

## Significance of symptomatic classification in patients with vertigo or dizziness who could not be diagnosed

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**Objective:** Undiagnosed cases are not simply diagnosed as vertigo or dizziness in Kitasato University Hospital. Instead, they are classified according to their symptoms, including the mode of attack occurrence, their recurrence, and relative association with a cochlear symptom. The most common of these symptoms are the "recurrent vertigo attacks without a cochlear sign." Therefore, this examination was to determine whether they will be able to be definitively diagnosed or remain undiagnosed.

**Methods:** The subjects were classified into those having "recurrent vertigo attacks without a cochlear sign" and those with signs that could be observed for longer than 1 year.

**Results:** Of the 228 patients with "recurrent vertigo attacks without a cochlear sign," 180 patients (78.9%) remained with "recurrent vertigo attacks without a cochlear sign," whereas 48 patients (21.1%) were diagnosed with a definitive diagnosis.

**Conclusions:** Studies concerning "recurrent vertigo attacks without a cochlear sign" revealed that 180 of the 228 cases (78.9%), had remained in the same group of "recurrent vertigo attacks without a cochlear sign" longer than 1 year. Therefore, it might be necessary to investigate how to properly treat and care for patients with "recurrent vertigo attacks without a cochlear sign" as a single unit of vertiginous disease.

**Key words:** symptomatic classification, undiagnosed cases, vertigo, dizziness, recurrent vertigo attacks, cochlear sign

### Introduction

Treatment of patients with vertigo or dizziness requires a broad perspective, as it involves various departments, including otorhinolaryngology, internal medicine, neurosurgery, orthopedics, ophthalmology, obstetrics and gynecology, and psychiatry. For example, otorhinolaryngology involves the treatment of system diseases, dizziness, and balance disorders caused by central nervous system disorders in addition to diseases of the inner ear. Furthermore, many institutions have established specialized vertigo or dizziness outpatient clinics. This is due to the development of equilibrium function testing, which can detect equilibrium disorders in the differential diagnosis and treatment of vertigo or dizziness. I.e., neuro-otological tests, particularly equilibrium function tests, in conjunction with auditory tests, can help clarify lesions in the inner ear and the eighth cranial nerve and the brainstem and cerebellum.

However, more than 40% of cases still fail to achieve a diagnosis,<sup>1-3</sup> this only demonstrates the difficulty of diagnosing vertigo or dizziness. Furthermore, many patients do not return to the hospital once their vertigo or dizziness has remitted, which may be partially due to insufficient follow-up. Undiagnosed cases are not simply classified as vertigo or dizziness in Kitasato University Hospital (KUH). Instead, they are classified according to their symptoms, including the attack mode, their recurrence, and relative association with a cochlear symptom.<sup>4-6</sup> The most common of these symptoms are the "recurrent vertigo attacks without a cochlear sign." Thus, it will be interesting to examine whether these "recurrent vertigo attacks without a cochlear sign" will lead to a definitive diagnosis or remain undiagnosed. However, there is yet no report that examines the course of these "recurrent vertigo attacks without a cochlear sign," as the Japanese Society for Equilibrium Research has not provided its official definition. Therefore, this

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study aimed at reporting the course of this symptom.

