



## Original article

## Single center experience in Japanese patients with syncope



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## ABSTRACT

**Background and purpose:** The present diagnostic method and features of syncope in Japan are unclear. Implantable loop recorder (ILR) and head-up tilt tests have recently become available for diagnosing syncope. The examination method and rates of diagnosing syncope may vary. This study aimed to clarify the present diagnostic method and features of syncope in a single Japanese medical center.

**Methods and results:** We retrospectively reviewed the medical records of consecutive patients who were seen at our hospital from January 1, 2009, to December 31, 2012. A total of 547 patients (328 men,  $60.4 \pm 21.5$  years) with syncope were seen at our hospital. Reflex syncope was diagnosed in 29.1% of the cases, orthostatic hypotension in 11.7%, cardiac syncope in 34.0%, and unexplained syncope in 23.9% by initial and early evaluations. The number of patients with situational syncope and orthostatic hypotension that could be diagnosed in the initial evaluation of the first examination was significantly greater than that in subsequent evaluations. Forty-three percent of the unexplained syncope patients received an ILR. The consent rate for ILR implantations in the unexplained syncope patients with a suspected arrhythmia nature was 53.1%. The cumulative ILR diagnostic rates were 47% and 65% at 1 and 2 years after the ILR implantation, respectively. The estimated ILR diagnostic rates were significantly greater than that for conventional test without using an ILR. When patients with unexplained syncope could be diagnosed, the recurrent symptoms were greatly reduced.

**Conclusions:** Syncope is induced by various causes in Japan. It is important that we understand the characteristics of each syncope cause. The consent rate for implanting an ILR in appropriate unexplained syncope patients is low. We need to educate these patients about the importance of making a diagnosis of syncope.

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## Introduction

Syncope is defined as a sudden loss of consciousness associated with a loss of postural tone, from which the patient recovers spontaneously. In Western countries, syncope is a common condition accounting for 1–6% of medical admissions and up to 3% of emergency department visits [1]. There are various causes of syncope and the prognosis of syncope differs according to the cause [1,2]. Actually, the prognosis is bad in cardiac syncope patients and good in reflex syncope patients [2]. Cardiovascular

physicians are frequently confused about how to diagnosis syncope. Moreover, in clinical practice, the features of Japanese syncope are unclear. Implantable loop recorder (ILR) and head-up tilt test (HUT) have become available for diagnosing syncope in recent years in Japan. ILR is useful for diagnosing unexplained syncope [3–6] and HUT is performed to confirm the diagnosis in suspected reflex syncope patients [7]. The examination method and diagnosis appear to have been improved by those tests. To confirm the facts and features of the diagnosis is of significance for syncope patients in Japan. The syncope guidelines of the European Society of Cardiology (ESC) were revised in 2009 [8], and the Japanese guidelines were made from that. The guidelines state the new risk classification for unexplained syncope patients [8]. According to the guidelines, we retrospectively analyzed the diagnostic methods and causes of the disease in Japanese syncope patients.

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## Methods

### Patient population

We retrospectively reviewed the medical records of 547 consecutive patients, from the inpatients and outpatients, who consulted the cardiovascular internal medicine department in our hospital for syncope from January 1, 2009 to December 31, 2012. The patients were excluded from the study if they were experiencing typical non-syncopal events, namely other disorders with impairment or loss of consciousness resembling syncope (i.e. transient ischemic attacks, metabolic disorders, epilepsy, intoxication, cataplexy, drop attacks, and psychogenic disorders). In addition, the patients were excluded if they had head trauma without a syncopal episode, or had a prolonged loss of consciousness disorder. The study was approved by the Ethics Committee of Showa University.

### Diagnosis criteria

The patients were diagnosed by 2 cardiovascular medicine specialists using the classification and pathophysiology of syncope described in the ESC guidelines [8]. The diagnoses were sorted into three categories: Reflex syncope, syncope due to orthostatic hypotension (OH), and cardiac syncope. Reflex syncope was defined as syncope triggered by pain, micturition or defecation, prolonged standing, stress, or HUT-induced syncope with a prodrome similar to the clinical symptoms. Syncope due to OH included not only general initial, classic, and delayed OH, but also OH together with reflex syncope and postural orthostatic tachycardia syndrome. OH was diagnosed on the basis of an abnormal decrease in the blood pressure upon standing during the active standing test or HUT. Cardiac syncope included arrhythmias, ischemic heart disease, and mechanical causes as represented by aortic valve stenosis and hypertrophic obstructive cardiomyopathy. Arrhythmic causes of syncope were diagnosed on the basis of documented arrhythmic events or positive electrophysiological study (EPS). Ischemic heart disease was diagnosed by the electrocardiogram (ECG) and coronary angiography including an acetylcholine stress test (CAG). Organic cardiac causes of syncope (i.e. aortic valve stenosis, hypertrophic obstructive cardiomyopathy, etc.) were confirmed by echocardiography. Non-syncope was defined as epilepsy, several metabolic disorders (i.e. hyponatremia and hypoglycemia), or vertebrobasilar transient ischemic attacks.

