

Treatment of musculoskeletal injuries of multiple-trauma patients in a Spanish tertiary referral hospital

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Purpose. To analyze the diagnostic and therapeutic protocol used in multiple-trauma patients with musculoskeletal injuries at a Spanish tertiary referral hospital that lacks a specific unit endowed with the functional structure to treat these patients.

Materials and methods. Retrospective observational study. All patients admitted to the Intensive Care Unit (ICU) between January 2001 and May 2003 with a diagnosis of multiple trauma to the musculoskeletal system were included. There were a total of 135 patients, of which 120 could be evaluated. The patients' clinical records were analyzed and a record was made of the mechanism of injury, ISS (Injury Severity Score) and NISS (New Injury Severity Score) calculations, treatment administered in each case and time of administration, any ensuing complications and mortality rate. The SPSS 11.0 software was used for data analysis.

Results. Mean age was 38 (range: 15-75 years). Ninety-five (80%) were male. The main mechanisms of injury were road accidents and pedestrian-motor vehicle collisions (65%). Mean ICU stay was 13.5 days (range: 1-130). Thirty-three percent were operated on for their musculoskeletal lesions. Main time-to-fracture stabilization was 9.3 days (range: 1-70). Thirty-three patients (28%) developed inflammatory systemic complications and 37 (31%) had serious infections. Twenty-one patients (18%) died 8.5 days (range 1-50 days) after their admission.

Conclusions. A comparison with protocols and results published by dedicated multiple-trauma units from other coun-

tries reveals the need for a greater degree of protocolization and multidisciplinary coordination to improve the treatment of the bone and joint pathologies of these patients in referral hospitals.

Key words: multiple-trauma patient, early treatment, injury assessment, long bone stabilization, delayed fracture fixation.

Tratamiento de las lesiones del aparato locomotor del paciente politraumatizado en un hospital universitario español de tercer nivel

Objetivo. Analizar el proceso diagnóstico y tratamiento del paciente politraumatizado con lesiones del aparato locomotor en un hospital español de tercer nivel sin unidad específica estructurada funcionalmente para la atención de estos pacientes.

Material y método. Estudio observacional retrospectivo. Se incluyeron todos los pacientes ingresados en la Unidad de Cuidados Intensivos (UCI) bajo el diagnóstico de politraumatismo con lesiones del aparato locomotor entre enero de 2001 y mayo de 2003, 135 enfermos, de los cuales 120 pudieron ser evaluados. Se procedió al estudio de las historias clínicas, registrándose el mecanismo causal, diagnósticos, cálculo del ISS (*Injury Severity Score*) y NISS (*New Injury Severity Score*), tratamientos aplicados y el momento en el que se realizaron, complicaciones desarrolladas y mortalidad. Se utilizó el *software* SPSS 11.0 para el análisis de los datos.

Resultados. La edad media fue 38 (rango 15-75 años). Noventa y cinco (80%) eran hombres. Los mecanismos causales principales fueron el accidente de tráfico y el atropello (65%). La estancia media en UCI fue 13,5 días (rango 1-130). El 33% fue intervenido de las lesiones del aparato locomotor. La demora media en la estabilización de las fracturas fue 9,3 días (rango 1-70). Treinta y tres pacientes (28%) desarrollaron complicaciones sistémicas inflamato-

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rias, y 37 (31%) presentaron infecciones graves. Veintidós pacientes (18%) fallecieron en una media de 8,5 días (rango 1-50 días) después de ingresar.

Conclusiones. La comparación con los protocolos y resultados publicados por unidades específicas para politraumatizados en otros países demuestra la conveniencia de una mayor protocolización y coordinación multidisciplinar para mejorar la atención de la patología osteoarticular de estos pacientes en centros de referencia.

