Conditions that Mimic Stroke in Elderly Patients Admitted to the Emergency Department

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Background: Stroke is the most common neurologic cause for patient admission to the emergency department (ED) and the risk of stroke increases with age. This study aimed to determine the clinical and demographical characteristics of stroke-mimicking patients 65 years or older who were admitted to the ED for stroke. *Methods:* After the retrospective file examination, patients 65 years and older who were admitted to the ED with an established final diagnosis of stroke as a result of history, physical examination, imaging, and required consultations were included in the study. *Results:* After scanning 671 records of patients 65 years or older, 87.3% (n = 586) were diagnosed with stroke and 12.7% (n = 85) received different diagnoses mimicking stroke. Of these 85 patients, 91.8% (n = 78) and 8.2% (n = 7) were prediagnosed with ischemic stroke and transient ischemic attack, respectively, by the ED physicians. After complete evaluations and consultations, the patients with stroke were typically diagnosed with vertebrobasilar insufficiency (n = 16, 18.8%). Of the patients, 76.5% (n = 65) were discharged after treatment and follow-up in the ED, and 21.1% (n = 18) were hospitalized. *Conclusions:* In older patients, stroke-mimicking conditions can cause signs and symptoms indistinguishable from true stroke, representing about 12.7% of elderly patients admitted to an ED with these diagnoses. **Key Words:** Stroke—stroke mimic—elderly—emergency department.

Introduction

Stroke is the most common neurologic cause for patient admission to the emergency department (ED), and the risk of stroke increases with advancing age. Stroke is the third leading cause of death in Western countries and is often a devastating disease.[1] Each year about 700,000 people experience a new or recurrent stroke. Of all strokes, 87% are ischemic; intracerebral and subarachnoid hemorrhage strokes account for the remainder. Stroke total-mention mortality in 2002 was about 273,000.[2] In the ED, stroke is diagnosed by physical examination, computed tomography (CT), and magnetic resonance imaging (MRI) after the evaluation of biochemical and hematologic parameters to eliminate metabolic causes.[3] The lack of imaging modalities in some hospitals, the requirement of an experienced team and technical equipment for imaging modalities, and the low sensitivity and specificity of tomography in the early stage of ischemic strokes and the failure of tomography to identify minor strokes lead to delays in the early diagnosis and treatment of patients.[4] For this reason, a number of diseases may be confused with stroke clinically and/or in radiology. Diseases that mimic stroke need to be eliminated from the diagnosis quickly and accurately. Patients admitted with stroke-mimicking conditions can be misdiagnosed by doctors in the clinical setting and EDs, which can result

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in increased morbidity and mortality.[5-9] Diagnosis is particularly difficult in patients 65 years or older, as aging physiology, atypical presentations of the diseases, pharmacodynamic changes, reductions in functional reserves, social problems, comorbid diseases, and multiple drug intake can aggravate differential diagnoses in overcrowded ED settings. A considerable number of patients presenting to the Uludag University Faculty of Medicine (UUFM)–ED are more than 65 years. Thus, the patients 65 years or older who were admitted to the UUFM-ED in 2011 and who were evaluated because of stroke but were diagnosed with different diseases (stroke mimics) were retrospectively analyzed via file records. The present study focused on stroke-mimicking and misdiagnosed acute stoke incidences and their causes in patients 65 years or older.

Materials and Methods

The study was approved by the UUFM Ethical Committee on March 2012 (number 2012-7/8). The study aimed to determine the clinical and demographic characteristics of patients 65 years or older who were evaluated in the ED because of stroke but were later diagnosed with another pathology. This retrospective study was designed to consist of patients presenting to the UUFM-ED with stroke symptoms between 1 January 2011 and 29 February 2012. In the current study, the patients with a prediagnosis of stroke coded as *ICD-10* were scanned in the "Avicenna" program, a hospital information management system, which has been used in our university hospital. In addition, we included all the patients diagnosed with stroke by scanning the records of those who were admitted for neurologic symptoms. The patients, 65 years or older, were initially considered to have stroke based on the initial assessment, anamnesis, physical examination, laboratory testing, and CT imaging. However, after detailed workup (such as MRI) and necessary consultations (neurology and other clinics), the final definite diagnoses of stroke were established, and the patients with a stroke-mimicking condition were sorted. The inclusion criteria were as follows: 65 years or older and admission with stroke symptoms. The exclusion criteria were as follows: less than 65 years, traumatic hemorrhage, and spontaneous subarachnoid, epidural, or subdural hemorrhage.

