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Surgery of Violence

1. Civilian Bomb Injuries

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Urban guerilla warfare seems to have become a part of life (and death) in the 1970s, and of its many weapons the bomb is perhaps the most repulsive and the most feared. The terrorist's bomb differs from that of conventional warfare as it is nearly always delivered by hand or in a motor vehicle. In these catastrophes quite a small charge, perhaps only 2-30 lb (1-14 kg) in a suitcase or parcel, is carried into a confined space. The casualties are caused by the blast itself, by flying debris, and occasionally by falling masonry. The wartime aerial bomb on the other hand was inevitably enclosed in metal, was very much larger, and caused its casualties mainly by falling masonry and flying metallic fragments. For example, if a 500-lb (230-kg) aerial bomb landed within a crowded bar there would probably be few survivors for the surgeon to worry about.

The car bomb contains a much larger charge of explosive, up to 500 lb (230 kg) or even more, placed within the vehicle. When such a bomb explodes without warning, people close by may suffer serious injury, but the majority of casualties receive relatively minor injuries from flying debris.

Organization

Perhaps the greatest problem from the surgeon's point of view is the simultaneous arrival at casualty of large numbers of patients, often in the evening when the majority of the senior medical staff have gone home. The initiation of a disaster plan and the organization of the casualty department will be discussed in a subsequent article. However, certain aspects of organization can be conveniently dealt with here.

When the staff has been mobilized we generally find it desirable to leave the most senior surgeon in the casualty department, sorting and categorizing the injured. The most seriously injured patients go straight to the resuscitation room in the casualty department, where it is essential to have the help of an anaesthetist. One cannot overemphasize the importance of rapid restoration of blood volume, maintenance of the airway by intubation if necessary, and the use of intercostal drains where indicated, even before x-ray films have been taken.

At the Royal Victoria Hospital we are fortunate in having an admission unit and, in addition, a large recovery room immediately adjacent to a suite of four theatres equipped for general surgery. These two areas are capable between them of accommodating 30 casualties. Those requiring immediate and major surgery are transferred to these areas with appropriate x-ray films, thus avoiding unnecessary disturbance of ordinary ward patients. A further senior member of the staff, often an anaesthetist, should be available to supervise the continuing resuscitation, to organize the distribution of casualties among the surgeons available, and, where indicated, to call in surgeons of other disciplines. It is also his duty to decide the priority of operation as the clinical state of the patients already admitted changes or as other more urgent cases arrive from the casualty department.

With this system the provision of beds at ward level becomes a less urgent matter. Ward patients can be discharged or transferred simultaneously with the other activities. We have found the senior nursing staff invaluable in making these arrangements. It has been our experience that on average less than 25% of the patients arriving at the casualty department require admission. This figure can of course reach over 50% after explosions in a confined space.

Types of Injury

Those closest to a large explosion may be blown to pieces by the force of the blast and do not need the services of the hospital. In those coming to hospital the wounds are characterized by their multiplicity and by the associated gross soiling which may occur. The common basic injury is a combination of bruises, abrasions, and lacerations. Wounds vary in size from minute punctures, due to glass or metal fragments, up to huge lacerations, often impregnated with all sorts of foreign bodies. The most bizarre was that of a woman whose thigh was transfixed by the leg of a table in the Abercorn Restaurant explosion (fig. 1). Perhaps the most macabre foreign body we have encountered was that of a 14-year-old youth, who lost his right hand when the bomb he was throwing exploded prematurely. He was found to have a small wound in his neck, and when this was explored, the missile proved to be the terminal phalanx of his missing thumb. Tattooing of the skin of exposed parts from propelled dust is commonly seen, but this is of little immediate importance.

The majority of the wounds have been peripheral, the legs accounting for over a third of all injuries treated. While the head has been the site of injury in about a third of all patients, the majority of the wounds were of a superficial nature; some,

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however, require the skills of a maxillofacial team. Isolated eye injuries are unusual, but they occur commonly in association with other facial injuries and range from simple corneal abrasions to serious penetrating wounds for which enucleation is the only possible treatment. In contrast to our experience with bullet wounds of the head, penetrating skull injuries and brain damage are uncommon after explosions. Special mention should be made of damage to the middle and inner ear resulting from shock waves spreading concentrically from the blast centre; this subject will be dealt with in a subsequent article. Less than 10% of all casualties have injuries to the chest or abdomen, and the majority of these wounds are superficial. Some of the more serious injuries never reach hospital.

