FIELD MEDICINE

EARTHQUAKE 2005: EXPERIENCE WITH MASS CASUALTIES AT MILITARY HOSPITAL, RAWALPINDI

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ABSTRACT

Objective: A massive earthquake struck North of Pakistan on 8th October 2005. The objective of this study was to evaluate the type of injuries and procedures carried out on the admitted casualties.

Study Design: Descriptive study.

Place and Duration of Study: Military Hospital, Rawalpindi from 8 Oct to 7 Dec 2006.

Patients and Methods: All the causalities were received at the emergency department. All the patients who needed admission for treatment were included. Patients who had minor injuries not requiring indoor treatment and those, brought in dead, were excluded from this study. The files of admitted patients were analyzed for type of injuries, procedures carried out, complications and causes of death. The data was entered in a computer, and results presented in tabular form in numbers and percentages.

Results: The total number of patients received was 1698, out of which 862 (50.8%) were admitted. Within the first three months 651(75.5%) cases were discharged after full treatment. A total of 2268 operations were performed. Out of these, 1025 (45.2%) were major surgeries. 323 (31.5%) plastic surgery procedures, needing colostomies 230 (22.4%) orthopaedic operations, 21(2.0%) patients underwent spinal surgery for blunt abdominal injuries 14 (1.6%) and laparotomies were done with 4 (0.4%). Sixteen (1.5%) amputations had to be done. Seveteen (2%) patients died in the hospital during admission, while 76 were brought in dead.

Keywords: Earthquake, surgery, debridements, Military Hospital

INTRODUCTION

A disaster is defined as a sudden massive disproportion between hostile elements of any kind and the survival resources that are available to counterbalance these in the shortest period of time. Disasters happen and when major disasters strike they put considerable strain on the system [1].

The 8th October 2005 earthquake that struck northern Pakistan and India, measuring 7.6 on Richter scale, was the world's third-deadliest natural disaster of the past 25 years, surpassed only by the 2004 Asian Tsunami and the 1991 cyclone in Bangladesh. An estimated 74,650 to 80,000 people lost their lives, an equal number were injured and 2.8 million were left homeless - a higher death toll than the average annual loss to all natural and man-made disasters combined during the 1990s, excluding armed conflicts [2,3]. Most of the earthquake victims were evacuated to Rawalpindi / Islamabad both in military / civil hospitals. Military Hospital (MH) was one of the main frontline hospitals which along with Combined Military Hospital (CMH) received the major bulk of initial casualties.

The objective of this study was to evaluate the type of injuries and procedures carried out on the admitted casualties, and to present recommendations based on these experiences

for improvement of disaster preparedness and management in such disasters.

PATIENTS AND METHODS

This descriptive study was based on the management of earthquake casualties at the surgical department of MH, Rawalpindi from 8 Oct to 07 Dec 2006. All the causalities were initially received at the emergency department of the hospital. Due to the massive inflow and the grievous nature of these causalities, the surgical unit was divided into three teams, at the very beginning. The first team (emergency team) worked at the Emergency Reception (ER), led by a senior registrar in surgery, assisted by a junior registrar and medical officers, with duties round the clock. Second team was the 'general surgery team' led by head of the surgical department and 4 consultant surgeons, helped by senior and junior surgical postgraduate trainees, posted in MH. The third team (specialist team) included the specialists like plastic, orthopaedic, paediatric, maxillo-facial and spinal surgeons. They managed the referred cases from general surgery team (second team), as well as referrals from the disaster area emergency hospitals. After the first 24 hours of working round the clock, casualties were managed on 12 hourly shifts, the working hours coinciding with the start and the end of the fast, this being the month of Ramadan.

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Triage was done at the ER and the patients were categorized into immediate, urgent and definitive groups by the first team. Initial assessment was done following the Advanced Trauma Life Support (ATLS) protocols [4]. Serious patients in 'immediate category' were resuscitated in the emergency operation theater adjacent to ER by the first team. After resuscitation patients were shifted to the main operation theatres where consultant surgeons (second team) were available round the clock. Urgent category patients (who needed surgical intervention but were not life threatened immediately) were admitted after primary survey and then sent to the wards for further care and management. Definitive care group included the patients who had already taken some treatment in earthquake-hit area and were formally referred for specific tertiary care management. These were seen and managed by the second and third team.

Inclusion criteria for the purpose of this were all patients who needed admission. Great emphasis was laid on proper paper work for each patient. The patient who could be discharged after treatment and those who were brought in dead were not included in this study. Only a few had proper identification, and many seriously injured women and children were unaccompanied.

MH is a 1200 bedded hospital with only 120 beds allocated for surgical patients. However during earthquake, most of the medical wards were converted to emergency surgical wards. Those patients in need of critical surgical management were placed in wards near Operation Theater / surgical intensive care unit.

Their file in the hospital included all the available data, photograph of each patient with any document available with the person. A dedicated new department was started for this purpose, with a dedicated photographer and a senior officer from the Statistics department of the hospital heading the team.

