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Introduction and operation of a multiple trauma unit in a general hospital

David Costa Navarro,[a,] Montiel Jiménez Fuertes,[a] Juan Carlos Medina Álvarez,[b] Luis Requena Meana,[c] Elena Jimeno Lecina,[c] Kenji Inaba,[d] Eugenio Herrero,[c] and José Antonio Velasco[e]*

[a]*Servicio de Cirugía General y del Aparato Digestivo, Comité de Politraumatizados del Hospital de Torrevieja, Alicante, Spain*
[b]*Servicio de Urgencias, Comité de Politraumatizados del Hospital de Torrevieja, Alicante, Spain*
[c]*Servicio de Cuidados Intensivos, Comité de Politraumatizados del Hospital de Torrevieja, Alicante, Spain*
[d]*Department of Surgery, Division of Trauma Surgery and Surgical Critical Care, Los Angeles County and University of Southern California Medical Center, Los Angeles, California, United States of América*
[e]*Área Quirúrgica, Hospital de Torrevieja, Alicante, Spain*

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ABSTRACT

Introduction: Although there is ample evidence on the importance of having good protocols for Trauma patient care, a teaching system for the personnel involved in this care is needed.

Methods: The aim is to describe how we have organised the care for this type of patient in Hospital Torrevieja by creating a Trauma Surgery Unit, a Trauma Committee, and a Trauma Team. We also describe how we have developed training in order to ensure personnel get the knowledge and skills to care for these patients correctly (Trauma Surgery Course).

Results: We prospectively describe the results. Seventy-nine patients were attended to and 38% had sustained combined multiple injuries, 35% isolated thoracic trauma, 15% combined thorax and abdomen, and 12% abdomen. The most frequent cause of trauma was traffic accident, closely followed by stab wounds. Trauma team activation was made in 27 cases. Overall mortality rate was 8.8%. During this period of time, 5 editions of the course have been given and 29.5% of the target personnel have already participated in them.

Conclusions: We conclude by highlighting the importance of having adequate protocols for treating these patients and the correct means for teaching the personnel.

*Corresponding author.
E-mail address: rdcosta@torrevieja-salud.com (D. Costa Navarro)
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Instauración y funcionamiento inicial de una unidad de politraumatizados en un hospital de segundo nivel

Palabras clave:
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Educación

R E S U M E N

Introducción: Existe amplia evidencia de que tener una metodología en la asistencia del politraumatizado es esencial, y es necesaria una correcta formación del personal sanitario para poder llevarla a cabo.
Material y método: Describimos cómo hemos estructurado la atención a estos pacientes en el Hospital de Torrevieja mediante la organización de una Unidad de Politraumatizados, un Comité de Politraumatizados y un Equipo de Trauma; cómo se realiza la formación del personal (curso de politraumatizados) y describimos de manera prospectiva los resultados de los 2 años de funcionamiento.
Resultados: Se atendieron 79 pacientes (3,4 al mes); de éstos, el 38% tenía traumas combinados, el 35% tenía trauma torácico, el 15% tenía traumas en el tórax y en el abdomen y el 12% tenía traumas en el abdomen. La causa más frecuente de trauma fueron los accidentes de tráfico y de arma blanca. Se activó el Equipo de Trauma en 27 ocasiones. La tasa de mortalidad fue del 8,8%. En este período se han realizado 5 cursos en los que han participado ya el 29,5% del personal al que va dirigido el curso.
Conclusiones: Es fundamental una adecuada protocolización en este tipo de pacientes y disponer de los medios para formar al personal.

Introduction

Currently there is evidence that it is essential to have a multiple trauma methodology and protocol in place in order to ensure the proper care of the multiple trauma patient,[1-7] so appropriate training of the personnel who will be responsible for their care is required. The Advanced Trauma Life Support (ATLS) methodology of the American College of Surgeons has shown itself to be more than effective and valid for every area of multiple trauma care.[1-10] However, in this hospital there are indications that there has not been enough training in this methodology,[11] meaning that our personnel need to be better informed about the basic concepts of multiple trauma patient care.

Our aim is to describe how the care of this type of patient is structured in our centre and how our personnel have been trained, and to describe the preliminary results obtained prospectively following multiple trauma patient care during the first 2 years that the hospital has been in operation.

