

important it is to do, who will perform that task, which resources I can use in completing this task, and what I shall do next? The success of action is dependent on just these decisions. Very often, the situation is difficult, and there is an obvious discrepancy between resources and needs. These decisive decisions are based on knowledge, observations, actual circumstances, and strength of will. These features of an individual leader of action are expected without organising the corresponding training or education to reach this level of preparedness.

The strength of mind to make decisions in priority order and use of resources in a critical situation can not be reached during theoretical lectures or reading from books. One must get interactive training in real or simulated emergency situations. To get wide experience in decision-making in real emergency situations is a dangerous way of learning for the casualties of these accidents. For example, wrong decisions concerning the priority order for treatment of the victims can result in an unnecessary loss of someone's life. It is much better to learn in simulated, interactive situations, where you will have much safer chance to learn by trials and errors.

I have collected my reportable experience in this particular issue from numerous training sessions with medical students using an interactive computer program for accident tactics (TRIAGE). This simple DOS-based program provides the trainee with a simulated accident scene and the task to take care of casualties. The trainee acts as a leader of the group, and has the obligation to make all decisions on the use of emergency care resources and equipment. The decisions include all of the features of the real situation, what to do, in which order the task is completed, who will perform the task and how the resources are utilised? All the decisions are collected in computer memory for final scoring and analysis. There is a progression of difficulty degree in the relation of resources and needs.

There is an obvious difference between persons in the preparedness to make sharp decisions in similar situations. Some persons have an inborn ability to act logically and according to the overall situation. They do not lose their limited resources or time in unnecessary tasks, but have a firm touch to concentrate only in the most important obligations. There also are those students who seem to be too weak to make decisions on priority order, but work with non-essential and non-urgent tasks forgetting to move forward. I assume that these trainees with a weak personality could learn to make sharper decisions with a continuous interactive training of tactics. The utilisation of the feedback is important in this aspect. The features of this computer simulation software will become more and more advanced in order to create more natural simulated situations.

Keywords: computers; decision-making; disasters; interactive simulations; learning; multi-casualty incidents; simulations; software; training; triage

Poster Session I

Wednesday, 12 May, 10:00–11:00 hours

P-1

Natural Approach to Ophthalmological Aid in Disasters

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Introduction: The number of disasters, in which the open parts of the body, especially the eye, were affected primarily by secondary wounding projectiles and fire, has increased lately. Therefore, it is necessary to study how the eye is affected in disasters, and to determine what measures need to be taken to provide first and specialized aid at various stages of evacuation. The purpose of this study was to work out a set of measures to provide ophthalmological aid in natural accidents and disasters on the basis of examination of the clinical manifestation of eye injuries.

Methods: A total of 7,378 patients with eye injuries inflicted in three types of disasters were examined: 1) An explosion of canisters with inflammable materials at a railway station in Yekaterinburg; 2) an explosion and fire on an oil pipeline at Ufa; and 3) an earthquake in Armenia. All of the patients were examined using generally accepted ophthalmological methods.

Results: It was established that pathological changes in the injured eye depended on how the injury was inflicted: 1) mechanical injuries connected with the shock wave caused penetrating eye wounds with intraocular foreign bodies; 2) burns related to explosions and subsequent fires mainly caused injuries of the eyelids; and 3) natural disasters, such as earthquakes, caused mainly mechanical injuries of the eye.

Conclusion: Ophthalmologists must be present on the site of disaster at the stage of sorting victims in order to determine the urgency and volume of specialized aid. Mixed teams including ophthalmologists must be formed at general medical centres to avoid overlooking eye injuries.

Keywords: disasters; earthquakes; explosions; eyelids; eyes; injuries to; foreign bodies; intraocular; multi-casualty incidents; ophthalmology

P-2

Eye Burns in Disasters Caused by Fire

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Burns usually are the most severe injury in accidents caused by explosions and fires. The purpose of this study was to study the eye injuries caused by a gas pipeline explosion in Ufa that occurred while two passenger

trains were passing each other in a valley filled with gas. The explosion caused mostly thermal rather than mechanical injuries. More than 1,200 people were injured of whom one in five received lethal burns. Since emphasis was on life-saving operations, eye injuries were discovered and diagnosed two days after the accident.

