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Original Article

Evaluation of the Effect of Extraction and Restorative Procedures on Blood Pressure and Pulse Rate Due to Anxiety in 6- to 12-Year-Old Children: An *In Vivo* Study

Nanditha Hegde, Sundeep K. Hegde, Sham S. Bhat, Gobichettipalayam Jegatheeswaran Anbuselvan[1], Dhanraj Pawan Kumar Bhandari[2], Senthilnathan Radhakrishnan[3]

Department of Pedodontics and Preventive Dentistry, Yenepoya Dental College and Hospital, Mangalore, Karnataka, [1]Orthodontist, Krishna Dental Clinic, Erode, Tamil Nadu, [2]Department of Orthodontics, Vivekananda Dental College for Women, Elayampalayam, Tiruchengode, [3]Oral and Maxillofacial Surgeon, Krishna Dental Clinic, Erode, Tamil Nadu, India

ABSTRACT

Background: The objective of this study was to determine the changes in the cardiovascular parameters, blood pressure, and pulse rate due to anxiety in children undergoing dental extraction and restorative treatment. **Materials and Methods:** A total of 150 children were included in the study based on inclusion and exclusion criteria. The parameters were measured at four and three intervals for the extraction and restorative group, respectively. The obtained data were analyzed using repeated measures analysis of variance test. **Results:** In the extraction group, the change in blood pressure in female children (144 mm Hg) was significant compare to male children (141 mm Hg). In the restoration group, the change in blood pressure in male children (140/84 mm Hg) was found to be statistically more significant when compared to female children (139/85 mm Hg). The pulse rate change in both sexes was equally significant in restorative and extraction group. **Conclusion:** It can be inferred that pain and fear anxiety play important roles in the cardiovascular changes during dental treatment because there was significant change in blood pressure and pulse rate over time during dental treatment.

Keywords: *Anxiety, blood pressure, extraction, restorative procedures*

Introduction

Even anticipation of pain during restorative procedures can increase anxiety and create stressful situation with possible cardiovascular alterations.[1] Most dental treatments are performed with the use of local anesthesia.[2] Administration of local anesthesia brings cardiovascular changes such as hypertension, hypotension, tachycardia, or bradycardia in some patients.[3] It has been observed that the child patients demonstrate a physiological stress response during routine dental checkups and treatment, which can cause changes in the blood pressure and pulse rate.[4] This study aimed to educate the dental professionals about the changes that can occur in the cardiovascular parameters during dental procedures, which in turn focuses on the need to follow some strategies to calm the patient.

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Materials and Methods

Informed consent was obtained from the child's parents and the study has been approved by institutional ethical committee. Children with special needs and children who had deep carious lesions and pulpally affected teeth were excluded from the study. A total of 150 children (100 in extraction group and 50 in restorative group) participated in the study. Past dental history was recorded and a pulse oximeter was used to record the blood pressure and pulse rate. The recordings were taken as follows: immediately as the patient was seated

Address for correspondence: Dr. Nanditha Hegde, Department of Pedodontics and Preventive Dentistry, Yenepoya Dental College and Hospital, Mangalore 575018, Karnataka, India.
E-mail: nandithahegde@gmail.com

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on the chair; during local anesthesia administration, during extraction procedure, and 10 minutes after extraction. The data were then divided into four groups based on age, gender, jaw, and past dental experience. For the restorative procedure, the child was briefed about the procedure; an airotor was used to prepare the cavity and restored using glass ionomer cement. Only one tooth was treated in each child. The recordings were taken as follows: immediately as the patient was seated on the chair; during the restorative procedure, when the airotor was used; and 10 minutes after the restorative procedure. The data were then divided in to three groups based on age, gender, and past dental experience, and the data were analyzed using repeated measures analysis of variance test.

Results

The results have been shown in Figures 1–21.

Discussion

Increase in blood pressure during dental surgery is considered to be attributable to activation of the sympathetic nervous system.[5] Inpijn *et al.*[6] discovered an increase in blood pressure during local analgesia and surgery but no change in pulse rate. Kamekura *et al.*[7] found that the blood pressure and pulse rate increased during extraction. However, the pulse rate increased immediately after local analgesia while diastolic pressure decreased.[7] Epinephrine in the local anesthetic has a number of hemodynamic effects.[8] In the extraction group, the change in blood pressure for female children was highly significant, which was similar to the findings of a study conducted by Chohan *et al.*[4] In this study, there was no correlation between the presence/absence of past dental experience; this proves that stressful and fearful reaction exists regardless of pain etiology.[9] Comparing the technique of local anesthesia administration, it was seen that there was an increase in blood pressure and pulse rate for both the techniques.

