

The 11 March 2004 Madrid terrorist attacks: the importance of the mortuary organisation for identification of victims. A critical review

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Abstract On the morning of 11 March 2004, Madrid lived the worst terrorist attack in its modern history, resulting to 191 people killed and more than 1,800 injured. The attacks evidenced a series of significant deficiencies in forensic task planning, especially in using standardised post-mortem data forms and gathering ante-mortem medical and dental data, responsible for the delay in identifying corpses in the worst state, which had to wait for DNA analysis. Fortunately, the ultimate result can be considered satisfactory, given the rapid response of the forensic team in examination and identification of the large number of victims (80% of the victims were identified within 40 h), consequence of a good mortuary organization in the Pavilion 6 of the Madrid Trade Fair (IFEMA), the professional fervor whereupon the different involved pro-

fessionals acted, some personal initiatives and the good general state of most of the corpses.

Keywords Madrid M11 · Terrorist attack · Forensic medicine · Mass disaster · Human identification

Introduction

Modern societies live exposed to a higher risk of incidents involving large death tolls, as well as considerable material and personal damages. To natural disasters and the effects of mass transport accidents (railroad, airplane...) we have to face, unfortunately, with an everyday more extended terrorism, mentioning the principal causes. Those types of

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incidents, always unexpected, dramatic and spectacular, claim a competent, immediate response from the authorities.

On the morning of March 11, 10 bombs exploded in Madrid onboard four commuter trains, killing a total of 191 people and wounding more than 1,800, making it the worst terrorist attack against civilians in Europe since the Lockerbie bombing [1] and the worst terrorist assault in modern Spanish history. Spain did not count (and does not count so far) on an organised plan and structure for the performance of forensic tasks in mass disasters or multiple victim incidents, which had to be improvised.

The physical and functional organisation of the mortuary, located in Pavilion 6 of the Madrid Trade Fair (IFEMA), contributed significantly to the speed with which the tasks of the forensic teams were carried out, allowing identification of 80% of the victims within 40 h.

Bombs went off in the attack at four points:

- *Santa Eugenia station*. At 7.36 A.M., the explosion of a bomb on a train which had just arrived at the station caused the death of 16 persons.
- *Atocha station*. Several explosions occurred here on two trains at 7.39 A.M. The first train was standing in the station platform when three out of the five bombs placed inside the train exploded, causing 29 instantaneous deaths. The second explosion occurred some 500 m away on a train outside the station opposite *Télez Street* where four bombs exploded causing 59 immediate deaths.
- At the same time, two bombs exploded on another train just as it had started out from *El Pozo station*, a working class neighbourhood of Madrid, causing 67 deaths. Two bombs failed to go off, one of which was recovered intact, enabling the police to examine its composition and activating mechanism.

Although we have not been able, perhaps due to the political implications of the attacks, to face a critical discussion on the forensic medical performance in the attacks, we feel we have an obligation to the scientific community to make our experience known to our colleagues, as only in this way can we evaluate our successes and errors with the purpose of learning from them for the benefit of others who have to face (and we hope they do not) similar situations to those we had to live through, in the same way that our actions were influenced by the experience brought by other authors.

Guidelines

As a result of the Lockerbie attack in Scotland, The Royal Society of Pathologists of The United Kingdom drew up a series of recommendations for forensic medical action in

large scale disasters which meticulously gathers all the aspects to be borne in mind when facing a situation such as this [2]. These were the basic guidelines managing our course of action in the Madrid attacks at the mortuary.

The Lockerbie recommendations advised against the use of a public mortuary. In fact, the number of corpses we were dealing with just a few hours after the explosions made us reject the idea of transferring them to the Forensic Institute. The use of hospital morgues was completely ruled out, as the wounded needed access to the hospitals, their capacity is limited and the installations are not suitable for working on that type of cadavers.

In these situations the ideal solution is to fit out a specific space, which furthermore should be established in advance in action plans for such disasters. Here, we must note that in Spain, the forensic medical role is not contemplated in such plans; a development for which we have lobbied for several years.

IFEMA No. 6 Pavillion

It was necessary to locate a single site where all forensic work could be carried out to [2]:

- Avoid complications in tasks of identification (thanks to centralisation of all the information).
- Avoid duplication of teams.
- Avoid the distressing pilgrimage of relatives through the different sites set up as mortuaries, as well as through the hospitals.
- Help to free up in part, or at least not further overload, the already saturated communications systems with the comings and goings of relatives searching for possible victims, transfer of victims once identified or transfer of teams from one site to another.