**Materials and Methods**

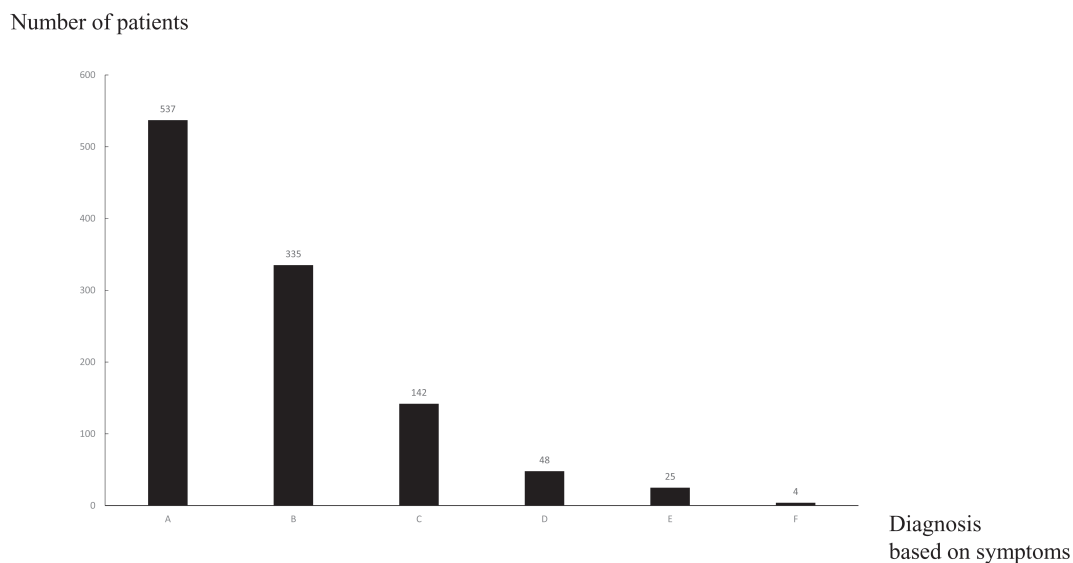
There were a total of 3,797 patients in this study who visited KUH or Kitasato University East Hospital (KUEH), which is a specialized vertigo or dizziness outpatient clinic, for the first time during the 10-year study period from April 2010 through March 2020. Cases for which a definitive diagnosis could not be made (n = 1,091) were classified into 6 categories (Table 1). The

228 patients classified into "recurrent vertigo attacks without a cochlear sign," the most common of these categories, and who could be observed for longer than 1 year, were analyzed in detail.

In addition to "recurrent vertigo attacks without a cochlear sign," there are other categories, which include "a single vertigo attack without a cochlear sign," "a single vertigo attack associated with a cochlear sign," "recurrent vertigo attacks associated with a cochlear sign," "provocative vertigo," and "continuous dizzy state." In addition, their definitions, including that of "recurrent

**Table 1.** Classification of undiagnosed cases by diagnoses based on symptoms

Classification	Definition
"A single vertigo attack without a cochlear sign"	Only one attack of vertigo, excluding vestibular neuritis.
"A single vertigo attack associated with a cochlear sign"	Only one attack of vertigo associated with a cochlear sign.
"Recurrent vertigo attacks without a cochlear sign"	Spontaneous, recurrent attacks of vertigo without a cochlear sign.
"Recurrent vertigo attacks associated with a cochlear sign"	Clear inner ear damage is not detected by audiometry or balance function tests, and if damage is detected, the variation cannot be confirmed.
"Provocative vertigo"	Those in which vertigo is induced only by position or movement of the body, excluding benign paroxysmal positional vertigo, cervical vertigo and orthostatic dysregulation.
"Continuous dizzy state"	Non-paroxysmal, continuous dizziness of no apparent cause, except psychogenic dizziness and systemic diseases.



**Figure 1.** Breakdown of undiagnosed cases

"Recurrent vertigo attacks without a cochlear sign" was the most common, accounting for 49.2% of cases. A. Recurrent vertigo attacks without a cochlear sign, B. Provocative vertigo, C. Recurrent vertigo attacks with a cochlear sign, D. A single vertigo attack without a cochlear sign, E. A single vertigo attack with a cochlear sign, F. Continuous dizzy state

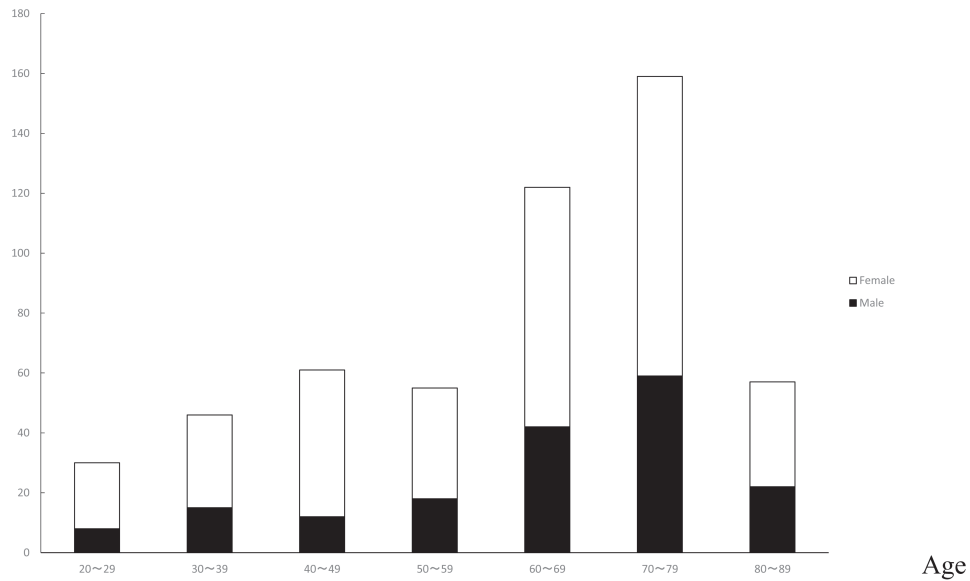
vertigo attacks without a cochlear sign," are shown in Table 1.

