

Critical role of the “Doctor-Heli” system on cerebral infarction in the superacute stage – Report of a Outstanding Pilot Case –

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In Japan, the physician staffed helicopter ambulance system, “Doctor-Heli” System, was first founded in our University Hospital in 1999. In this system, a helicopter is based at an Emergency Medical Center at all times and dispatch with both emergency physicians and a nurse upon a request by paramedics. This system has made possible a critically earlier development of the initial management at the point of care and rapid transport to the hospital.

We presented the case suffering from acute cerebral infarction was transported by the “Doctor-Heli” and received the intervention for thrombolysis successfully. It was less than three hours from the onset to the completion of the intervention. The “DoctorHeli” system has a potential benefit for patients with acute cerebral infarction because of it enables quite early clinical diagnosis and rapid transport.

Key words: physician staffed helicopter, doctor helicopter, cerebral infarction, thrombolysis

INTRODUCTION

In Japan, the Ministry of Health, Labor and Welfare initiated the trial of the physician staffed helicopter ambulance system, “Doctor-Heli” system, in our University Hospital in 1999 to evaluate the role in emergency care. In this system, the helicopter is equipped with almost the same facility as those in the emergency room, and the helicopter is based at our Emergency Medical Center at all times. If paramedics at the scene judge that the patient is severe enough and needs to treat and transport to our University Hospital for the urgent and specialized treatment as soon as possible, they request the “Doctor-Heli”. Upon the request, both emergency physicians and a nurse get on the helicopter and dispatch to the scene within four minutes in the average.

It takes only seven minutes in the average

from the dispatch to the beginning of the urgent initial treatment at the scene by emergency physicians. Contrarily, in the case of conventional ambulance car, it can often take more than thirty minutes to one hour before the beginning of initial treatment at our University Hospital being located at the urban to suburban area. Thus, the time before receiving the initial treatment was demonstrated to be critically shortened by the introduction of the “Doctor-Heli” system.

Finally, this trial demonstrated that the “Doctor-Heli” system exerts magnificent effects on survival rates and reduced sequelae. Based on the results, Japanese government decided to dispose the “Doctor-Heli” system all over the country and budget for this project. At the present time, this system is disposed at seven prefectures.

On the other hands, cerebrovascular disease is by far the most frequent single

organ disease in Japan. Recently, the new methods of treatment for cerebral infarction in the superacute stage are developing, that is the thrombolytic therapy.

This report illustrates the first case in which our “Doctor-Heli” system played a critical role in the outstanding recovery from cerebral infarction made possible by successful thrombolytic intervention at unexpectedly short duration after the onset.

CASE REPORT

A seventy-seven years old female was manifested by a sudden consciousness disturbance at 3:40PM, and the ambulance car was called by her family at 3:43PM. When the paramedics arrived at the patients home at 3:46PM, her vital signs were as follows; consciousness level E3-V4-M5 by the Glasgow Coma Scale (GCS), respiration rate 24/min., heart rate 120/min., irregular, blood pressure 140/90 mmHg. Because right hemiparesis were observed, the paramedics considered a possibility of stroke and requested a dispatch of the “Doctor-Heli” at 3:53PM. When the “Doctor-Heli” landed the heliport nearby the patient’s home at 4:00PM, consciousness level was E3-V4-M5 by GCS with respiration rate 24/min., heart rate 120/min., BP 160/90 mmHg. The neurological examination disclosed the right hemiparesis, conjugate deviation to the left and dysarthria. After the “Doctor-Heli” crew took the venous

line and gave the oxygen, the “Doctor-Heli” took off the heliport at 4:04PM. When the patient was transported to the emergency room at 4:10PM, vital signs were stable. An emergent head CT demonstrated no responsible lesion yet. An electrocardiogram showed atrial fibrillation. On the basis of these findings, cardioembolic stroke due to the left middle cerebral artery occlusion was suspected. Because it was not long time after the onset, we thought this case might be a good candidate for selective thrombolysis with interventional angiography. After consulted neurosurgeon took the informed consent from her family and initiated the intervention at 5:00PM. Angiography demonstrated the occlusion at the branch of the left middle cerebral artery (Fig. 1). By infusing urokinase of 920,000 units, partial recanalization (approximately 90%) was accomplished (Fig. 2). The time interval from the onset to the end of recanalization was 2 hours and 20 minutes.

