Management of the Patients with Ventricular Assist Device in the Quake-hit City during the Great East Japan Earthquake

Masatoshi Akiyama

Abstract—We unexpectedly experienced a management of the patients with ventricular assist device (VAD) in Sendai, one of the damaged cities during the Great East Japan Earthquake. Our patients included three inpatients with an extracorporeal VAD and two outpatients with an implantable VAD. It is reconfirmed that ensuring uninterruptible electricity supply is crucial for the patient with VAD during an unpredictable disaster. The cooperation of the patients’ local community plays a key role during a disaster, and the education for VAD patients’ community services should be constantly repeated.

I. INTRODUCTION

On March 11, 2011, Japan suffered the Great East Japan Earthquake. Power outages were very damaging for hospitals, since many life-supporting medical devices and tasks required power source. Outpatients with mechanical devices also suffered from power outages. The recovery of power outages took between one to four weeks. Tohoku University Hospital is localized in Sendai, Miyagi prefecture, the nearest major city, 130km from the epicenter and one of the damaged cities during the disaster. We managed five patients with VADs. Hence, we unexpectedly experienced the management of these patients; therefore, we will present our experiences and discuss the countermeasure against unforeseeable disasters.

II. PATIENTS

We managed three patients with extracorporeal VADs at hospital. Hospital emergency power generator automatically started just after the power outage following the earthquake. Fortunately, all consoles of extracorporeal VAD operated without any damages. Hospital power supply was restored in the morning on March 12.

We managed two outpatients with implantable VADs. It was difficult to confirm their survival, because the telephone services were interrupted for extended period of time. A patient came to our hospital on foot. We confirmed that his general condition was stable but we had him admitted to our hospital because of power outage at his home. Another outpatient was at home when the earthquake occurred. His house was also disconnected with power supply. He took the batteries and the battery charger to the neighbor fire station by himself to be supplied with electricity. This patient stayed at the fire station overnight and was carried to our hospital by an ambulance in the morning on the following day. Both patients had to be hospitalized until the power outage recovery, and it took almost 4 weeks. Once these patients were discharged home, these patients had to be re-admitted to our hospital due to the power outage after the largest aftershock on April 7, and remained in our hospital for another week.

III. DISCUSSION

When the earthquake occurred, the electric power in the hospital was supplied from the emergency power generator, and all VAD consoles continued operation. On the other, outpatients were exposed to life-threatening condition, i.e., power outage. The VAD suppliers recommended the patients to live in an area within two hours of public transportation to hospital. It is, however, unfavorable to move long distance just after the huge earthquake because some roads will be damaged and a lot of aftershocks will occur. The outpatient decided to go to neighbor fire station to be supplied with electric power. Fire station staffs had a good knowledge on LVAD because they attended our repeated LVAD education program. Fire station staffs safely carried the patient to our hospital the following day of the earthquake. The necessity for LVAD education to the community services for patients with LVAD cannot be over-emphasized not only because the number of patients requiring VAD increases but also because the geologists predict that another great earthquake is likely to take place in Japan.

The USA and Canada suffered the largest power failure in 2003. During this time, many patients with home medical devices sought assistance in the emergency departments. The use of home medical equipment has become more common and is likely to increase. Many of these devices rely on the electric supply. Prezant et al. suggested that the current capacity to respond to public health emergencies could be easily overwhelmed by widespread or prolonged power failure. Disaster preparedness planning would be greatly enhanced if fully operational, backup power systems were mandated, not only for acute care facilities, but also for community-based patients dependent on electrically powered lifesaving devices.

REFERENCES