

Factors Delaying Hospital Arrival after Acute Stroke in Southern Taiwan

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Background: Acute stroke management emphasizes prompt recognition of symptoms and early medical attention. The effectiveness of stroke treatment is highly dependent on amount of time lapsed between onset of symptoms and treatment. In this study, factors that delayed seeking medical attention after stroke in southern Taiwan were explored.

Methods: This was a prospective one-center study in which information was collected from patients who arrived at the emergency department of the study hospital within 48 hours after stroke onset. All the data were categorized into arrival time less than 2 hours (T<2 hours) and from 2 to 48 hours (T=2-48 hours) after stroke onset.

Results: There were 789 stroke patients screened and 197 (25%) of them fulfilled the inclusion criteria. Among the 197 patients, 52 (26%) arrived at the study hospital within 2 hours of stroke (median, 75 minutes) and 145 (74%) arrived between 2-48 hours (median, 575 minutes). Among patients with T=2-48 hours, 47 (24%) patients initially sought medical attention at other hospitals or clinics within 2 hours. The factors associated with T=2-48 hours included interhospital transfer, location of stroke onset, first aid at outpatient clinic, and lack of awareness of emergent medical help for stroke.

Conclusion: Significant prehospital delays for stroke patients exist in Taiwan. The implementation of well designed, effective public health programs, coordination of stroke centers within the community hospitals, and effective emergent medical service system are needed to minimize the time to evaluation and treatment of stroke. Because of the high population density and the high incidence of stroke in Taiwan, the programs mentioned above could have a major impact on improving the care of stroke patients.
(*Chang Gung Med J* 2002;25:458-63)

Key words: prehospital-delayed, acute stroke, emergency medical service, hospital, treatment.

Stroke is the second leading cause of mortality in Taiwan.⁽¹⁾ The incidence rate of first-ever stroke in Taiwan is 330 per 100,000 population aged older than 36 years and, 71% of these events are cerebral

infarctions.⁽²⁾ Recent reports have established the utility of intensive medical and surgical intervention in the hyperacute treatment of stroke. Stroke should be managed as a medical emergency similar to that

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Received: Jul. 24, 2001; Accepted: Apr. 9, 2002

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given to acute myocardial infarction. Stroke had received a great deal of attention in Taiwan after the positive results of ischemic stroke therapy with recombinant tissue plasminogen activator (rt-PA) given within 3 hours after stroke.⁽³⁾ One of the specific in-hospital time-related goals of the National Institute of Neurological Disorders and Stroke treatment guidelines is 60 minutes from the door to drug administration in acute stroke management.⁽⁴⁾ Acute stroke management emphasizes prompt recognition of symptoms and early medical attention.⁽⁵⁻⁷⁾ Minimizing any delay for the stroke victims arriving in the emergency room is important for the initiation of acute management. Prehospital delays comprise the majority of time from symptom onset to potential treatment. Several factors⁽⁸⁻¹⁴⁾ affect the interval from stroke onset to hospital admission. We conducted this study to explore the factors that caused the delay hospital arrival in acute stroke patients in southern Taiwan.

METHODS

This study was conducted in an area with three million habitants in southern Taiwan, one of the 17 Emergency Medical Service (EMS) regions. Twenty-seven hospitals including 3 medical centers and 24 community hospitals are located in this area. All hospitals provide 24-hour computed tomography (CT) scanning and laboratory facilities located adjacent to the respective emergency departments (ED). Only the patients in the study hospital were enrolled. The inclusion criteria were patients with focal neurological symptoms of presumed vascular origin and who sought help at ED within 48 hours of onset of symptoms. Exclusion criteria were patients who sought help after 48 hours after stroke symptoms occurred, lack of specification of time on symptoms onset, and patients or families who were unwilling to participate the study. Patients arrived at ED with an initial suspicion of stroke were evaluated by a neurologist. Once the diagnosis of stroke was made, patients were then admitted to the neurology department. All patients had a CT scan study either in the study hospital or other hospitals. A preset structured interview with the patients, families, relatives or witnesses was made within 48 hours of hospital admission. National Institutes of Health Stroke Scale assessment was performed as the severity of stroke.

