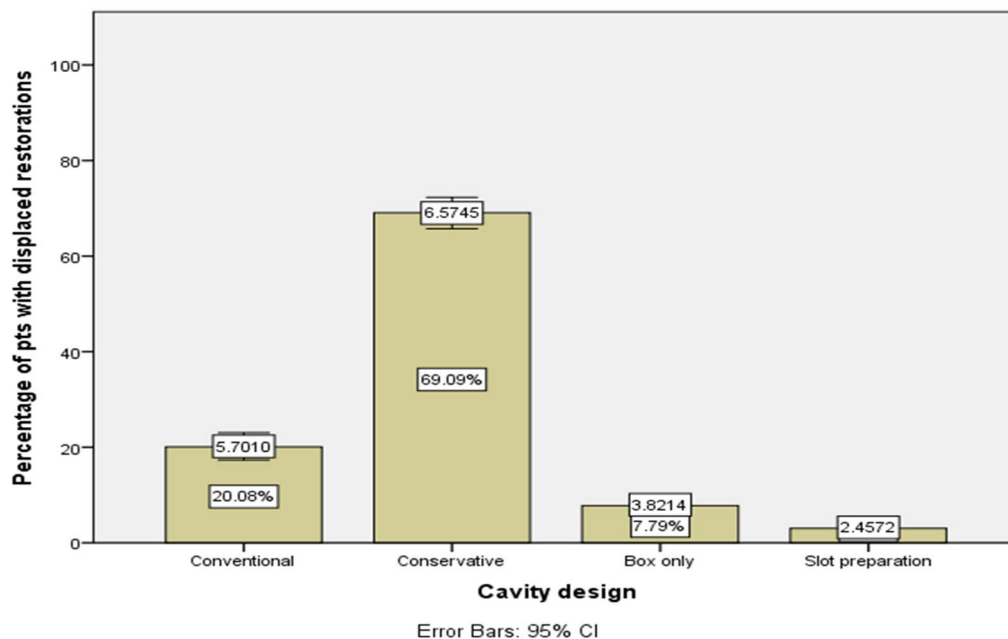


Fig 5 : Shows the distribution of the cavity design. The X axis depicts the cavity design as conventional, conservative, box preparation and slot preparation and Y axis as the percentage

of patients with displaced restorations . Most of the displaced restorations were seen in the conservative cavity design with 69%.

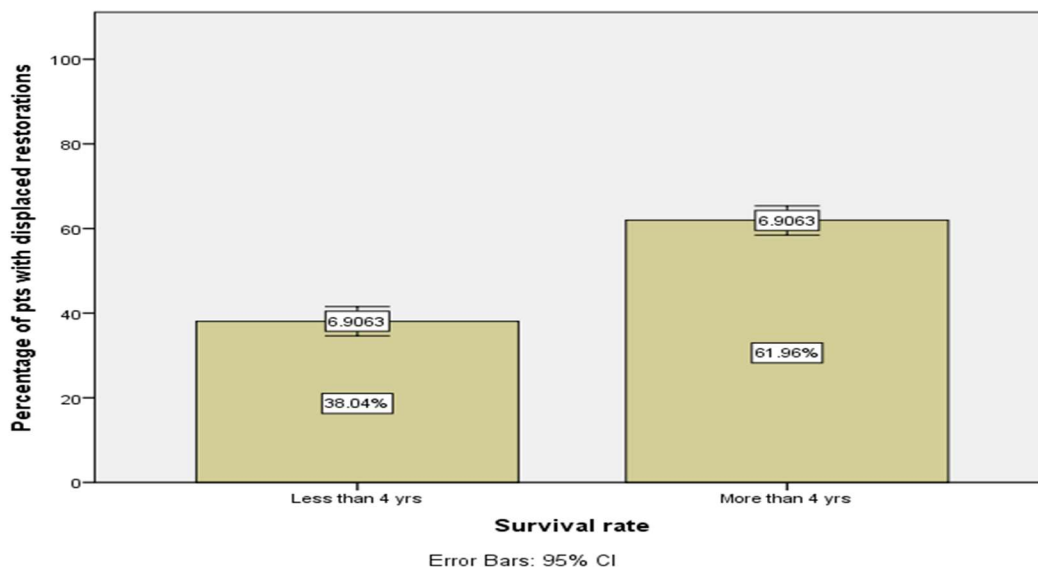


Fig 6 : Shows the distribution of the survival rate of the restorations. The X axis depicts the survival rate and Y axis as the percentage of patients with displaced restorations . 61% of the restorations had a survival rate of more than 4 years and 39% had a survival rate of less than 4 years.

