Brief Report

A Report of the Injuries Sustained in Iran Air Flight 277 that Crashed near Urmia, Iran

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Abstract

Background: On January 9, 2011 Iran Air Flight 277 crashed during approach to Urmia, Iran. Out of 105 passengers, 27 survived. This brief report presents a perspective of the passengers' sustained injuries.

Methods: We reviewed the recorded injuries of all passengers as provided by the Legal Medicine Organization authorities. The Injury Severity Score (ISS), an anatomical scoring system, was used to provide an overall code for those who survived with multiple anatomical injuries.

Results: There were a total of 96 ISS body region injuries among those who survived. Facial injuries (83%) were the most frequent injuries noted among fatalities, which was statistically significant (P = 0.000). In those who survived, injuries to the head and neck (37%) and facial (33%) regions were relatively less frequent than other anatomical regions. The most serious injuries among survivors belonged to the extremity (85%) region, particularly lower limb fractures (62%). Differences in extremity injuries between the survivors and fatalities were not statistically significant.

Conclusion: The findings of this study were similar to other studies where the most frequent serious injuries were fractures of the extremities, particularly the lower limbs.

Keywords: Abbreviated injury scale, airplane crash during approach, injury severity score, mass casualty incidents

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Introduction

'Airplane crash during approach' is defined as an emergency landing under circumstances where a normal landing is impossible. Usually the airplane is damaged, the circumstances are not under the pilot's control and a runway is not available.[1,2] Usually, because of extensive damage and fire, airplane crash accidents do not lend themselves to an extensive analysis of the occupants' injuries. Therefore there is limited detailed analysis of such accidents.[3-6]

On January 9, 2011 Iran Air Flight 277, a Boeing 727, crashed during approach about 5 miles from the Urmia airport runway at 19:40 pm local time. Fortunately, the airplane did not catch on fire; thus, this facilitated the identification and examination of victims. However, heavy snow and thick fog made the rescue activities difficult (Figure 1).

This brief report presents a perspective of the flight passengers' sustained injuries.

Materials and Methods

Of the 105 passengers on this flight, 27 survived and 78 died. The legal medicine authorities examined all passengers and recorded their injuries.

Autopsies were performed on the 3 cockpit crew who perished. However, passengers who died were not autopsied and X-ray examinations were not performed to detect occult skeletal fractures. The examinations of those killed were limited to the clinical appearance and obvious external body region injuries. Death certificates were issued because of multiple injuries. Injuries of the survivors were registered according to hospital in-patient records.

We reviewed the documented examinations from the legal medicine authorities for all passengers. We used the Injury Severity Score (ISS), which is an anatomical scoring system, to provide an overall code for patients with multiple anatomical injuries. The ISS is a process by which complex and variable patient data is reduced to a single number. To calculate an ISS for an injured person, the body is divided into 6 ISS body regions, which are: head and neck (including cervical spine); face (including the facial skeleton, nose, mouth, eyes and ears); chest (including thoracic spine and diaphragm); abdomen or pelvic area (including abdominal organs and lumbar spine); extremities or pelvic girdle (including pelvic skeleton); and external (skin). Each injury in the body region is ranked according to the Abbreviated Injury Scale (AIS). AIS classifies each injury according to its relative severity on a 6 ordinal scale: 1 (minor), 2 (moderate), 3 (serious), 4 (severe), 5 (critical), and 6 [maximal (currently untreatable)]. We used only the highest AIS number for each body region. To calculate a final ISS code, the 3 most severely injured ISS body regions have their AIS score squared and added together to produce the ISS code. The ISS ranges from 1 to 75. Severity of each patient's injuries is classified according to the ISS code: 1 – 8 (minor), 9 – 15 (moderate), and 16

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Figure 1. Cockpit of the Boeing 727 that crashed near Urmia on January 9, 2011.

and above (serious).[7–9]

Fisher's exact test was used to for data analysis and *P* values less than 0.05 were considered statistically significant.

Results

There were 27 survivors, of which all were adults. There were no pre-or in-hospital deaths. All passengers (survivors and fatalities) sustained multiple anatomical region injuries. Table 1 presents the AIS (range: 1 to 6) of the 6 ISS body regions and the ISS codes of the 27 survivors. Except for one individual, all survivors sustained more than one ISS body region injury and a total of 96 ISS body region injuries were recorded. The mean ISS code was 23 (1 to 41).

Among survivors, 18 (67%) had severe injuries, 7 (27%) had moderate, and 2 (7%) had minor injuries according to the severity of the ISS codes.

Of those who died, 65 (83%) out of 78 had facial injuries which were the most frequent obvious injuries. The difference in facial region injuries between survivors (33%) and fatalities (83%) was statistically significant ($P = 0.000$). Among survivors, injuries to the head and neck (37%) and facial (33%) regions were relatively less frequent than other anatomical regions. The most frequent injuries among survivors were external (100 %) and extremities (85%) body regions. However the external injuries consisted of swellings, bruises, abrasions, and superficial lacerations, all of which were minor injuries (AIS 1) that did not substantially impact the final ISS codes. From 27 survivors, 17 (62%) sustained lower limb fractures which were the most frequent site for extremities injuries. The difference in extremity body region injuries between the survivors and fatalities was not statistically significant. Among survivors, 16 (59%) out of 27 sustained fractures to their spinal columns, which were at different levels. Spinal injuries were included in the head and neck, abdominal, and thoracic ISS body regions.