Material and methods

Hospital Torrevieja-Salud is the result of a joint venture and is responsible for the management and provision of healthcare to area 22, which consists of 39 services (its surgical services include the General and Digestive System Service [SCGD], and the Traumatology, Ophthalmology, Maxillofacial, ENT, Urology, Thoracic, and Vascular Surgery and Surgical Intervention Services). It has 256 beds at its disposal (hospitalization). In 2008 it performed a total of 20 368 interventions, 3496 of these interventions were urgent and 1068 of them corresponded to the SCGD, which has 10 specialists and is organized into

Table 1 – Objectives and functions of the Multiple Trauma Committee

Objectives and Functions
To determine the general care protocols for all multiple trauma patients and specific protocols for each type of injury
To foster collaboration between the Emergency Care Medical Service (SAMU) units responsible for care at the accident site and pre-hospital care, as well as with their coordinator centre or Information and Emergency Coordination Centre (CICU)
To promote and decide the referral of patients to reference centres when they cannot be treated at this Centre
To monitor the morbidity and mortality of this type of patient by organizing morbidity and mortality sessions and to modify the care protocols accordingly to improve patient care, by analyzing such cases
To promote and manage activities linked to increasing knowledge and awareness of care protocols amongst personnel implicated in the care of the multiple trauma patient (Course on Multiple Trauma)
To inform the medical board and management of the hospital and the administrative authorities and accredited institutions of the activities performed with respect to the abovementioned objectives

SAMU indicates doctors responsible for urgent pre-hospital care.

Table 2 – Trauma Team activation criteria defined by the Torrevieja-Salud Multiple Trauma Committee

Pre-hospital Activat ion (SAMU)

1. Coma without airway management: patients with a Glasgow Coma Scale (GCS) score lower than 9 points, in whom it was not possible to achieve airway management (orotracheal intubation) and initiate ventilation
2. Haemodynamic instability: patients with a systolic pressure lower than 90 mmHg or a heart beat higher than 120 after the application of vigorous fluidotherapy or in cases in which venous access cannot be achieved
3. Respiratory instability: patients with severe respiratory damage (pulse oximetry less than 90% after the application of oxygenotherapy, tachypnoea higher than 30 or extreme respiratory effort), in whom it has not been possible to achieve airway management and initiate mechanical ventilation
4. High-risk traumatisms: patients with special injuries, which means initial care has to be started as soon as possible:
   a. Open wounds in the neck or chest
   b. Firearm wounds in the neck, chest or abdomen, or
   Amputation of a limb

Intrahospital activation (emergency doctor)

1. Undetected emergency: in cases in which none of the circumstances envisaged in the pre-hospital activation section apply and in cases in which for some reason activation did not take place before the arrival of the patient
2. Haemodynamic or respiratory instability: in cases in which a tendency towards a deterioration in blood pressure or breathing persists after treatment has been applied or, in particular, if there is clinical evidence of:
   a. Flail chest or
   Clinical evidence or reason to suspect cardiac tamponade

3. *Vascular injuries* which result in problems in the irrigation of a limb or significant haemorrhaging
4. *Head injury:* in cases of moderate head injury (GCS: 9 to 12) or severe head injury (GCS: 3 to 8) in which prior activation has not taken place
5. *Spinal cord traumatism*
6. *Multiple fractures or pelvic fracture*
7. *At the discretion of the emergency doctor on duty*

SAMU indicates doctors responsible for urgent pre-hospital care.

independent functional units which treat different diseases. Each of these acts as an independent unit which organizes its own protocols and clinical procedures, and manages the treatment of its patients.

Multiple Trauma Committee

To protocolize, supervise and manage the care of the multiple trauma patient, the SCGD came up with the idea of creating an interdisciplinary Multiple Trauma Committee (MTC), which consists of accident and emergency (A&E) and intensive care doctors, surgeons, anaesthesiologists, paediatricians, and doctors specialized in urgent pre-hospital care (SAMU) with special training in multiple trauma patient care. The committee has created its operational protocols in collaboration with a prestigious and experienced Trauma Centre in the United States (Division of Trauma Surgery and Surgical Critical Care, Los Angeles County and University of Southern California Medical Center). These protocols have been adapted to the operational characteristics of centres in Spain and, specifically, to the context of the Hospital Torrevieja. The committee normally meets once a month in order to meet its objectives (Table 1).

Multiple Trauma Unit of the General Surgery Service

The exception to this rule is the Multiple Trauma Unit (MTU), which has 2 surgeons who are specifically trained in *trauma surgery*, although all the surgeons in the service collaborate with the unit, as 2 surgeons are required to be on duty at the unit every day. The members of the MTU are directly responsible for the organization of the MTC, the daily monitoring of all trauma patients during their hospitalization, including any time they spend in the ICU (in collaboration with this service), and their subsequent follow-up during outpatient appointments, as well as the teaching of other members of personnel. In addition, where necessary, they may have to be available for telephone consultations or be required to be on call in the hospital (this is what we call the "third located member").

