

*Original Article***Triage of war-injured troops in the Iran-Iraq War**

*Masoud Saghafi-Nia\**, *Seyed Masoud Khatami\*\**, *Nahid Nafissi\*\*\**,  
*Yadollah Rezaei\*\*\*\**

**Abstract**

**BACKGROUND:** This study compared the triage of Iran-Iraq war-injured troops within the first two years of the war with that after the first two years.

**METHODS:** This was a retrospective study, which compared the triage of the admissions for abdominal injuries during the first two years of the Iran-Iraq War with that in the next 6 years. Out of nearly 50,000 cases, 1,176 ones were randomly selected and their triage information was recorded and analyzed.

**RESULTS:** About 12.5% of patients were operated on within less than 8 hours during the first two years. From 1982 towards the end of the conflict (1988), the patients were treated within progressively shorter periods of sustaining injury; 68.8% were operated on within less than 4 hours of injury. The mean delay between injury and treatment in the first two years of war was 12 hours while it was 5 hours between 1982 and 1988. The difference was significant ( $P < 0.05$ ) but the mortality rate was not significantly different.

**CONCLUSIONS:** Patient triage was conducted differently at various stages of conflict. Better patient triage after 1982, may have been due to improved care and more specialized triage of injured troops.

**KEY WORDS:** Iran-Iraq war, abdominal injuries, triage.

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**D**r. Larrey, a military surgeon in Napoleon's army, was the first one who developed the concept of triage, the categorization of patients in proportion to the severity of their injuries and the need for urgent surgery<sup>1</sup>. The flood of numerous casualties in a short period of time may paralyze the medical facilities and cause irreversible damage to the injured<sup>2</sup>. Earlier detection of the extent of injury and quick life-saving measures are essential to decreasing morbidity. Rapid transfer of the wounded, employment of trained medical personnel and advanced medical

equipment, and the provision of a peaceful environment for treating the wounded are factors of significance<sup>3,4</sup>. On the other hand, in impassable zones, locations visible to the enemy or when the wounded cannot be moved out of the war zone due to intensity of conflict, appropriate on-site treatment facilities can be set up for early patient care and possible surgical interventions before transfer to safer areas. Triage of patients in war zones is performed to this end. Both approaches were used in treatment of the war-wounded in the Iran-Iraq War (1980-1988). Various guidelines, including

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\*Assistant Professor of Anesthesiology, Trauma Research Center, Baqiyatallah Medical Sciences University, Tehran, Iran.  
e-mail: dr\_sagafi@yahoo.com (Corresponding Author).

\*\*Professor of Surgery, Department of Surgery, Faculty of Medicine, Baqiyatallah Medical Sciences University, Tehran, Iran.

\*\*\*Surgeon, Iranian Mine Victim Rescue Center, Tehran, Iran.

\*\*\*\* Assistant Professor of Orthopedic Surgery, Trauma Research Center, Baqiyatallah Medical Sciences University, Tehran, Iran.

those based on physiological criteria have been used in patient triage: blood pressure < 90 mmHg, pulse rate > 120/min and 12/min < respiratory rate < 35/min. Also, applicable were the configurable remote access measurement system (CRAMS) criteria, which offer a 20-point scoring system; patients with major traumas score 8 or less, and those with minor traumas score 9 or higher<sup>5-7</sup>. This study can serve as a prelude to more extensive investigations of the different aspects of treatment of casualties during the Iran-Iraq war.

## Methods

This retrospective study covers the triage of the admissions for abdominal injuries during a period of 8 years, from September 1980 until June 1988. Iran-Iraq border is 1200 km long with different geographical pattern along with. Then, transferring the casualties to backup hospitals was done with different rates and patterns. Data for abdominal injuries, outcome and triage were obtained by the review of various emergency services and hospitals records from different cities behind the front lines of the Iran-Iraq War. The training level of the medical team, medical equipment and general conditions were comparable. Medical records of the war-injured and deceased troops with penetrating abdominal traumas were obtained. Out of nearly 50,000 cases of war trauma and blast injury due to various projectiles and shrapnel, 1,176 cases with complete and analyzable medical details were randomly selected and evaluated. Patient triage was conducted differently at various stages of Iran-Iraq conflict. Between 1980 and 1981, triage of the war-wounded was mainly performed by non-specialists and the patients were transferred to existing hospitals, as well as makeshift hospitals set up in schools and hotels in cities behind the front lines within relatively long periods of sustaining injury. Then, the patients were divided into two groups; the first group included admissions before September 1982 and the second group involved admissions after that. The patients were classified into three sets according to the length of time between injury

and administration of surgical treatment: less than 8 hours, between 8 and 16 hours, and more than 16 hours (or unknown period). These figures show the interval between injury and surgery and are not representative of the actual patient transfer times. Within group analyses and between groups analyses were done using t-test, Chi-square and Fisher exact tests.