The restorative group showed an increase in blood pressure and pulse rate during cavity preparation as compared to the baseline readings. This finding is comparable to the finding of a study carried out by Gortzak *et al.*[10] According to Major *et al.*[11] and Cioffi *et al.*,[12] immediately before the start of excavation, the mean heart rate increased, which is probably due to anticipatory reaction of the patient. No correlation was

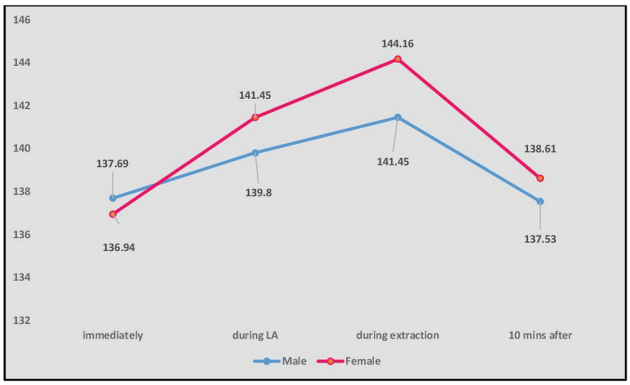

Figure 1: Comparison of systolic blood pressure based on gender (extraction group)

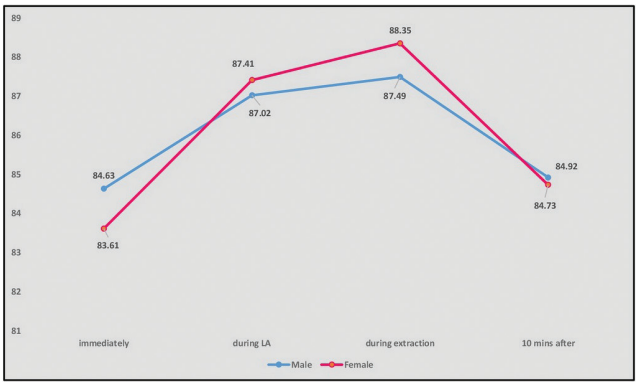

Figure 2: Comparison of diastolic blood pressure based on gender (extraction group)

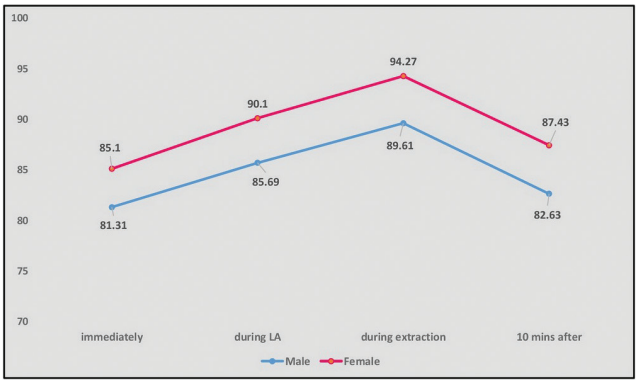

Figure 3: Comparison of pulse rate based on gender (extraction group)

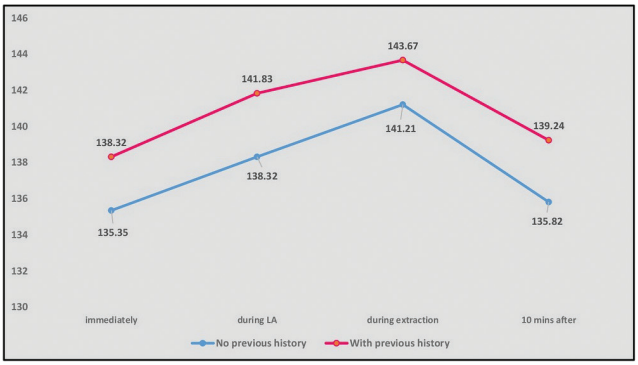

Figure 4: Comparison of systolic blood pressure based on past dental experience (extraction group)

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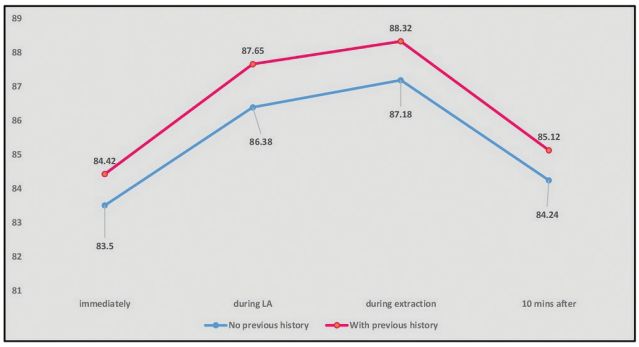

