
Assessment of Preferred Method of Temporisation Technique in Single Crown Tooth Preparation - A Retrospective Study

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Abstract: Temporary restoration are used for short or long term between the time of tooth preparation until the definitive indirect restorations are fitted. Various techniques are used to fabricated these restorations- direct ,indirect ,combination of both. The aim of this study was to assess the preferred method of temporisation in single teeth crown preparation. This study was conducted at a private dental institute between June 2019 to March 2020. 86000 patient records were analyzed. Total of 976 teeth which had temporary crowns following single tooth crown preparation were included and assessed for technique of fabrication with gender of the patient, type of teeth temporised and the technique used for temporisation. The tabulated data was analysed using SPSS software . Incomplete date were excluded from the study. Statistical analysis was done using a chi -square test. In our study we observed that maximum number of temporisation procedures was done in males with predominance in maxillary posteriors. Association between the type of teeth restored and the temporisation technique showed that direct technique was the most preferred technique and it was most commonly done in maxillary posteriors (p <0.05). The interim restoration plays a significant role in maintaining the occlusal function and protects the prepared tooth, hence proper temporisation is required following tooth preparation.

Keywords: Crown preparation; Direct technique; Indirect technique ;Post endodontic restoration; Temporisation

INTRODUCTION

A temporary restoration is an important part of prosthetic therapy .It can be used as an intermediate stage for short or long term between the time of tooth preparation until the definitive indirect restorations are fitted (Abdullah, Pollington and Liu, 2018). Accurate temporary restoration are essential and serve various functions, including protection of pulpal tissues, preventing bacterial contamination and preserving the periodontal tissues (Dumitrescu, Okada and Inagaki, 2010; Nugala et al., 2012; Singh, Tripathi and Rai, 2016; Ortega et al., 2017). Temporisation of the endodontically treated also influence its success rate. Various factors also determine the success of endodontic treatment which include initial cause for infection (Teja, Ramesh and Priya, 2018) (Jose, P. and Subbaiyan, 2020) and inflammation (R, Rajakeerthi and Ms, 2019), diagnostic aids used (Ramanathan and Solete, 2015; Janani, Palanivelu and Sandhya, 2020), anatomical consideration (Kumar and Delphine Priscilla Antony, 2018), instrumentation protocol ,type of irrigants used (Noor, S Syed Shihaab and Pradeep, 2016; Siddique and Jayalakshmi, 2019) and its activation protocol (Ramamoorthi, Nivedhitha and Divyanand, 2015), intracanal medicaments used (Rajendran et al., 2019) (Manohar and Sharma, 2018), obturating materials ,coronal seal (Hussainy et al., 2018), permanent restorations like veneers (Ravinthar and Jayalakshmi, 2018) , periapical pathosis and intra oral environment (Nasim and Nandakumar, 2018).

A well fabricated temporary restorations should provide a preview of future prosthesis and enhance the health of the abutments and periodontium. The mechanical properties of temporisation materials are important and should be considered to ensure the clinical success of the final restoration. (Tsitrou et al., 2009)

A properly designed and fabricated interim restoration is crucial to success of a definitive prosthesis. (Miura et al., 2019) The interim restoration protects the prepared teeth and the margin from oral bacteria and external pressure and maintains occlusal function and positional stability by preventing drift ,rotation and

eruption(Shillingburg and Sather, 2012).The rationale for interim restoration includes (Wassell et al., 2002; Burns et al., 2003; Santosa, 2007)(Keys, Keirby and Ricketts, 2016)comfort and pulpal protection,Occlusion and position stability, periodontal health ,esthetics,diagnosis.

Provisional restoration may be made directly on prepared teeth(Regish, Sharma and Prithviraj, 2011)(Fehling and Neitzke, 1994) with the use of matrix or indirectly by making an impression of prepared teeth(Boberick and Bachstein, 1999).Combination of direct - indirect technique (Bennani, 2000)has also evolved as a sequential application that involves fabrication of a preformed shell that was reclined intra orally.

The commonly used materials for fabrication of provisional crowns were classified as acrylics or resin composites.Several types of acrylic resin materials were available for interim restorative treatment like polymethyl methacrylate resins or combinations of unfilled methacrylate resins. Prefabricated restorations can be either prefabricated or custom made (D. et al., 2012).