Palabras clave: *politraumatizado, tratamiento precoz, evaluación de lesiones, estabilización de huesos largos, fijación diferida de fracturas.*

The treatment of multiple-trauma patients is one of the remaining challenges in the world of medicine, owing to the complexity of the patient's general situation and the need to coordinate several specialties that will enable carrying out a global examination of the patient¹. In the last few years there has been an increase in the incidence of this kind of pathology, which is mainly caused by traffic accidents²; this, together with the lack of specific guidelines and of multidisciplinary teams in most Spanish hospitals, makes the treatment of these cases put the entire hospital to the test, there being, on occasion, serious difficulties to solve the cases satisfactorily.

Both in the U.S.A. and in some countries of the European Union, there are monographic centers or at least specific units inside hospitals designed for the treatment of this kind of patient. The lack of this kind of unit in our country³ makes the coordination between different specialties more difficult, as a result of which each specialty frequently treats the patient only for the pathology with which it is concerned, and following the exclusive criterion of immediate patient life-risk, and without the general guidance of a doctor who would prioritize and direct the moves of the different specialties². In the case of injuries of the musculoskeletal system, but leaving out those of the pelvic ring, we can affirm that fractures are often relegated to the last stage of the treatment, this having significant consequences even for the patient's possibilities of survival⁴.

Hospitals in Spain have not been classified in relation to the availability of resources for the treatment of multiple trauma patients; this classification does exist, however, in other western countries (*levels I to V*)³. Initial treatment of these patients often depends on administrative criteria, such as the geographic influence area of the hospital, rather than on the severity of the patient's clinical situation³. On account of this, the first center where these patients are assisted is often a hospital with very scanty resources.

There is evidence proving that although the injuries of the musculoskeletal system, excluding the bleeding from the injuries, do not put the patient's life directly at risk, the ab-

sence of fracture stabilization does indirectly produce a series of alterations, chiefly in the lung area, which extend the patient's period of recovery and increase his morbimortality^{4,5}.

Because of this, it is considered essential to achieve early stabilization of long bone fractures, whether it is permanent (*Early Total Care*) or temporary (*Damage Control Orthopedic Surgery*), until they are treated completely and according to the needs of each case^{4,6-8}.

This work has been carried out in a third level university hospital, which at present assists a population of around 800,000 inhabitants. The center lacks a specific unit for the treatment of multiple trauma patients, who are therefore directly admitted into the Intensive Care Unit (ICU) from where the corresponding consultation to the different services is made.

The aim of this work is to review consecutive cases of multiple trauma that were treated in our hospital so that we may find out what type of injuries were involved, what treatment and evaluation methods were used initially, how much time went by before the musculoskeletal injuries were identified and treated, what complications appeared and what the mortality rate was.

MATERIALS AND METHODS

This study was devised with an observational and retrospective perspective. We included all the patients admitted into the adult ICU of our hospital with a diagnosis of multiple trauma and injury of the musculoskeletal system, during the period extending from January 2001 to May 2003. The list of patients was obtained from the database of the unit.

We defined as multiple trauma patients those patients who presented with two or more severe, peripheral or visceral trauma injuries, with the possibility that these could affect one or several of the patient's functions thus threatening his survival⁹. We included fractures and dislocations within the group of injuries of the musculoskeletal system, but left out twists, sprains and bruises.

135 patients fell within the inclusion criteria. We were not able to examine 15 of these due to problems with the availability of their medical histories, so our final sample of analysis was formed by 120 patients. We reviewed the medical histories, obtaining parameters and variables (shown on Table 1) from discharge reports, evolution reports and the results from complementary exploration (radiological, microbiological, etc). Subsequently, we classified the injuries according to the AIS (*Abbreviated Injury Scale*)¹⁰. We obtained the ISS (*Injury Severity Score*) and the NISS (*New Injury Severity Score*)¹¹ for each patient from the values given by the AIS scale¹².

The database and statistical studies were produced with the SPSS 11,0, and we consider p values equal to or under 0.05 to be significant.

