Editorial
Orthopaedic trauma following tsunami: Experience from Phang Nga, Thailand

C Watcharong
Takuapa Hospital, Phang-Nga province, Thailand

B Chuckpaiwong, B Mahaisavariya
Faculty of Medicine Siriraj Hospital, Bangkok, Thailand

On the morning of 26 December 2004, a tsunami hit the western coast of southern Thailand, including the provinces of Phuket, Phang Nga, Krabi, Chumporn, Trang, and Ranong. Six to 8 huge waves measuring 5 to 7 metres high destroyed almost everything along the beach and inundated areas more than 300 metres from the seashore. Victims were injured by debris carried by the waves, including stones, trees branches, as well as concrete, broken glass, and metal from buildings destroyed by the surging water. Most of the victims sustained lower-limb injuries because of being submerged in the water, and most of the survivors had minimal to moderate injuries to the body and extremities. Causes of death included drowning, being entrapped inside collapsing buildings, and being thrown under cars.

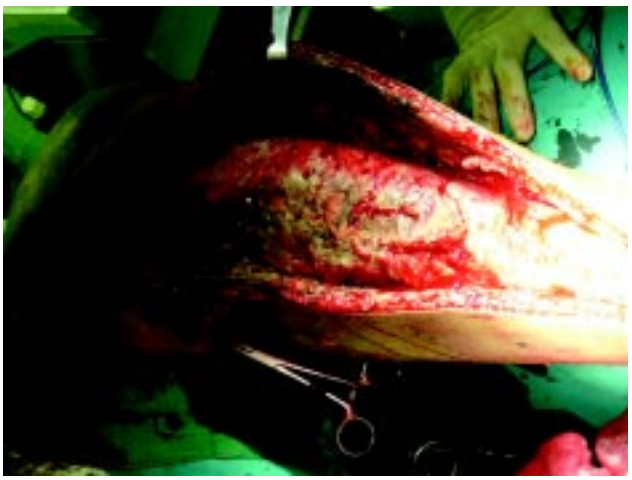
Takuapa Hospital of Phang Nga province, a general hospital with 180 beds, located 3 km from the coast, was severely affected. During the first 24 hours of the disaster, more than 1000 patients presented to the emergency room; however, only 10 physicians were available: 5 general practitioners, 2 orthopaedists, 2 paediatricians, and one surgeon. While the hospital was capable of accommodating a mass casualty of only 50 to 60 patients, more than 500 patients were admitted to the hospital within 3 hours. All available staff were called to the emergency room to help resuscitate and identify patients requiring surgical debridement. Some severely injured patients were transferred to a nearby provincial hospital. Because telephone services were not available for several hours, the call for help was passed directly from the ambulance drivers to the medical staff of the provincial hospital, who then dispatched several ambulance and medical personnel to assist.

During the first day after the tsunami, more than 1000 patients were admitted to Takuapa Hospital, half of them requiring hospitalisation; however, because there were only 4 operating theatres, most patients were unable to be operated on within the golden period. Almost all wounds were treated late and gradually became infected. Most of the 60 severely injured patients were transferred to provincial hospitals and many injured tourists were transferred to hospitals in Bangkok. Almost 200 patients who required emergency surgical intervention were treated at Takuapa Hospital. The next morning, organisations in Bangkok such as Faculty of Medicine Siriraj Hospital dispatched more physicians to assist in the rescue efforts.

Most of the severely injured patients had open fractures of the long bones on either or both of the upper and lower limbs. Wounds were of specific characteristics: multiple; of small-to-medium size; along the head, face, and extremities; often on the posterior aspect of the head, back, buttocks; and legs. Almost 140 patients undergoing surgical intervention had infected wounds, most of which were severely contaminated and foul-smelling. Some wounds had only small opening tracts but contained large amounts of contaminants such as sand, soil, and sticks inside the cavity. During debridement, extensive fat necrosis was usually found above and below the fascia of the muscle, along with greyish, sand-like contamination. Most of the wounds had spread to more than 5 times their initial size (Fig. 1). The wounds were adequately

Figure 1 Photograph showing greyish, sand-like contamination along the wound spreading to more than 5 times its initial size.

(a)



(b)

Figure 2 Photographs showing one of the most severely contaminated wounds at the posteromedial aspect of the knee.

debrided and sutured on the first day, but almost all were infected, required redebridement, and were left open for drainage. One third of the cases needed redebridement due to further tissue necrosis. One of the most severe and massive contaminations was found in a wound at the posteromedial aspect of the knee (Figs. 2a and 2b). Only 3 to 5 cases of open fractures of the distal humerus, hand, distal tibia, and femur were treated at Takuapa Hospital. The fractures were not securely fixed with any implants because of the serious contamination of the wounds.

According to Takuapa Hospital, as of 19 January, 5222 cases had presented to the emergency room; 2937 (56%) were admitted to hospital and the remaining were treated as out-patients. Most of the patients were adults: 36% were aged 40 to 60 years and 32% were aged 20 to 39 years. Foreign patients numbered 1087 (21%). Most wounds were to the lower (2545; 49%) and upper (1685; 32%) extremities, the rest being found on the buttocks, back, neck, head, and chest. More than 3000 victims were found dead. Takuapa Hospital recorded 115 dead, 105 (91%) were dead on arrival. Ten patients died of gram-negative septicemia, mostly caused by *Klebsiella* and *Escherichia coli*.

Several problems arose in the care of orthopaedic trauma patients after the tsunami. The available medical personnel, equipment, and surgical facilities were inadequate to deal with the huge number of patients, and failure of the communications system hindered the rescue efforts between hospitals. Almost all wounds and open fractures were treated late and became infected, being highly contaminated and of special characteristics. Infecting organisms were mostly gram-negative.

A well-organised team that can provide rapid initial treatment for large numbers of patients is the key to a successful tsunami rescue effort. Wounds sustained in this kind of disasater are inevitably severely contaminated; therefore, adequate debridement and delayed suture are recommended for all patients. Antibiotics and tetanus prophylaxis are requisite to all patients who have sustained wounds.