ASSESSMENT OF SAFETY OF THE EXTRACTION OF TEETH IN GERIATRIC INDIVIDUALS WITH HEART DISEASE

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Abstract

Introduction- It remains difficult to extract teeth painlessly from elderly patients who have cardiovascular disorders while keeping cardiovascular stress within a reasonable range. For the health and quality of life of these chronic disease patients, it is essential to properly manage tooth extraction. **Methodology-** A physical examination was conducted by competent investigators, and all patients were questioned using the same questionnaire. Baseline characteristics and concurrent chronic illnesses were items in the questionnaire survey. Demographics, sex, and age made up the baseline characteristics. Participants were positioned in a semi-recumbent position and attached to Holter probes after tooth extraction preparation. After a dentist administered anaesthesia, patients were instructed to rest for 5 minutes before being monitored. After the tooth extraction and one minute of anaesthesia, another electrocardiogram was taken. **Results-** The elderly accounted from 75.3%, and patients aged 70–79 years had highest proportion. The most frequent comorbidities were hypertension, coronary heart disease, arrhythmia, cerebrovascular accident, and diabetes. In analysis of factors influencing the safety of tooth extraction in the elderly, a significant difference was not ed in systolic blood pressure at different time points. In addition, change in heart rate was different between males and females. Detection rate of cardiovascular events by use of a Holter monitor was significantly higher than with a general monitor. **Conclusion-** The majority of older dental extraction patients have cardiovascular disease and other multi-organ disorders, so it is crucial to improve the pre-operative examination. It is preferable to assess the disease condition and, if required, use medicines to calm the patient's anxiety.

Keywords- Cardiovascular Stress, Anaesthesia, Extraction, Geriatric Population

INTRODUCTION

Cardiovascular diseases are one of the main causes of mortality in the developed world (1). The two cardiovascular conditions that cause most deaths are ischemic heart disease and cerebrovascular disease, with heart failure in third place. In addition to their associated morbidity, such disorders are important due to the number of affected individuals and the many patients subjected to treatment because of them. Patients with cardiovascular disease constitute risk cases in dental practice, particularly in the absence of adequate medical control.

When treating the oral health of geriatric patients, it is more useful to consider physiological age and functional status than chronological age, as there is really nothing about older adults that is "typical." In fact, the geriatric population is a highly diverse and heterogeneous cohort ranging from healthy/independent, to frail/semi-dependent, to fully dependent on others for their daily activities. Older adults of similar chronological age have vast differences in their oral, systemic, and mental health. The healing potential is decreased in older patients, and the risk of complications increases with age. Phillips et al.[2] reported that age is a significant

predictor of delayed clinical recovery. It is reported that neurosensory deficit with inferior alveolar nerve injury is related to increased age and that the sensory recovery might be incomplete in older patients.

Thus, it remains difficult to extract teeth painlessly from elderly patients who have cardiovascular disorders while keeping cardiovascular stress within a reasonable range. For the health and quality of life of these chronic disease patients, it is essential to properly manage tooth extraction. Dental teams emphasise education, research, and health management in this demographic and are receptive to the growing need for dental care among the elderly.[3]

We conducted a survey of senior dental extraction patients who had cardiovascular illness and assessed their cardiac monitoring. Aiming to identify the risk for problems from tooth extraction and take action to lessen or prevent adverse cardiovascular events in these patients, factors influencing the safety of tooth extraction were examined based on age, sex, and pre-existing chronic conditions in the patients.

METHODOLOGY

Retrospective evaluations of 14,832 individuals, with a median age of 67.3 years and a range of 18 to 92 years, were conducted from January 2018 to December 2022. In the clinics of the Sree Mookambika Institute of Dental Sciences' Department of Public Health Dentistry, patients with cardiovascular disease had their teeth extracted. Among these patients, 7077 primary hypertensive patients (median age: 68.125; range: 60-93 years) had their hearts monitored while having their teeth extracted. There were 4140 women and 2937 men. In addition, from December 2022 to February 2023, 89 patients (Hypertension Risk Group C [6]) were included. They underwent cardiac monitoring with a Holter monitor during the tooth extraction, and their median age was 69.35 years.

A physical examination was conducted by competent investigators, and all patients were questioned using the same questionnaire. Baseline characteristics and concurrent chronic illnesses were items in the questionnaire survey. Demographics, sex, and age made up the baseline characteristics. Chronic diseases and their conditions included: 1) coronary ath-erosclerotic heart disease (CAD): a history of angina pectoris, myocardial infarction (MI), percutaneous coronary intervention (PCI)/Coronary artery bypass grafting (CABG), and cardiac func- tion. 2) Diabetes mellitus: diabetes mellitus was diagnosed ac-cording to the WHO criteria for diabetes (1999): fasting blood glucose ≥ 7.0 mmol/L, 2-h postprandial blood ≥ 11.1 mmol/L. Diabetes mellitus (DM) was divided into type 1 and type 2. 3) Hypertension: presence and course of hypertension, medication, and blood pressure. Hypertension was diagnosed according to the Guideline for the Prevention and Treatment of Hypertension in China [2005]: systolic blood pressure ≥ 140 mmHg, or diastolic blood pressure ≥ 90 mmHg; 4) other cardiovascular diseases: rheumatic heart disease, congenital heart disease, viral myo- carditis; 5) Cerebrovascular diseases: cerebral infarction, cerebral embolism, and cerebral hemorrhage; 6) Digestive diseas-es: gastric ulcer, duodenal ulcer, acute viral hepatitis, cirrhosis, primary sclerosing cholangitis, and cholelithiasis; 7) Bleeding disorders: purpura, vitamin C deficiency, idiopathic thrombo-

cytopenic purpura, and hemophilia.