Most of the previous studies(Wassell et al., 2002; Abdullah, Pollington and Liu, 2018; Miura et al., 2019) focus on the importance of the provisional restoration only in the prosthodontic aspects ,none has emphasised its importance after the single endodontically treated teeth.post treatment procedure.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)

Thus this study aims to assess the various techniques used in fabrication of the temporary crowns during single crown tooth preparation.

MATERIALS AND METHODS

Study design and setting:

This retrospective study setting is mainly a type of university based and a single centered study which examined the records of patients from June 2019 to March 2020 undergoing treatment at Saveetha Dental College and Hospitals, Chennai. This was initiated after the approval from the institutional scientific review board (SDC/SIHEC/2020/DIASDATA/0619-0320).

Study population and sampling:

After assessment in the university patient data registry,patients who underwent 1365 single crown tooth preparation data was retrieved, out of which 389 incomplete data were excluded.Therefore a total of 780 patients who underwent single crown tooth preparation for 976 teeth were included in the study.Incomplete data was excluded from the study.The inclusion criteria of our study was all the patients above the age of 18 yrs, who had undergone temporisation following single crown tooth preparation.The treatment was performed in undergraduate clinics, postgraduate clinics and comprehensive care unit of the university. This data included all vital teeth and root canal treated teeth which had undergone single crown tooth preparations.Exclusion criteria included teeth which underwent bridges were excluded. The data was cross verified by another examiner to avoid errors.Sampling bias was minimised by verifying the photographs and radiographs by an external reviewer.

Data collection:

After verification of dental hospital management system records of all patients, data such as name, age, gender of patients and temporisation technique were extracted.The temporisation methods were categorised into direct technique,indirect technique and direct-indirect technique. Repeated patient records, incomplete data without proper notes were excluded from the data.The data was tabulated and all data was transferred to an MS Excel sheet and further sorted

Statistical analysis:

The data from Microsoft Excel was exported to IBM SPSS (version 20.0 chicago USA) and subjected to Statistical analysis.Chi-square test was then employed with a level of significance set at $P < 0.05$.The statistical analysis between gender, teeth number ,temporisation technique was carried out in SPSS software and analysed using Chi-square test. The outcome was represented in the form bar charts.

RESULTS AND DISCUSSION

Our study included 780 patients who underwent single crown tooth preparation for 976 teeth.Gender distribution of the patient revealed 435 males (55.3%) and 351 females had undergone single crown tooth preparation (44.7%).Teeth distribution data revealed maximum number of single crown tooth preparations were done in maxillary posteriors for 431 teeth (44.4 %) and the least being mandibular anteriors - 13 teeth (1.3%). With

regards to temporisation techniques that was followed, direct method of temporisation was done in 699 teeth (72.1%) and the least being indirect technique in 121teeth (12.5%). Association between teeth number and temporisation technique revealed that most common one was direct method in maxillary posteriors (32.06%) and the least being direct-indirect technique method in mandibular anteriors (0.10%) ($p < 0.05$). Association between gender of the patient and temporisation technique revealed that maximum number of temporisation technique followed was direct method done in male patient (40.41%) and the least being indirect technique method in female (5.05%).