Hospital Torrevieja Trauma Team

The Trauma Team (TT), established under the supervision of the MTC, consists of the A&E doctor who attends the patient on arrival, the surgeons on duty and the intensive care doctor, as well as the nursing personnel, auxiliary staff, radiodiagnostic technicians, and orderlies. The TT can be activated directly, either by the pre-hospital care unit (SAMU) or by the accident and emergency doctor, when the patient has already arrived at the Emergency ward (Table 2). In the former case the SAMU Unit makes a telephone call specifically for this purpose in the triage area of the Hospital's Emergency ward to notify the doctor responsible for activation (if possible, the patient's essential clinical data is forwarded as well). Immediately after this, the Emergency doctor activates the call, contacting the other members of the TT, who must go to the Vital Care Area of the Emergency ward the moment they receive the call. If the

presence of other specialists is required (vascular surgeons, paediatricians, maxillofacial surgeons, traumatologists, etc), the TT informs them at their judgement.

Training of personnel: Torrevieja-Salud advanced course on multiple trauma

The MTC is responsible for organizing this course, which trains pupils (doctors and nurses) in accordance with the guidelines of the American College of Surgeons. During the course, which lasts 20 hours and admits a maximum of 12 pupils per course, basic notions and concepts are taught, as well as other more advanced aspects of multiple trauma care, such as the reception and initial treatment of the patient, the activation criteria of the *trauma team*, fluidotherapy, the treatment of thoracic and abdominal trauma, pre-hospital care, etc. Furthermore, clinical case studies are presented for illustration purposes and pupils participate in the care of simulated cases using the Kelly® mannequin, in accordance with the hospital protocols. Basic surgical techniques used in multiple trauma patients are also practiced during a workshop, which employs anatomical pieces taken from animal corpses (pigs). The key objective is to inform pupils about care protocols and the general premises of care for this type of patient. The course has been awarded EVES (Valencian School of Health related Studies) official certification and has received accreditation from the Lifelong Training Commission.

Hospital Torrevieja and multiple trauma patient care

Hospital Torrevieja, which has been set up as indicated above, fulfils the following functions, which are characteristic of a trauma centre: it provides definitive care to the multiple trauma patient in the majority of cases (except in severe head injury); it works in collaboration with another higher level centre to achieve its objectives as a trauma centre (Hospital General of Alicante: serious head injury cases are referred to this centre); it has several surgeons, who are trained in multiple trauma surgery at its disposal so that they can participate in the care of this type of patient as soon as possible when they are needed (they are either available at the centre or can be located), and it performs teaching and research activities.

Table 3 – Injury mechanism

Mechanism	Number of patients	Percentage
Fall from a heighta	16	20
Accidental falla	12	15
Collision	5	6
Sharp weapon	14	18
Firearm	0	0
Traffic accident (car)	17	22
Traffic accident (motorbike)	14	18
Traffic accident (quad)	1	1

A fall from a height is defined as a fall from a height of more than 2 m. The rest have been treated as accidental falls.

Results

Patients treated at the Trauma Unit

From November 2006 to October 2008 (23 months) a total of 79 multiple trauma patients (3.4/month) with an average ISS (*injury severity score*) of 9.2 (5.0) received trauma care. An outstanding feature of this period were the peaks of up to 9 patients, who required care during the bank holiday weekends in October and May respectively, and during the month of August 2007 (in 2008 these peaks were less pronounced).

Thirty-eight percent had combined traumatisms of the thorax and abdomen with head injury or traumatism of the pelvis or limbs, 35% had thoracic traumatism alone, 15% combined traumatism of both the thorax and abdomen, and 12% abdominal traumatism alone. The mechanisms underlying these injuries are shown in Table 3. A total of 27 TT activations were conducted during the entire period; however, in the period up until June 2007 (when the first multiple trauma course was held) it was not activated, when it should have been, in the case of 9 (29%) out of 31 patients whereas, after the multiple trauma courses began, the TT was not activated, when it was indicated, in 8 patients out of a total of 48 cases (16.6%).

Fifty-one percent of the patients had to be admitted to the ICU, owing to the greater severity of their injuries, either following surgical treatment or in order to monitor conservative treatment, while the rest were directly admitted to a ward under the responsibility of the SCGD MTU.

As far as the treatment which was applied is concerned, 35% received conservative treatment, which involved observation and support measures, 35% only required one or more thoracic drainage sessions and support measures, and 30% required surgical treatment (this excludes surgical treatment of fractures by the Traumatology service), although in one of these patients the treatment was initially conservative and then surgery was required within the first 24 hours. The global mortality rate was 8.8%. One patient died while undergoing a 2-phase CT scan, as a result of traumatic rupture of the aorta (Trauma Injury Severity Score [TRISS]: 86.9%) and 2 patients died in the operating theatre (one of these after resuscitative thoracotomy and control of chest damage and the other during the course of a laparotomy to control damage in which a grade V liver injury was discovered; TRISS 59.4% and 96.2% respectively).