Table 1. Variables obtained from medical histories for carrying out the study

Personal data, characteristics and background
Medical history number, age, sex, associated illnesses
Accident characteristics
Mechanism of production, associated circumstances
On admission clinical data and initial treatment
Heart rate, breathing frequency, systolic and diastolic blood pressure, Glasgow scale and temperature. Need of intubation, chest tubes, pericardiocentesis and other resuscitation maneuvers
Main injuries and treatment given
Visceral and peripheral injuries, types of treatment and time elapsing before its application. Stay at ICU and necessary time of intubation
Systemic complications
Systemic inflammatory response syndrome, shock and type thereof, adult respiratory distress syndrome, deep venous thrombosis, pulmonary thromboembolism, fat embolism syndrome, pneumonia, sepsis and compartmental syndrome
Evolution and sequels

ICU: Intensive Care Unit.

RESULTS

Description of the sample

Out of the 120 patients, 95 were male (79%) and 25 were female (21%). The average age for the whole group was 38 (range 15-75); for the male group, the average age was also 38 (range 15-75); and for the female group, it was 36 (range 15-68). All the patients were over 13 years of age, which is the minimum age for entering the adult ICU. The most frequently found mechanism of injury was traffic accidents (45%), followed by falls (29%) and pedestrian accidents (21%). No differences were found between males and females as regards this point. In 28 patients (23%) we found elements in their background or among their habits which could have set off the trauma (heavy drinking, a psychiatric record, or drug consumption) and which were more common in the female group than in the male group, being found in 32% of the patients in the former group (8 patients) and in 21% of those in the latter (20 patients).

On admission, heart rate was not registered in the histories of 22% of the patients, and in those cases in which it was registered, 28.3% had a frequency of 100 or more beats per minute. 44.2% of the patients presented a score of 15 on the Glasgow Scale, while this value was not registered in the medical histories of 14.2% of the patients. As regards head and thoracic injury, 68.3% of the patients were diagnosed with head and neck trauma (CET). When classified according to the Glasgow Scale, and not considering those patients for whom this value was not obtained, 66% presented with a mild CET (13-15 points), 6% showed a moderate CET (9-12 points) and 28% had a severe CET (8 or fewer points). 45% of the patients showed bilateral pulmonary contusion and 20%, unilateral pulmonary contu-

Table 2. Types and frequency of long bone fractures

Bone	Frequency	%
Fémur		
Unilateral	18	15.0
Bilateral	2	1.7
Total	22	16.7
Tibia and/or fibula		
Unilateral	22	18.3
Bilateral	4	3.3
Total	30	21.6
Humerus		
Unilateral	7	5.8
Radius and/or ulna		
Unilateral	10	8.3

sion. On admission 8% of the patients showed an isolated pneumothorax. An equal percentage of patients were diagnosed with isolated hemothorax. 16% presented both diagnoses. In 32% of the cases at least one chest tube was placed in. 8% of the patients were transferred with chest tube placement, and this number increased to 59.2% on entering the ICU. The average period in the ICU was 13.5 days, 12.5% of the patients then being sent to their hospital beds before the first 24 hours. In 9 patients (7.5%), it was necessary to perform a tracheotomy. The average time of intubation was 12 days. Intubation was removed within the first 24 hours in 30% of the cases.

During their stay in hospital 33% of the patients underwent surgery of the musculoskeletal system, 17.5% underwent neurosurgical treatment, 11% abdominal surgery and 6% maxillofacial surgery.

75% of the patients (91 patients) presented with some type of limb fracture. The distribution of long bone fractures is shown on Table 2. Musculoskeletal surgeries were performed with an average delay of 9.3 days (1-70 range; 1.5 average). The types of techniques that were employed are shown on Table 3. In 27 patients (22.5%) at least one of the fractures was open, this kind of fracture making up one third of the total number of fractures. We performed 4 emergency amputations of the lower limbs.