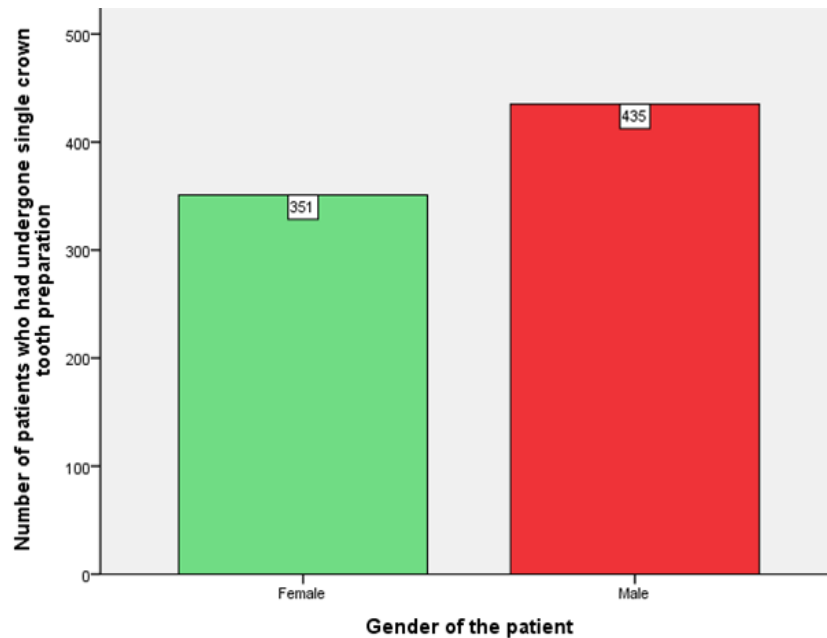


Fig.1: Bar graph showing the gender distribution of the patients who had undergone single crown tooth preparation. X axis represents the gender of the patient and Y axis represents the number of patients who had undergone single crown tooth preparation.435 males (55.3%) (red bar) and 351 females had undergone single crown tooth preparation (44.7%) (green bar).

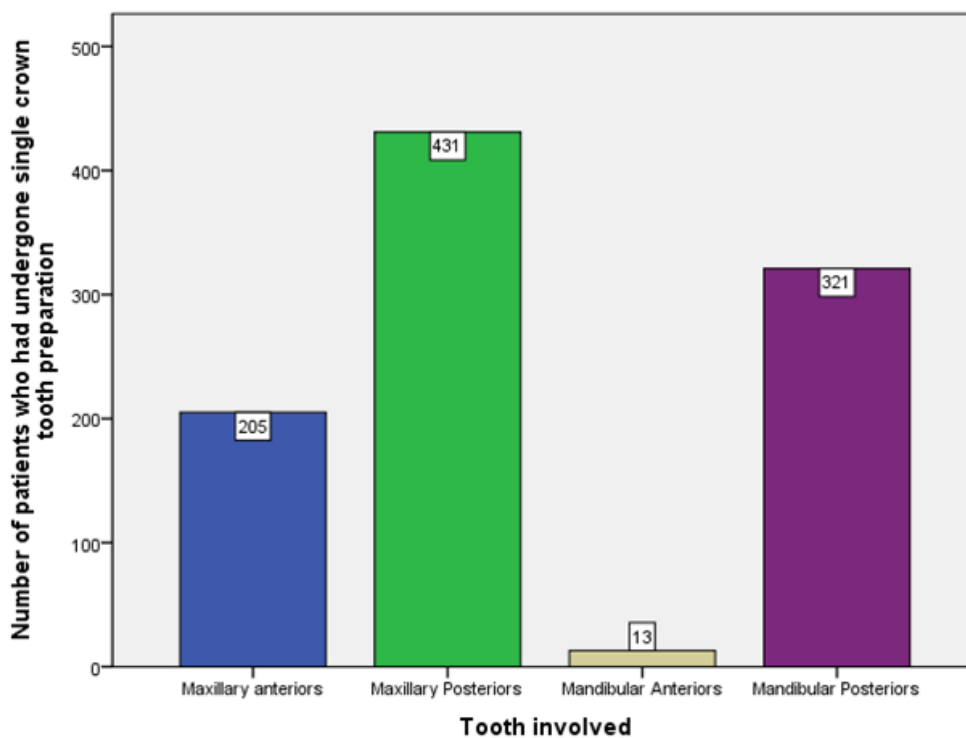


Fig.2: Bar graph showing the teeth distribution of patients who had undergone single crown tooth preparation. X axis represents the teeth involved and Y axis represents the number of patients who had undergone single crown tooth preparation. Maximum number of single crown tooth preparations were done in maxillary posteriors for 431 teeth (44.4 %) (green bar) and the least being mandibular anteriors with 13 teeth (1.3%)(beige bar).