The place finally chosen by the crisis cabinet in the attack was Pavilion no. 6 in IFEMA, in the Madrid Exhibition Centre (Parque Ferial Juan Carlos I). This trade fair centre is located on the ring road surrounding Madrid urban centre, to the north east, and enjoys magnificent access and communications through the highways which surround the capital. Furthermore, the Exhibition Centre location is quite far from the main hospitals, so there was no interference with getting wounded victims to hospitals. Apart from this pavilion, two adjoining halls were fitted out to attend relatives needing psychological attention and social services.

From an operating point of view, IFEMA was confirmed as an ideal location for this type of case, fulfilling all the conditions gathered in the Royal College of Pathologists report [2], especially the ease and swiftness with which the Centre technical services can install panels to separate areas, bring on-line water, electricity, phone line points or access to IT networks, enabling us to set up the space

(10,800 m²: 120×90 m) attempting to reproduce the majority of the sections and areas existing at the Institute. The plan illustrates schematically the different areas, which we will now describe in detail (Fig. 1).

Sequence of the operations

The sequence of the operations carried out was the following:

- Around 12 midday, bodies began to arrive from the four scenes of the attack. Transfer was arranged from each attack scene such a way that corpses could be numbered arriving the morgue according to their origin, avoiding mixing corpses from different locations.
- Only a single entrance door was set up, and on arrival at the Pavilion corpses were given a number from the morgue itself. The numbering carried the initial C for “catastrophe” (disaster) followed by the initial of the place of origin (A: Atocha/ E: Santa Eugenia/ P: El Pozo/ T: Téllez/ and X: for corpses coming from hospitals) followed by the number assigned on admission by order of entry. Then, five zones were set up in the mortuary area (Fig. 1, area 2).

The process with each corpse was as follows:

1. Autopsy area

Transfer to the autopsy area (Fig. 1, area 3).

Seven work points were organised in each of which a team of three forensic doctors and three members of the scientific police (one being a photographer) worked.

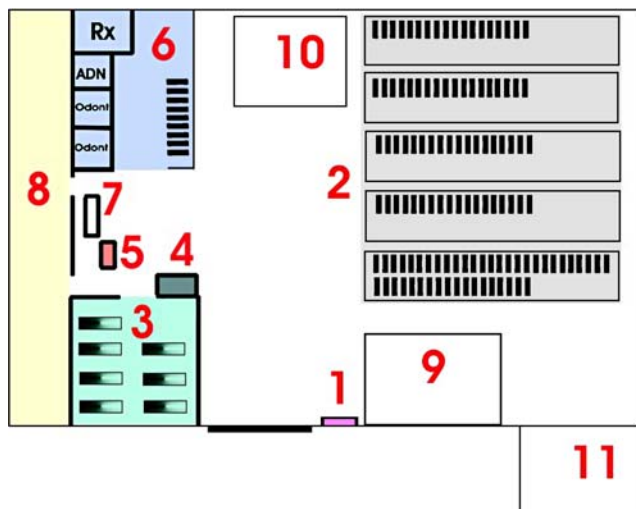


Fig. 1 Different areas. 1 Entrance, 2 mortuary, 3 autopsy area, 4 equipment store, 5 check point and documentation control, 6 specialized area—anthropology/odontology; radiology; and DNA, 7 scientific police, 8 catering, 9 personal objects, 10 coffins, 11 family recognition

At the entrance to the autopsy area a checkpoint was set up (Fig. 1, area 5), at which one person handed in the documentation which had to be filled out for each corpse, checked that a photo was taken with the admission number and that the corpse entered the autopsy area.

The scientific police were in charge of recording and photographing clothes and personal effects, obtaining a portrait photo and taking fingerprints, using abbreviated DVI forms (<http://www.interpol.int/Public/DisasterVictim/forms/>).

The forensic doctors carried out external corpse examination and gathered identifying data (general characteristics of gender, approximate age, hair colour, physical facial features, presence of scars or tattoos among others) which were noted by scientific police in their abbreviated DVI forms and the injuries presented, as well as samples for complementary analysis (for example chemical explosives analysis). Getting of post-mortem data from external examination of bodies was performed by forensic doctors, at this time, in a non-standard way and despite having printed copies of complete DVI forms, these were not used because of the lack of instructions in this respect and the absence of a clear chain of command. Each of the forensic doctors' teams obtained the data which was judged to be more interesting or useful in an arbitrary way. So, the information was incomplete and imprecise. On the other hand, personnel data of the forensic doctors themselves and signature of note sheets, indispensable for a further consultation of the autopsy notes, and to set up the responsibility of the work and the chain of custody was in many cases not included in the notes.

Corpse remains of sufficient mass (such as limbs for example) were placed on a table to be matched to the corpses from the same attack scene. Those that could not be matched were deposited, together with the smaller remains, in bags called “zero bags” for subsequent taking of DNA samples.

