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Association of age and gender in patients undergoing pulp capping- a retrospective study

KIRAN K[1], DR.SOWMYA.K[2]*, DR.VIVEK NARAYAN[3]

[1]Saveetha Dental College and hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India.
[2]Senior lecturer, Department of Consevative dentistry and Endodontics, Saveetha Dental College and hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India.
[3]Senior lecturer, Department of Oral Medicine and Radiology, Saveetha Dental College and hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India.
*Corresponding Author
Email ID: 151701031@saveetha.com[1], sowmyak.sdc@saveetha.com, viveknarayan@saveetha.com

Abstract: Pulp capping is a procedure commonly performed to preserve the vitality of the pulp in teeth with lesion approximating or involving the pulp. Careful case selection is critical as its successful clinical outcome depends on several factors. The aim of the study was to evaluate the association between patients' age and gender with pulp capping. The study was a retrospective analysis done in a university set up. Data of patients who underwent pulp capping were collected by evaluating the patient records and tabulated. Data was imported to IBM SPSS version 20 software and statistical analysis done. The frequency of pulp capping was higher in the age group of 16 to 30 years, however there was no significant association between pulp capping in different age groups (Chi square: p value- 0.358). Gender of the patients had no significant association with pulp capping (Chi square: p value-0.93) although pulp capping was performed more frequently in males. Within the limitations of the study, it was concluded that different age groups and gender did not affect the treatment planning for pulp capping.

Keywords: Age; direct pulp capping; gender; indirect pulp capping

INTRODUCTION

The consequence of pulp exposure during excavation of caries can be serious resulting in infection, pain and the tooth ultimately requiring endodontic therapy (Nasim and Nandakumar, 2018). Root canal therapy can take multiple appointments and is highly expensive (Rajendran *et al.*, 2019). As an alternative, pulp capping can be done in such cases to preserve the vitality of the teeth (Manohar and Sharma, 2018). Pulp capping is of two types: direct pulp capping - when the medication is placed directly over exposed pulp and indirect pulp capping - when the medication is placed over thin residual dentin to avoid exposure of pulp (Fuks and Peretz, 2016),(Ramanathan and Solete, 2015). The ultimate aim of this procedure is to remove the bacteria, arrest progression of the caries and stimulation of the pulp to form reparative dentin to provide a durable and bio compatible seal over the pulp, so that it is protected from bacteria and other toxic agents (Ramanathan and Solete, 2015; Ravinthar and Jayalakshmi, 2018; Siddique *et al.*, 2019). The long term success of a pulp capped tooth is dependent on several factors like the site and size of exposure, age of the patient, type of pulp capping, pre operative status of pulp, pulp capping material used and quality of permanent filling (Cho *et al.*, 2013).

The success of pulp capping largely depends on the vitality of the pulp (Rajakeerthi and Ms, 2019). One of the factors that determines the repairative potential of pulp is the age of the patient. Dental pulp is a dynamic tissue that constantly undergoes changes as the age progresses ((Bernick and Nedelman, 1975). There is a progressive reduction in the size of the pulp chamber as part of the aging process. The vascularity of the pulp also greatly reduces with age. The blood vessels present in the coronal pulp chamber as well as the blood vessels entering through the apical foramen diminishes with age (Bennett, Kelln and Biddington, 1965). This can in turn affect the repair potential of the pulp.

Several authors have studied the outcome of pulp capping in several age groups and have obtained different results (Cho *et al.*, 2013),(Lipski *et al.*, 2018). This poses a conundrum in treatment planning for pulp capping.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)
Hence this study was undertaken to evaluate the association of pulp capping with different age groups and gender of the patients.

MATERIALS AND METHODS
This is a retrospective study conducted in a university setting. The case records were reviewed from June 2019 to April 2020 and the patient data who underwent pulp capping was collected and evaluated. An institutional committee approval was obtained to access the personal data of the patients. A total of 426 records of patients who underwent pulp capping was retrieved and both photographic and radiographic evaluation was done. Cross verification was done by two reviewers to minimise bias. All the teeth that underwent direct or indirect pulp capping were recorded. The samples were divided into 5 groups based on their age: 1-15 years, 16-30 years, 31-45 years, 46-60 years and 61-75 years. The data was tabulated and analysed using IBM SPSS software version 20. Descriptive statistics was done to determine the frequency percentage of age, gender and type of pulp capping and Chi square test was done to find the association between the teeth undergoing pulp capping with the age and gender of the patients. The level of significance was set at 0.05. The results were presented in the form of graphs.