Time of onset was defined as the time the patient or an observer first noted a neurological deficit. If the stroke was found on awakening, the time of onset was considered as the time when the patient last fell asleep. Patients with arrival time less than 2 hours (T<2 hours) from the onset of symptoms was compared to those with arrival time between 2-48 hours (T=2-48 hours).

Student t-test and Chi-square testing were used to compare the characteristics of patients between T<2 hours and those with T=2-48 hours. Medians, means and standard deviation were used to describe continuous data.

RESULTS

From September 1998 to March 1999, 1152 persons were admitted to the neurological ward. There were 789 stroke patients screened and 197 (25%) of them fulfilled the inclusion criteria. All the enrolled patients had a structured interview within 48 hours after admission.

The characteristics of the 197 eligible stroke or transient ischemic attack (TIA) patients and stroke are presented in Table 1 and Table 2. Eighty five percent of the patients had ischemic stroke or TIA and 15% had intracerebral hemorrhage. Seventy-

Table 1. Characteristics of Patients

| | T< 2 Hrs (N=52) N (%) | T=2-48 Hrs (N=145) N (%) |
|------------------------------------|-----------------------------|--------------------------------|
| Age (years) | 60.4 (34-87) | 64.3 (18-86) |
| Male/Female | 30/22 | 86/59 |
| Place of residence | | |
| Kaoshiung City/County | 47 (90%) | 106 (73%) |
| others | 5 (10%) | 39 (27%) |
| Education level: | | |
| above junior high | 12 (23%) | 34 (23%) |
| below junior high | 40 (77%) | 111 (77%) |
| Living alone | 4 (7%) | 4 (2.7%) |
| Other associated diseases: | | |
| diabetes mellitus | 17 (32%) | 44 (30%) |
| Hypertension | 29 (56%) | 77 (53%) |
| Hyperlipidemia | 4 (7%) | 8 (5.5%) |
| peripheral vascular disease/angina | 3 (5.7%) | 7 (4.8%) |
| smoking | 10 (19.2%) | 23 (15.8%) |
| family history of stroke | 11 (21.1%) | 10 (6.8%) |

Table 2. Characteristics of Stroke

| | T< 2 Hrs (N=52) N (%) | T=2-48 Hrs (N=145) N (%) |
|---------------------------------------|-----------------------------|--------------------------------|
| Stroke type: | | |
| Ischemic | 42 (80%) | 125 (86%) |
| Intracranial hemorrhage | 10 (20%) | 20 (14%) |
| first-ever | 38 (73%) | 116 (80%) |
| Recurrent | 14 (27%) | 29 (20%) |
| NIHSS (mean ; SD) | 10.7 ; 7 | 9.15 ; 7 |
| Referred from other hospitals: | | |
| Yes | 8 (15%) | 78 (54%) |
| No | 44 (85%) | 67 (46%) |
| Average time delay (minutes) | 72.1 (23-120) | 740.8 (122-2550) |
| Average transportation time (minutes) | 26.3 (10-90) | 44.9 (5-210) |
| Type of transportation: | | |
| Ambulance | 11 (21%) | 33 (22.8%) |
| Others | 41 (79%) | 112 (77.2%) |
| Manifestations of stroke: | | |
| Consciousness disturbance | 15 (28.8%) | 23 (15.8%) |
| Hemiparesis | 32 (61.5%) | 100 (69%) |
| Slurred speech | 22 (42.3%) | 39 (26.9%) |
| Sensory disturbance | 6 (11.5%) | 23 (15.8%) |
| Vertigo/dizziness | 13 (25%) | 43 (29.6%) |
| Headache | 0 (0%) | 8 (5.5%) |
| Others | 4 (7%) | 18 (12.4%) |

eight percent of the patients were first-ever stroke and 22% were recurrent stroke. The mean age for the entire group of patients was 63.3 years. Among the stroke risk factors, 54% had hypertension, 31% diabetes mellitus, 17% tobacco consumption, 11% family history of stroke, 6% hyperlipidemia, and 5% peripheral vascular disease or angina. Nineteen percent had been unconscious from symptom onset, 67% paresis, 31% speech disturbance, 15% sensory disturbance, 28% vertigo/dizziness and 4% headache as initial symptoms. Twenty-one percent had the idea of not needing emergent medical help for stroke.