Criteria for exclusion from tooth extraction [6]: 1) contradictionsfor tooth extraction; 2) a history of mental disorders or being uncooperative with tooth extraction; 3) patients with primary hypertension were not medicated on the day of tooth extraction or patients had secondary hypertension; 4) acute cardio- vascular or cerebrovascular diseases within the last 6 months e.g., acute coronary syndrome, cerebral infarction, and cere- bral hemorrhage), or patients received major surgery within the last 6 months; 5) anti-coagulation (warfarin, aspirin) or an- ti-platelet therapy was not discontinued at 1 day before surgery; 6) fasting blood glucose was poorly controlled before surgery and the fasting blood glucose was >8 mmol/L; 7) patientswith DM or valve replacement surgery were not treated with antibiotics within 3 days after tooth extraction.

Cardiac monitoring with Holter monitor

Participants were positioned in a semi-recumbent position and attached to Holter probes after tooth extraction preparation. After a dentist administered anaesthesia, patients were instructed to rest for 5 minutes before being monitored. After the tooth extraction and one minute of anaesthesia, another electrocardiogram was taken.

Statistical analysis

Version 21.0 of SPSS was used for the statistical analysis. Qualitative data are expressed as rate or ratio, and quantitative data as mean standard deviation. Analysis of variance was used to compare group means. Data having an atypical distributions were first transformed using the natural logarithm, and then the analysis of variance was performed. The t-test was used to evaluate the means of the two groups. Statistics was judged significant at a value of P 0.05.

RESULTS

Table 1. Blood pressure and HR of males and females at different time points (c±s)

	SBP (mmHg)		DBP (mmHg)		HR	HR	
	Male	Female	Male	Female		Male	Female
Max	168.41±16.52*	172.86±16.68*	94.25±8.30	94.66±9.97	-	-	-
First visit	151.7±22.28*	157.42±21.98*	79.49±11.94	78.93±10.70	77.06±10.43	76.58±7.90	77.33±11.29
Before dental extraction	149.34±18.43*	155.94±17.60*	78.48±10.65	77.16±10.75	80.32±9.30	79.2±13.2**	89.64±13.25**
During dental extraction	153.62±19.39*	161.52±17.85*	79.69±10.23	82.49±10.19	-	-	-
1 min after anesthesia	-	-	-	-	92.11±8.68	79.39±9.42**	95.64±14.22**
After dental extraction	149.67±19.04*	155.41±18.56*	77.78±10.9	76.03±10.13	82.32±11.89	80.07±10.43**	89.43±10.97**

* Difference in the SBP between males and females at different time points (P<0.05); ** difference was noted in the heart rate between males and females, before tooth extraction, 1 min after anesthesia and after tooth extraction (P<0.05).

Table 2. Blood pressure of patients with different comorbidities during tooth extraction.

Comorbidities	SBP (mmHg)	DBP (mmHg)
HBP	160.61±12.37	82.46±9.33
CHD	162.96±13.29	79.29±13.31
Arrhythmia	156.74±15.16	90.14±9.17
Cerebrovascular diseases	159.54±18.84	80.07±8.32
DM	158.66±14.45	78.95±11.38

Position	SBP (mmHg)		DBP (mmHg)	
	Male	Female	Male	Female
Clinostatism	149.67±19.04*	155.41±18.56*	77.78±10.9	76.03±10.13
Seat	142.34±16.28*	147.63±17.66*	74.48±10.80	71.83±8.62

Table 3- Blood Pressure at the supine position at the sitting. SBP at sitting after tooth extraction significantly reduced when compared with Clinostatism. (p<0.05)

Table 4. HR and heart rhythm monitored with Holter monitor during tooth extraction.

