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Cardiac Arrhythmia Before Dental Treatment in Elderly Patients

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Summary

Seventy–five dental patients between the ages of 65 and 94, who had previously been diagnosed as having cardiovascular diseases (CVD), were observed between January 1995 and August 1998. The visits were conducted either in the hospital or at home. There were a total of 477 patient–visits, and at each patient–visit, an ECG (lead II) was monitored for 5 minutes as part of a general health assessment before dental treatment. As a result, various arrhythmias were found. One patient was prescribed an antiarrhythmic drug because of ventricular bigeminy. Dental treatment was deferred for two patients because of multiple VPC or sinus tachycardia. In this study, we found that a potentially serious arrhythmia in patients with no history of arrhythmia, and routine pre–operative assessments including an ECG are recommended.

Introduction

The elderly population is rapidly increasing, and therefore, there are many elderly dental patients. Because arrhythmia is due to morphological cardiac muscular change and electro–physiological change with senility, it occurs in many elderly patients[1,2]. There is a risk of arrhythmia during dental treatment, and elderly patients who attend a dental clinic may be diagnosed for the first time with arrhythmia. Therefore, the assessment of elderly patients'general condition before dental treatment is important. There are no previous reports in which an ECG in elderly patients was performed on every visit to a dental clinic. Moreover, the risk and frequency of arrhythmia for such patients has not been previously reported.

The purpose of the study was to clarify the incidence of arrhythmia and the risk in elderly patients. To perform dental treatment more safely for these patients, we investigated their arrhythmia before dental treatment.

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Subjects

The subjects were 75 patients (35 males and 40 females) aged 65 to 94 years. Forty-nine subjects (65.3%) were between 65 and 74 years old, 17 (22.7%) were aged 75–84, and 9 (12.0%) were 85 years or over. All attended the Special Patients Clinic (SPC) in Matsumoto dental hospital or were visited at home for dental treatment between January 1995 and August 1998. Their cardiovascular disease diagnoses are listed in Table 1. Subjects with hypertension were the most common, followed by those with cerebrovascular disease. Twenty-five subjects were diagnosed as having arrhythmia by a medical doctor prior to their visit with us.

Table 1. Cardiovascular disease (CVD) diagnoses in 75 elderly dental patients at the first visit

hypertension	48 (64.0%)
cerebrovascular disease	39 (52.0%)
arrhythmia	25 (33.3%)
ischemic heart disease	19 (25.3%)
cardiac valvular disease	6 (8.0%)
heart failure	4 (5.3%)
cardiomyopathy	3 (4.0%)
pacemaker for arrhythmia	2 (2.7%)

Methods

Seventy-five subjects' electrocardiograms (standard 12-lead ECG) were recorded on their first dental visit. Before treatment, their general condition was checked and their ECG was monitored. Before treatment, their general condition was checked and their ECG was monitored. The total number of patient visits, including those who came to the SPC and those visited in-home, was 477. Each patient's ECG was monitored (lead II) for 5 minutes. Each patient-visit resulted in one of the following four outcomes : completion of dental treatment as planned, starting dental treatment after observation, starting dental treatment after medication (taking antiarrhythmic medicine), or deferring of dental treatment.

Results

Existence of Arrhythmia on the First Visit

Twenty-five subjects (33.3%) had previously been diagnosed to have a conduction defect or arrhythmia, but 36 (48.0%) were found to have various arrhythmias by a 12-lead ECG on their first dental visit. The types of arrhythmias identified are indicated in Table 2. It was discovered that atrial fibrillation (Af) and ventricular premature contraction (VPC) were most frequent (13.3% each), followed by right bundle branch block (RBBB) and abnormal Q wave (9.3% each).