Figure 5: Comparison of diastolic blood pressure based on past dental experience (extraction group)

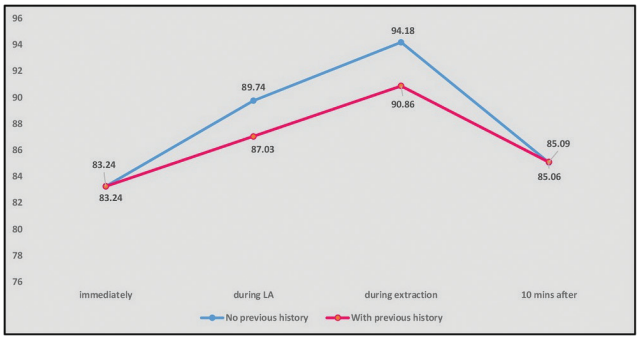

Figure 6: Comparison of pulse rate based on past dental experience (extraction group)

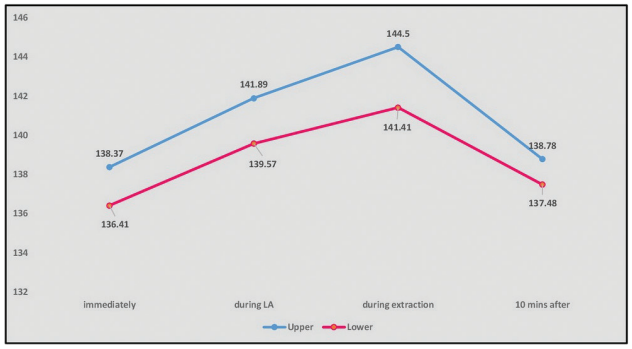

Figure 7: Comparison of systolic blood pressure based on technique (extraction group)

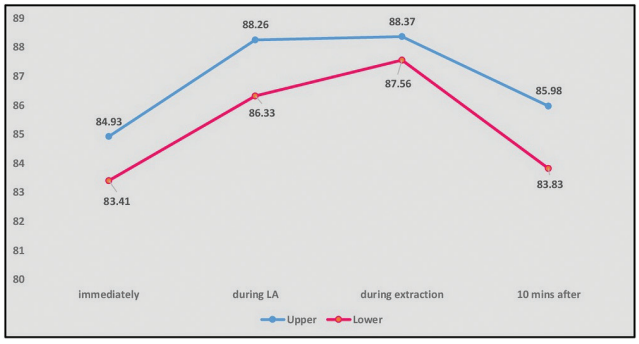

Figure 8: Comparison of diastolic blood pressure based on technique (extraction group)

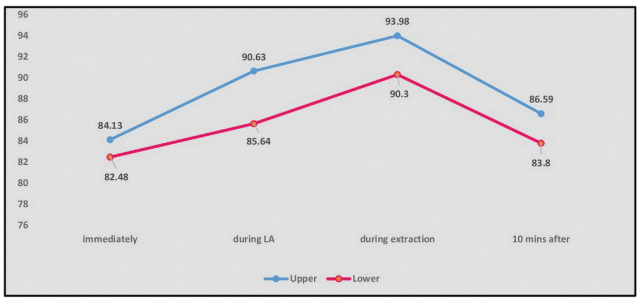

Figure 9: Comparison of pulse rate based on technique (extraction group)

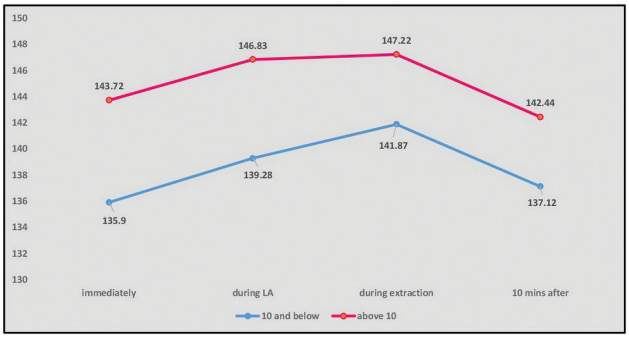

Figure 10: Comparison of systolic blood pressure based on age (extraction group)