RESULTS AND DISCUSSION
The following were the results obtained from the analysis. Out of 426 patients, the highest number of pulp capping was done in the age group of 16-30 years and the least was in the age group of 61-75 years [Figure 1]. Pulp capping was performed more commonly in males (56.1%) than females (43.9%) [Figure 2]. Indirect pulp capping (69.7%) was performed more frequently than direct pulp capping (30.3%) [Figure 3].
A comparison between different age groups for direct and indirect pulp capping was carried out. No significant association was found for direct and indirect pulp capping with the different age groups (Chi square test; p value- 0.358) [Figure 4]. And also gender comparison was done. Between the males and females there was no significant association with direct and indirect pulp capping was found statitistically.(Chi square test; p value- 0.93) [Figure 5].
Although pulp capping has been performed in all the age groups in this study, it was more common in the age groups below 30 years [Figure 1]. This could be in accordance with the studies that suggest higher success rate for pulp capping in patients younger than 40 years of age as explained by the high capacity of pulp tissue in young patients (Jose, P. and Subbaiyan, 2020)(Lipski *et al.*, 2018),(Jose, P. and Subbaiyan, 2020). Also, pulp capping performed for traumatic exposure of pulp in immature teeth (Floratos, Tsatsoulis and Kontakiotis, 2013),(Janani, Palanivelu and Sandhya, 2020) could have resulted in a higher number of pulp capping cases being done in the younger age group.
Although pulp capping was performed more in males than females, there was no significant association found between gender and pulp capping [Figures 2 & 5]. Previous studies have shown that the gender of the patients did not have any effect on the treatment outcome of pulp capping ((Lipski *et al.*, 2018)). This could encourage clinicians to perform pulp capping similarly in both males and females.
From Figure 3 it is understood that indirect pulp capping is performed more frequently than direct pulp capping. This is in accordance with the previous studies that states better prognosis and higher success rates for indirect pulp capping (Hilton, 2009; Floratos, Tsatsoulis and Kontakiotis, 2013). Studies suggest that permanent restorations placed after direct pulp capping has less success rate than compared to indirect pulp capping (Teja, Ramesh and Priya, 2018; Jose, P. and Subbaiyan, 2020).
Although patients in the 16-30 age group had a higher number of pulp capping done, no significant association was found between age and pulp capping [Figure 4]. The emphasis on the importance of strict isolation protocols and availability of newer materials can make pulp capping more predictable even in older age groups (Cho *et al.*, 2013).
The complexity of root canal anatomy may lower the success rate of root canal treatment than expected. The new concept of preventive endodontics emphasises on avoiding root canal treatment to minimise failure in teeth with vital pulps. Hence vital pulp therapies can prove to be a simple, accessible and affordable treatment option whenever possible (Mohammadi *et al.*, 2016)(Kumar and Delphine Priscilla Antony, 2018).
The limitations of this study is that the sample size is small. It is imperative to evaluate the other factors affecting the prognosis for pulp capping before accurate treatment planning can be done. Future studies must include follow up and evaluation of the survival rate of pulp capped teeth for the different age groups.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; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*,

2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

CONCLUSION

With the limitations of the study, it can be concluded that neither the different age groups nor gender affected the treatment planning for pulp capping. Better understanding of pulpal response, importance of isolation and advancement in material science has enabled clinicians to plan and perform pulp capping in all age groups with predictable outcomes.

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GRAPHS

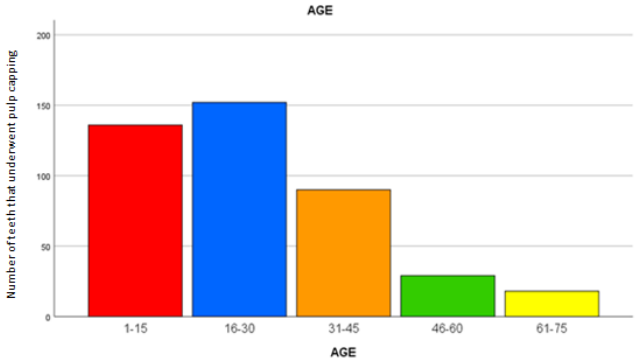

Fig.1: Bar diagram representing the distribution of pulp capping done in different age groups of patients. X-axis represents the different age groups and Y-axis represents the frequency of pulp capping. Red denotes 1-15, blue denotes 16-30, orange denotes 31-45, green denotes 46-60 and yellow denotes 61-75 age groups. Highest frequency of pulp capping was done in the 16-30 age group and lowest in 61-75 age group.

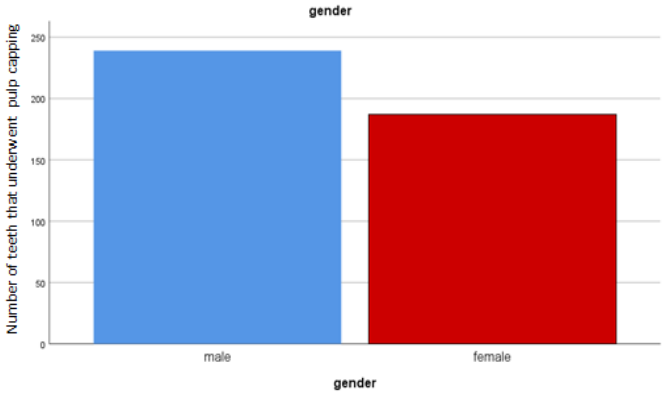

Fig.2: Bar diagram representing the distribution of pulp capping done in males and females. X-axis represents the gender and Y-axis represents the frequency of pulp capping. Blue denotes males and red denotes females. The graph shows that pulp capping being performed more in males (56.1%) than females (43.9%).