20 patients presented with femoral fractures, two of which were bilateral. The emergency treatment consisted of: 1 case of stabilization with external fixator; 2 cases of osteosynthesis with gliding screw-plate; 3 cases of amputations; trans-skeletal traction was applied in 11 fractures (figs. 1 and 2); in 2 patients the fracture was immobilized with cast splints; and no emergency treatment was performed in 3 fractures. In 4 cases traction was changed for an intramedullary nail, and in 1 case for a gliding screw-plate (the average delay for these surgeries was 14.8 days; 2-44 range). The traditional cast treatment was chosen for 2 cases, which had initially been treated with traction. Six patients with femoral fractures died: one presented with a bi-

Table 3. Surgical techniques used in this study

Technique	Frequency	%
Intramedullary	11	27.5
External fixator	12	30.0
Screw-plate	4	10.0
Other	6	15.0
Reduction	3	7.5
Amputation	4	10.0
Total	40	100.0



Figure 1. Anteroposterior x-ray of femoral shaft fracture treated with tibial skeletal traction, showing initial fixation signs in patient with head and neck trauma.



Figure 2. Lateral x-ray of femoral shaft fracture with tibial skeletal traction, showing initial fixation signs in patient with head and neck trauma.

lateral fracture, no fracture stabilization was achieved and the patient died on the second day after the accident; in the case of another patient with a bilateral fracture, we amputated one limb and the other limb was stabilized through an external fixator, but the patient died on day 15 after the accident. In three of the patients who died, trans-skeletal trac-

tion was used, but two of them died on day 8 and the other on day 13, without receiving any kind of additional stabilizing treatment; another patient died on the day of admission, and we did not perform any kind of stabilization of the femoral fracture.

33% of the patients presented with some kind of fracture of the pelvic ring (40 patients). Six artery embolizations were performed and 5 external fixators were placed. 40% presented with vertebral fractures (48 patients), the most common ones being those in the lumbar spine (24 patients, 50%) followed by the cervical spine (13 patients, 27%). Two glenohumeral and one hip dislocation were diagnosed.

Scoring scales for trauma: ISS and NISS

The average mark of the ISS was 26.7 (6-57 range; 26 median), whereas in the NISS the average mark was 31.2 (6-57 range; 29 median). We found differences between the two marks in the same patient in 55% of the cases.

Infectious complications

The most frequently found infectious complication was the lower respiratory tract infection (pneumonia or bronchopneumonia), which we observed in 23.3% of the patients. Hemoculture tests were positive in 20% of the cases (24 patients; 20 developed staphylococcus); positive uroculture tests were obtained in 16.7% (20 patients; 6 developed *Candida* spp. and 8 developed *Escherichia coli*); and catheter culture test was positive in 7.5% of the cases (9 patients). We also observed infections in surgical wounds in 3 patients and in the chest tube in 2. Septic shock was diagnosed in twenty-three patients (19%), and it was the most frequent cause of shock on entry into the ICU.

Systemic complications

The most frequent ones were the shock of any etiology (31%), systemic inflammatory response syndrome (SIRS) (22%) and the adult respiratory distress syndrome (ARDS) (15%). We diagnosed 6 cases of deep venous thrombosis, 2 cases of pulmonary thromboembolism, 1 case of fat embolism syndrome and 1 compartmental syndrome.

Patients that died

Twenty-one patients died (17.5%). The average survival time was 8.5 days (1-50 range, 4 median), and 43% of the patients died in the first 48 hours. Average age and sex distributions were similar to those of the global sample. In 17 cases (80%) the mechanism of injury was a traffic accident or a pedestrian accident. 60% of the patients that died entered the emergency department with the systolic blood pressure at 90. 70% underwent a severe CET. 85% was diagnosed pulmonary contusion. The average score in the ISS

was 34 (19-50 range) and in the NISS, 37 (37-57 range). 87% was diagnosed some kind of shock. The most frequent ones being distributive and septic shock. 73% presented SIRS and 60%, ARDS. 40% underwent an infection of the lower respiratory tract.

All the patients who died within the first 24 hours (6 cases) had less than 6 on the Glasgow Scale, on admission, and 4 underwent pulmonary contusion. The ISS and the NISS were similar to those of the rest of the patients who died.