Postinterventional CT demonstrated no complication such as intracranial hemorrhage, and MRI confirmed the infarction area around the insula. Although right hemiparesis and motor aphasia remained a little, the patient could go up and down the steps with some support. The patient was discharged on the 55th inhospital day. It would have taken 35 minutes from the scene to the hospital by ambulance, if the patient was transported by

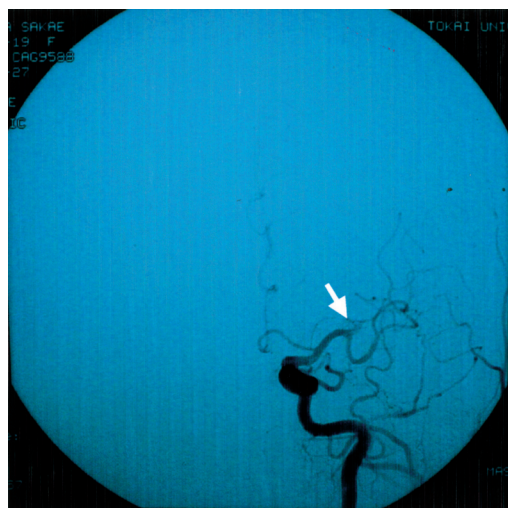


Fig. 1 Left internal carotid artery angiography. The occlusion at the branch of the middle cerebral artery was demonstrated (arrow).

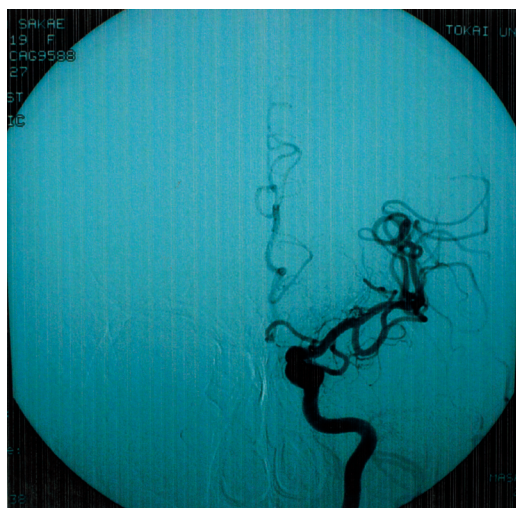


Fig. 2 After the thrombolysis with urokinase, the recanalization was recognized.

ambulance.

DISCUSSION

Cerebrovascular disease is one of the three major causes of death in Japan. For cerebral infarction, thrombolysis either by systemic medication through venous line or by selective medication utilizing the technique of angiography, the intervention of thrombolysis reduces the sequela after cerebral infarction, if many conditions for the indication are fulfilled [1]. Despite as increasing incidence of symptomatic intracerebral hemorrhage, treatment with intravenous thrombolytic agents within three hours of the onset of ischemic stroke improved clinical outcome at three months [2]. Also treatment with intra-arterial thrombolysis within 6 hours of the onset of acute ischemic stroke caused by middle cerebral artery occlusion significantly improved clinical outcome at three month [3]. The intervention should be performed exactly and rapidly. If the patient is transferred the more quickly, the results would be more fruitful. Thrombolytic agents administered within three hours after the onset of the disease, means that patients must arrive or be transferred to the hospital capable of the intervention by specialists within about two hours after the onset. However, this therapeutic time window is too short actually, and only 38% of patients with cerebral infarction arrive or are transferred to the hospital within three hours [4]. This problem especially applies to those patients who are located a long distance away from the hospital or those who cannot reach the hospital easily.

In the United States, helicopter has been used to transport the victims from the front line in the battle field to the regional hospital in the rear in the Vietnam War since 1950s. The transport system utilizing helicopter became widespread in the United States today. Paramedics and nurse usually took a ride onto the helicopter, but physician is not involved usually. In Germany and France, the emergency helicopter system in which physician is boarding the helicopter from the base to the scene is well developed all over the country. The emergency helicopter systems are different by countries. It is generally reported that such system has strong impacts on those patients with trauma, coronary disease and out-of-hospital cardiac arrest [5-11]. Regarding to cerebral infarction, it was reported that

a helicopter-based transport system offers a potential benefit because it can link a rural region to a stroke center and promote access to thrombolytic therapy in the United States [12]. However, the flight crew consisted of a pilot, nurse and a paramedic. Physician is not involved usually in the United States.

In Japan, the “Doctor-Heli” system was started in 1999. Treatment and transporting the patients suffering from CVD is considered as one of the most important role. The “Doctor-Heli” system makes it possible of early and exact decision for the transport because emergency physician see the patient at the scene and of much shorter and less turbulent transport than the ambulance car. Also, the attendant physician can inform the hospital staff for the needs of preparation of head CT, MRI, angiography, therapeutic intervention, and so on from the scene, which can afford the time to complete the treatment within three hours. Needless to say, the emergency treatments including intubation, ventilation, venous access and medication of drugs and so on are always possible in this physician staffed helicopter system.

On the other hands, the “Doctor-Heli” system has a limitation in the available time. Almost all the “Doctor-Heli” is disposed at the suburban area so far. In the current system, the helicopter can be used neither after the sunset nor in the bad weather condition, because the helicopter should be operating according to the visual flight rule. This issue needs to be solved by the new aviation technology. Another problem is noise and strong wind out of rotary wing of helicopter. We and also regional fire department staffs informed the residents the significance of this system and now it was well accepted.

However, our case suggests the critical role of the “Doctor-Heli” system in the management of cerebral infarction in the superacute stage.

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