

In July 1994, >800,000 refugees suddenly moved into Zaire. It was such a rapid movement of refugees that international organizations did not have enough time to plan relief for them. Provision of assistance in large refugee camps is very difficult. From that experience, the International Federation of Red Cross and Red Crescent Societies (IFRC) invented a new system named ERU (Emergency Relief Unit) for refugee situations and disaster relief.

In May 1999, >400,000 Kosovar people moved into Albania. Eighty percent of those Kosovar refugees stayed with host families, and other 20% stayed in refugee camps. To support the refugees staying with host families, the Japanese Red Cross Society (JRCS) opened dispensaries and mobile clinics.

From October 2001, 70,000 Afghan people crossed the border into Pakistan; they were called "invisible refugees". It was very difficult to assist them.

Since each situation of refugees is very different from others, relief activities for refugees must be designed according to the situation.

**Keywords:** Afghan; assistance; camps; Kosovo; refugees; relief; Zaire  
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### The ICRC Hospital in Dili, East Timor during Sub-Acute Phase after the September 1999 Conflict

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**Introduction:** The conflict that broke out in East Timor in September 1999 destroyed all of the social structures including medical care. The International Committee of Red Cross (ICRC) began to support Dili General Hospital as a referral hospital in East Timor.

**Objective:** To report the medical conditions in Dili using the statistics of the patients admitted to the hospital.

**Methods:** Data were abstracted from the patients admitted to the ICRC Dili General Hospital between January 2000 to March 2000.

**Results:** A total of 1,426 patients were admitted out of 4,240 outpatients (33.6%).

1. Neonatal patients were predominant in number compared to the other age groups. A second peak of patients admitted was observed in the decade of 20 years.
2. The most common diseases were related to the obstetrics and gynecology (25.6%), followed by respiratory diseases (19.3%). Only two cases of war wounded were admitted.
3. Tropical diseases such as malaria, dengue fever, and heat stroke were noted in 234 cases (16.4%).

The medical situation at Dili in East Timor was not related to war wounded or conflict, but reflected the ordinary state of a general hospital in a tropical setting.

**Keywords:** admissions; conflict; dengue fever; East Timor; gynecology; heat stroke; hospital, general; malaria; obstetrics; respiratory; statistics; tropics; wounded

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### Evaluation of the Response to the Crisis in South Vulkan

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Approximately 860,000 refugees entered Albania and Macedonia from Kosovo since the start of the crisis in Former Yugoslavia in 1999. The Japanese Red Cross Society (JRCS) sent delegates to the Macedonia-Yugoslavia border for the needs assessment and the coordination two weeks after the start of NATO's bombing.

The JRCS started the medical support for those refugees from the end of April 1999, as the dispensary and mobile clinic health service in Albania, with the cooperation of Japanese and Albanian medical teams. The JRCS dispatched a medical team two weeks after the peace agreement from the Albanian border into Kosovo, to start the medical service for the repatriated refugees, repaired 13 ambulancias (clinics), and rebuilt one medical center in the northwest part of Kosovo.

The process of the mission was summarized in this presentation, and the coordination was emphasized as crucial as medical activities.

**Keywords:** clinics; coordination; evaluation; Japanese Red Cross; Kosovo; medical services; needs assessment; refugees  
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### Forgotten Emergencies in Sudan and Sierra Leone

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Sudan and Sierra Leone have suffered from internal conflicts since 1983 and 1991 respectively. These prolonged conflicts decreased the capacity of the healthcare system, in spite of increasing needs for healthcare. Therefore, the International Committee of the Red Cross (ICRC) has been providing protection and assistance since beginning of the conflicts.

Three ICRC relief missions for the Sudanese and Sierra Leone were described:

1. From June to October 1999, at Lopiding Surgical Hospital in Lokichokio (Kenya: 20 km from Sudan border);
2. From October 1999 to June 2000, at Juba Teaching Hospital in South Sudan; and
3. From January to July 2001, at Kenema Government Hospital in Sierra Leone.

The strategy of the ICRC surgical team (Ward Nurse, OT Nurse, Surgeon, Anesthetists, and Administrator) was to take a "capacity building" approach. The challenges to this approach were presented including: 1) Dealing with cultural differences; 2) Dealing with de-motivated staff; and 3) Security (conflict situation and health).