The statistical analysis of the data was performed using Microsoft Excel XP and SPSS 13.0 (Statistical Package for Social Science) software. The descriptive statistics of the study variables were calculated. All data are expressed as the median values or percentages (%).

Results

We scanned the records of 671 patients 65 years or older with a diagnosis of stroke. Of these patients, 87.3% (n = 586) were diagnosed with stroke and treated as necessary, whereas 12.7% (n = 85) received different diagnoses mimicking stroke. Of the 671 patients admitted, 43.5% were between the ages of 65 and 74 years (n = 37), 43.5% were 75 and 84 years (n = 37), and 12.9% were more than the age of 85 years (n = 11). Approximately 54.1% of the patients (n = 46) were female, and 45.9% were (n = 39) male.

The most frequent presentation of the patients later diagnosed with stroke mimics was the impairment of consciousness (23.5%, n = 20). Fourteen patients (16.5%) exhibited weakness, 11 (12.9%) had seizures, 11 (12.9%) showed syncope, and 9 (10.6%) exhibited dizziness/vertigo (Table 1). When the complaint span of the patients was considered, patients most commonly present with complaints within 3-24 hours or 24-48 hours (Table 2).

Hypertension (17.6%, n = 15), diabetes mellitus, and hyperlipidemia comorbidities (n = 18, 21.2%) were most frequently identified in the stroke-mimicking patients, whereas malignancy (5.9%, n = 5) and atrial fibrillation (3.5%, n = 3) were less common. Additionally, 10.6% (n = 9) exhibited dementia, and 9.4% (n = 8) exhibited a history of stoke. There were no systemic diseases in 2.4% (n = 2) of the patients. Electrocardiographic results revealed that 88.2% (n = 75) of the patients possessed normal sinus rhythm, 9.4% (n = 8) had AF, and 2.4% (n = 2) showed sinus arrhythmia.

Approximately 91.8% (n = 78) and 8.2% (n = 7) of the patients were prediagnosed with ischemic stroke and transient ischemic attack (TIA), respectively, by the emergency physicians, and neurologic consultations were required. However, the diagnoses were inconsistent with the results of the neurologic evaluation and advanced investigations. After further evaluation and consultation, the patients who were incorrectly believed to have had a stroke were typically given final diagnoses of vertebrobasilar insufficiency (VBI) (18.8%, n = 16). Other diagnoses included epileptic seizure (n = 13, 15.3%), metabolic

Table 1. *Complaints of the patients*

	n	%
Weakness	14	16.5
Numbness	1	1.2
Speech disorder	5	5.9
Impairment of consciousness	20	23.5
Headache	2	2.4
Dizziness/vertigo	9	10.6
Vision disorder	1	1.2
Nausea/vomiting	5	5.9
Seizures	11	12.9
Syncope	11	12.9
Vertigo + syncope	2	2.4
Speech disorder + weakness	2	2.4
Fever + impairment of consciousness	2	2.4
Total	85	100

Table 2. *Durations of presentation after the onset of symptoms*

	n	%
First 3 h	10	11.8
3-24 h	48	56.5
24-48 h	14	16.5
48-72 h	4	4.7
>72 h	9	10.6
Total	85	100

encephalopathy (n = 13, 15.3%), hypertensive attack (n = 8, 9.4%), delirium secondary metabolic encephalopathy (n = 6, 7.1%), chronic stroke sequel (n = 5, 5.7%), and cardiac syncope (n = 3, 3.5%). Additionally, 2 patients received a diagnosis of psychosis, encephalitis, and conversion disorder (1.2%), and 2 patients were diagnosed with meningitis and vasovagal syncope (2.4%) (Table 3).

