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Crush and compartment syndrome due to earthquake injury

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Abstract

The seismic oscillations that come from unanticipated energy in the planet's crust and the shaking of the earth by these waves are known as earthquakes, ground shaking, or earthquakes. Orthopedic injuries sustained during or following an earthquake include those to the bones, joints, and muscles. Such injuries could result from traumatic occurrences like a fall, jolt, or collapse brought on by an earthquake's impact. The region's and nation's health systems are heavily impacted by the earthquake. Many individuals suffer injuries, and towns are destroyed. For doctors, diagnosing and treating injuries can occasionally be difficult and complex. Earthquake is a great natural disaster that can be seen all the time in every geography. We must thus modify our health systems to accommodate this unexpected calamity.

Keywords: compartment syndrome, orthopedic, earthquake

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Introduction

Crush injury is characterized as damage seen in tissue following high-energy trauma. Crush syndrome refers to the condition where toxic metabolites from the crushed extremity induce renal failure, electrolyte imbalance, and multi-organ failure (1).

Compartment syndrome, on the other hand, is characterized by the cessation of capillary blood flow as a result of elevated pressure in the area between the closed bone and fascia, the onset of ischemia in the muscle and nerve tissues, and as a result, a permanent loss of function (2). The Kahramanmaraş earthquake, which had an impact on 11 provinces in February 2023, occurred in a region of our nation that is prone to earthquakes (Figure 1). The most typical post-earthquake crush injury, compartment syndrome, will be discussed in this article along with treatment options.

Diagnosis

Long periods of time spent under the rubble can put the body as a whole and the extremities under strain, leading to the loss of the extremity and death. Compartment syndrome is a medical emergency in the field of orthopedics. After the compartment's pressure builds up, it happens. Muscle and nerve tissue necrosis results from decreased perfusion pressure brought on by increased compartment pressure. Long-term morbidity may grow due to irreparable damage to muscles, neurons, blood vessels, and skin from prolonged ischemia. Identification of patients who are at risk, accurate diagnosis, and quick treatment are therefore crucial (3).

Diffuse edema in the tissues starts to develop first after crushing the extremity as a result of an earthquake or high-energy trauma. Trauma-related pictures may initially return, but after 6 to 8 hours, permanent nerve and muscle necrosis takes place. If an emergency fasciotomy is not performed to treat this clinical condition, the pressure will not be reduced and tissue perfusion will not be improved, creating a vicious cycle in which the swelling worsens and the compartment pressure rises, worsening the tissue nutrition (3). It is first important to suspect compartment syndrome before making a diagnosis. When a patient is conscious, the diagnosis is made by pain that is excessive for the context, increased agony with passive stretching, numbness, tingling, and failure to take pulses if the condition gets worse. The first observation is frequently severe pain that is disproportionate to the damage or inspection. The discomfort frequently intensifies with passive stretching of the appropriate compartment and is typically deep, intense, and burning. Sadly, the majority of the symptoms, such as acute pain, pain with passive stretching, paresthesia, and paralysis, have low diagnostic sensitivity even though the diagnosis is made clinically. As a result, the diagnosis cannot be ruled out by their absence. The clinical signs of the patient who is suspected of having compartment syndrome must therefore be carefully evaluated often (4).

Figure 1: Kahramanmaraş earthquake in Turkey

Treatment

Fasciotomy, in a nutshell, is the technique of severing the fascia encircling the compartments from one side in order to relieve the compartment's increasing pressure. Damage to the extremity happens in crush-type injuries for two different reasons.

The first is how trauma directly affects every tissue in the extremities. The second is compartment syndrome secondary to edema in the deep tissues, which is also caused by trauma. As a result, muscle and nerve tissue damage and distal circulatory disorder occur.

There isn't much we can do immediately to address the first type of injury, direct tissue damage brought on by trauma. However, the elevated pressure in the compartment needs to be rapidly lowered in cases of advanced or emerging compartment syndrome to be able to arrest the process of necrosis by restoring circulation and oxygenation to tissues, in particular muscle and nerve tissues. The only way to accomplish this is to open a fasciotomy to the appropriate extremity and lower the pressure in all compartments with elevated pressure (5).

To avoid muscle necrosis, the fasciotomy should ideally be opened within the first six hours and preferably in an operating room. If limb ischemia exceeds 12-24 hours, irreversible peripheral nerve changes are added to the picture in addition to muscle necrosis (5).

Studies on the application of hyperbaric oxygen therapy (HBO2) in post-earthquake injuries are few and far between. 630 patients who sustained injuries as a result of the Marmara earthquake on August 17 were the subject of a study. The patients received HBO2 therapy for a total of 946 sessions. In conclusion, HBO2 therapy was recommended as an adjunct to fasciotomy, wound debridement, and anti-biotherapy in the treatment of compartment syndrome caused by a crush injury, which is typically noticed following an earthquake (6).

It is debatable whether to leave the wounded limb in patients with crush syndrome after earthquakes or amputate it. While making this decision; The general condition of the patients, their response to conservative treatment, the degree of injury of their extremities, the availability of hospitals in the earthquake zone and the experience of health professionals are taken into account. In addition, it should be taken into account whether close follow-up can be made, whether there are equipped hospitals close to the disaster area, and patient referral opportunities. Thus, the choice of whether to keep or amputate a bruised limb will vary from patient to patient and be determined by the situation at hand.

Amputation of the victim's limb should, in certain circumstances, not be viewed as a loss of limb but rather as an effort to save the victim's life. Necrosis, successive debridement of infected tissues, and appropriate administration of antibiotics should be carried out under sterile settings in order to prevent major consequences like sepsis that may arise after fasciotomy is conducted owing to compartment syndrome developing in the oppressed limb. Close patient follow-up is necessary in this circumstance. Cutting should be used right once if it is determined that these preventative therapies are ineffective for a patient who develops crushing syndrome in the limbs (7).

When we are unable to closely monitor a patient, our relentless efforts to save the limb rather than amputate it may end in the patient's death. Again, patient losses won't be avoided if the limb amputation is done too late. In the Van earthquake, complications like infection during the follow-up forced the amputation of one-third of the patients who had fasciotomies, and another one-third passed away despite all attempts (8). One of the key goals of our professional practice is to safeguard the patient's limbs. However, amputation should be preferred over limb-sparing treatments if individuals with crush syndrome have one or more of the following conditions and we must continue therapy there;

-A patient with an irreversible arterial injury and a circulatory limb

- Widespread and severe crushing of the limbs in patients with severe chest, head, and abdominal trauma, immunodeficiency, chronic kidney, lung, and liver failure, and in situations where the victim's limb cannot be removed from the rubble

- In elderly and frail patients whose kidney, heart, and respiratory functions rapidly deteriorate and whose sepsis situation is uncontrollable despite prophylactic medications (9).

Conclusions

Therefore, following an earthquake, patients should competently receive first aid. When deciding whether to amputate a patient with a crush injury in the earthquake area, additional problems with the patient, his response to conservative treatment, the degree of injury to the limb, the status of hospitals in the earthquake area, and the experience of health professionals, whether close monitoring can be done, whether there is a well-equipped hospital nearby, patient referral opportunities (adequate ambulance, seasonal and geographical conditions, etc.) should be taken account. Therefore, the choice of whether to keep or amputate a crushed limb depends on the individual patient and their current health.

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