Among the 197 patients, 52 (26%) patients arrived at the study hospital within 2 hours. There was other 47 (23%) patients sought medical attention at other hospitals or clinics within 2 hours. Twenty-two percent were transported by ambulance and only 11 patients used EMS in T<2 hours group. Among the 8 patients who were transferred from other hospitals, 7 patients used ambulance to reach the study hospital. There were 33 patients used EMS in T=2-48 hours group and among the 78 patients who

were transferred from other hospitals, 25 patients used ambulance and 53 patients used private car or taxi to reach study hospital. The average transportation time and time delay were 35.6 and 406.5 minutes respectively. Six percent sought first aid at outpatient clinic of the study hospital and 33% received initial treatment at other hospitals. Forty-four percent was referred from other hospitals.

Interhospital transfer, location of stroke onset, first aid at outpatient clinic and delayed medical management due to unawareness of emergent medical help hinder the timely seeking medical attention (Table 3).

Table 3. Univariate Analysis of Factors Correlated with Prehospital Delay

| Factors | T< 2 Hrs (N=52) | T=2-48 Hrs (N=145) | p |
|--|--------------------|-----------------------|--------|
| Location of onset (outside the city) | 5 (10%) | 39 (27%) | <0.05 |
| Education below junior high | 40 (77%) | 111 (77%) | NS |
| Living alone | 4 (7%) | 4 (2.7%) | NS |
| Symptoms recognized by others | 13 (25%) | 28 (20%) | NS |
| Referred from other hospital | 8 (15%) | 78 (54%) | <0.001 |
| First aid at out-patient clinic | 0 (0%) | 12 (8%) | <0.05 |
| Idea of not need for emergent medical help | 0 (0%) | 42 (29%) | <0.001 |
| First treated at other hospital | 6 (12%) | 59 (30%) | <0.001 |
| Previous stroke | 14 (27%) | 29 (20%) | NS |
| Ischemic stroke | 42 (80%) | 125 (86%) | NS |
| Intracranial hemorrhage | 10 (20%) | 20 (14%) | NS |
| Stroke severity (NIHSS > 7) | 32 (62%) | 91 (63%) | NS |
| Arrival time, night | 30 (58%) | 64 (44%) | NS |

NS: not significant

NIHSS: National Institutes of Health Stroke Scale

DISCUSSION

Significant prehospital delays were evident in this study. There was only 6.6% of the stroke patients screened could arrive in the study hospital within 2 hours after symptoms onset. However, there was 26% of the enrolled acute stroke patients sought medical attention in the study hospital within 2 hours after symptoms were identified. As compared with 30-60% of the acute stroke patients arrived in the ED within 3 hours of symptoms onset in other studies,⁽¹⁵⁾ our results are encouraging and feasible to set up acute stroke therapy or conduct trials in this area.

With the other 23% of the enrolled acute stroke patients could seek medical attention other than the study hospital within 2 hours after symptoms onset, and the possible eligible patients excluded from this study, further studies and efforts to explore the factors facilitating transfer of patients in this area are needed. The knowledge of stroke as an emergency medical problem was sparse among the patients or caregivers, and this was due to the low education level among them or the poor public medical education in this area. In this study, 77% of the patients and 58% of the caregivers were below junior high graduates or were illiterate. The difference of education levels influencing stroke management were poorly understood and the impact of low educational levels on stroke management needs further study.