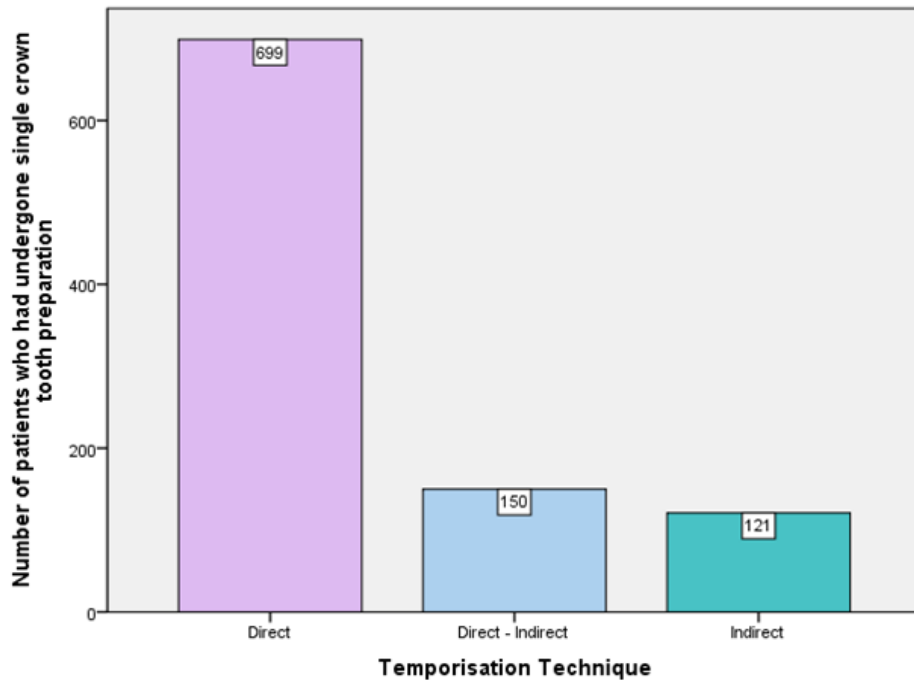


Fig.3: Bar graph showing the temporisation technique that has been followed during single crown tooth preparation. X axis represents the technique followed and Y axis represents the number of patients who had undergone single crown tooth preparation. Following single crown tooth preparations Direct method of temporisation was done in 699 teeth (72.1%) (violet bar) and the least being Indirect technique in 121teeth (12.5%)(blue bar).

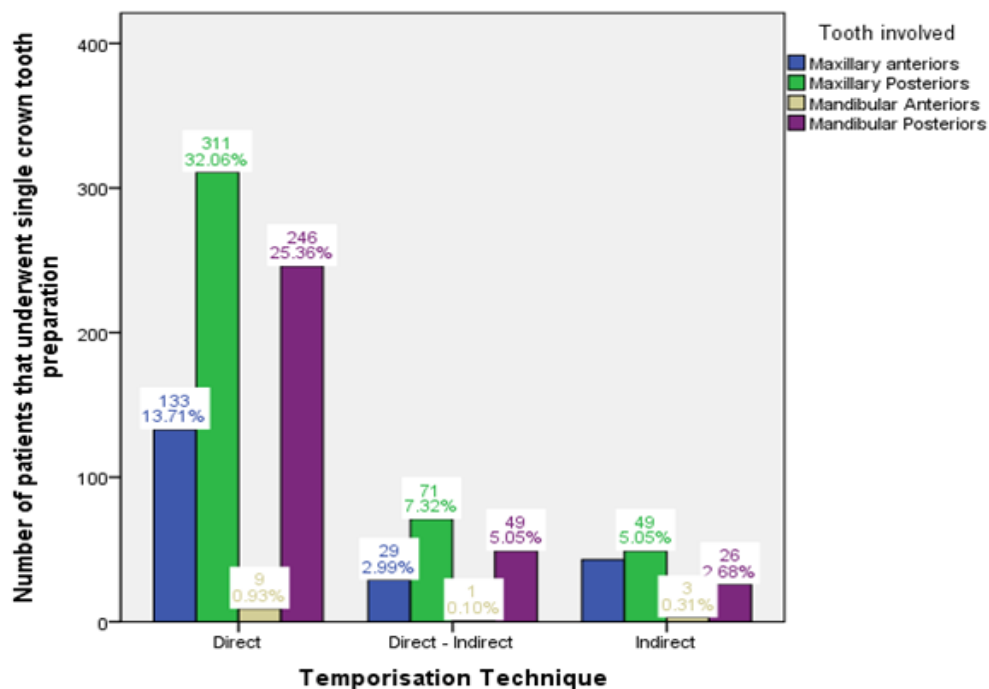


Fig.4: Bar chart showing the association between teeth number and temporisation technique. X axis represents the temporisation technique and Y axis represents the number of patients who had undergone single crown tooth preparation in different regions: Maxillary anteriors;maxillary