### Diagnosis of syncope (initial evaluation, early evaluation, and late evaluation)

We sorted the initial, early, and late evaluations according to the time of the tests for syncope. We defined the initial evaluation as examinations on the day that the patient consulted the medical institution for syncope for the first time. An early evaluation was defined as tests performed within three months after the syncope. We examined and diagnosed the patients during each evaluation period. Nevertheless, we could not diagnose the patients who were diagnosed with unexplained syncope. We followed up the patients in late evaluation.

#### Initial evaluation (primary evaluation)

We defined the initial evaluation as possible examinations (i.e. detailed history and blood examination, ECG at the time of the consultation, and standing test), and as appropriate, when these syncope patients were examined for the first time.

We diagnosed reflex syncope and OH by a clinical history of syncope or positive active standing test. Cardiac syncope was confirmed from ECG abnormalities causing the syncope

(e.g. complete atrioventricular block and ST elevation due to a myocardial infarction, etc.) at the time of the consultation.

#### Early evaluation (secondary evaluation)

If we could not diagnose the patients with syncope in the initial evaluation, these patients needed a secondary evaluation. An early evaluation was defined as tests performed during the admission for syncope or during outpatient visits within three months after the onset of the syncope. The tests during the early evaluation period included invasive tests such as an EPS, CAG, and the available tests during the outpatient care (e.g. ultrasound cardiography, 24 hours Holter ECG, and HUT).

Reflex syncope and OH were induced and diagnosed using HUT. We diagnosed structural cardiovascular disease using echocardiography, CAG, or contrast-enhanced computed tomography scan. Arrhythmias were diagnosed by positive EPS or documented arrhythmias causing syncope by prolonged ECG or treadmill test.

#### Late evaluation (tertiary evaluation)

We followed up the unexplained patients who could not be diagnosed in either evaluation. The follow-up period was from January 1, 2009 to July 31, 2013. The unexplained patients were divided using a risk stratification of unexplained syncope. The risk stratification had three categories, low-risk, low-risk for recurrence, and high-risk groups. The high-risk features were defined according to the ESC guidelines (Table 1) [8]. If a patient without any high-risk features had only one, or two or more episodes of syncope, we placed the patient into the low-risk and low-risk for recurrence groups, respectively. We did not perform any further syncope tests in the low-risk patients. We advised the appropriate patients with a suspected arrhythmia nature in the low-risk for recurrence group and high-risk group to receive an ILR. We performed conventional tests for the unexplained syncope patients without indication and agreement of ILR. We compared the diagnostic rates between the patients with an implanted ILR and those in the group undergoing conventional tests. We evaluated the recurrent symptoms after therapy when the unexplained syncope could be diagnosed in the late evaluation.

**Table 1**

High-risk features of unexplained syncope according to the European Society of Cardiology guidelines [8].

(1) Severe structural or coronary artery disease
1. Heart failure
2. Low LVEF
3. Previous myocardial infarction
(2) Clinical or ECG features suggesting arrhythmic syncope
1. Syncope during exertion or supine
2. Palpitations at the time of syncope
3. Family history of SCD
4. Non-sustained VT
5. Bifascicular-block (LBBB or RBBB combined with anterior or left posterior fascicular block) or other intraventricular conduction abnormalities with a QRS duration $\geq 120$ ms
6. Inadequate sinus bradycardia (<50 bpm) or sinoatrial block in absence of negative chronotropic medications or physical training
7. Pre-excited QRS complex
8. Prolonged or short QT interval
9. RBBB pattern with ST-elevation in leads V1–V3 (Brugada pattern)
10. Negative T wave in the right precordial leads, epsilon waves, and ventricular late potentials suggestive of ARVC
(3) Important comorbidities
1. Severe anemia
2. Electrolyte disturbance
LVEF, left ventricular ejection fraction; VT, ventricular tachycardia; SCD, sudden cardiac death; LBBB, left bundle branch block; RBBB, right bundle branch block; bpm, beats per minute; ARVC, arrhythmogenic right ventricular cardiomyopathy.

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