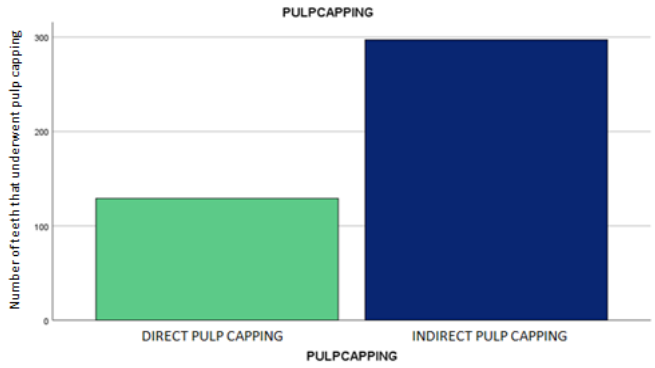

Fig.3: Bar diagram representing the frequency distribution of direct and indirect pulp capping. X-axis represents the type of pulp capping and Y-axis represents the frequency of pulp capping. Green denotes direct pulp capping and blue denotes indirect pulp capping. Graph shows that indirect pulp capping was performed more frequently than direct pulp capping.

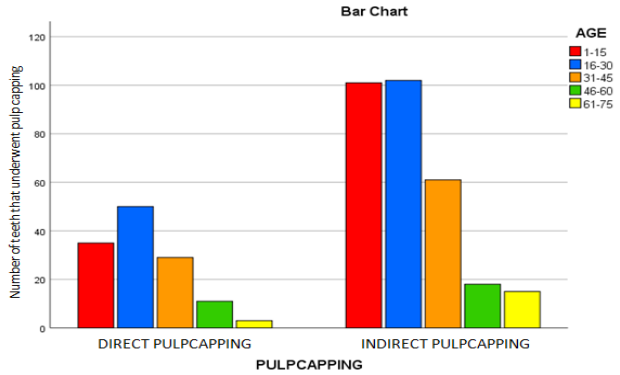

Fig.4: Bar diagram representing the association between pulp capping and different age groups. X-axis represents the type of pulp capping and Y-axis represents the number of teeth that underwent pulp capping. Red denotes age group 1-15 years, blue denotes 16-30 years, orange denotes 31-45 years, green denotes 46-60 years and yellow denotes 61-75 years. Indirect pulp capping was performed more frequently in age groups less than 30 years. However,no significant association was found between age and pulp capping (P value- 0.358 >0.05; Chi square value- 4.376)

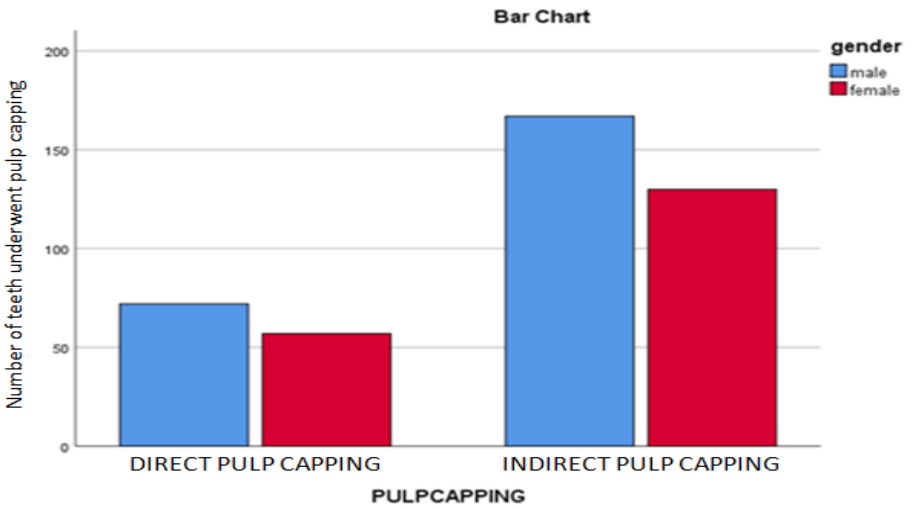

Fig.5: Bar diagram representing association between pulp capping and gender. X-axis represents the type of pulp capping and Y-axis represents the number of patients undergoing pulp capping. Blue color denotes males and red color denotes females. Both direct and indirect pulp capping was performed more commonly in males than females. However, no significant association was found between gender and pulp capping (P value- 0.93>0.05 Chi square value- 0.006)