## Results

Before September 1982, increased patient transfer time and time wastage was markedly high; 110 out of 219 patients with abdominal injuries (~50%) were operated on after 16 hours of suffering injury. 12.5% and 37.5% of patients were operated on within less than 8 hours and between 8 and 16 hours, respectively. Eleven patients (5.5%) all of whom were operated on after 8 hours did not survive while all of those operated before 8 hours survived but, Fisher exact test didn't detect any significant difference in mortality before and after 8 hours. On the other hand, from September 1982 towards the end of the conflict (1988), the patients were treated within progressively shorter periods of sustaining injury; overall mortality rate was about 8%, which was not significantly different than that in the first two years. Out of 957 patients 659 ones (68.8%) were operated on within less than 4 hours of injury. The mean delay between injury and treatment in the first two years of war was 12 hours (range: 1-100 h) while it was 5 hours (range: 1-80 h) between 1982 and 1988. The difference was significant ( $P < 0.05$ ). Overall, 88 (7.5%) cases didn't survive; 8 had 5 or more organ damages, 18 had 4 organ damages, 26 had 3 organ damages, 29 had 2 organ damages and 7 had 1 organ damage. It is important to note that in all deceased cases, colorectal injuries were part of the damage picture. The rate of mortality in elderly patients (>70 years in particular) was five times as high as in young patients.

## Discussion

Before September 1982, Iran faced with situations in which the number of war wounded

requiring surgical attention overwhelmed the available facilities. From September 1982 towards the end of the conflict (1988), the patients were treated within progressively shorter periods of sustaining injury. With the prolongation of war and increased experience of medical authorities during the war, well-equipped hospitals were established in proximity to conflict zones; this led to marked reduction of patient transfer time. Also, better patient triage expedited the delivery of optimal treatment to the wounded. Mortality and morbidity from abdominal injuries reached 60% in World War I; this was partly due to delayed patient transfer from conflict zones as well as incompetent fluid therapy and blood transfusion<sup>8</sup>. Patient mortality and morbidity fell to 30% in World War II owing to set up near war front lines of advanced surgical facilities with all equipment and personnel required for patient transfer and better operating rooms and transfusion capabilities<sup>8,9</sup>; needless to underline the crucial role of newly discovered antibiotics in saving lives. In the Korean War, the use of helicopters shortened patient transfer time from 8.9 hours registered in World War II, to 6.2 hours, resulting in a 12% decrease in mortality<sup>9</sup>. During the Vietnam War (1969), the patients were transferred to well-equipped immobile hospitals set up immediately behind the front lines. These centers had advanced

diagnostic and treatment equipment and highly trained personnel. Patient transfer time decreased to 35 minutes and mortality dropped to 2.4-10%<sup>8,9</sup>. In the Northern Ireland Civil Conflict (1969), mortality and morbidity approximated 15% despite proximity to medical facilities; this was due to extensive bomb blast injuries<sup>8</sup>. In the War of 1973, 20% of the injured were operated on at well-equipped hospitals set up close to front lines, with a mortality rate of nearly 20%. The remaining 80% were transferred to hospitals further back within an average of 3-4 hours, after early resuscitation, with mortality rate falling to 5%<sup>8,9</sup>. Then, more rapid patient transfer from the scene of conflict<sup>10-12</sup>, application of accepted principles in triage of the war injured by the senior surgeon present at treatment centers in operational zones<sup>3,8,13</sup>, the employment of trained and dedicated medical personnel and advanced medical equipment<sup>14,15</sup>, as well as the provision of a peaceful environment for treating the wounded can be keys to lowering mortality and morbidity of injured troops<sup>3,15,16</sup>. It is worth noting that various crises as well as Iran's economic embargo during the 8-year long war, coupled with Iraq's considerable advantage in terms of armament and logistics had significantly complicated the challenges confronted by the Iranian treatment personnel.

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