posteriors;mandibular anteriors and mandibular posteriors. Maximum number of temporisation technique followed was direct method in maxillary posteriors (32.06%) and the least being direct-indirect technique method in mandibular anteriors (0.10%) Chi-square test was done to find the association between the type of teeth treated and method of temporisation. Pearson's Chi-square value = 21.840, df = 6, p value 0.01 (<0.05) hence statistically significant.

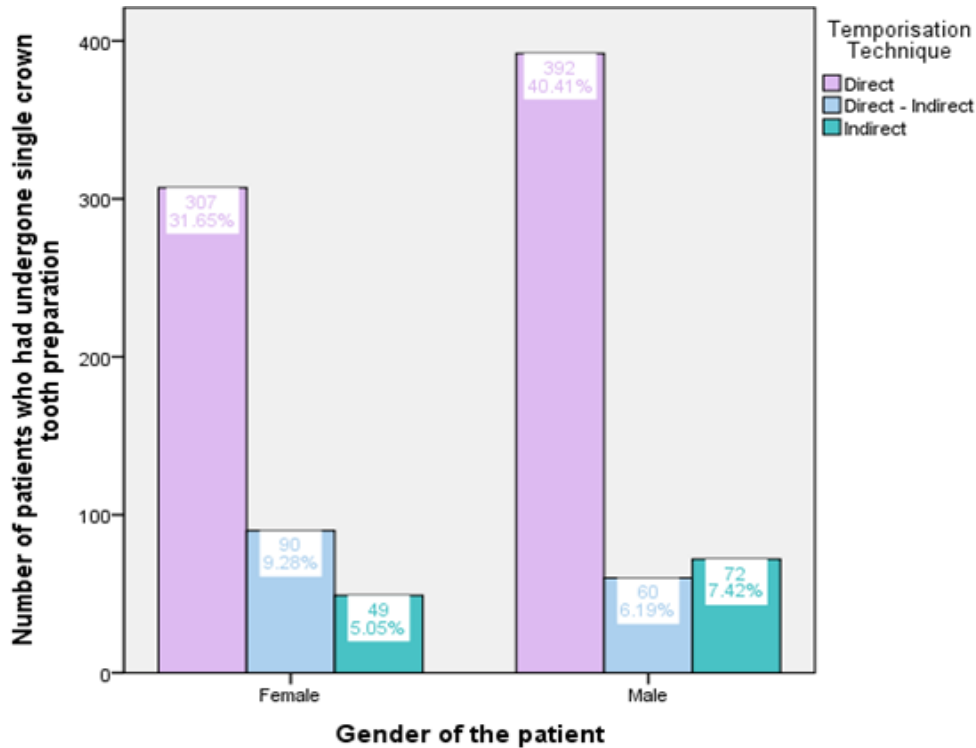


Fig.5: Bar chart showing association between gender and temporisation technique. The X axis represents the gender of the patient and Y axis represents the number of patients who had undergone single crown tooth preparation and temporary restoration given using different techniques of temporisation. Maximum number of temporisation techniques followed was direct method in male patient (40.41%) and the least being indirect technique method in female(5.05%). Chi-square test was done and the association between the type of teeth treated and method of temporisation. Pearson's Chi-square value =14.530, df = 2, p value 0.01 (<0.05) hence statistically significant.