DISCUSSION

This university hospital provides health coverage to an area of around 800,000 inhabitants. Yearly, we attend 290,000 emergency cases (information obtained from the web page of the center). However, less than five severe multiple trauma patients with injuries in the musculoskeletal system enter our service monthly. This is proof of the great scattering that takes place when patients are taken to different hospitals, a situation which arises out of the fact that there are no national centers with the capacity for attending the great number of multiple trauma patients, and capable of organizing physical structures with specific personnel and clinical guidelines. This problem conditions all the relevant results obtained in this work.

There are two emergency departments in this hospital that can admit multiple trauma patients: the one at the General Hospital, which is in charge of cases with head, neck, thoracic or abdominal injuries or with a theoretical ISS above 16 (calculated for orientation, during the patient's transfer to the hospital); and the Trauma Emergency Department, physically separate from the former, which admits only patients with injuries in the limbs and a theoretical ISS inferior to 16. Severe patients (with an ISS above 16) are received in the resuscitation unit of the Emergency Department of the General Hospital, together with other kinds of patients. The ICU and the emergency physicians are in charge of providing initial treatment and of admitting the patient in. Consultation of the different specialties is started from this location or, on occasion, from the resuscitation unit.

An outstanding feature of the patients that we attended is that the majority in our sample is male and they amount up to four times the number of females. This is different from other series¹¹ in which the male group makes up 58%. In our sample, alcohol consumption is higher in men than in women (13,7% and 4% respectively), whereas psychiatric histories are 10 times more frequent in women than in men (24% and 2.1% respectively), which in turn reflects the higher percentage of suicidal attempts in the former group¹³. Another characteristic of our sample is the absence of patients with trauma caused by fire or blade weapons; this

kind of patient tends to make up a numerous group among trauma patients in other centers. In the case of *Trauma Center level I Mount Sinai Hospital*, for instance, 36% of multiple trauma patients presented with wounds of this kind, and they accounted for 59% of the deaths occurring during the first hour and 56% of those happening between the first and the first 48 hours¹⁴. The average age in our sample, globally or grouped by sex, is inferior to 40, as has been found in other series in the literature^{11,15}. This average age, in a society like ours, which has a long life expectancy, and excluding the direct effects on the patient and his/her relatives, makes us think that the economic and social effects of multiple trauma should be of great significance. In the United Kingdom, for instance, the expenditure on the treatment of multiple trauma patients for the year 1994 amounted to 20 million pounds¹⁶.

During these patients' transfer to hospital, intubations were performed on 8.3%, and this percentage increased to almost 60% on arrival at hospital. We suggest this could be one of the elements that ought to be corrected.

The diversification in the evaluation and application of initial emergency treatment is noteworthy, as is apparent in the fact that the medical histories lack the register of significant variables such as heart rate (22%), the Glasgow Scale (14%), breathing frequency (75%), oxygen saturation (55%) --although these parameters are systematically monitored--, or temperature, which was not registered in the any of the histories despite the fact that it has an important effect on the heart and vascular functions, on the coagulation cascade and on platelet function². Neither have we observed any specific evaluation or early treatment guidelines such as the ATLS (Advanced Trauma Life Support).

The average number of days in the ICU was 13.5, a higher average than that of other international reference centers, which between the years 1995 and 2000 had an average of between 5 and 7 days^{15,16}. We must also point out, however, that 12.5% of these were transferred to their hospital beds during the first 24 hours and that the patients that are treated by the Neurosurgery Department (17%) spend the post-op period in the ICU.

Twenty-one of the patients in our sample died: 17 men (81%) and 4 women (19%), the quantities being proportional to the number of individuals of each of the two groups in the global sample. Among the causes of the traumas of the patients that died, 81% had a direct relation with traffic (43% with traffic accidents and 38% with pedestrian accidents; 32% of the people who suffer a pedestrian accident die). During the year 2001 the number of deaths in traffic accidents in our country amounted to 5,696, the majority of the victims being between the ages of 15 and 34, and in this age group 1,878 were men and 452 were women (National Institute of Statistics).