**Keywords:** capacity building; culture; experiences; motivation; security; Sierra Leone; staff; Sudan; team, surgical  
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### Patient/Medical Care

### Analysis of 372 Patients with Crush Syndrome

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To clarify clinical features and determine the severity in patients with crush syndrome from the Hanshin-Awaji earthquake, medical records of 6,107 patients hospitalized in 95 hospitals were reviewed retrospectively, and 372 patients with crush syndrome were identified. The major sites of crush injury were in the lower extremities (74%), the upper extremities (10%), and the trunk (9%). Pelvic fractures, limb fractures, and abdominal injuries were the most frequently associated injuries. Patients with trunk compression and/or with abdominal injury had a higher mortality rate. A total of 50 patients (13.4%) died. The causes of death within five days after the earthquake were hypovolemia and hyperkalemia. Peak serum creatine kinase (CK) concentration increased with the number of crushed extremities. Mortality and the risk of acute renal failure were highest in patients with CK concentration greater than 75,000 U/L.

**Conclusion:** The severity of crush syndrome can be estimated by both the number of crushed limbs and peak serum CK concentration, which reflects the extent of underlying muscle damage. These results help us to recognize the crush syndrome, evaluate its severity, and to consider indications for transferring the patients to unaffected hospitals for critical management.

**Keywords:** creatine kinase (CK); crush syndrome; hyperkalemia; hypovolemia; mortality; risk; severity; sites  
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### Diagnosis, Treatment, and Pathophysiology of the Crush Syndrome

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Crush syndrome with acute renal failure has been identified as a major medical complication that occurs among people who are trapped under the debris from earthquakes, bombings, and other events that result in entrapment. Traumatic rhabdomyolysis induced by ischemia reperfusion injury plays a crucial role, although the pathophysiology is not fully understood. Initially, prolonged limb compression may cause stretch myopathy as well as ischemic injury. Immediately following decompression of limbs, re-establishment of the microcirculation produces an adverse effect; reperfusion injury that promotes further ischemia, muscle swelling, and myonecrosis that leads to an acute compartment syndrome. In association with these local events during limb compression/decompression, a massive loss of extracellular fluid into the injured muscles and solutes leaking out of damaged muscles results in the development of systemic manifestation. Chief among these are hypovolemia and hyperkalemia which, synergistically, have a potential for early death, metabolic acidosis, shock, coagulopathy, and acute renal failure (ARF).

A history of prolonged limb compression trapped by heavy objects and a physical finding of limb paralysis following extrication should suggest the diagnosis of crush syndrome. The treatment consists of aggressive volume replacement followed by forced diuretic therapy, which may combat shock and correct the hyperkalemia. If ARF has occurred, regular hemodialysis is indicated. Although the surgical management of injured limbs still is controversial, suggestions were provided in this report.

**Keywords:** acidosis; acute renal failure; crush syndrome; hemodialysis; ischemia; myonecrosis; reperfusion; rhabdomyolysis; shock  
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### Radiographic Imaging and Histological Findings of Crush Syndrome

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**Objective:** To identify the radiographic imaging and histological findings of crush syndrome to better understand the pathophysiology of its development.

**Radiographic findings:** Seven patients injured in the Hanshin-Awa Earthquake underwent serial computerized tomography (CT) and magnetic resonance imaging (MRI) examinations of the injured extremities. In all patients, the CT showed persistent edema of the subcutaneous tissue until approximately one month after the injury. In four patients who developed acute renal failure, CT revealed transient high density areas in the muscle, which was confirmed histologically as calcification. An MRI performed 4 to 5 weeks after the injury revealed inhomogeneous high intensity areas in injured muscles on T2-weighted images in all patients, indicating prolonged edema within the muscles. The use of Contrast T1-weighted MRI localized the injured area more clearly than did CT.

**Histological findings:** Muscle tissue was taken by biopsy from six patients 40 to 50 days after their injury. In four patients, typical myopathic changes such as necrosis, regeneration, and inflammatory cell infiltration were observed. Neurogenic muscular changes, such as small angular fibrosis, also were observed in three patients. In five patients, calcium deposition was demonstrated by von Kossa staining.

**Conclusions:** These radiological and histological findings support the notion of calcium-related biochemical events intrinsic to crush syndrome and show that the mechanism of the injury is not simple, but sustained and complicated.

**Keywords:** calcifications; computerized tomography; edema; fibrosis; histology; imaging; inflammation; magnetic resonance imaging; myonecrosis; necrosis  
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### Clinical Presentations of Typical and Atypical Crush Syndrome

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