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Original Research Article

Evaluation of the changes in pre-extraction blood pressure and pulse rate values with post-extraction blood pressure and pulse rate values

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ABSTRACT

Background: Aim and objectives were to compare the differences in blood pressure and pulse rate readings before and after extraction of a tooth.
Methods: A total of 250 patients were selected for the study, out of which, 124 were males and 126 were females. All the patients were in an age group from 20 till beyond 73 years of age. Blood pressure and pulse rate readings were measured before the start of the procedure. Extraction procedure was performed and post extraction blood pressure and pulse rate values were recorded. Both the values were compared and evaluated.
Results: There was an obvious increase in systolic blood pressure and pulse rate values after a tooth extraction.
Conclusions: Blood pressure and pulse rate values showed changes before and after tooth extraction but were within normal limits.

Keywords: Blood pressure, Extraction, Teeth, Pulse rate, Vital signs, Systolic, Diastolic

INTRODUCTION

Extraction of a tooth is one of the basic oral surgical procedures, many a times performed when the teeth cannot be saved. Various reasons for extraction of teeth include, periodontitis, dental caries, supernumerary and malposed teeth, teeth extraction for orthodontic treatment, non-restorable teeth and others. Extraction of teeth is generally perceived as a painful procedure by most of the patients, leading to patient's anxiety, fear, and apprehension. The use of local anesthesia for extraction of teeth also has a role in the changes seen in heart rate and blood pressure after extraction of teeth.[1] All these features in turn cause an increase in blood pressure and pulse rate values during extraction and other dental procedures.[2]

Arterial pulse is defined as pressure changes transmitted in the form of waves through arterial wall and blood column from the heart to the periphery, while blood pressure is the lateral pressure exerted by the flowing blood on the vessel walls.

The aim of this study is to evaluate and compare the changes seen in the blood pressure and pulse rate values after extraction of tooth and its significance to a dental extraction procedure.

METHODS

A total of 250 patients who had reported to the Department of Oral and Maxillofacial Surgery at College of Dental Science and Hospital, Rau, Indore, India, for extraction of the teeth from February 2022 to May 2022 were taken up for the study. These included 124 males and 126 females. All these patients were divided into 10 age groups with six years of age difference from 20-25 years, 26-31 years, 32-37 years, 38-43 years, 44-49 years,

50-55 years, 56-61 years, 62-67 years, 68-73 years, and age of 73 and above.

All the patient's required extraction of the teeth due to various reasons as caries, periodontitis, orthodontic treatments, malposed and others. All of them were explained the need for extraction of teeth. A well-informed written consent was obtained. Blood pressure and pulse rate readings before and after extraction were noted in preformed charts along with patient details as age gender and the type of tooth being extracted.

Inclusion criteria considered for the study are only healthy medically fit patients were included in the study; blood pressure was recorded in the right arm, in sitting position with a sphygmomanometer; right arm radial pulse was considered for the pulse rate readings; a time duration of approximately 30 to 45 minutes was kept between pre and post extraction readings.

Exclusion criteria considered for the study are patients with known medical history and other underlying conditions were not included in the study; patients on regular medications for any systemic disease; mentally retarded and highly uncooperative patients; impacted, ankylosed, root canal treated conditions of the tooth wherein it was expected that extraction procedure could take a longer time to finish; pregnant female patients.

In few patients pre operative blood pressure readings recorded were very high. These patients had an increased blood pressure values either due to some reason or maybe they were not aware about having hypertension condition. Such patients were excluded from the study and a physician consultation and consent was advised for the extraction procedure at a later date.

Values were calculated and statistics was done to evaluate the statistical significance of the study. All the data were entered into a database on Microsoft excel. Microsoft word and excel have been used to generate the tables and graphs. Statistical analysis was done using SPSS software version 16.

RESULTS

The study comprised of a total of 250 patients. Out of these 124 were males and 126were females (Table 1).

As regards the pulse rate, 39.2% (98) of the patients had an increase in the pulse rate after extraction. Whereas in 35.6% (89) of the patients, the pulse rate values showed a decrease after the extraction. In 25.2% (63) of the patients there was no change in the pulse rate values before and after extraction (Figure 1).

In regards to systolic blood pressure values.

Similar to the pulse rate readings the systolic blood pressure values also showed a clear increase in 41.4% (103) of the patient after extraction, while in 26.8% (67) of the patient there was a decrease in systolic blood pressure readings.

In 31.6% (79) of total patients there was no change in systolic blood pressure values after extraction (Figure 2).

Table 1: Demographic data.