Table 2. Arrhythmias or abnormal ECG findings identified on the first visit in 75 elderly dental patients

	No. of subjects
None	39 (52.0%)
Arrhythmia	36 (48.0%)
(1 or moro of those below)	
•Af[1]	10 (13.3%)
•VPC[2]	10 (13.3%)
multiple VPC over one/m	2
sporadic VPC under one/m	8
•RBBB[3]	7 (9.3%)
•abnormal Q, ST depression	7 (9.9%)
•SVPC[4]under 5/m	4 (5.3%)
•sinus bradycardia	4 (5.3%)
•I° A–V block[5]	3 (4.0%)
•Pacing wave	2 (2.6%)

1 Af : atrial fibrillation
2 VPC : ventricular premature contraction
3 RBBB : right bundle branch block
4 SVPC : supraventricular premature contraction
5 I° A–V block : first–degree atrioventricular block

Table 3. Arrhythmias or abnormal ECG findings identified before dental treatment in 477 patient–visits made by 75 elderly dental patients

	No. of patient–visits
None	201 (42.1%)
Arrhythmia	276 (57.9%)
(1 or moro of those below)	
•Af	80 (16.8%)
Af under 99/m(bpm)	76
Af with tachycardia	4
•RBBB	78 (16.4%)
CRBBB[1]	71
IRBBB[2]	7
•Sinus bradycardia	47 (9.9%)
•I° A–V block	46 (9.6%)
•VPC	37 (7.8%)
multiple VPC over 10/m	3
multiple VPC of 2–9/m	7
multiple VPC of one/m	4
•Sporadic VPC under one/m	23
•Pacing wave	21 (4.4%)
•SVPC	12 (2.5%)
•Sinus tachycardia	3 (0.6%)

1 CRBBB : complete right bundle branch block
2 IRBBB : incomplete right bundle branch block

Arrhythmia detected before dental treatment over all patient–visits

Accounting for all regularly scheduled visits of the 75 subjects, on 276 (57.9%) of the 477 patient–visits, arrhythmia was detected before dental treatment by ECG monitoring. None of the patients had loss of consciousness or blood pressure decrease with arrhythmia. As shown in Table 3, the most common type of arrhythmia identified was Af (16.8%). The remaining arrhythmias in order of frequency were as follows : RBBB (16.4%), sinus bradycardia (9.9%), first–degree atrioventricular block (A–V block) (9.6%), VPC (7.8%), supraventricular premature contraction (SVPC) (2.5%) and sinus tachycardia (0.6%). The types of VPC were multiple VPC greater than 10 per minute (0.6%), multiple VPC from 2 to 9 (1.5%) per minute, multiple VPC of one per minute (0.8%) and sporadic VPC less than one per minute (4.8%). Af with tachycardia was discovered in 4 patients (Table 3).

Presence of arrhythmia on the first visit compared to subsequent visits

Of the 39 subjects(52.0%) in whom arrhythmia was not detected (i.e., who had a normal 12–lead ECG) on the first visit, 12 were identified with arrhythmia before dental treatment on the second or subsequent visits. Their arrhythmias were sporadic VPC, SVPC or Af. Conversely, six of the 36 subjects who were identified with arrhythmia on the first visit did not show arrhythmia before dental treatment on the second or subsequent visits. They showed sporadic VPC or SVPC on the 12–lead

Table 4. Presence of arrhythmia on the first and subsequent visits in 75 elderly patients

		Before dental treatment (second or later visit)		
		None	Arrhythmia	total
first visit	None	27 (69.2%)	12* (30.8%)	39
	Arrhythmia	6** (16.7%)	30 (83.3%)	36
	total	33	42	75

12 patients* : VPC, SVPC, Af
6 patients** : VPC, SVPC

ECG on the first visit (Table 4).