If we analyze the moment at which they died, we find that in 29% of the cases it happened within the first 24

hours, and in 66% of the cases in the first 48 hours, a larger percentage than that found in other series (49%)¹⁴. All the patients that died in the first 24 hours had a score inferior to 6 on the Glasgow Scale, they all presented a heart rate above 110 and 66% had pulmonary contusion. The main causes for death in the first hours are generally trauma-produced wounds that are incompatible with life, a massive loss of blood and complications⁹, due to which the measures taken to prevent death are orientated towards fighting or replacing the loss of blood and towards solving breathing problems. The inclusion of clinical guidelines such as the one of the American School of Surgeons, ATLS, has proved effective in reducing mortality¹⁷⁻¹⁹ and could be of use. In the case of patients that die afterwards, (70% of the total number of patients that died, in our series), the chief causes are systemic and inflammatory complications, mainly pulmonary^{2,9}, which is reflected in the increase in systemic complications in this group of patients in our sample: shock in 87%, SIRS in 73%, pulmonary contusion in 93%, ARDS in 60% and pulmonary infection in 40%. As has been often pointed out in the literature^{2,4-9,20-22}, inflammatory systemic complications become more frequent and severe when long bone fractures have not been stabilized at an early time. Therefore, it is necessary to correct the stabilizing methods used in the patients of the series, by trying to eliminate trans-skeletal traction and to encourage stabilization with temporary external fixation or permanent osteosynthesis, depending on the patient's condition.

Out of the total number of patients that died, 24% was diagnosed mild CET according to the Glasgow Scale. In these patients the most common injuries were localized in the thoracic cavity, 85% of them also having pulmonary contusion. This, added to the inflammatory and infectious complications, could have been the cause of death.

With respect to the surgical treatment that was given, surgery of the musculo-skeletal system was the one most used (in 33% of the patients). The average delay of the surgical fixation of the fractures was 9.3 days (1-70 range), thus making it manifest that early stabilization guidelines had not been used in the first 24 hours. Two of these guidelines are Early Total Care, which consists in surgical stabilization through permanent methods such as intramedullary nailing in the case of femoral fractures, and Damage Control Orthopedic Surgery, which consists in the temporary stabilization of the fracture by means of external fixation in the case of patients in extremely severe conditions, and in a second stage of definitive stabilization^{6-8,20,22}. These guidelines have been used in the European and North American monographic centers for several years and they have been shown to reduce morbidity and mortality, since they hold in check both inflammatory complications and local and systemic complications^{4-8,20,22}.

This aspect is especially significant in our sample, particularly in long bones such as the femur or in the fracture

of the pelvis. Only 3 out of 20 femoral fractures were stabilized surgically in the first 24 hours by means of plates or external fixation. In 11 cases, trans-skeletal traction was used, this being a method which should stop being used in this kind of patient because it increases considerably the appearance of complications such as respiratory failure, complications of an infectious kind, the use of opioids, and the local complications of fractures, and should be replaced by early surgical stabilization⁵. In 5 cases of emergencies a conservative method or a method of non-surgical action was used. In the 5 cases in which the emergency treatment was substituted for a permanent one (changes from trans-skeletal traction to intra-medullary nailing in 4 cases, and a DHS plate in one case) the change was performed on days 2, 6, 10, 12 and 44 after the production of the trauma. If we follow the literature, we should avoid giving this kind of treatment between the 2nd and 5th days due to the systemic inflammatory complications that are produced by the surgery in this period^{2,4,6-8,20,22}.

The bleeding in a fracture of the pelvis may be of 500-2,000 ml, or more²¹. In our sample there were 40 fractures of the pelvis (33% of the patients), which were treated with 6 embolizations and 5 stabilizations by means of an external fixator. Other studies²² point out that in multiple trauma patients with an injured pelvic ring and retroperitoneal bleeding the chosen treatment is pelvic stabilization, since the most common cause of bleeding in a non-penetrating trauma is pelvic fracture. In those cases in which the bleeding persists, an angiography and embolization are recommended, though most bleedings do not have an arterial origin. They have a venous origin or otherwise they originate in the extremes of the fracture²². It is surprising to find, in the sample, that there are a greater number of embolizations than of stabilizations with external fixation, this being in principle a second therapeutic stage, and all the more so in our hospital, since the intervening radiologist is on localized duty.