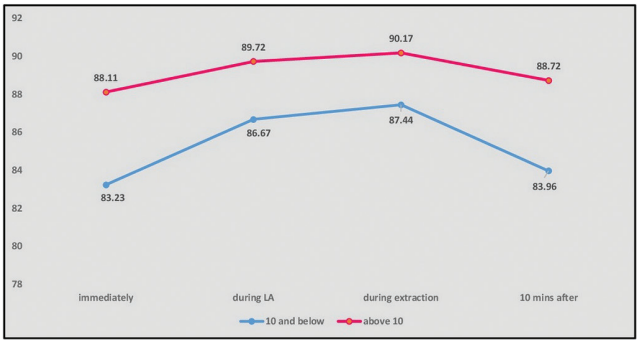

Figure 11: Comparison of diastolic blood pressure based on age (extraction group)

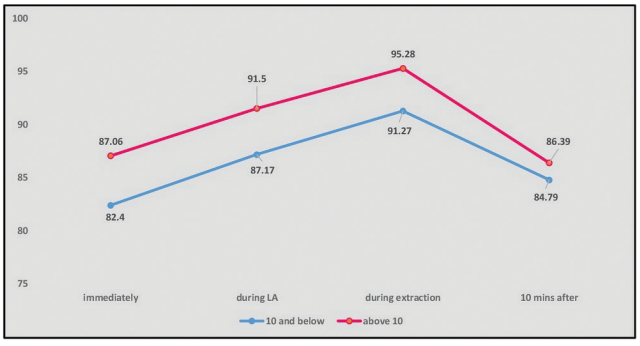

Figure 12: Comparison of pulse rate based on age (extraction group)

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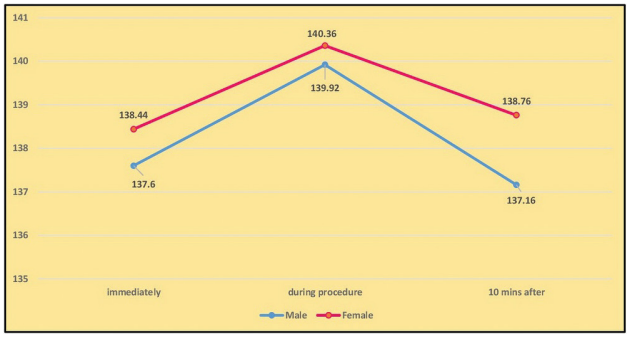

Figure 13: Comparison of systolic blood pressure based on gender (restorative group)

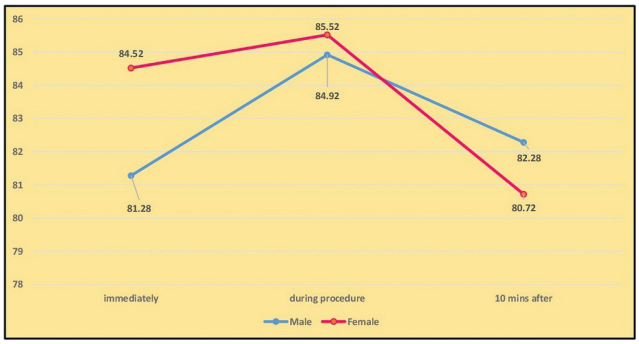

Figure 14: Comparison of diastolic blood pressure based on gender (restorative group)

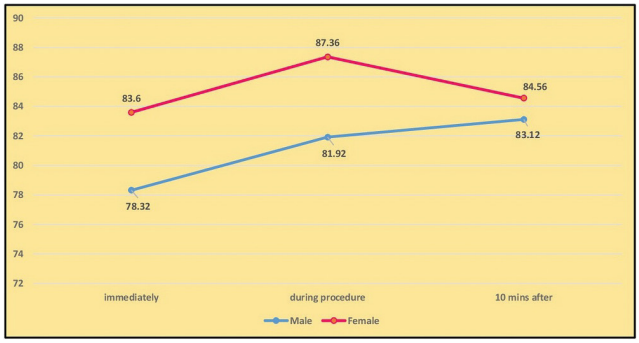

Figure 15: Comparison of pulse rate based on gender (restorative group)

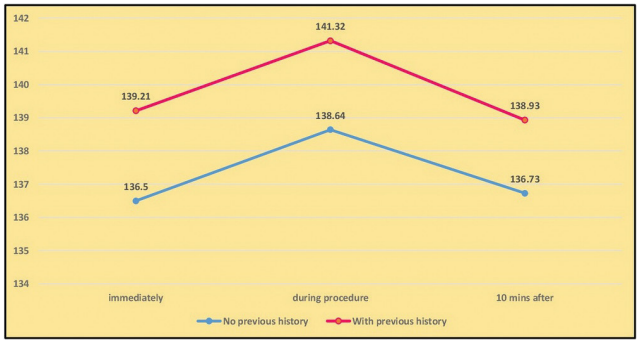

Figure 16: Comparison of systolic blood pressure based on past dental history (restorative group)