We examined 473 patients, of whom 440 (89%) had 2–4 degree burns of the eyelids, 103 (22%) had 1–2 degree burns of conjunctiva, 10 (2%) had 2–3 degree corneal burns, five (0.01%) had penetrating eye wounds (2 of these had intraocular glass foreign bodies), and seven (0.014%) had eye contusion with brain injuries. Thus, eyelid burns prevailed, of which 69 patients (14.6%) had skin and cartilage necrosis with eyelid melting.

Conclusion: Eyelid burns are the most common injury in disasters caused by fire. Corneal burns and penetrating eye wounds and globe contusion make up a small part of the total injuries to the eyes. Therefore, ophthalmologists must be present at the stage of sorting and removing disaster victims from affected areas.

Keywords: burns; conjunctiva; cornea; explosions; eyelids; eyes; fire; foreign bodies; ophthalmology; Ufa

P-3

Burn Disasters from a Propane Gas Explosion

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Introduction: Approximately 3,000 propane fires and explosions are reported yearly in the United States. More than 9% of these cases result in bodily injury, and mortality occurs in more than 7% of the injured. Most of the accidents seem to be due to a lack of knowledge regarding the handling of propane gas or liquid petroleum gas, which are low-cost and widely used fuel resources. A review of a major burn incident from a propane gas explosion in Kaohsiung, Taiwan, along with prevention strategies and warning systems are reported to help increase public awareness of the problems associated with propane gas.

Results: On 13 September 1997, a huge, fiery explosion occurred on the roadside in a residential area of Kaohsiung while workers for the gas company were replacing gas pipelines. First, the workers tried to clear the old gas pipelines by water irrigation through a drilled hole. After 15 minutes of water irrigation without smelling an obvious odor, they proceeded to cut the old pipelines. Subsequently, a heavy, garlicky odor profused suddenly. The workers telephoned the fire department for assistance, and two fire engines arrived to begin evacuation. At this moment, a huge, fiery explosion occurred that destroyed 18 houses and 92 vehicles. Moreover, there people died instantly and 24 people were injured severely.

In this incident, there were six persons with near 70% second degree burns, and nine people with second degree burns between 20% to 50% of their body surface area. The task was overwhelming for the burn units in the four hospitals around that area. Despite aggressive

treatment, more patients died later, and many others still needed reconstructive and rehabilitative therapy in both physical and emotional aspects.

Conclusion: The danger of a propane system cannot be overemphasized. Proper precautions should be taken in both an industrial and a household situation. The odor is not an adequate device for detection of this volatile gas. Other devices for gas detection should be applied and careful instructions for their use provided. This effort, in conjunction with the industry's enhanced safety inspection, rigid operation standards, and the ongoing educational efforts, might prevent deaths and injuries that currently are associated with propane gas.

Keywords: arsenic; cyanide; laboratory studies; poisoning; signs, clinical

P-4

Primitive, But Practical: Stamping-Bellows for Artificial Ventilation

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In critical situations such as during an acute phase of a disaster, artificial ventilation may be needed for the patients with respiratory failure of any form. Practical problems, and so on. The use of a hand-squeezing bag like Ambu® can ventilate a patient well, but the use of the bag-valve mask precludes the application of any other resuscitative measures by the ventilator except ventilating the patient.

The authors have successfully applied the use of a stamping bellows to ventilate an anesthetized patient through an anesthesia machine. The method also is applicable without an anesthesia machine so long as inspiratory/expiratory one-way valves are included in the system. By connecting the bellows with disposable plastic, corrugated tubes and a T-connector to an Ambu bag that is used for its valves, artificial ventilation of a patient is possible.

Using bellows is by no means a new idea. In 1898, the American surgeon, Rudolph Matas, showed how to intubate and how to ventilate a patient with "Fell-O'Dwyer apparatus" using an operator's thumb as a valve.

Ventilation using a foot gives an operator free hands, and allows the operator the ability to perform other procedures while providing adequate ventilation. The authors will demonstrate the prototype and its use.

Keywords: artificial ventilation; bag-valve ventilation; bellows; foot ventilator; ventilation; ventilatory support