The data we have presented evince the need to establish a more fluent relation in the coordination between the Emergency Departments and the ICU, as well as the need for a greater involvement of the Trauma Department in the evaluation and initial treatment of these patients.

In the classification scales of the multiple trauma patients there are no differences between the values of the patients that died in relation to the moment of death (Table 4). The distinction between the use of the ISS and the NISS, whose main difference is that the NISS allows us to take into account two different injuries in the same area of the body, is evident in our results; 56% presents a higher score in the NISS than in the ISS. Other authors point out that in 61% of the cases in which there is a discrepancy between the ISS and the NISS it is the injuries of the musculoskeletal system that are responsible for this¹¹, the NISS being a better prognostic factor when the scoring is high²³.

Table 4. Mean and range of ISS and NISS in deceased patients

Patients	ISS	NISS
Total deaths	34 (19-50)	37 (19-57)
Deaths during 1st day	35 (19-50)	37 (19-50)
Deaths after 1st day	34 (21-45)	37 (27-57)

ISS: Injury Severity Score; NISS: New Injury Severity Score.

Table 5. Comparison between several variables in different hospitals

	Stoke*	Portland**	La Paz***
Age (mean)	40.2	35.6	38
Mean SBP on admission	134.2	137.8	113.87
ISS (mean)	25	26.3	26.7
GCS (mean)	10.5	12.9	11.66
Days in ICU (mean)	3.6	5.0	13.5
Mortality rate	17.4%	11.4%	17.5%
Dead patients:			
Age (mean)	47.5	39.9	41
ISS (mean)	30.5	36	34.38
GCS (mean)	6.6	9.5	6.9

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GCS: Glasgow Coma Scale; ISS: Injury Severity Score; SBP: systolic blood pressure; ICU: Intensive Care Unit.

Greenspan et al¹⁰ have observed that the lethal dose of the ISS for multiple trauma patients between 24 and 44 years of age is 40, whereas if the patient is older than 65 it is reduced to half the score. In our sample, 12.5% presents an ISS greater than 41 and 27.5% presents an NISS greater than 41. These percentages are higher than those presented by Lavoie et al²³, and they are justified because our sample is formed only by patients admitted into the ICU and they therefore present *a priori* a greater severity.

Table 5 compares the results of this series with those of a previous study¹⁵ that includes two centers, one European and the other North American, and was carried out in 1995 and 1996, whose inclusion criteria were an ISS > 15 and not dying in the Emergency Department. The chief difference that is made evident is a greater average stay in the ICU in our hospital, which forces us to take into account that all our patients stayed for at least one day in this unit.

We have reached five conclusions:

1. With the exception of traumas caused by blade weapons or by fire weapons in other centers, the severity and the characteristics of the patients admitted into this hospital are equal to those of the other centers.

2. There are certain points in the initial evaluation of patients that can be corrected, such as the written systematic register of data like respiratory frequency, heart rate or temperature.

3. The use of initial evaluation and treatment guidelines, such as the ATLS, and the greater coordination between the different specialties could improve the assistance of these patients. The Trauma Service should have greater involvement in the evaluation and initial treatment of the multiple trauma patient, specifically in the diagnosis and early temporary or permanent stabilization of the fractures of long bones and the fractures of the pelvis in patients that require it.

4. The criteria regarding the permanent treatment of fractures of the long bones in this type of patient are not clearly defined in our hospital. There are great differences in relation to the procedures and fixation period in comparison to the recommendations that are followed in other reference centers.

5. Although we have not been able to show any differences regarding the morbimortality of our patients in relation to that found in other centers due to the characteristics of this study, our hospital could benefit from establishing clinical guidelines and an organization of multidisciplinary units with a view to improving the assistance of these patients.

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Conflict of interests

The authors have declared to have no conflict of interests.