Age group (In years)	Total patient	Males	Females
20-25	38	8	30
26-31	32	16	16
32-37	29	14	15
38-43	49	23	26
44-49	29	15	14
50-55	37	23	14
56-61	18	7	11
62-67	5	5	0
68-73	9	9	0
>73	4	4	0
Total	250	124	126
Chi square	0	0.0079	0.0077
Mean	25	12.4	12.6
Std. Dev.	15.3	6.93	10.44

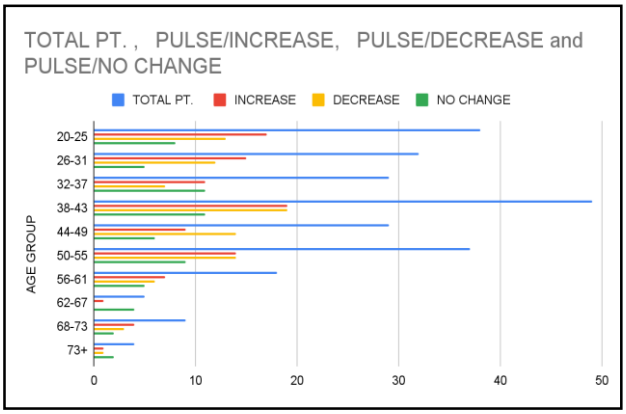

Figure 1: Pulse data.

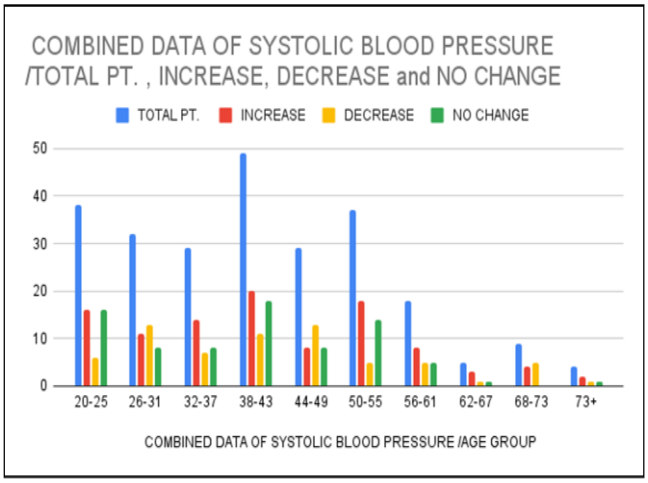

Figure 2: Systolic blood pressure data.

In regards to diastolic blood pressure values. In 52% (130) of the patients, there was no change in the diastolic blood pressure value after extraction. Only 23.6% (59) of the patients had an increase in diastolic blood pressure after extraction whereas only 24.4% (61) of the patients had a decrease in the diastolic blood pressure values after extraction (Figure 3).

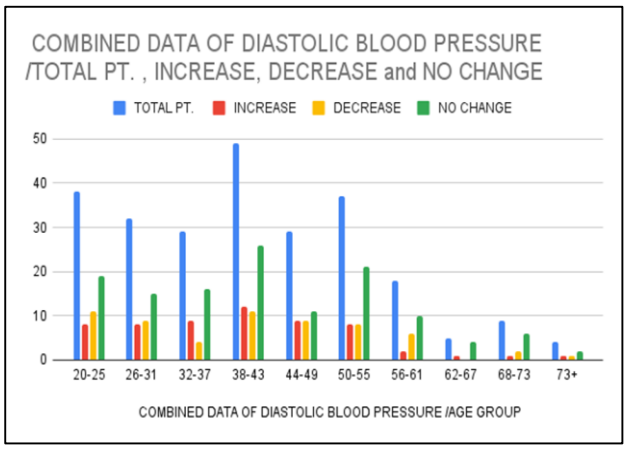

Figure 3: Diastolic blood pressure.

Statistical analysis showed $p<0.0001$ which is statistically significant. Overall, it was clear that systolic blood pressure and pulse rate values increased after extraction of the tooth, while diastolic values majorly remained unchanged as expected for healthy patients.

DISCUSSION

Blood pressure is defined as lateral pressure exerted by the column of the flowing blood on walls of arteries.

Blood pressure is recorded as a reading, that is systolic by diastolic. Normal blood pressure is 120/80 mmHg. Systolic blood pressure is the maximum pressure exerted in the arteries during systole of the heart. Normal value is 120 mmHg with a range of 110-140 mmHg. Diastolic blood pressure is the minimum pressure exerted in the arteries during diastole of the heart. The normal diastolic blood pressure is 80 mmHg with a range of 60-80 mmHg.[3]

Pressure changes transmitted in the form of waves through arterial wall and blood column by the flowing blood is also measured as blood pressure.[4]

Blood pressure and pulse or heart rate are one of the few vital signs of the human body essential for being alive, conscious and well oriented.