This study was performed in accordance with the Helsinki Declaration, and ethical approval was received from the ethics committee of Kitasato University (B21-143).

### Results

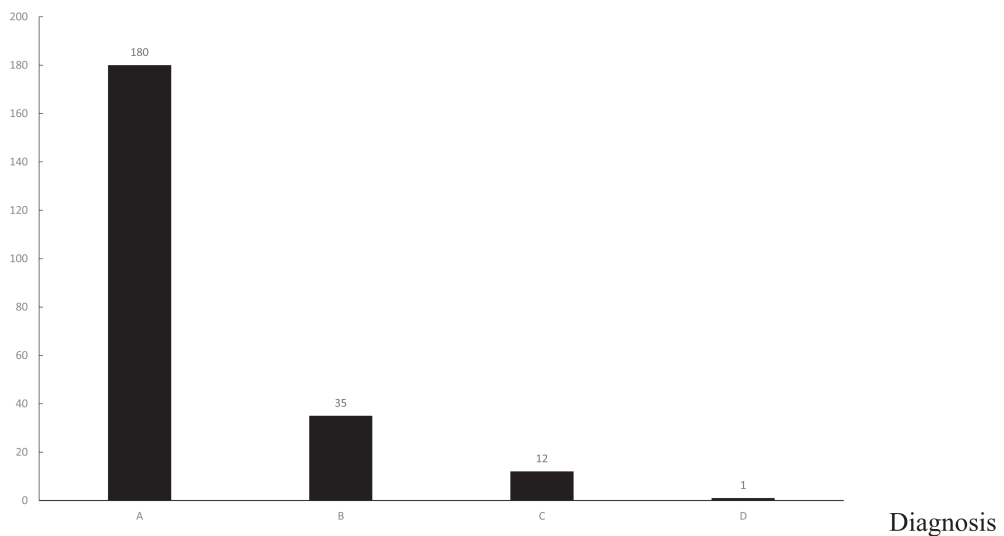
Among the 3,797 patients recorded during the 10-year study period, 1,091 patients were undiagnosed: 537 (49.2%) with "recurrent vertigo attacks without a cochlear sign," 142 (13.0%) with "recurrent vertigo attacks associated with a cochlear sign," 48 (4.4%) with "a single

Number of patients



**Figure 2.** Gender and age distribution of the 537 patients with "recurrent vertigo attacks without a cochlear sign." Most of the patients were female, with the peak age in their 70s.

Number of patients



**Figure 3.** Changes in diagnosis during follow-up

"Recurrent vertigo attacks without a cochlear sign" was the most common diagnosis (78.9%).

**A.** Recurrent vertigo attacks without a cochlear sign, **B.** Meniere's disease, **C.** Psychogenic dizziness, **D.** Drug-induced equilibrium disorder

vertigo attack without a cochlear sign," 4 (0.4%) with "a single vertigo attack associated with a cochlear sign," 335 (30.7%) with "provocative vertigo," and 25 (2.3%) with "continuous dizzy state" (Figure 1).

