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Review article

Possible cases of dental treatment-associated death under local anesthesia in Japan: A review of the literature

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ABSTRACT

Objective: Local anesthesia (LA) is widely used in dental treatment. Although the administration of LA agents is generally very safe, adverse reactions caused by LA are relatively common. The present study was performed to elucidate the possible causes and clinical problems occurring in cases of dental treatment-associated death under LA in Japan.

Methods: We reviewed possible cases of unexpected dental treatment-associated death under LA in Japan between 1951 and 2014. Cases of outpatients with unexpected death occurring during or after dental treatment under LA were included in the study.

Results: A total of 38 possible cases of dental treatment-associated death under LA in Japan were selected. Twenty-five of the patients (66%) had no definite relevant medical history or had an inadequate description of medical history. Thirty-six cases (95%) developed adverse events within 30 min of LA application. Emergency first-aid treatment was performed by the dentist in 50% of the cases. The possible causes of death were divided into three major categories: heart failure, cerebrovascular disorders, and anaphylaxis.

Conclusions: Unexpected dental treatment-associated deaths under LA were reported. It may be difficult to predict these adverse events before treatment from patient records. This study warns that severe adverse events or mortality are possible even during outpatient dental treatment with use of LA alone. A dentist is required to manage these situations. Also, mortality cases must be avoided with maximal reliability on the dentist.

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Introduction

With the rapid aging of Japanese society, many patients with severe medical history routinely visit dental clinics as outpatients. Most of these patients have some type of pain in the oral and maxillofacial region. Therefore, local anesthesia (LA) is widely used in dentistry [1]. Careful administration of LA agents to facilitate dental treatment is generally safe [2]. However, these agents can cause adverse reactions of different types and severity [3], ranging from minor transient vasovagal attacks to life-threatening collapse [4]. Although allergic reactions to LAs are very rare, they do occur at a low incidence rate [1]. Adverse reactions to dental LAs are relatively common, but most are transient [2]. Mild systemic reactions are also common, due to mistaken intravascular injections or rapid absorption if excessive amounts of LA agents are administered [1,2]. On the other hand, general anesthesia (GA) is the most important factor related to dental treatment-associated death [5]. Coplans et al. found 71 dental-related deaths in England and Wales during the decade from 1980 to 1989; these included 42 GA-related deaths, 20 of which were in hospitalized patients.

After investigation in 1992, the Japan Society of Anesthesiologists (JSA) Committee on Operating Room Safety has continued to collect the data of critical incidents during surgery and prepares a report every 4 years. In the current report, they have confirmed continuous improvement in mortality over the past 15 years. The GA-related mortality was 5.60 per 10,000 cases, while the LA-related mortality was only 0.71 per 10,000 cases [6,7]. However, some dental treatment-associated deaths under LAs have also been reported. Dentists and oral surgeons must avoid unexpected severe complications, especially death, in dental treatment. To the best of our knowledge, there are no previous systematic studies reporting possible cases of dental treatment-associated death under LA in Japan. The present study was performed to elucidate the possible causes and clinical problems in patients with dental treatment-associated deaths under LA in Japan.

Materials and methods

Review of the literature

Two authors (M.M. and J.S.) independently reviewed the possible cases of unexpected dental treatment-associated deaths under LA in Japan between 1951 and 2014. Finally, the two reviews were combined by carefully checking both for the following investigations. We investigated cases from published Japanese or English language literature and medical databases, including Medline on Ovid® (<http://ovidsp.tx.ovid.com/>), the Japan Medical Abstract Society Web® (<http://login.jamas.or.jp/enter.html>), and a database of legal precedent (<http://courts.go.jp/>).

We collected case information of unexpected deaths during or after dental treatment in patients administered with LA only. One hundred and fifty two published cases satisfied these inclusion criteria. We excluded the cases with the following criteria: inpatient cases, GA (or sedation) cases, and cases without definitive information about LAs. We excluded unexpected deaths associated with odontogenic infection regardless of LA use, including sepsis caused by odontogenic infection after dental extractions and infectious endocarditis after dental treatment. We excluded overlapping cases and cases with unclear relation of death and treatment using LA. We

also excluded cases with a long time lapse with an adverse event occurring from the following day after administration of LA.

Background and clinical factors

After the review, we studied the background and clinical factors of the patients, including age, gender, relevant medical history, dental treatment, LA agents, onset time of adverse events, first symptoms, emergency first-aid treatment and response to the treatment provided while the patient was in the clinic or hospital, and possible cause of death.

Results

Subjects

A total of 38 cases of possible dental treatment-associated death under LA in Japan were selected in the present study (19 men, 18 women, 1 unknown gender, median age 45 years, range, 1–77 years) [8–20].

The age distributions of the 38 patients are listed in Table 1. The study population included only four and three cases under 10 and over 70 years old, respectively, and the most patients were in their sixties.

The medical history of the patients is listed in Table 2. Twenty-five of the 38 patients (66%) had no definite relevant medical history or inadequate description of medical history. Other patients had history of several relevant medical conditions including cardiac disorders, hypertension, and diabetes mellitus. However, exception for one female patient with amyotrophic lateral sclerosis who required a house visit because she was bedridden, the patients were able to visit the dental clinic or hospital as outpatients.

The patients received several routine dental treatments under LA as shown in Table 3. Thirteen patients received dental caries treatment and 19 underwent tooth extraction.

Table 4 shows the LA agents used in these patients during the dental treatment. The most commonly used LA agent was 2% lido-

Table 1
Ages of patients.

	0–9 yrs:	4 cases
	10–19 yrs:	4 cases
	20–29 yrs:	7 cases
Age: 1–77 years	30–39 yrs:	0 cases
(median: 45 years)	40–49 yrs:	7 cases
	50–59 yrs:	5 cases
	60–69 yrs:	8 cases
	70–79 yrs:	3 cases

Table 2
Medical histories (overlapping).

None or unidentified	25 cases
Hypertension	6 cases
Cardiac disorder	4 cases
Diabetes mellitus	2 cases
Anemia	1 case
Asthma	1 case
Thyroid disorder	1 case
Amyotrophic lateral sclerosis	1 case
Muscular Dystrophy	1 case
Malignant hyperthermia	1 case

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