At the end of each day a combined meeting of the surgical team and the administrators was held to discuss the day's problems with possible solutions. Clinical cases were also discussed and a combined plan chalked out for these patients.

After receiving the initial treatment patients were shifted to rehabilitation and

follow-up wards. In these wards they were managed by doctors from non-surgical specialties. Day to day care, documentation, finding of relatives, physiotherapy, dressings and psychiatric support was provided in these wards. After full recovery and rehabilitation patients were discharged. In some cases this took as long as 6 months.

Data was summarized on the basis of total number of causalities, injuries, procedures, complications, infection rate, rehabilitation and mortality. This was then fed into a computer, and print-outs generated. These were used for identification and analyses, as well as being made available to the higher headquarters and the civil government, for data collection purposes.

Data had been analyzed using SPSS version 10. Frequencies and percentages were used to describe the data

RESULTS

Total number of patients received in Military Hospital, Rawalpindi were 1698 while 76 dead bodies were received from 8th October to 7th December. Maximum patients received in a single day were 78, on 10th Oct. The maximum number of patients on hospital strength at one given time was 511 i.e. on 15th Oct (normal number of beds on the surgical side is 120). During the initial days most of the causalities received were un-attended and directly referred from the Earthquake hit area. Later on more serious and attended causalities started to follow and the influx was maximum between 10th Oct to 5th Nov 2005.

Total number of causalities admitted were 862 (50.8%) and 836(49.2%) were treated as outdoor cases. Out of 862 cases 33 (3.8%) cases (mainly serving soldiers) were transferred to peripheral military hospitals, after initial treatment, for follow up care and within the first three months 651(75.5%) cases were discharged after full treatment. As almost all the cases were of poly-trauma a total of 2268 operations were performed. Out of these major and minor operations were 1026 (45.2%) and 1243 (54.8%), respectively (tab-1).

Major injuries encountered were compound fractures of bones and massive soft tissue losses (Table-2). Complications were observed in 25 (1.5%) cases. Nine patients developed tetanus. They were all

Table-1: Details of Major Procedures Performed (n= 1025)

Types of Procedures	No of Proces (%)
Major wound debridement	**238 (23%)**
Orthopedic op	
a. Close reduction	230 (22.4)
b. Ext Fixation	47 (4.6)
c. Open reductions with fixation	108 (10.5)
-I L / IM Nail	14 (13.0)
- Plating	46 (42.6)
- K-wire	28 (25.9)
- Austin moore	6 (5.6)
- D H S	5 (4.6)
- Malleolar screw	21 (2)
d. Hip Spica	
Amputations	**16**
Plastic Surgery	
a. Flaps	**127 (12.4%)**
• Local Flaps	62 (48.8)
• Sural flaps	24 (18.9)
• Radial Forearm Flap	12 (9.4)
• Soleus Flaps	11 (8.7)
• Gastroc Flaps	04 (3.1)
• Abdominal Flaps	03 (2.4)
• Medial Leg Flaps	04 (3.1)
• Supra Malleolar Flap	01 (0.8)
• Free Flap	01 (0.8)
• Groin flaps	02 (1.6)
• Cross Finger Flaps	02 (1.6)
• Cross Leg Flap	01 (0.8)
b. Split Skin Grafts	**196 (19.1%)**
Spinal Surgery	**21 (2%)**
Other procedures	
a. Laparotomies	17 (1.6%)
b. Colostomies	4 (0.4%)

Table-2: Types of Fractures (n = 406)

Multiple Injuries	No of factors (%)
Upper limb Fractures	
Shoulder Injuries	9 (2.2%)
Clavicle	8 (2%)
Humerus	17 (4.2%)
Elbow Injuries	8 (2%)
Radius Ulna	24 (5.9%)
Hand Injuries	54 (13.3%)
Lower limb fractures	
Hip dislocations	8 (2%)
Femur	47 (11.6%)
Tibia Fibula	60 (14.8%)
Ankle	07 (1.7%)
Foot	26 (6.4%)

recovered from rubble several days after the earthquake, and had grossly contaminated wounds (Fig 1), and could not get prophylaxis at the disaster site. Five suffered from crush syndrome and 3 developed necrotizing fascitis (Table-3). The causes of death in the 17 (2%) patients who died after admission are given in (table-4).

DISCUSSION

In mass casualty situations, demands always exceed the capacity of personnel and facilities. Mass casualties such as sailing ship disasters and war casualties have occupied the attention of surgeons since the 17th century [1-5]. In the last few years, there has been an increased incidence of civil disasters; the spectrum of possible catastrophes has also increased dramatically as a result of an increasing technologically sophisticated society [6,7].

The emphasis of medical management shifts from individualized treatment to standardized therapy for disaster victims with the aim of providing maximum benefit to a maximum number of salvageable patients. A successful medical response to multi-injury civilian disasters, either natural or man-made, dictates formulation, dissemination and periodic assessment of a contingency plan to facilitate the triage and treatment of victims of the disaster [8-10].