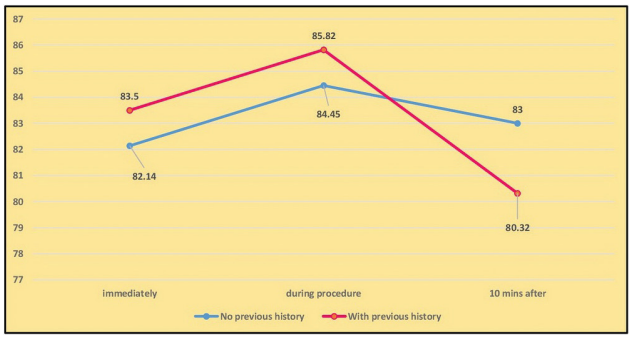

Figure 17: Comparison of diastolic blood pressure based on past dental history (restorative group)

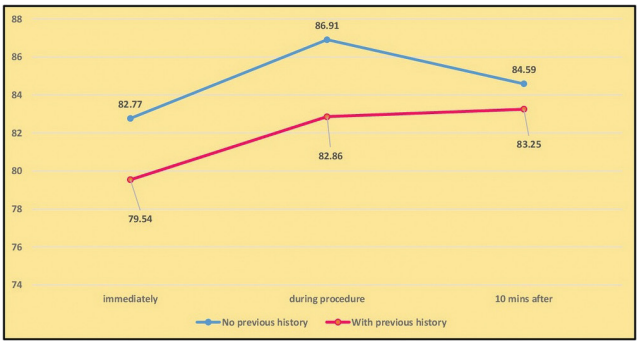

Figure 18: Comparison of pulse rate based on past dental history (restorative group)

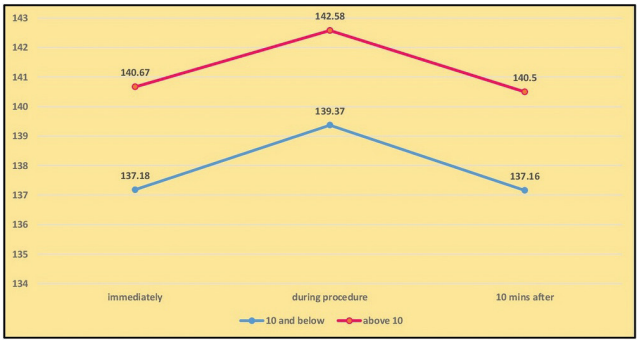

Figure 19: Comparison of systolic blood pressure based on age (restorative group)

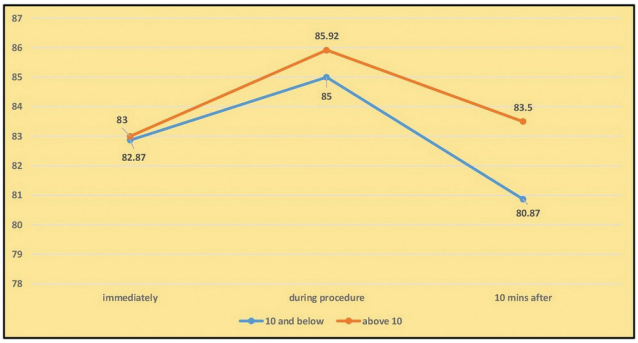

Figure 20: Comparison of diastolic blood pressure based on age (restorative group)

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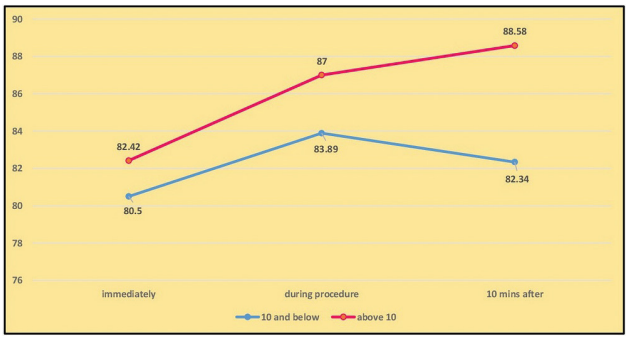

Figure 21: Comparison of pulse rate based on age (restorative group)

found between the presence or absence of past dental experience. The changes in blood pressure and pulse rate in children less than 10 years of age was found to be highly significant. Children who are younger tend to have more anxiety levels.

Through the findings of this study, we can conclude that even performance of a simple dental procedure such as restoration of a tooth can evoke cardiovascular changes in a child due to anxiety. Adequate analgesia and stress-reducing techniques will reduce the cardiovascular responses in the patient.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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