Once the study was complete and all documentation had been filled out, the corpse was replaced in its bag and taken from the autopsy area, once again passing through the check point which noted the exit, collected the file with all the documentation which was then handed to the central documentation desk.

The corpse could then follow one of two courses. If it was a well preserved corpse from which fingerprints could be taken, it was returned to its mortuary position, occupying the original place according to its number, while awaiting identification. If fingerprints could not be taken, it was passed to the area called Forensic Institute where the following tests were performed (Fig. 1, area 6):

- X ray examination.
- Sample taking for DNA analysis by the Madrid National Toxicology Institute staff and scientific police.
- Anthropological and odontological examination.

Once these studies were completed, the corpses were replaced in the bags, and, like the fingerprinted group, returned to their original place.

The operations carried out in this first phase of corpse examination ended at 1:30 A.M. on 12 March, just 12 h after commencement.

2. X-ray area

In the area farthest away from the autopsy area, an X-ray zone was set up, where two forensic doctors and two technicians worked using portable equipment transferred from a nearby hospital.

The main aim of the X-ray examination was to search for identifying elements such as osteosynthesis material, intrauterine devices,...

3. Anthropology–odontology area

Two teams were formed to study this type of corpse, each of which comprised

- An anthropologist
- Two odontologists
- An assistant

The staff of these teams proceeded to obtain data on the physical profile of the corpse (sex, approximate age, etc.) and dental identification elements, including intra-oral X-rays.

Interpol Disaster Victim Identification forms (<http://www.interpol.int/Public/DisasterVictim/forms/>) were filled out for all the 46 corpses studied in this area and all post-mortem data were introduced in a specific dental identification software WINID-3 (<http://www.winid.com/>).

All the information gathered, deposited on the desk adjoining the check point, was shared between forensics and police. Post-mortem data from corpse examination were compared with ante-mortem data supplied by the police to officially establish corpse identity and fill out the corresponding documentation to send to the court and proceed, following court authorisation, to delivery the body to relatives.

The identification work (except for cases pending DNA analysis) was completed at 7.30 A.M. on Sunday, 14 March.

The team which worked round the clock to identify the victims through the first 3 days after the attacks coordinated the work of four different disciplines: forensic doctors and auxiliary staff from the Madrid Forensic Institute, technicians from the National Toxicology Institute, professors of Legal Medicine at the Complutense University and members of the scientific police, bearing out a maxim which must always be held present in resolution of a catastrophe such as we experienced on 11 March:

In a disaster there cannot exist unhealthy competition between the different services involved. All are present to

help the victims, not to claim any kind of personal success for themselves [3].

Forensic tasks

The forensic medical task focused on the following points:

- Establishing, in coordination with the police, the *identity* of each victim.
- Establishing the nature of wounds and determining the *cause of death* of each victim (as required under the Spanish Criminal Justice Act) with the aim of providing proof regarding the source and circumstances of the disaster.

1. Identification process. (Andradas J. Identificación de víctimas y Medicina Legal. Seminario Europeo “Reflexiones sobre las actuaciones en materia de protección civil tras los atentados terroristas del 11 de marzo de 2004 en Madrid”. Escuela Nacional de Protección Civil. Madrid. 2004.)

Out of the total of 191 fatal victims: 145 (approx.76%) were identified through fingerprints, as the majority of the bodies were not seriously destroyed. This was possible mainly due to the fact that in Spain the police have on their National Identity Document files the right index finger print of all Spanish citizens and resident immigrants.

Of the remaining 46 cases, 15 (8%) could be identified based on a group of elements proceeding from examination of their clothing and personal effects, the presence of tattoos, medical details such as previous operations, dental data and direct final recognition by relatives. This fact was especially meaningful for relatives, as at the time there was public criticism over failings in identification work of Spanish military personnel killed in an air crash in Turkey (the so-called Yakolev-42 case). In this respect, we must note that medical and dental ante-mortem data available were gathered by no expert police staff and no trained volunteer personnel. So, those data were highly insufficient, lacking prior medical and dentistry records such as dental charts or X-rays which without doubt limited the possibility of immediate identification in some cases, even when these showed quite specific dental work or surgical devices.

The remaining 31 cases, the corpses in the worst state, were identified using DNA techniques.

2. Determining cause and circumstances of death

The second objective was diagnosing the cause of death.

The passengers received the direct impact of the explosion, the majority of them died due to the so-called “tunnel” effect of the explosions. The bombs exploded at the end of the carriages, where the luggage compartment

sections were located. After the bomb exploded, the blast traveled rapidly through the carriage interior, which offered no resistance. Finally, the rear of the carriage, where the explosion took place, burst open.