Only 4 out of the 27survivors sustained internal injuries to their abdominal organs.

The 4 recorded abdominal injuries consisted of the 3 cockpit crew who were autopsied and one passenger who had extruded abdominal organs. Since fatalities were not autopsied, some fatal intra-abdominal, intra-thoracic, brain contusion and concussion injuries were not recorded. Therefore comparative analyses for these body regions were not an accurate reflection of this difference. The 3 cockpit crew sustained the most severe and extensive injuries in all 6 ISS body regions.

Discussion

In airplane crashes, injuries are produced by horizontal, vertical, and transverse force axes. Head, neck, facial, and thoracic injuries occur when the transmitted horizontal deceleration force exceeds the limits of the human body's tolerance to abrupt deceleration. The vertical deceleration force produces spinal fractures. Bending and torsional forces produce fractures in the extremities. However, combinations of different forces in 3-dimensional space produce many complex mechanisms for injuries.[4]

In 1968 Zanca reported an airplane crash accident in which 21 of 66 occupants survived. In that accident the registered injuries among survivors in order of frequency were: abrasions, wounds and contusions, fractures, shock or impending shock, internal injuries, and concussions. Most fractures occurred in the lower limbs.[6]

Carter et al., in 1973, reported a total number of 203 injuries for all passengers of an airplane crash. Fractured extremities, which comprised 79 (39%) out of 203 total injuries, were the most frequent seen among victims.[4]

On February 25, 2009 Turkish Airline Flight 1951 crashed during approach to Schipol Airport, Amsterdam. Of the 135 passengers, 9 including the 3 cockpit crew died, 11 had serious injuries, 22 had moderate injuries, 87 had minor injuries, and 6 were uninjured. A total of 297 ISS body region injuries were recorded, of which most were to the head, face, spine, and extremities.[3,5]

The findings of the current study were similar to previous reports on survivors[3–6] in which the most frequent serious injury was fracture of the extremities, especially in the lower limbs.

In the current study, the cockpit crew who perished sustained extensive injuries in all 6 ISS body regions, which was similar to other reports.[3–6] It seems that the cockpit crew are at the most endangered position. Therefore, improvements in cockpit design might reduce and protect the crew from extensive injuries.

Table 1. AIS of 6 ISS body regions and final ISS codes in survivors.

Cases Number	ISS body regions						
	Head and neck	Face	Chest	Abdomen	Extremity	External	ISS code
1	3	0	0	0	0	1	10
2	0	0	0	0	3	1	10
3	0	0	0	3	3	1	19
4	2	1	0	3	4	1	29
5	0	0	0	0	3	1	10
6	0	0	4	4	3	1	41
7	0	1	3	0	3	1	19
8	0	1	3	3	4	1	34
9	2	0	3	0	4	1	29
10	0	0	0	0	0	1	1
11	4	1	3	3	0	1	34
12	0	0	3	0	4	1	26
13	0	0	4	3	3	1	34
14	0	0	0	0	3	1	10
15	3	0	0	0	0	1	10
16	0	0	4	3	3	1	34
17	0	0	0	0	2	1	5
18	2	0	3	0	3	1	22
19	1	2	4	4	3	1	41
20	3	0	3	0	4	1	34
21	0	1	0	3	4	1	26
22	4	0	3	3	4	1	41
23	0	0	0	0	3	1	10
24	0	1	0	3	4	1	26
25	4	3	4	3	3	1	41
26	0	0	0	3	2	1	14
27	0	1	0	3	3	1	19

AIS: Abbreviated Injury Scale (1- minor; 2- moderate; 3- serious; 4- severe; 5- critical; 6- maximal); ISS: Injury Severity Score

In the current study we did not evaluate the relation between seat locations, severity of the incurred injuries, and death because the seating positions of all occupants were not officially available to the authors of this study. In addition, since about two-thirds of seats were occupied, it was probable that some passengers had changed their seats during the flight and did not occupy their assigned seats.

A major flaw of this study was that examinations of passengers who perished was limited to clinical appearance and obvious external injuries of the anatomical body regions. Therefore we were unable to compare the true differences between the head and neck, abdomen, and chest ISS body region injuries among survivors and fatalities. Doubtlessly those who perished had undetected intra-abdominal, intra-thoracic, and cranial injuries which were more than their registered injuries. Evaluations of skeletal injuries would have been completed and the number of skeletal fractures increased if X-rays had been taken from the bodies of those who died. Therefore, it might be reasonable to suggest that in such accidents autopsies should be regularly performed on those who expired.

This study might hopefully provide an understanding of the survival aspect of airplane crash accidents that occur during approach. A study of these types of injuries may provide a resource for subsequent research and assist investigators to make recommendations that reduce the occurrence of similar injuries.

Conflict of interest

All data in this study was provided by the Legal Medicine Organization in Urmia, West Azarbaijan, Iran.

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