

Blast Injuries and Wound Ballistics: A Mini Review

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Abstract

While gunshot and explosive wounds are most commonly seen during battlefield fighting, they are no longer uncommon in civilian practise in France. The interaction of the projectile with the human body, as well as the transmission of energy from the projectile to tissues, is the foundations of wound ballistics. Ballistic wounds are treated using a number of approaches, including debridement of the extremity wound and the lack of initial closure, additional medical care, routine immobilisation, revision surgery, and secondary closure. Because injuries are directly or indirectly related to the shock wave (blast) emerging from the explosion, victims of explosions frequently present with a complex clinical picture.

Keyword: Wound ballistics • Injuries • Surgery

Introduction

Ballistic injuries are caused by simple biomechanical principles: when a missile collides with the human body, it transmits its energy to the human tissues, and this energy transfer defines the injuries. As a result, the more energy a projectile loses as it passes through tissue, the more damage it causes. A gunshot projectile can transfer its kinetic energy in three different ways, in addition to frictional energy loss during penetration: fragmentation, mushrooming, and tumbling. The IPLT and the degree of injuries are also affected by factors connected to the impact zone. By trapping the projectile before it causes any penetrating injury, ballistic protections reduce the wounding effects of missiles. These safeguards, however, are far from perfect, and their shortcomings are described further below [1,2].

The fundamentals of blast injuries

The nature of the explosive device, its packaging, the environment in which the explosion happens, and the location of the victim at the time of the explosion all influence the pressure characteristics of the shock wave generated by the explosion, as well as the sort of injuries caused. If there are no impediments, the shock wave pressure profile for an open-air explosion is characterised by a transitory phase of hyper-pressure that declines fast with distance. With distance, the chance of blast injury reduces rapidly. Because of the compounding effect of the restricting structures, explosions in urban areas or restricted places complicate and enhance the destructive power of the charge. Injuries are determined not only by the magnitude of the explosion and the shock wave, but also by the lesional mechanism at work [3]. Typically, the victim suffers several injuries.

Myths vs. facts

The bullet pushes and thrusts the tissues back along its intracorporeal course, causing a transient cavitation. Although the brief cavitation created by high-velocity missiles can be larger than 10 cm in diameter, the tissues that are pushed back and compressed are not always harmed. Because of a misunderstanding of this principle and the advent of hypotheses claiming that tissues engaged in this transient cavitation are condemned to necrosis,

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surgical debridement has resulted in absolutely unneeded mutilation. All wounds, particularly war wounds, are filthy and infection-prone. For ballistic wounds, this premise holds true as well [4]. First and foremost, despite the fact that the missile is hot, it is not sterilised and, in any case, is incapable of sterilising the wound. Finally, and most importantly, all ballistic wounds become infected secondarily, resulting in Fackler's aphorism, Treat the wound, not the weapon [5].

Blast's real consequences

While the impacts of primary blast injuries cannot be overlooked, they must be viewed in their proper context. According to reports, explosion injuries affect less than 15% of the wounded, with the majority of cases consisting of solitary eardrum puncture. Patients that suffer blast injuries are usually near to the explosion's centre, especially in open-air explosions. Furthermore, because they are also victims of multiple penetrating injuries, shock wave projection, or burns, these individuals rarely show with isolated severe primary blast injuries. The diagnosis of these injuries is usually self-evident. In open-air explosions, secondary blast injuries caused by shrapnel are the most common type of injury. The first and most important step in managing explosion victims is to triage the injured. Explosion victims are rarely isolated cases, and their injuries frequently span a wide range of severity, from minor to life-threatening. Most victims suffer superficial riddling, so their management should not take precedence over the more seriously injured [6,7].

Ballistic wounds should be treated as contaminated at all times. As a result, surgical debridement is required and should be performed in conjunction with enough irrigation on a regular basis. Debridement is based on the notion of removing all tissues that are plainly destined for necrosis and performing mechanical detergic cleaning along the projectile's passage. Nonetheless, caution should be exercised to avoid exacerbating any existing ailments. Consequently, whether dealing with a ballistic projectile or multiple riddling injuries, the edges of the penetration wounds should be debrided sparingly, surgical approaches for debridement should pass through the existing wounds, and longitudinal exploration of the extremities should follow the guidelines. Because skin and soft tissues are less well vascularized, they can be debrided more extensively. According to the standards for extremities surgery, all fascias should be opened wide. Injured muscle along the missile's trajectory should be debrided, however due to haemorrhage and edoema, it may be difficult to tell the difference between contused but live tissue and necrotic tissue. As one moves forward, hemostasis should be performed. All of the following debridement stages must be completed in conjunction with extensive tissue lavage and regular instrument changes.

Conclusion

Skin and soft tissues are less well vascularized; they can be debrided more extensively. According to the standards for extremities surgery, all fascias

should be opened wide. Injured muscle along the missile's trajectory should be debrided, however due to haemorrhage and edoema, it may be difficult to tell the difference between contused but live tissue and necrotic tissue. As one moves forward, hemostasis should be performed. All of the following debridement stages must be completed in conjunction with extensive tissue lavage and regular instrument changes. In terms of medical and surgical management, explosions are similar to gunshot wounds in that there isn't anything that is unique to them. There is no reason to treat the explosive agent any more than there is for the missile to be treated.

Disclosure of Interest

The authors declare that they have no competing interest.

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