Although the CT scans of 85.9% (n = 73) of the patients were normal and 14.1% (n = 12) were pathologic, stroke was not considered. Pathologic CT findings revealed chronic infarct areas in the left parietal lobe (n = 1), right superior temporal lobe (n = 1), left occipital lobe (n = 1), left frontal lobe (n = 1), right frontal lobe (n = 1), bilateral inferior temporal lobe (n = 1), bilateral parietal lobe (n = 1), left basal ganglion (n = 1), and bilateral thalamus (n = 2). Although the reports suggested that 1 patient had an acute–subacute infarct in the right occipital lobe and that 1 patient had an acute infarct in the right frontal lobe, acute infarct was not considered because it was incompatible with clinical findings of these patients.

Approximately 51.8% (n = 44) of the patients did not undergo diffusion MRI, but 7.1% (n = 6) of the patients undergoing MRI exhibited pathological findings, and 41.2% (n = 35) of the scans were unremarkable. In 2 patients with pathologic findings, a subacute infarct area was identified in the right parietal lobe, but it was not classified as a stroke because of an inconsistency with the clinic findings. Chronic infarct areas were also identified in the left inferior temporal lobe (n = 1), in the brainstem (n = 1), at the bilateral basal ganglion (n = 1), and at the thalamic level (n = 1).

Table 3. *Stroke mimics diagnosis*

Diagnoses	n	%
VBI attack	16	18.8
Epileptic seizure	13	15.3
Metabolic encephalopathy	13	15.3
Hypertensive attack	8	9.4
Delirium secondary metabolic encephalopathy	6	7.1
Chronic stroke sequel	5	5.7
Sepsis	5	5.9
Syncope	5	5.9
Meningitis	2	2.4
Psychiatric diagnosis	2	2.4

Approximately 76.5% (n = 65) of the patients were discharged after their follow-up and treatment in the ED, 21.1% (n = 18) were hospitalized, and 2.4% (n = 2) rejected treatment and left the ED. Nearly 66.6% (n = 12) of the hospitalized patients were transferred to the clinic, and 27.8% (n = 5) were sent to an intensive care unit; 5.5% (n = 1) died in the ED because of metabolic encephalopathy. The duration of ED stays ranged from 2 to 48 hours (median = 7.00), whereas the duration of clinic stays ranged from 5 to 21 days (median = 8.00).

Discussion

Given that age is one of most substantial risk factors for stroke, the increasing age of the world population has led to increases in mortality and morbidity because of stroke. When presentation frequency of the elderly patient population to our hospital ED was taken into account, we wanted to stress the importance of considering other diseases in the differential diagnosis of patients with stroke-mimicking symptoms. Emergency physicians should rule out stroke in patients who symptoms mimic stroke, and as the staff members of a stroke team, emergency physicians are responsible for starting thrombolytic therapy in the appropriate patients within a reasonable amount of time.[10] Several studies have investigated the incidence of stroke-mimicking conditions at the triaging stage and have reported incidences of 10%-50%.[7-9] In a study by Kothari et al,[11] the rate of misdiagnosis by emergency physicians varied from 5% to 33%, whereas the study by Ferro et al[12] reported a 9% misdiagnosis rate. In a similar study, 104 (25.3%) of 411 patients admitted to the ED with a stroke code received diagnoses other than stroke.[13] However, the majority of these studies were conducted on all age groups with stroke diagnoses. Our research is the first study to address the incidences of stroke mimics in a population 65 years or older after initial screening, neurologic assessment, CT scan, MRI, and laboratory testing. In our study, 12.7% of 671 patients 65 years or older received different diagnoses mimicking stroke. In a study by Vroomen et al,[9] under the age of 50 years, stroke mimics occurred in 21% of 87 (n = 18) patients, whereas above the age of 50 years, stroke mimics were very rare (3% of 583 patients, n = 15). Artto et al[14] stated that stroke mimics were much more common in younger patients. In comparison, Hemmen et al[13] reported that mean age of 104 patients with stroke-mimicking conditions was 65 years old. In our study, although we included patients above the age of 65 years, the frequency of diagnoses other than stroke was consistent with the overall rates reported in previous studies. However, this rate might be considered high, given the number of patients 65 years or older presenting to our ED, the frequency of comorbid

diseases, the expression difficulty of older patients, and specific pathophysiologic factors.