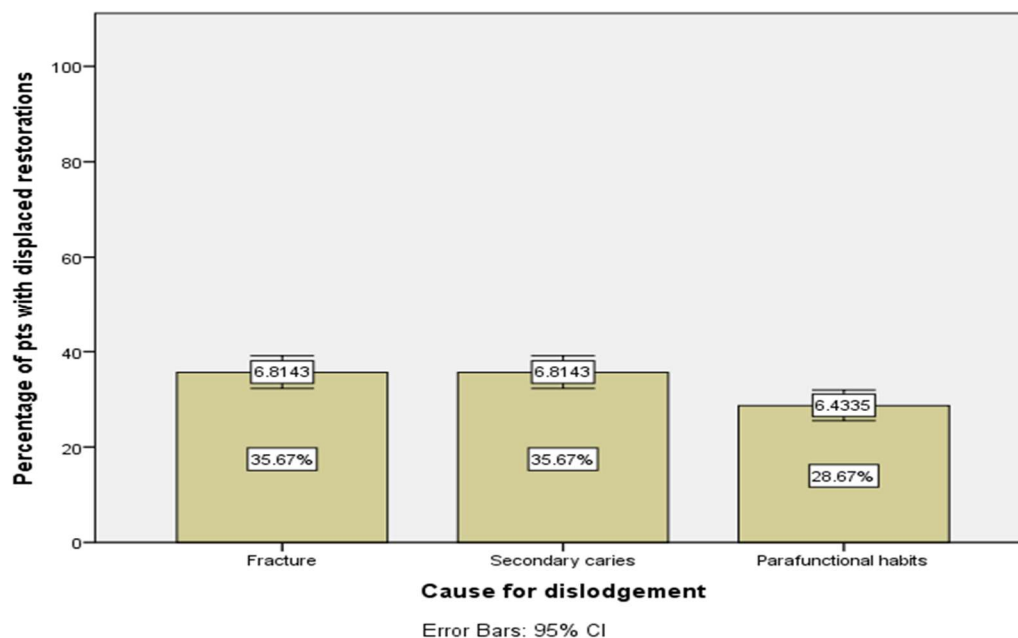


Fig 7 : Shows the frequency of the cause of dislodgement . The X axis depicts the cause and Y axis as the percentage of patients with displaced restorations . 35.67% were due to fractured restorations, 35.67% due to secondary caries and 28.67% due to parafunctional habits.

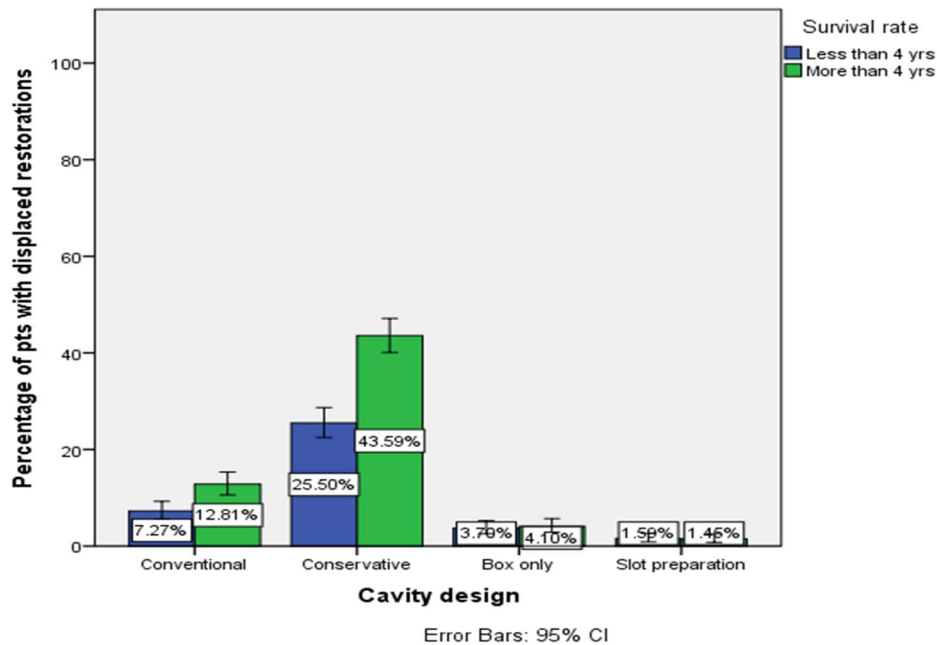


Fig 8: Bar graph showing the association between cavity design and survival rate of patients with displaced restorations . X axis represents the cavity design and Y axis the percentage of patients with displaced restorations . Blue represents less than 4 yrs and green represents more than 4yrs . Conservative cavity design had a survival rate of more than 4 years. This was found to be statistically significant. Pearson Chi square, $p= 0.03$ ($P<0.05$, statistically significant).