Blood pressure values gets altered in physiologic and pathologic conditions. Few physiologic factors which increase blood pressure, include stress, anxiety, excitement, emotions, fear, apprehension and exercise. Factors such as sleep and rest cause a decrease in blood pressure physiologically.

Most of the times the emotions such as fear, apprehension and anxiety cause an increase in systolic blood pressure and pulse rate. In healthy patients, there is no resistance to blood flow via vessels during diastole and so there is no change in diastolic blood pressure values. Diastolic blood pressure also depends on peripheral resistance. In young healthy patients, the peripheral resistance is not altered and so the diastolic BP also showed no alteration.

Young healthy patients have free pulsatile blood flow along healthy intact vessel walls with a normal pulse rate, which leads to no fluctuation in diastolic blood pressure.

Extraction is generally considered as a painful procedure by most of the patient and so they are anxious, apprehensive and scared, at least till the procedure is carried out. The stress and anxiety during a dental treatment is said to be significantly associated with increase in the blood pressure and heart rate.[5] Once the procedure gets completed, the increased blood pressure and pulse rate values return to normal almost immediately.

This shows a close relation exists between extraction procedure and these vitals of the human body. Any stress in response to the extraction procedure leads to an increase in systolic blood pressure and heart rate but within the safe limits.[6]

The increase in blood pressure is common during a dental surgical procedure. This increase is also related to difficulty in tooth extraction and the volume of local anaesthetic used.[7]

One such similar study regarding the impact of dental treatments on blood pressure readings, has also reported, that there was an increase in blood pressure values during dental procedures.[8]

This increase was attributed to stress and anxiety faced by the patient during the dental procedure. The increase in value is lasts only for some time till the procedure was over and did not cause any change in the dental procedure being done.

One other such study on evaluation of changes in blood pressure in patients submitted to dental surgery procedure was study on 135 randomly selected patients by Polliana Keller De et al.[9] They reported that the variations in blood pressure readings were attributed to anxiety and stress caused by dental procedure. The study also reported that reduction of stress and control of anxiety for and during dental treatment are beneficial to limit the excess variation in blood pressure values.

Few studies reports that this increase in blood pressure and heart rate values during a dental surgery cannot be

predicted by the baseline blood pressure.[10] During a dental surgery it is reported that the augmented sympathetic outflow in the body can be considered as a mechanism which can lead to increase in the heart rate and blood pressure values.[11]

Epinephrine is an important component used in the local anaesthesia. Epinephrine gives a relatively blood less field, helps to increase the time duration of local anaesthesia and decreases the chances of systemic toxicity. But this epinephrine has been attributed to the increase heart rate and blood pressure values during a dental surgical procedure.[12]

Meyer in a study reported that there is an obvious increase in blood pressure and heart rate values during a dental surgery in both normotensive and hypertensive patients.[13]

Tan Yeung, R'ong did a study on differences in BP and pulse rate readings before and after extraction of the teeth. This study reported 75% of the patients had no significant changes in blood pressure, before and after extraction procedure. Even the pulse rate values did not show any significant changes in 92.5% of the patients.[14]

A study by Kumar also reported that the variations in blood pressure and pulse rate readings are common after a dental treatment.[15] But they also claimed that these variations returned to normal almost immediately after the procedure. There was no harm observed due to these increased blood pressure and pulse rate values after a dental treatment procedure as extraction.

They also agreed that anxiety and apprehension regarding the dental treatment was the main reason for the increase in BP values.

This study evaluates the changes in blood pressure (systolic and diastolic) and pulse rates readings before and after an extraction procedure. Very few such studies have been reported in the literature.

This study was done in a dental institute, wherein there are students, interns, graduates, post graduates, senior faculty and other equally and highly qualified and experienced faculties. This study involved, junior interns, staff, and post graduate staff also. Having so many people involved in taking blood pressure, heart rate readings and performing the extraction procedure, there is every chance of having some discrepancy and error in the readings and values.

Furthermore, not all patients were pre-medicated for extraction. All type of teeth were extracted with all the possible reasons for extraction.

These could be the few drawbacks of the study, which may have affected the exact results but overall, this study is very much relevant to the clinical practice in dental surgical procedures.

CONCLUSION

Dental extraction procedures do cause some anxiety, apprehension on the part of patient. This leads to an increase in the blood pressure and pulse rate values to a certain limit. A proper counselling of patient prior to the extraction, a painless, stress-free extraction procedure along with a proper extraction technique will surely help to limit the variations in the blood pressure and pulse rate readings.

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