Patient–visit outcomes with ECG monitoring for arrhythmia before dental treatment

Of the 477 patient–visits, 460 (96.4%) resulted in treatment being completed as planned without any particular action taken regarding arrhythmia. In fourteen (2.9%) patient–visits, dental treatment was initiated after an extended observation because of multiple VPC, Af with tachycardia or sinus tachycardia, and in 2 (0.4%), dental treatment was deferred because of multiple VPC or sinus tachycardia. In 1 patient–visit(0.2%), dental treatment was initiated after administring an antiarrhythmic drug. The patient was a 65 year–old male with dilated cardiomyopathy, who was found to have ventricular bigeminy before dental treatment. Because his ECG showed a normal sinus rhythm after an injection of lidocaine, a crown was fixed on his tooth at that visit. Other patients who had arrhythmia did not take antiarryhthmic drugs (Table 5).

Table 5. Outcomes of 477 patient–visits with ECG monitoring for detection of arrhythmia before dental treatment in 75 elderly patients

completing treatment (No particular action)	460 (96.4%)
starting after observation	14 (2.9%)
starting after medication	1 (0.2%)
deferring dental treatment	2 (0.4%)

Patients for whom dental treatment was initiated after medication or deferred because of arrhythmia

Because one patient, age 65, was found to have bigeminy 26 days after his previous treatment, he was administered antiarrhythmic medication. At the next visit, multiple VPC (5/minute) was noted, and his dental treatment was thus deferred. Thereafter, his ECG showed sporadic VPC, and so treatment was completed during an other visit. However, he died from pneumonia one month after his last dental treatment, which was 4 months after receiving the antiarrhythmic medication. An-

other patient, an 82 year–old female with hypertension and cerebrovascular disease, had a normal ECG on the first visit, but developed sinus tachycardia (HR=120/m) 7 days later. Howevere, she turned to a normal ECG at two weeks later, and an extraction was performed as planned (Table 6).

Table 6. Patients revealing severe arrhythmia before dental treatment

Case	Age	Sex	Disease	Planned treatment	Arrhythmia	Correspondence	Days after previous treatment
1	65	M	Cardiomyopathy	Crown Root canal	bigemny multiple VPC (2–9/mm)	lidocaine deferred	26 days 29 days
2	82	F	Hypertension Cerebrovascular	Extraction	sinus tachycardia (over 120/m)	deferred	7 days

Discussion

Elderly patients tend to have systolic hypertension as arteriosclerosis progresses 3). Many elderly patients have and die due to cardiovascular disease (CVD)[4]. Hypertension, cerebrovascular disease, arrhythmia and ischemic heart disease were frequently observed in the CVD diagnoses of the subjects. Therefore, a pre–operative assessment is very important for elderly dental patients with CVD. We believe that such assessments need not only measure the blood pressure and heart rate, but also the ECG.

Twenty–five patients were previously diagnosed with arrhythmia. A total of forty–two patients in this study at one time or another were confirmed as having arrhythmia by monitoring their ECG before dental treatment. Because a patient's arrhythmia may not always be confirmed, dentists should assess an ECG before dental treatment of elderly patients.

Our results show that there was a high incidence of various arrhythmia before dental treatment. Their arrhythmias were VPC, SVPC and Af : predominantly geriatric arrhythmias. Elderly people are reported to have more multiple and multiform types of VPC[2,5], and our data results agree as well as clarify the existence of risk before dental treatment. However, there are no risk criteria of VPC except for the Lown grading system for ventricular arrhythmias[6]. This grading system assesses the risk of arrhythmia only in patients with acute myocardial infarction. Our subjects were not patients with acute myocardial infarction, but they had various chronic cardiac diseases or old myocardial infarctions. Accordingly, they did not fit the Lown grading system, and there were no criteria to assess the VPC before dental treatment.

We think that the purpose of managing arrhythmia is to prevent the sudden death of dental patients during treatment and immediately thereafter. VPC in elderly patients may increase, or their general condition may worsen over subsequent visits. If so, dental treatment should be performed carefully or deferred.