Our study analysed the gender,teeth distribution ,type of temporisation technique used during the single teeth crown preparation.Among the 976 teeth analysed,gender distribution showed the predominance with males (55.3%) than the females (44.7%).Maximum number of teeth temporised was higher in number among the maxillary posteriors (44.4%) which was in accordance with the study by Abdullah et al(Abdullah, Pollington and Liu, 2018) which showed that posteriors as the most often teeth temporised than the anteriors.But this was contradicted by Burns et al (Burns et al., 2003),which showed no significant difference among the distribution of teeth.Thus the result can be justified by the reason that posterior teeth were the ones which take up the maximum load during mastication and thus chances of alteration of the prepared tooth structure such as chipping(Waerhaug, 1980; Moulding, Loney and Ritsco, 1994) ,fracture were higher in the posterior teeth.Molars and premolars were temporised primarily to help in occlusion and mastication while the anteriors were temporised for esthetic reasons.(Waerhaug, 1980; Moulding, Loney and Ritsco, 1994)

There are three types of techniques used in fabrication of provisional restoration which includes direct ,indirect and combination of both.(D. et al., 2012),(Gratton and Aquilino, 2004; D. et al., 2012)Direct temporisation technique uses a mold or matrix ,which is made from the preoperative diagnostic cast or from a diagnostic wax up.After tooth preparation,the matrix is trial checked in the patient's mouth and the teeth are lubricated by petroleum jelly. Then the matrix with provisional material is placed on the prepared teeth and allowed to polymerise.The heat produced during polymerisation can be dissipated using air water syringe.Once the material reaches the rubbery stage,the restoration was repeatedly resealed until complete setting so as to avoid locking of the restoration during polymerisation.(Gratton and Aquilino, 2004)(Deines, 1988; Haddix, 1988)

Indirect temporisation technique uses an irreversible hydrocolloid /non aqueous elastomeric impression after tooth preparation, which was then poured with fast setting plaster/stone. The matrix was then trial checked on the cast followed by fabrication of the provisional restoration directly on the cast (Gratton and Aquilino, 2004; Abdullah, Pollington and Liu, 2018). Indirect -direct temporisation which is a combination of two techniques is considered to provide the most accurate fitting prosthesis providing better periodontal and prosthetic outcome. In this technique a thin shell is fabricated indirectly on the cast which is then relined with provisional restorative material intraorally. (Gratton and Aquilino, 2004; D. et al., 2012).

In this study direct technique of temporisation (72.1%) showed higher incidence than the indirect and direct-indirect technique. Similar result was observed by Panagiotis et al (Psichogios and Monaco, 2003) that direct technique was preferred over the indirect technique, which was contradicted by studies of Abdullah et al (Abdullah, Pollington and Liu, 2018) and Tahayari et al (Tahayeri et al., 2018) which preferred indirect technique than the direct technique. It can be justified that the direct technique was preferred over the indirect technique because of its time efficiency and cost effectiveness (Abdullah, Pollington and Liu, 2018) (Gratton and Aquilino, 2004; Dumitrescu, Okada and Inagaki, 2010). It also reduces the number of visits and also an intermediate impression procedure. But there are also many advantages of indirect technique over the direct technique like no exothermic polymerisation or chemical irritants from monomer, proper marginal adaptation which means more accurate restorations can be made with indirect technique, recommending their application in areas recovering better marginal adaptation. (Gratton and Aquilino, 2004; Abdullah, Pollington and Liu, 2018) The indirect -direct technique though proves to be a traumatic means of fabrication, due to its requirement of time and laboratory support (Gratton and Aquilino, 2004) it was not used widely.

The association between the type of technique and the gender of the patient showed a significant association with the direct technique as the most preferred temporisation technique which was in accordance to the study Jacobs et al (Jacobs, Steele and Wassell, 2002) that showed the posterior teeth were temporised primarily for mastication and occlusion which was most preferred by male while esthetics being the prime concern for majority of female population.

The limitations of this study was it is done in a small population, without much emphasis on the type of material used for temporisation and also did not consider the success of temporisation and the type of permanent restoration and its outcome. Therefore future studies should be carried out by emphasizing these factors. 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:

From this study it was observed that 55.3% males and 44.7% females had undergone single crown tooth preparation. Maximum number of single crown tooth preparations were done in maxillary posteriors for 431 teeth. For temporisation techniques, direct method of temporisation was done in 72.1% of the patients, and the least being indirect technique in 12.5% patients. Association between teeth number and temporisation technique revealed that most common temporisation technique was direct method and it was done maximum in maxillary posteriors, results were statistically significant. The success of the temporisation not only depends on the temporisation technique but also on the materials used, hence to overcome the shortcomings either technique combination of both or direct relining of direct and indirectly fabricated provisional restoration is recommended, which should be advocated in clinical practice.

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