Although most of the patients or families expressed the understanding of the emergent need to send the patients for help, there were still a high percentage of the patients who arrived between 2-48 hours. The possible delay can be explained by the late recognition of the symptoms of stroke. No matter who decided to seek medical attention, patients tend to arrive late at hospitals. Cultural factors and lack of knowledge about stroke were possible causes. In Taiwan, many people especially the elderly, are reluctant to seek medical attention unless being advised. Patients or family members often think that the symptoms might go away by themselves. Also, our results did not suggest that the experiences from previous stroke or family history of stroke contributed to minimize the delay in arriving ED earlier.

In this study, the emergency department of the study hospital is within 2-hour traffic distance for patients in the catchment area. For patients in the catchment area but with those arrived in the study hospital 2-48 hours after symptoms onset were those who initially sought first aid at nearby hospitals or clinics. They were transferred to the study hospital when there was no improvement or even deterioration of the symptoms. Patients who were transferred from other hospitals always arrived between 2-48 hours. This lag of time eliminated the chance for emergent treatment after stroke. Two studies conducted in northern Taiwan had shown the similar results.^(16,17) This kind of delay needs to be reduced when acute therapies, such as intravenous rt-PA or intraarterial thrombolysis, are available.^(18,19) Regional plans need to be developed so that the

patients with acute stroke are treated at regional hospitals or promptly transfer to hospitals where treatments are available. This may mean that some patients bypass hospitals that do not have stroke therapies available.

The average time to reach a hospital was less than 45 minutes in this study. The access to a hospital was not a hindrance in this area. Previous reports showed that use of EMS was independently associated with earlier arrival,^(20,21) and 55% of the patients in one study were transported to ED by ambulance. The percentage of patients using EMS in our study was low, and only 22% of our patients arrived by ambulance. Patients not using EMS were not associated with late arrival in this study. This finding may be related to our compact geographic region. The majority of our patients arrived by other vehicles instead of ambulance. Although EMS system plays a major role in an out-of-hospital emergency services, but in this area, using all available vehicles instead of ambulance to rush to the hospital after stroke symptoms was recognized and should not be discouraged.

Although other studies had demonstrated the influence of stroke types in hospital arrival,^(7,17,22) our results showed no difference of hospital arrival between infarction and hemorrhagic stroke patients, neither the admission delay related to the initial severity of the stroke. These offer a chance to screen most of the stroke patients for the eligibility of acute stroke therapy from the easily accessed medical facilities.

In this study, our data do show the characteristics of acute stroke patients in southern Taiwan and explored the factors contributed to the presentation of these events. Our results offer important and useful information to the physicians and the public for the management of acute stroke. It is needed he need for implementation of effective public health programs designed to minimize the time to evaluation and treatment of stroke, coordination of a stroke center within the community hospitals, and providing an effective EMS system to overcome the problems. These results may be useful in strategic planning for stroke management.

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南臺灣急性腦中風到院時間研究

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- 背景：**最新的腦中風治療取決於緊急的症狀確認，及時的尋求協助，及病發後緊急送至醫院。本研究探討延遲急性腦中風病人尋求緊急醫療協助的因素。
- 方法：**病發後48小時內到達高雄長庚醫院的腦中風病人，依到院時間區分成於兩組：病發後兩小時內到達醫院(T<2 hours) 及2-48小時後到達醫院(T=2-48 hours)。
- 結果：**總計789位腦中風病患接受篩檢，其中197 (25%) 位病患符合研究標準。197位收案的腦中風病患，52 (26%) 可於病發後兩小時內到達高雄長庚醫院(中數：75分鐘)。145位 (74%) 於2-48小時到達(中數：575分鐘)；其中47位 (23%) 可於兩小時內到達其他醫療院所尋求治療。影響病人無法於兩小時內到達高雄長庚醫院的因素為：由其他醫院轉送至高雄長庚醫院，較遠的病發地點，先到門診接受處置，及不認為需要緊急醫療的觀念。
- 結論：**建立腦中風緊急送醫的觀念，治療院所間的聯繫合作，及有效的緊急醫療轉送將有助於減少急性腦中風病人到院時間的延遲。
(長庚醫誌 2002;25:458-63)

關鍵字：到院時間，急性腦中風，緊急醫療轉送，醫院，治療。

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