The injuries observed corresponded to:

- Blunt trauma due to objects originating directly from the bomb or the surroundings propelled by deflagration.
- Thermal injuries (burns) and
- Blast injuries due to the action of the shock wave.

Complete autopsies were not carried out except for a few cases, as external examination in the great majority of cases enabled determination of the cause of death.

It is possible that performing complete autopsies could have provided relevant data of interest in the forensic pathology area, but given the characteristics of the disaster, our prime objective at all times was to identify the victims aiming to avoid as far as possible the uncertainty and anxiety experienced by families awaiting news about their missing loved ones.

Conclusions

Although the ultimate result can be considered satisfactory, given the large number of victims and the rapid response of the forensic team in examination and identification of the victims, the 11 March 2004 Madrid attacks evidenced a series of substantial deficiencies in planning the forensic action, overcome in part by the professional commitment of the different specialists involved, certain personal initiatives and the good state in general of the majority of corpses, enabling identification of 76% of the victims through fingerprints.

Just as has been found in this case, the possibility of organising the necessary infrastructure in a short time for ideal reception of victims, with sufficient space at a location – generally on the city outskirts – makes trade fair centres a location of choice for use as a morgue in multiple victim accidents or large scale disasters. In this case, the IFEMA trade fair centre proved the ideal location for these tasks.

Numerous studies have highlighted the usefulness of forensic odontology and radiology in providing fast and reliable identification in multiple victim incidents [4–9] and the value of reliable ante-mortem dental and medical records in the quick identification [10, 11]. In spite of that, in this case, identification tasks focused on fingerprints (obviously due to the good preservation of cadavers) [12] and DNA analysis [13, 14], both under management of scientific police, who furthermore, were in charge of all the ante-mortem data collection. Dental and medical ante-mortem records, gathered by no expert police staff and no

trained volunteer personnel, were highly insufficient and only unspecific data provided by relatives in terms of “some fillings”, “gold crown”, “prosthetic device” and any others like that were available for matching, making identification process by those methods unfitting. Contrary to that, post-mortem records showed quite specific dental work and medical findings which would have enabled faster and reliable identifications, avoiding an unnecessary suffering to relatives. To prevent the limitations derived from the lack of dental and medical data, it would be necessary to include forensic experts in the teams in charge of gathering ante-mortem data.

Disaster action plans for forensic teams’ performance and the use of standardised forms and protocols for disaster victim identification is also stressed by international organizations (<http://www.interpol.int/Public/DisasterVictim/default.asp>) [15–17] and specialised authors [18, 19]. Although no single protocol can anticipate all possible circumstances, as the instructions of the DVI forms themselves state (<http://www.interpol.int/Public/DisasterVictim/forms/>), the use of the forms enables us to take note of all the information that can be gathered, as it is impossible to know which information will be of interest with a view to comparing data (<http://www.interpol.int/Public/DisasterVictim/default.asp>) and identifying the personnel in charge of the different operations carried out. Even though it was not necessary performing complete autopsies, standardisation in gathering not only identification but also medical data (location, intensity and type of injuries, among others) [20] enable us to gain access to valuable data for a best understanding and more reliable reconstruction of the event, like the localization of explosive devices or the relative position of the victims with respect to them, even more in the case of suspected suicide bombers [21, 22].

In our opinion, all these faults were mainly because of the lack of instructions and the absence of a clear chain of command, demanding improvisation and favouring forensic doctors to act in an arbitrary way.

After Sunday, March 14, no work of study of the whole objective data obtained has been accomplished, neither setting itself in common, nor discussion or critical analysis done. Only different reasons to the very sense of forensic medicine can explain this attitude for those who watched the information gathered. Three years later, Spain does not have so far an organised national structure for forensic teams’ performance in catastrophes or multiple victim events and legislation in matter of civil defense does not consider the inescapable forensic tasks, leaving it out of planning and coordination with the rest of teams involved in these types of incidents.

On the other hand, the advances undergone by the forensic sciences regarding identification (forensic anthro-

pology, odontology or DNA...) and the peculiarities of the organization of the medical legal activity in our country, require the participation and coordination of diverse agencies (National Corp of Forensic Doctors, National Institute of Toxicology and Forensic Sciences and Scientific Police) which depend on different administrative instances (Ministry of Justice, Department of Justice of Autonomous Communities and Home Office). It seems crucial to establish a continuous and stable relational frame among those distinct agencies involved in.

In our mind, all the above justifies the need to include forensic action in emergency plans, setting in motion mechanisms of coordination and standardisation, with the necessary legal adjustments and the creation, through the initiative of the central state administration and participation in the event of the competent regional authorities, of a national structure for forensic action in disasters, articulated through the corresponding Institutes of Legal Medicine.

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