Among the 537 patients with "recurrent vertigo attacks without a cochlear sign," 228 (42.4%) were observed

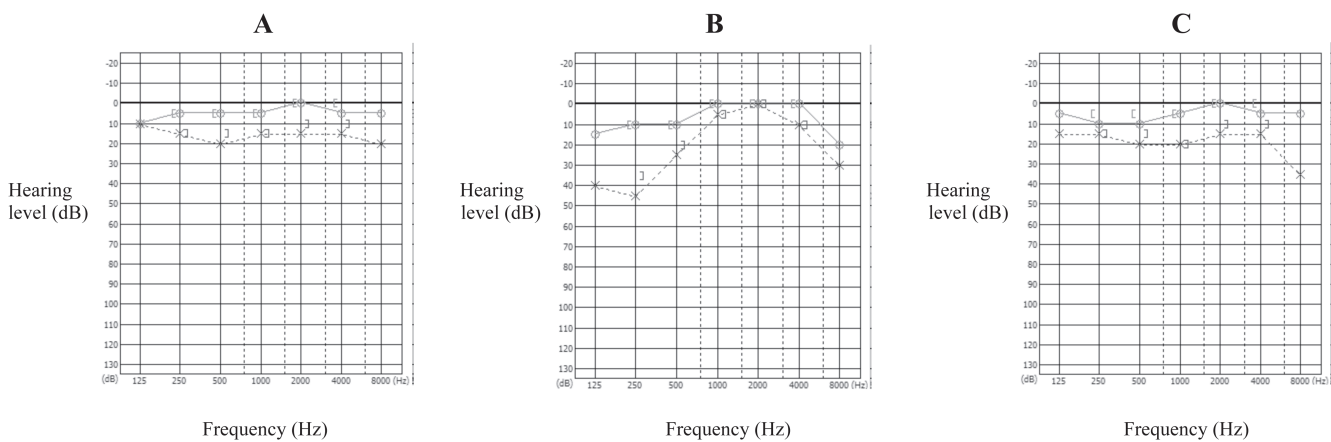
longer than 1 year, including 69 males and 159 females. The age distribution was 21 – 88 years, with a median age of 66 years (Figure 2).

As many as 180 patients (78.9%) remained with "recurrent vertigo attacks without a cochlear sign" during follow-up. However, 48 patients (21.1%), for whom a

**Table 2.** Changes in diagnoses during follow-up

Undiagnosed cases	N = 1,091	Patients followed up longer than 1 year (N = 486)	Diagnoses during follow-up
Recurrent vertigo attacks without a cochlear sign	537	228 (42.4%)	Recurrent vertigo attacks without a cochlear sign 180 (78.9%) Meniere's disease 35 (15.4%) Psychogenic dizziness 12 (5.3%) Drug-induced equilibrium disorder 1 (0.4%)
Recurrent vertigo attacks associated with a cochlear sign	142	83 (58.4%)	Recurrent vertigo attacks associated with a cochlear sign 63 (75.9%) Meniere's disease 20 (24.1%)
A single vertigo attack without a cochlear sign	48	27 (56.2%)	A single vertigo attack without a cochlear sign 17 (63%) Recurrent vertigo attacks without a cochlear sign 10 (37%)
A single vertigo attack associated with a cochlear sign	4	4 (100%)	Recurrent vertigo attacks associated with a cochlear sign 3 (75%) Meniere's disease 1 (25%)
Provocative vertigo	335	130 (38.8%)	Provocative vertigo 102 (78.5%) BPPV 28 (21.5%)
Continuous dizzy state	25	14 (56%)	Continuous dizzy state 14 (100%)

BPPV, benign paroxysmal positional vertigo



**Figure 4.** Hearing history of a case diagnosed with Meniere's disease

With rotatory vertigo lasting about 20 minutes, the patient began having left-sided hearing loss and aural fullness, and there was an increase in the left low-frequency threshold.

A. At the time of "recurrent vertigo attacks without a cochlear sign" (X years) B. At the time of diagnosis of Meniere's disease (X + 2 years) C. Most recent (X + 5 years)

definitive diagnosis was made, included 35 patients with Meniere's disease (15.4%), 12 patients with psychogenic dizziness (5.3%), and 1 with drug-induced equilibrium disorder (0.4%) (Figure 3 and Table 2). Below is a case study and the summary.