The most common reason for presenting to ED in our study was somnolence (23.5%), followed by other complaints such as weakness, syncope, seizure, dizziness, nausea and vomiting, speech disorder, fever, and numbness. In study including 317 cases, Kanisch et al[15] reported the rate of structural and nonstructural causes of somnolence to be 42% and 58%, respectively. The differences between these studies are the result of differences in study settings, dates, and features of the patients included in the studies.

Many important stroke-like cases can be addressed clinically (systemic, psychogenic, and other central causes). After initial examination by emergency physicians, 91.8% (n = 78) and 8.2% (n = 7) of the patients were prediagnosed with ischemic stroke and TIA, respectively, and the neurology department was consulted. After the scanning of 671 patient records and workups, 87.3% (n = 586) of the cases were diagnosed with stroke and treated as necessary, whereas 12.7% (n = 85) received diagnoses other than stroke. In a study conducted in the ED, 65 false diagnoses (18.2%) were identified. The subtypes of these false diagnoses were detected as 46 TIA (70.8%), 18 ischemics (27.7%), and 1 hemorrhagic (1.5%).[16] Morgenstern et al[17] screened 13,015 patients and reported that the diagnostic sensitivity of the emergency physician was 91.5%. Laskowitz et al[18] reported that on initial adjudication, site and adjudicator diagnoses of stroke were concordant in 83% of patients. In our study, the most frequent diagnoses mimicking stroke included VBI (18.8%, n = 16), epileptic seizure (n = 13, 15.3%), metabolic encephalopathy (n = 13, 12.9%), hypertensive attack (n = 8, 9.4%), delirium secondary metabolic encephalopathy (n = 6, 7.1%), chronic stroke sequel (n = 5, 5.7%), and cardiac syncope (n = 3, 3.5%). In a study by Hemmen et al,[13] in 44 of the 104 stroke mimics (42.3%), the acute disease was caused by a severe neurologic condition other than ischemic stroke. Only 60 (14.6%) stroke codes were reported for patients without a severe and acute neurologic condition. The majority of these cases consisted of hypoglycemia, old stroke, hypotension, and intoxication.[13] Vroomen et al[9] reported that 15 patients in their study had migraine with prolonged aura, 13 had a conversion disorder, 4 had partial epilepsy, and 1 was hypoglycemic. Vroomen et al[9] also established that migraine and conversion were the predominant stroke mimics in the younger age group, whereas epilepsy was an additional, equally prevalent mimic in the older age group. VBI term is used for defining clinic syndrome with positive physical examination findings that usually represents as temporary and recurring symptoms, which originates from lesions existing at the irrigation areas of vertebral, basilar, or posterior cerebral arteries. VBI can be distinguished from TIA by several radiological methods via demonstrating cerebral hypoperfusion.[19] Syncope is defined as a temporary symptom that is characterized by a sudden loss of postural tonus and consciousness. Presyncope term is used for defining symptoms developed just before the unconsciousness. Similar terms to syncope and presyncope are used for describing syncope prodrome alike events in which unconsciousness does not exist. Epilepsy, hypoglycemia, hypoxia, hypoventilation accompanied with hypocapnia, and vertebrobasilar TIA are listed in the differential diagnosis of complete loss of consciousness without global cerebral hypoperfusion, whereas carotid-originated TIAs and drop attacks are listed in the differential diagnosis of global cerebral hypoperfusion without unconsciousness.[20]

