

## What should we do as orthopedic surgeons in catastrophic disasters?

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On March 11, 2011, Japan was consecutively hit by three unprecedented disasters caused by The Great East Japan (Tohoku) Earthquake: an earthquake of magnitude 9.0, an incredibly powerful tsunami, and a nuclear power plant breakdown. As Japan had experienced The Great Hanshin-Awaji Earthquake in 1995, we were prepared to provide the victims with appropriate medical care to some extent. Nevertheless, providing medical treatment after the Tohoku earthquake was extremely difficult due to the fact that the types of injuries in Tohoku were quite different from those in Hanshin. Based on our experiences in Hanshin and Tohoku, I would like to send a message to the world concerning the role of orthopedic surgeons in catastrophic disasters.

### The Great Hanshin-Awaji Earthquake in 1995

The great earthquake of magnitude 7.3 occurred at 5:46 a.m. on January 17, 1995, in the Hanshin area and Awaji Island, devastating the large city of Kobe, with a population of 1.4 million. Approximately 6,434 people lost their lives and more than 30,000 people were injured. More than 70% of the victims transferred to hospitals on the first day of the earthquake were trauma patients, and they needed treatment provided by orthopedic surgeons. A large concentration of trauma patients was seen on the first 3 days after the quake. Five days after the quake, patients requiring treatment by physicians, such as for pneumonia, increased. According to the records of the Department of

Orthopaedic Surgery, Kobe University Medical School, more than 50% of fracture sites caused by the earthquake were found in the patients' trunk, including ribs, pelvis, and spine. This was because most people were sleeping when the earthquake hit early in the morning and they were crushed and injured by collapsing houses or buildings. The most characteristic feature of this quake was that many people suffered from crush syndrome due to prolonged limb compression or direct muscle trauma. Many of them were transferred to hospitals outside the disaster-stricken area to undergo dialysis in order to save their lives.

### The Great East Japan Earthquake in 2011

The earthquake of magnitude 9.0, which ripped through the northeastern coast of Japan at 2:46 p.m. on March 11, 2011, was the most powerful earthquake ever known to have hit Japan. The earthquake triggered powerful tsunami waves, which reached heights of up to 40.5 meters. Buildings collapsed, highways buckled, fires broke out, and some of the towns located along the coastline were entirely swept away. The catastrophic disaster claimed more than 20,000 lives, and more than 3,000 people are still missing even 9 months after the catastrophe. Approximately 440,000 people were evacuated and obliged to live in temporary shelters. Those injured due to the collapse of houses and buildings were taken to hospitals just as those who had been injured in The Great Hanshin-Awaji Earthquake were. The disaster medical assistant teams (DMATs) organized in many parts of Japan after the Hanshin earthquake were dispatched by air immediately after the earthquake that occurred on the afternoon of March 11. In this Tohoku earthquake, however, doctors had to face the harsh realities of the catastrophe in which they could not do

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anything to save some lives as many of the victims had drowned because the tsunami swept inland before the doctors reached the disaster-stricken areas. In fact, the number of tsunami victims was much greater than that of the casualties in the earthquake itself.

### **Nuclear power plant breakdown in Fukushima Prefecture**

Japan currently faces a nuclear threat after the breakdown of the nuclear plant in Fukushima caused by powerful tsunami waves. The residents of adjacent areas were evacuated because high levels of radiation were detected. Since then, many evacuees in Fukushima have shown symptoms of post-traumatic stress disorder (PTSD). Mental health counseling by psychiatrists and clinical psychotherapists have been provided to those who have developed PTSD.

### **Medical treatment in catastrophic disasters**

It is said that we need 3 T's, namely, transportation, triage, and treatment, for carrying out emergency medicine in disaster-stricken areas.

*Transportation* In both the Hanshin and Tohoku earthquakes, either the destruction or the congestion of roads made it extremely difficult to transport patients and relief aid by land. Alternative means of transportation of patients such as by helicopter and by boat should be carefully arranged well in advance.

*Triage* Wounds or illnesses should be assessed on the basis of their seriousness and urgency in order to save as many lives as possible with limited medical resources. Patients with life-threatening injuries such as heavy bleeding should be treated prior to prognoses of function of limbs.

*Treatment* In cases of emergency, a support system should be established among orthopedic surgeons because many of them are needed to treat trauma patients immediately after an earthquake due to the collapse of buildings and houses.

In addition to the 3 T's, it is also necessary to train orthopedic surgeons who can diagnose crush syndrome, which they usually do not treat. They should be trained to make an early diagnosis of crush syndrome on the spot with topographical findings and laboratory data and to send the patients to medical facilities with emergency rooms or dialysis equipment. Finally, it should be emphasized that rehabilitation of the elderly is another area in which orthopedic surgeons can contribute in disasters. Many elderly people who are obliged to live in limited space in temporary shelters tend to lose the ability to walk due to the atrophy of locomotive muscles. Orthopedic surgeons should provide them with appropriate rehabilitation treatment to have them retain their locomotive abilities. In conclusion, I would like to express my sincere gratitude for all the supports from abroad to help Japan in such unprecedented disasters.

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