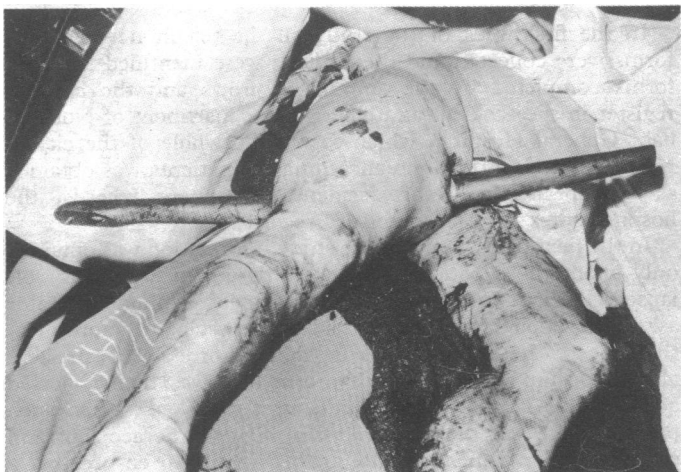


FIG.—Woman's thigh transfixed by leg of a table.

Burns have been surprisingly uncommon, accounting for only about 3% of admissions. They are of two types. The flash burn is due to radiant heat and affects only persons close to the centre of the explosion. Clothing protects against this type of burn, and thus the hands and face are the areas usually affected. In contrast, the flame burn arises chiefly from burning clothing or when the building catches fire, and thus all areas of the body may be affected. Our worst experience of burns was that of a young couple who each sustained fatal burns, involving 80-90% of the body surface, when the letter bombs which they were making in their "factory" blew up.

Blast injuries of the lung are a special problem that we have occasionally encountered. They take the form of alveolar haemorrhage, which in severe cases give rise to obstruction of the respiratory passages with blood and froth. A subsequent article will deal in depth with this problem.

Management

It may at first seem that there is little difference between the management of injuries produced by high-speed motor accidents and those produced by a bomb explosion. But this is not so. The main difference is the gross tissue damage and wound contamination, which makes gas gangrene a major hazard, particularly with wounds of the thigh or buttocks. It is therefore essential that debridement should be thorough, all dead tissue

being most carefully excised. On no account should there be any attempt at primary suture of a bomb wound in which muscle has been involved. We have more than once seen gas gangrene result from such injudicious wound closure. After debridement the wounds are dressed and splinted, where indicated, with plaster-of-Paris. Wounds are left undisturbed until the fifth or sixth day unless pain, pyrexia, odour, or soaking of the dressings dictates otherwise. If, on inspection, the wound appears clean, delayed primary suture or grafting may be carried out at the five-day inspection. This often has to be further delayed when the wound looks unhealthy or shows any signs of sepsis. All the casualties are given tetanus toxoid and a broad-spectrum antibiotic. On this regimen, we have not seen a single case of tetanus after these injuries, even though tetanus from agricultural accidents still occurs occasionally in this Province.

In our experience of public house bomb incidents, similar to those seen recently in England, there have been many traumatic amputations. After trimming of the skin flaps, primary closure should only rarely be attempted, when all divided muscle is seen to be absolutely healthy and uncontaminated. It is far safer to leave the flaps approximated with a few loose sutures and perform delayed primary suture later.

Less than 10% of casualties admitted have wounds of the trunk, and only 10% of these have penetration of the pleura or peritoneum. However, even apparently superficial wounds in the area of the trunk should be assessed most carefully, as the underlying wound may be serious. We know, for instance, of one patient with a tiny puncture wound in the left flank; this was not explored, and he died a few days later with biliary peritonitis due to puncture of the common bile duct. This merely underlines the fact that all penetrating wounds of the chest or abdomen must be explored.

Rehabilitation

Physical and psychological rehabilitation must begin immediately. The need for physiotherapy to the uninvolved muscle groups and joints is obvious, but what is not so apparent is the need for mental preparation of the patient for the eventual transfer to the outside world. For example, we have seen the bilateral amputee remain calm, co-operative, and stoical in the protective hospital environment, only to break down on discharge from hospital. Though the incidence of psychiatric illness in general, and depression in particular, has been reduced in Belfast during the "Troubles", the individual involved in an explosion suffers a tremendous psychological upset, and often takes years to regain confidence.

Conclusion

Terrorist bombs may produce large numbers of casualties, placing a great strain on the resources of even a large hospital. The pattern of casualties varies greatly from one incident to another, so that considerable adjustment to a predesigned disaster plan may be required. It is a great advantage to have some vacant space within each major hospital in which numerous casualties can be accommodated.

The clinical management of the individual casualty is dominated by the need for massive resuscitation, for careful attention to the airway, and for scrupulous debridement, with delayed closure of all wounds. The mortality of these injuries is surprisingly low. In rehabilitation the psychological aspects of the problem should be remembered.