During the first week wound excisions, applying of plaster casts, splints, amputations and external fixator application was the major work load. The emphasis was on strong immobilization and early skin cover (fig 2). In the second week, in addition to all of the above, open reduction of fractures with fixation plus soft tissue covering was done (fig-2). During the 3rd and 4th Week plastic (grafting, flaps) and spinal surgeries were performed.

The spinal surgeries very much needed to be performed in 1st and 2nd week, had to be perforce shifted to 3rd and 4th week because of shear workload and limited theater space. For better outcome from spinal surgeries early operative intervention should be facilitated in near by hospitals. Definitive orthopaedic surgery, laparotomies and debridements continued through out.

Only 17 (2%) deaths occurred out of 862 admitted cases is in indeed a commendable feat. But some of these could also have been prevented. Seven deaths were due to tetanus. Early administration of globulin at the site of injury for major and dirty wounds may have prevented these. All patients admitted in the hospital received anti-tetanus globulin,

Table-3: Complications seen in admitted cases (n= 862)

Cases	No of Patients
Crush Syndrome	5 (0.6%)
Colostomy for pereneal wound care	4 (0.5%)
Fasciotomies	5 (0.6%)
Necrotizing Fascitis	2(0.2%)
Tetanus	9 (2.9%)
Total	25 (2.9%)

Table-4: Causes of deaths in hospital

Cases	No of patients (%)
Total	7 (0.8%)
Tetanus	7 (0.6%)
Poly Trauma / Sepsis	5 (0.2%)
Spinal Injury	2 (.2%)
Crush Syndrome	2 (0.1%)
Head Injury	1 (0.1%)
Total	17 (2.0%)

Fig.1: Traumatic amputation with grossly contaminated wound

Fig.2: Early external fixation and skin cover

according to the WHO protocol, thus preventing any admitted patient from developing tetanus. Only two patients died of acute renal failure following crush syndrome where as we expected many more as reported by several studies from Turkey (Marmara 1999 and Bingol 2003 earthquakes) [11,12]. This could be because of early vigorous fluids given in the disaster area. Almost all patients who arrived had intravenous infusions running, a procedure which the first aid workers did very well at the initial spot and en-route. Early isotonic saline followed by mannitol infusion is recommended for all such patients who are at risk [12].

More than 90% patients were able to get curative treatment here while the rest needed prolonged rehabilitation at other facilities, before discharge. These were mainly patients with severe spinal injuries. Only 16 (1.6%) amputations were required to be performed. In the Turkish study of Marmara 1999 earthquake 11.1% of extremity injuries needed amputations [11]. This could be because of aggressive wound management, fewer patients with renal failure [12], availability of resources for active observation and discussion among the surgeons before deciding. Surgical Site Infection (SSI) occurred in two orthopaedic implant surgeries. Both grew staphylococci, similar to the other studies [13]. We lost only 3 flaps and 2 grafts, which is remarkable considering the magnitude of surgeries performed, and less than ideal sterilization conditions. Redo-surgeries were performed in 6 patients, with better outcome.

When compared to Tsunami causalities in Indonesia where large number of redo surgeries had to be carried out [14-16]. This may be due to the meticulous and systematic review of all the wounds by senior consultants, as well as methodological care of wounds, in a tertiary care hospital.

Most of the problems encountered were of logistic in nature. However a few definite problems were encountered and need improvement for future catastrophes. Sufficient number of long limb splints, and external fixators were not available in the initial days. Procurement of appropriate implants was a big problem, as the market soon ran out of its stores. Sufficient number of these need to be always kept in store, as part of disaster management emergency stores. Considering the number of split thickness grafts which needed to be carried out, sufficient dermatomes and meshers were not readily available. On our feedback the voluntary teams that came from other parts of the country brought these items with them.

Mobilization of medical students and other trained and untrained volunteers took a long time to take off. Eventually they turned out to be a highly motivated and essential force, with benefits both for the patients and students themselves.

Patients were managed in 13 different wards with limited manpower. Many patients needed to be shuffled into various wards time and again for administrative (V.I.P. rounds) and social needs. This caused great hurdles in the continuity of care for these patients.

Patient waiting times outside theatres increased greatly once the load increased. As the teams were located in one theatre area, all procedures including debridements and major dressings had to be performed there. A separate area, near their wards and away from the main operating theatres, where such procedures can be carried out would reduce the clogging up of waiting areas, as well as prevent mixing of dirty and clean cases. Volunteer medical teams from home and abroad came in large numbers. All had traveled great distances and were truly dedicated. However, the limitation factor in the end was the theatre space, equipment, supplies and paramedical staff, not the

surgeons. A better coordination is required for sending the teams to where they are needed most, instead of deputizing them in an already staffed tertiary hospital.

Most of the procedures, even dressings needed to be carried out under general anaesthesia, in these already distressed patients. Intravenous Ketamine turned out to be a safe and adequate anaesthetic for most situations. This point has already been confirmed in other reports [17,18].

CONCLUSION

Major bulk of the work involves soft tissue injuries, bones, spine and plastic surgical procedures.

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