Ballistic injuries

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Terminal ballistics (or wound ballistics) describes the interac tion between projectiles and target tissue. This interaction and subsequent transfer of energy cause injury . The kinetic energy of the bullet is related to the mass and velocity of the impacting projectile. Both the mass and velocity of military firearms may be considerably greater than those commonly seen in civilian trauma, leading to higher energies and more severe wounds. While the weapon and ammunition type may be a determinant in the potential injury caused, many other factors, including range, angle, clothing, armour and anatomical variation, will determine the actual wound pattern. Although an understand ing of ballistic science may allow a surgeon to anticipate possible injuries, each should be evaluated and managed individually . In consideration of the damage done, tissue may be described by the areas of disruption caused by the projectile and the permanent and temporary w ound cavity , which are illustrated in Figure 34.2 . T he permanent cavity is the localised area of definitive tissue injury caused by contact with the projectile. This area of cell necrosis is the result of direct contact, crushing and laceration of tissues in the path of the projectile. T he size and - trajectory of the projectile determines the cavity size. This type of cavity is the predominant wound e ff ect of pistol bullets, - which have relatively low energy . Higher energy projectiles, including military rifle and machine gun bullets, may be subject to greater degrees of deformation and tumbling as they travel through tissue. This increases the e ff ective cross- sectional area of the projectile and may lead to a larger and - less regular permanent wound cavity . In contrast, the temporary wound cavity is created by lat - eral displacement of tissue that has not been in direct contact with the bullet. The degree of damage in this area is depen - dent on the amount of energy transferred by the bullet and the material properties of the tissue itself. Individual tissues have - an elastic strength that resists the stretching caused by a pro - - jectile. As the energy incr eases, the tissue is no longer able to rebound and, above certain thresholds, contusion, laceration and permanent damage may occur. Skin, muscle, lung and bowel wall tissues have good elastic strength and may r ebound well following stretch, with minimal damage within the tem - - porary wound cavity . In contrast, liver, brain and spleen have poor elasticity and are more likely to shatter when stretched. The incompressibility of fluids within hollow organs (bowel and bladder) means that they ar e vulnerable to stretch despite favourable properties of the tissue wall itself. - Summary box 34.2 Ballistics /uni25CF - /uni25CF /uni25CF

A B Figure 34.2 Diagram showing the permanent wound cavity (A) and the temporary wound cavity (B). This relatively large temporary cavity is more typical of a higher energy weapon. Internal ballistics – characterise the projectile within the weapon during /f_i ring External ballistics – characterise the projectile in free /f_l ight Terminal ballistics – characterise the projectile/tissue interaction

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Revision #1
Created 2025-12-31 15:14:05 UTC by Omar Ayman
Updated 2025-12-31 15:14:05 UTC by Omar Ayman