Training of personnel

During the period from November 2006 to October 2008 (23 months) there were 5 Hospital Torrevieja Courses on Multiple Trauma, in which a total of 54 people participated, 20 of whom were doctors from different areas of specialization who might at some point find themselves involved in the care of multiple trauma patients and 34 were nursing personnel, a figure which represents 29.5% of the total number of personnel the course is targeted at.

Discussion

Death as a result of trauma continues to be the first cause of death between 1 and 44 years of age.[12,13] Worldwide it is estimated that every year 1.2 million people die and up to 50 million are injured in traffic accidents. In Spain, according to López Bastida,[14] in 1997 231 000 people were victims of traffic accidents. He quantified the total costs derived from traffic accidents as 6280 million euros, which accounts for 1.35% of GDP. But not all cases of multiple trauma are due to traffic accidents. We need to bear in mind that, according to the WHO, violence accounts for the loss of 850 000 lives a year worldwide and it is the cause of countless cases of physical and emotional injury. All this is highly relevant to health area 22, given that it has special urban and sociodemographic characteristics, which make it an area with high levels of crime. Furthermore, in the summer and, as it is a place which caters for tourists, the population reaches 600 000. From this we can infer the likelihood of traffic accidents, which often involve serious casualties, given its proximity to the AP-7, A-7 and N-332 motorways and the very dense daily flow of traffic. In view of all this data, it should not be necessary to provide any more evidence to show that a Centre with the capacity to treat multiple trauma patients successfully is needed. The preliminary data which we provide is proof of this, given that there are months in the year (those with the greatest influx of tourists) in which the number of multiple trauma patients increases to 9, which is quite a high number for a regional hospital. Moreover, the 2 most common causes registered in our centre are traffic accidents, followed by injuries caused by a sharp instrument (Table 3), and this supports what we have stated above.

The MTU was designed to offer better care to this type of patients. It is based on the TT activation model and the treatment protocols have been developed since this centre began its operations, which are based on those of a hospital with extensive experience. This has shown itself to be beneficial to the patient, as it reduces the time employed in resuscitation and decreases any delay in surgical intervention where this is indicated, especially in penetrating traumatisms. In line with this, Petrie et al concluded that the most serious patients, with an ISS higher than 12, clearly have a better outcome when they are attended within a TT activation system.[13] However, in another study published by Ketharpal,[15] despite the fact that it found that the presence of a trauma surgeon improves the way the team functions, to the extent that it reduces the time required to instate surgical treatment (amongst other factors), it does not have as much impact on TRISS-based mortality. Whatever the case, the data in this study, as the author indicates, is from level I *trauma centres* and cannot be extrapolated to other centres. It is also retrospective and does not evaluate morbidity which may be somehow linked to the doctor who attended the patient, and it excludes a significant number of patients, owing to the impossibility of locating their records.

There are differences in the organization of the TT with respect to the American model that we have followed. In the last 50 years the USA has been the paradigm for multiple trauma patient treatment, due to the efficiency and deep specialization of its *trauma centres*. However, this has led to a situation in which *trauma surgeons* have become increasingly distanced from General Surgery. In our centre, on the other hand, the surgeons in the Multiple Trauma Unit are not *trauma surgeons* but general surgeons with training in multiple trauma care, which is why, amongst other things, the figure of the intensive care specialist has been incorporated into the *trauma team*. We have seen that what might appear to be a disadvantage in actual fact is not, given that the results for the treatment of the multiple trauma patient in specially organized general surgery services, as opposed to services in which care is administered exclusively to multiple trauma patients, are as good as or better in some respects,[16] which could be explained by the fact that, nowadays, general surgeons may have more surgical experience of extensive abdominal procedures, as some authors have claimed.[17,18] On the other hand, Morales García[11] recently published the claim that resident Spanish surgeons receive little training in this field, although this situation could be improved if there were a greater effort on the part of the surgery services, which are aware of this deficiency and of the need to have personnel who are properly trained in this field. This is why we consider it indispensable to provide the necessary training to our personnel so that the care of multiple trauma patients can be organized as we have indicated. To know the magnitude of the problem nationally and how these patients are being attended is equally or more important than identifying what level of training we have reached, which means that the creation of a National Multiple Trauma Patient Register is indispensable.

In conclusion, we can say that Torrevieja is a geographical area which would benefit from the presence of a centre with sufficient capacity to deal with multiple trauma patients and that this provision of care must be correctly protocolized and based on the knowledge of highly experienced *trauma centres*. It must ensure that its hospital personnel have a basic knowledge of multiple trauma care and that they are familiar with its protocols, for which it is indispensable to have some kind of system which ensures the proper training of the personnel who work at the centre.

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