	Before		During		After	
Increase	0		26	(81.25%)	24	(75.00%)
Decrease	0		3	(9.36)	4	(12.50%)
Sinus tachycardia	2	(6.25)	3	(9.36)	3	(9.36)
Sinus bradycardia	2	(6.25)	1	(3.12)	2	(6.25)
Ventricular premature beats	3	(9.36)	9	(28.13%)	11	(34.38%)
Atrial premature beats	1	(3.12)	9	(28.13%)	10	(31.25%)
Atrial fibrillation	1	(3.12)	1	(3.12)	1	(3.12)
I°AVB		5 (%)		5 (%)		5 (%)

Table 5- Change in P-QRS-T, HR and heart rhythm monitor during tooth extraction

		Before		During		After	
HR	Increase	0		73	(82.02%)	76	(85.40%)
	Decrease	0		7	(7.87%)	6	(6.74%)
Heart rhythm	Sinus tachycardia	16	(17.98%)	14	(15.73%)	15	(16.86%)
	Sinus bradycardia	1	(1.12)	0		1	(1.12)
	Ventricular premature beats	0		7	(7.87)	7	(7.87)
	Atrial premature beats	2	(2.25)	6	(6.67)	6	(6.67)
	Atrial fibrillation	9	(10.1)	9	(10.11%)	9	(10.11%)
	Pacemaker rhythm	3	(3.37)	3	(3.37)	3	(3.37)
	I°AVB	1	(1.12)	1	(1.12)	1	(1.12)
P wave	Rise	0		0		0	
	Broadening	0		1	(3.12%)	1	(3.12%)
QRS amplitude	Decrease	0		0		0	
	Increase	0		3	(9.36%)	3	(9.36)
ST segment	Elevate	0		1	(3.12%)	1	(3.12)
	Level or tapered down under	2	(6.25)	5	(15.63%)	5	(15.63%)
	The tapered down	1	(3.12)	1	(3.12%)	1	(3.12)
T wave	Increase or high-edge	0		0		0	
	Decrease	1	(3.12)	6	(18.75%)	6	(18.75%)
	Convert	3	(9.36)	4	(12.5%)	4	(12.5%)

DISCUSSION

As people age, oral health issues become more significant. The Third Oral Health Survey in China found that 78.9-91.7% of patients with dental decay are not treated, which is similar with our findings. The incidence of tooth decay in subjects aged 65 to 74 years is 98.4%, with a lower incidence in men than in women. The number of moderately senior patients visiting the hospital is larger than that of extremely elderly patients, but lower than that of younger elderly due to more attention being paid to dental health due to higher living standards. According to our findings, individuals with systemic chronic conditions who needed tooth extractions were mostly aged 70 to 79. 3.6% of patients over 65 years old do not have insurance, according to an epidemiological study.[4] Thus, the U.S. Preventive Services Task Force recommends regular dental visits for patients aged 65 years.[5]

Our findings indicated that among 13 527 patients going through tooth extraction, primary hypertension, coronary heart disease, arrhythmia, cerebrovascular accident, and diabetes mellitus (DM) were the 5 most common comorbidities. Patients with these diseases contributed 67.53%, 52.29%, 23.73%, 15.81%, and 14.42%, correspondingly. Additionally, the prevalence of these disorders increased even more among the elderly. Myocarditis and

arrhythmia (ventricular or atrial premature beat) were significant comorbidities in adolescents, but coronary heart disease and hypertension were significant comorbidities in the elderly.

According to Gryphon et al.6, chronic conditions including coronary heart disease and diabetes mellitus can raise the risk of oral disorders. In the case of chronic conditions, advanced age may unquestionably enhance the risk for difficulties during tooth extraction. Only one-third of hypertensive patients in most Latin American cities and China have hypertension under good control, according to an epidemiological study7; only 2% of hypertensive patients in rural areas have good blood pressure control; and in India, 12% and 9% of hypertensive patients, accordingly, demonstrated blood pressure control in urban and rural areas. Elderly hypertensive patients with uncontrolled blood pressure are a common sight in developing regions. A study[8] of 155 280 patients who were admitted to hospitals for tooth decay or periodontal disease and examined revealed that DM was an independent risk factor for tooth loss. The prevalence of loose teeth was as high as 38.3% and was greater in DM patients than in non-DM patients. 44.36% of patients (n=6000) had one concurrent chronic condition, while 55.64% of patients (n=7527) had two or more comorbidities. Age-related increases in the prevalence of cardiovascular disorders among dental patients may increase the risk of problems following tooth extraction, a topic that has drawn more attention recently.[9]

In clinical practise, emphasis has been placed on the cardiovascular consequences of minor oral procedures, including tooth extraction. Additionally, it has been observed that tooth extraction may result in acute myocardial infarction, malignant arrhythmias, and sudden death due to vagal reflex-induced coronary spasm. Monitoring of the heart in general may reveal these alterations. The average monitor, nevertheless, exhibits low sensitivity to myocardial ischemia without pain during tooth extraction. So it appears that 12-lead Holter monitoring is appropriate for assessing asymptomatic myocardial ischemia. According to our research, Holter monitoring is preferable than conventional monitoring for the elderly.

CONCLUSION

The majority of older dental extraction patients have cardiovascular disease and other multi-organ disorders, so it is crucial to improve the pre-operative examination. It is preferable to assess the disease condition and, if required, use medicines to calm the patient's anxiety. Heart rate, blood pressure, and oxygen saturation must all be monitored intraoperatively. Holter monitoring is advised for older patients with coexisting illnesses or high-risk chronic diseases since it can assist detect arrhythmia and painless myocardial ischemia and prevent surgical consequences.

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