The primary goal in the radiological imaging of stroke patients in the acute setting is to confirm the stroke diagnosis, rule out stroke mimics, and discriminate ischemic and hemorrhagic strokes. Basic radiologic modalities that can be used for this purpose include CT and MRI (especially diffusion-weighted MRI). In line with this objective, a prospective study compared noncontrast CT (NCCT) and MRI (diffusion weighted) in a consecutive series of patients referred for emergency assessment of suspected acute stroke. The results revealed that diffusion-weighted magnetic resonance (MR-DWI) detected acute strokes (ischemic or hemorrhagic), acute ischemic strokes, and chronic hemorrhage more frequently than CT.[21] MR-DWI can change the management strategy of NCCT-negative patients with new stroke-like symptoms when a decision about patient treatment requires additional information.[22] Diffusion examination in acute stroke assessment with MRI is necessary but not sufficient. False-negative or false-positive cases are infrequently observed. Although MR-DWI has proved highly sensitive in acute ischemic stroke diagnosis, there is increasing evidence that it may fail to detect acute stroke lesions.[23-25] The incidence of negative MR-DWI findings in patients with acute ischemia ranges from 0%[26] to 21%.[23,27] In the case of ischemic stroke, the findings of false-negative MRIs may appear within hours from symptom onset, especially in cases of small-sized lesions and brainstem or cerebellar lesions.[21,24,28,29] In a study that retrospectively reviewed 346 patients admitted for ischemic stroke, 19 cases with initial negative DWI findings were identified. False-negative studies occurred more often in posterior circulation strokes (11.9%).[30] In another study, data of 78 patients with stroke-mimicking conditions of unknown etiology in the NCCT scan were analyzed and ischemic stroke was detected in 17 patients with MR-DWI.[22] Among 985 consecutive intravenous thrombolysis-treated patients, Artto et al[14] identified 14 stroke mimics, 694 (70.5%) patients with neuroimaging-positive ischemic stroke results, and 275 (27.9%) patients with neuroimaging-negative ischemic stroke results. Similarly, in our study, neuroimaging was employed for the patients with advanced age,

focal neurologic findings, and stroke-like symptoms. All 85 patients underwent CT scans, and although pathologic findings were detected in 14.1% of the patients, they were not considered descriptive of the clinic findings at that time. After MR-DWI, 41.2% (n = 35) of normal and 7.1% (n = 6) of pathologic findings were thought to be clinically incompatible with stroke.

In a recent study by Koc et al,[31] for geriatric patients presenting to the ED with neurologic complaints, the rates for hospitalization and ambulatory treatment were 54.6% and 43.7%, respectively. In our study, 21.2% (n = 18) of the patients were hospitalized, and 5.5% (n = 1) died in the ED setting. In another study, 3.4% of patients were hospitalized, 1.7% were transferred, and 3.3% died.[16]

Most false diagnoses that occur in elderly patients can be attributed to systemic causes. In our study was detected misdiagnoses of stroke in 12.7% of elderly patients. Accurate stroke diagnosis is very important in terms of thrombolytic therapy, early responses, appropriate treatments, and preventing high costs. Although there are some difficulties in clinical presentation (history, physical examination), risk factors, and neuroimaging studies in elderly patients, emergency physicians will be useful to be consulted to related departments of such patients to rule out mimicking conditions. For this reason, we are of the opinion that studies with a larger cohort of patients presenting with stroke-like symptoms should be conducted to explore the epidemiological and clinical trends as a guide for differential diagnosis.

Limitations

Several limitations of the current study may be important in interpreting the findings. First, this is a retrospective study that evaluated diagnoses according to *ICD-10* coding. The most important limitation is the size of our population because of inclusion of patients 65 years or older. Comorbidities are common in this age group, and anamnesis and physical examination cannot be performed efficiently and entirely. Furthermore, it is very difficult to discriminate stroke because of the specific physical and psychological features of the old age group. Additionally, the generalization of our results may be misleading because this is a single-center study. Last but not least, the clinical findings and diagnoses could not be compared in terms of presentation because of the small number of patients. The comparisons could have been performed with a larger cohort of patients and could be helpful in diagnostic decisions.

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