#### *A case of Meniere's disease*

A 51-year-old woman came to KUEH, first, because of recurrent episodes of rotatory vertigo without a cochlear sign, which lasted 5–10 minutes without any specific trigger. At the first visit, she had no body equilibrium disorder or eye movement disorder, and her hearing was normal. Moreover, she was not aware of any stress. However, the duration of rotatory vertigo gradually became longer, lasting about 20 minutes. Left-sided hearing loss and aural fullness also appeared. The patient was diagnosed as having left-sided Meniere's disease and was treated with medication, although still under observation. The hearing history is shown in Figure 4.

#### *Summary of a psychogenic dizziness case*

A 32-year-old woman first came to KUH complaining of recurrent floating dizziness. At the initial examination, no body balance disorder or eye movement disorder was observed. Also, her hearing was observed to be normal. On the Self-rating Depression Scale (SDS), she was normal (44 points). During the follow-up, her complaint gradually became stronger. However, considering that there were still no abnormalities in the examination findings, SDS was performed again despite a discrepancy between the complaint and the findings. Eventually, the patient was referred to the psychiatry department of KUH on suspicion of psychogenic dizziness because the SDS score had increased (44–54). Subsequently, the subjective symptoms improved after treatment at the psychiatry department.

#### *Summary of a case of drug-induced equilibrium disorder*

A 40-year-old man first came to KUH complaining of recurrent floating dizziness without any specific trigger. At the time of his first visit, he had no body balance disorder or eye movement disorder, and his hearing was normal. However, during follow-up, findings showed that his medication dosage (carbamazepine) was increased from 200 mg to 400 mg, which he had not reported before during his first visit. Additionally, information was provided to the psychiatry department, which subsequently reduced the medication dose (from 400 mg to 200 mg). This resulted in an improvement in subjective symptoms.

Among the undiagnosed cases, except for "recurrent vertigo attacks without a cochlear sign," 83 patients with

"recurrent vertigo attacks with a cochlear sign," 27 patients with "a single vertigo attack without a cochlear sign," 4 patients with "a single vertigo attack with a cochlear sign," 130 patients with "provocative vertigo," and 14 patients with "continuous dizzy state" were examined for longer than 1 year. The courses of the respective diagnoses indicated that among the 83 patients with "recurrent vertigo attacks with a cochlear sign," 63 remained with "recurrent vertigo attacks with a cochlear sign" (75.9%), whereas 20 were confirmed to have Meniere's disease (24.1%). Findings also showed that among the 27 patients with "a single vertigo attack without a cochlear sign," 17 remained with "a single vertigo attack without a cochlear sign" (63%). In contrast, 10 had recurrent vertigo without a cochlear sign that changed to "recurrent vertigo attacks without a cochlear sign" (37%). Furthermore, among the 4 patients with "a single vertigo attack with a cochlear sign," 3 had recurrent vertigo with a cochlear sign and later changed to "recurrent vertigo attacks with a cochlear sign," whereas 1 patient had a definitive diagnosis of Meniere's disease. Additionally, among the 130 patients with "provocative vertigo," 102 remained with "provocative vertigo" (78.5%), whereas 28 patients had benign paroxysmal positional nystagmus, thereby leading to the definitive diagnosis of benign paroxysmal positional vertigo (BPPV) (21.5%). Furthermore, all 14 patients in a "continuous dizzy state" remained so (Table 2).

## Discussion

A correct diagnosis is essential for appropriate treatment, not only for vertigo or dizziness but for all diseases. Arriving at a diagnosis is not very difficult, provided the typical symptoms and findings are present. However, in cases when they are not, treatment may be difficult. Additionally, when a definitive diagnosis cannot be made, notwithstanding various tests and careful follow-up, the diagnosis of vertigo or dizziness can be undertaken for the time being.

Murofushi<sup>7</sup> stated that about 30% of cases do not lead to a definitive diagnosis, which corroborated the findings from the KUH recorded at 28.7% (1,091 of 3,797 patients). According to Murofushi,<sup>7</sup> cases that do not lead to a definitive diagnosis are: 1. no abnormality to begin with, 2. an abnormality but cannot be detected by the current level of medicine, or 3. an existing abnormality at the time of the attack but had already normalized by the time of examination. Furthermore, reports indicate that abnormalities in balance function tests decrease with time from the onset of vertigo.<sup>8</sup> Therefore, in the KUH

and KUEH, patients are classified according to their symptoms rather than vertigo or dizziness to explain this possibility and alert patients to their course. However, note that this symptomatic classification is original and unofficially defined by the Japanese Society for Equilibrium Research.

