C26 Fatal Injuries From Penetration by Weapons — Thrown or Stabbed?

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The goals of this presentation are to consider the defense that is commonly used in fatal cases of penetration by implements such as knives, screwdrivers, or scissors, that the implement was thrown to create the injury, as opposed to stabbed, and to discuss the distances over which the weapon is claimed to have been thrown, which is typically several meters. The questions that will be addressed are: (1) is it possible for implements such as knives, screwdrivers, or scissors to penetrate human tissues to sufficient depth to create fatal injuries by a throw?; (2) how much energy is required for penetration of skin and the underlying tissues, and at what speed would the implement have to be thrown?; and, (3) can the implements be thrown with sufficient accuracy to make penetration by the blades likely or does the yaw, pitch, and tumble prevent the implements from penetrating?

This presentation will impact the forensic science community, particularly forensic pathologists but also forensic scientists and engineers who are asked to provide expert opinions on the likelihood of a stabbing versus throwing in fatal cases, by discussing whether implements used in causing death from penetrative injuries can be thrown to give the same injuries as a stab wound.

Kitchen knives, screwdrivers, and scissors are not designed for throwing. When they are thrown, there tends to be considerable yaw, pitch, roll, and tumble during flight.

It is difficult to throw an implement with precision such that it orientates itself with the point foremost on impact. Even over short distances, the rotation from throwing the implement will often lead to it impacting handle first.

Whether or not an implement would have sufficient energy to penetrate the body can be estimated by calculating the kinetic energy.

The kinetic energy of an implement can be calculated from the formula K.E. = $0.5mv^2$ where m is the mass of the knife and v is the throwing velocity. The mass of the implement and maximum throwing velocity then need to be known for someone throwing that implement.

O'Callaghan *et al.* have previously considered the throwing of a glass shard and found that the maximum throwing velocity that could be obtained was $20ms^{-1}$.[1] They measured the energy required to penetrate skin and found for a sharp glass shard an energy of 7.7 J was required to allow skin penetration.

Figure 1 shows calculation of the relationship between throwing velocity and impact energy for a typical weapon. The threshold throwing velocity to allow skin impact is arrowed.

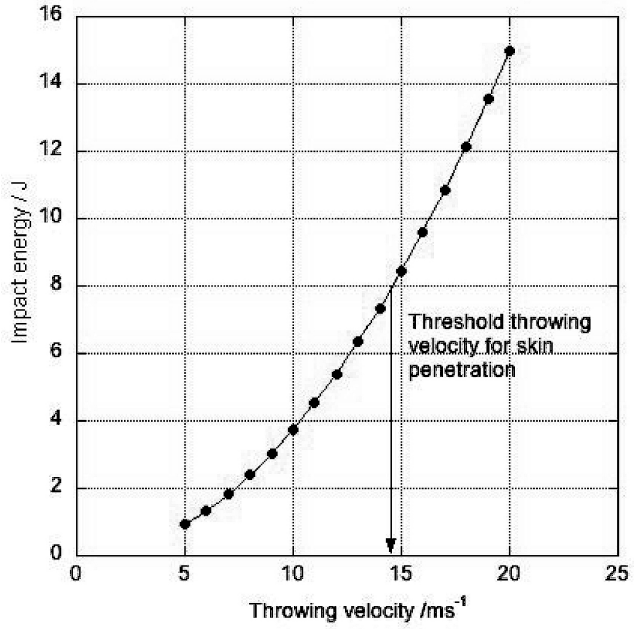

Figure 1: Impact energy versus throwing velocity for a 75g weapon. Assuming a sharp tip and that skin penetration occurs at 7.7 J, the threshold throwing velocity for skin penetration is $14.5ms^{-1}$.

This presentation will show the range of throwing velocities that can be achieved by throwers with knives, screwdrivers, and scissors and the ability of thrown knives to penetrate skin. The energy for skin penetration will be measured for the various implements and compared to their sharpness. The presentation will illustrate the different

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throwing characteristics of the different implements and discuss the implications of the results in interpreting throwing versus stabbing scenarios.

Reference:

1. P.T. O'Callaghan, M.D. Jones, D.S. James, S. Leadbeatter, S.L. Evans, L.D.M. Nokes, A biomechanical reconstruction of a wound caused by a glass shard—a case report, Forensic Science International 117 (2001) 221-231

Stabbing, Throwing, Sharpness

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