Monitoring of an ECG and blood pressure is necessary for safe dental treatment. The analysis of VPC before dental treatment should consider the type and severity of cardiovascular disease and the kind of dental treatment. Some reports concur that patients with many incidences of VPC have a tendency to die suddenly[7–9]. The rate of sudden death among patients with complex VPC is 15.5% (Ruberman, et al. 1977[7]) over three years. However, there is another opinion that the R on T type of

VPC and multiple VPC in patients without myocardial infarction and cardiomyopathy do not require treatment, but should merely be observed[10-12]. Those patients sudden death did not occur within a few days after or during dental treatment. Mori et al.[13] reported that more than 5 VPC per minute and of the short run, multiform, or R on T type require elimination or treatment under general anesthesia. A higher incidence of VPC deteriorates cardiac output, which aggravates cardiac failure and can possibly develope into fatal arrhythmia such as ventricular tachycardia or ventricular fibrillation[14]. Especially dental treatment with stress, the sudden death of dental patients with high-risk arrhythmias may occur.

Since some arrhythmias (like chronic atrial fibrillation, right bundle branch block, first degree AV -block, sinus bradycardia and SVPC) present low risk[15,16], dentists may initiate dental treatment while monitoring the patient.

In this study, treatment was deferred in a patient with sinus tachycardia over 120 per minute. It has been reported that tachycardia over 120 per minute can be fatal in patients with hypertension and cardiac disease[17]. We believe that elderly patients with sinus tachycardia or tachycardiac atrial fibrillation over 120 per minute at rest are also at a high risk during dental treatment.

During dental treatment, if a conscious patient has a risky, but not a potentially fatal arrhythmia such as ventricular fibrillation and tachycardia, we believe that the patient does not need antiarrhythmic medication immediately but should be observed carefully. After the observation, if the patient's VPC decreases, dental treatment begin if severe pain is avoided. If the patient's VPC does not decrease before dental treatment, we must defer dental treatment. As a result, 14 elderly patients began dental treatment after the observation. Two were deferred, and only one was given lidocaine before dental treatment.

From the above results, patient presented with a serious condition during dental treatment. However, our findings indicate that elderly patients in good condition during one treatment might develop symptoms before the next dental treatment, i.e., elderly patients' general condition tends to deteriorate rapidly. Even when a patient's information is available, the conditions may not always be in concurrence with the doctor's information and may change day by day. Arrhythmia can not be detected by sight only. Therefore, before dental treatment, an elderly patient's general condition should always be assessed thoroughly, including an ECG, to ensure safe dental treatment and prevent sudden death during treatment.

Conclusions

In this study, a total of 477 (75 subjects) ECG were assessed before dental treatment, and various arrhythmias (multiple VPC, multiform type of VPC, atrial fibrillation, right bundle branch block, SVPC, first degree A-V block) were found. Only one patient (0.2%) was given antiarrhythmic medication before dental treatment because of ventricular bigeminy. For 2 (0.4%) dental treatment was deferred because of multiple VPC or sinus tachycardia, and for 14 (2.9%), treatment was initiated after the observation because of multiple VPC, Af with tachycardia or sinus tachycardia. Because potentially serious arrhythmias were discovered in patients with no history of arrhythmia, dentists should perform routine pre-operative assessments including an ECG.

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和文抄録：高齢者における歯科治療前の不整脈

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75名の循環器疾患を有する高齢者（65歳から94歳）が調査対象者であった．調査は，1995年1月から1998年8月までであった．対象者は松本歯科大学病院特殊診療科を受診した患者あるいは訪問歯科診療の患者であった．延べ477名の患者が歯科治療前に5分間の心電図（第Ⅱ誘導）が観察され，全身状態が評価された．その結果，57.9%の者に様々な不整脈が認められた．初診時に不整脈が認められない者でも歯科治療前に30.8%の者に不整脈が認められた．歯科治療前に特別な対応を行った者は3名であり，うち1名は二段脈のために薬物投与された後に歯科治療が実施された．1名は多源性心室性期外収縮の頻発，もう1名は洞性頻脈のために歯科治療が延期された．循環器疾患を有する高齢者の場合，重篤な不整脈を認めることがあり，歯科治療前には常に心電図を含む慎重な全身状態評価の必要性が示唆された．