In total, 180 of 228 patients (78.9%) remained in the diagnostic group of "recurrent vertigo attacks without a cochlear sign" and reflected no abnormal findings during follow-up. As mentioned above, to our knowledge, there are no reports on the course of "recurrent vertigo attacks without a cochlear sign." Also, the course of so-called vertigo or dizziness remains undefined in a high percentage of the reported cases (70%–90%). This may be an indication of the difficulty of diagnosing vertigo or dizziness. Furthermore, many patients do not return to the hospital after the vertigo or dizziness has gone into remission. Consequently, insufficient follow-up may be a factor. Moreover, a balance function test may not reveal any obvious abnormalities when a patient presents with vertigo or dizziness. Here explaining to the patient that "it is normal" or "there is nothing wrong" may cause the patient to become dissatisfied or distrustful of the physician. According to Takeda,<sup>9</sup> in this scenario, because the patient is anxious about the cause of his or her vertigo or dizziness, such explanations may lead to doctor shopping. Alternatively, there are many patients whose symptoms do not improve and whose anxiety is not resolved. Therefore, those patients stop coming to the hospital. Among the 537 patients classified as having repetitive balance disorder, about 228 (42.4%) were seen regularly for follow-up and met the criteria for inclusion into the present study. This consisted of less than half of the sample population.

However, 48 of 228 patients (21.1%) were diagnosed during the follow-up. The patient presenting with Meniere's disease reflected a prolonged duration of vertigo. Also, subjective cochlear symptoms began to appear. Additionally, an audiological examination revealed a low-tone sensorineural hearing loss, thereby leading to the diagnosis of Meniere's disease, which improved with treatment. However, because the previous vertigo duration was not as prolonged as that in Meniere's disease, vestibular Meniere's disease could not be diagnosed. Therefore, the patient was categorized as having "recurrent vertigo attacks without a cochlear sign." Consequently, it is difficult to determine whether the recurrent vertigo was a precursor of Meniere's disease or whether it was completely unrelated.

For the confirmed case of psychogenic dizziness, the subjective symptoms did not improve, which is typical

of cases involving patients with vertigo or dizziness. This case further lead to depression and a vicious cycle of worsening subjective symptoms. Therefore, the patient was referred to the psychiatry department, which specializes in treating depressive disorders. Subsequently, her subjective symptoms improved.

Meanwhile, 1 case was confirmed to be a definitive diagnosis of drug-induced equilibrium disorder. Such a definitive diagnosis could have been made sooner if a more detailed interview at the initial examination was conducted. This observation substantiates the claim of the famous British neurologist and professor of neurology at New York University School of Medicine, Dr. Oliver Sacks, who is well-known to have said, "History is everything." Hence, the importance that the physician not cut corners in taking the patient's history was reinforced, notwithstanding the busyness in the outpatient clinic. The author of the present study provided the patient's information to the psychiatry department at the KUH, and by adjusting the oral medication the patient's subjective symptoms improved over time.

Given the above case, a definitive diagnosis may be made during follow-up, and appropriate treatment may relieve the suffering of vertigo or dizziness. Therefore, it is important to monitor the patient carefully and not terminate the treatment unilaterally when an abnormality is not detected.

Additionally, while in the present study, the focus was on "recurrent vertigo attacks without a cochlear sign," there were cases in which the definitive diagnosis was confirmed in other cases that had previously been undiagnosed. Furthermore, in the case of BPPV, otolith replacement therapy resulted in the disappearance of vertigo, thereby suggesting that the same observation is true for cases other than "recurrent vertigo attacks without a cochlear sign."

In conclusion, the ratio of undiagnosed vertiginous patients to patients with confirmed vertiginous disease was approximately 28.7%. Those vertiginous patients for whom a definitive diagnosis could not be made were classified into 6 groups based on recurrence, cochlear signs, etc. Among them, the cases of "recurrent vertigo attacks without a cochlear sign" were followed up. It was revealed that 180 of 228 cases (78.9%) still had symptoms even after 1 year. Therefore, it is warranted to further investigate how to treat and care for patients with "recurrent vertigo attacks without a cochlear sign" as a single unit of vertiginous disease.

**Conflicts of Interest:** None

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