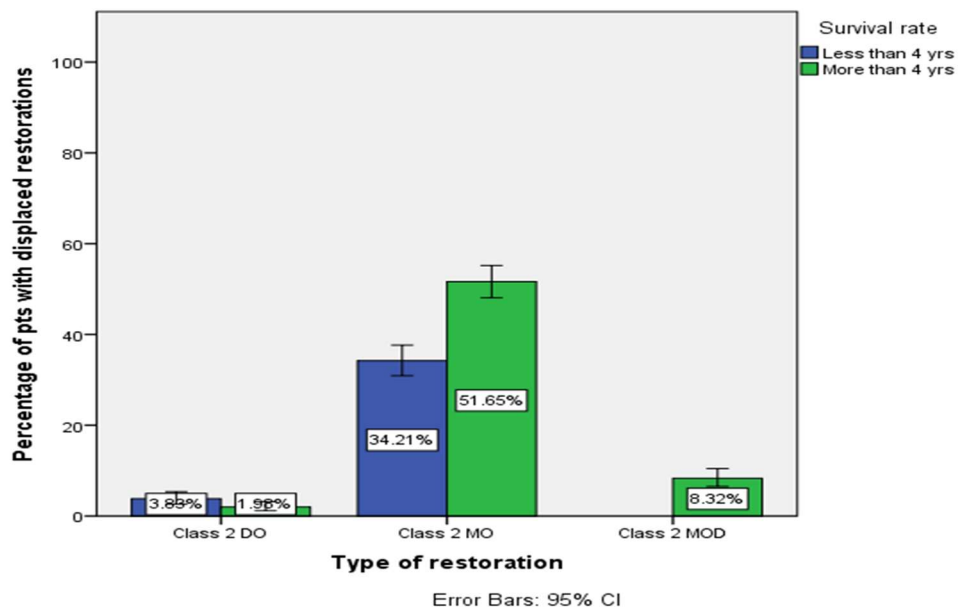


Fig 9: Bar graph showing the association between type of restorations and survival rate of patients with displaced restorations . X axis represents the type of restorations and Y axis the percentage of patients with displaced restorations . Blue represents less than 4 yrs and green represents more than 4yrs . Class 2 MO had a survival rate of more than 4 years. This was

found to be statistically significant. Pearson Chi square, $p= 0.001(P<0.05,$ statistically significant).

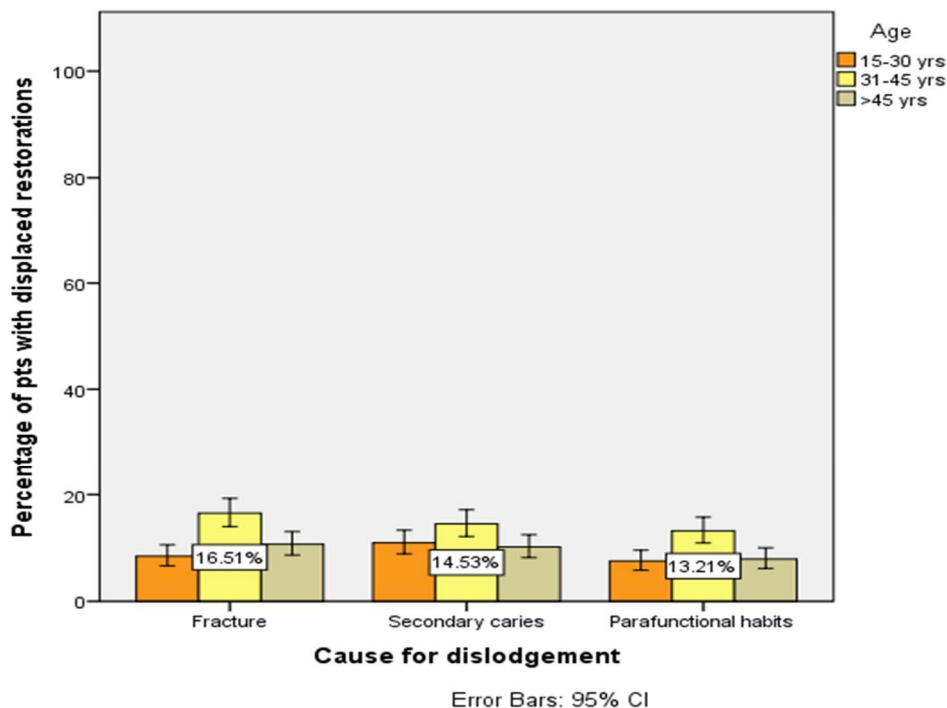


Fig10 : Bar graph showing the association between cause of dislodgement and age group of patients with displaced restorations . X axis represents the cause of dislodgement and Y axis the percentage of patients with displaced restorations . Orange represents 15-30 yrs , yellow represents 31-45 yrs and brown represents > 45 yrs . Fracture was the most common reason for dislodgement among 31-45 yr olds . This was found to be statistically significant. Pearson Chi square, $p= 0.02(P<0.05,$ statistically significant).