## D41 Behind Armor Blunt Trauma Injuries in Law Enforcement From Ballistic Impact: Body Armor Assessment

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During this presentation, attendees will gain knowledge of the different types of injuries caused by ballistic impacts to the armor-protected regions, the injury mechanics, and the effects to end users. The types of injuries that occurred, the extent of the injury, and the lasting effects will be discussed for key cases.

The data that is yielded by this research project will help the forensic science community by better protecting the law enforcement officers that protect the citizens. This research will provide valuable insights that will ultimately drive new standards of officer care, provide recommendation for changes to the current certification standard, allow for validation of current research models and improve the collection and analysis of vests that have protected officers from a ballistic impact.

Over 3,000 police officers have been saved due to utilization of a bullet proof vest.[1] The International Association of Chiefs of Police (IACP) and DuPont have joined together to capture these cases in one database. The IACP/DuPont Survivors' Club database provides a means for examining this group of case studies using specific criterion such as threat and region of impact. The goal of the current research effort is to assess the types of injuries caused by ballistic impacts to the armor- protected regions as well as the potential mechanisms of injury.

Prior to commencement of the study, approval was garnered from the Wayne State University Human Investigation Committee. Permission to access this database was granted for this project by IACP, DuPont, and "third parties for the purpose and enhancement of law enforcement officer safety." The information regarding each injury was acquired from three different sources. First, consenting members of the Survivors' Club were asked to complete a questionnaire via a telephone interview, which was adapted from the current version of the Survivors' Club application. Second, the participants were asked to release medical records related to the injury including records from both the initial emergency room visit and follow-up medical treatment. Finally, the police records for each of the participants' cases were requested to enhance the information obtained through the phone interview and medical records.

A total of 453 letters were mailed to those identified in the IACP/DuPont Survivors' Club database fitting the criteria. A second letter was sent in December 2006 to remind officers about the study. A total of 56 officers agreed to participate. Medical records were procured from 36 of the survivors and follow up interviews were conducted with 29 of the survivors. Of the 56 cases, 29 of them exhibited remarkable examples of the behind armor blunt trauma (BABT). BABT occurs when a high velocity low mass projectile, such as a bullet, strikes the body armor and causes an injury. Minor injuries that coincide with a BABT include superficial or severe bruising, abrasions, and some superficial lacerations. According to the Abbreviated Injury Scale (AIS) 2005, 10 of the cases were considered AIS 410402.1, which indicates that these cases were mild contusions to the thorax region. Three of the cases were considered a combination of both AIS 410402.1 and AIS 410602.1 with both mild contusion and laceration to the thorax region. Two cases were considered AIS 510402.1 denoting mild abdominal contusions.

A few notable cases present with more serious injuries from BABT. The first case involved severe bruising with approximately one inch in diameter of skin necrosis in the thorax region. This is uncommon and more research is needed to determine the exact cause of the injury. A second case involved an injury that is becoming more common due to the increase flexibility of newly developed armor. This injury has been referred to as a backface signature injury or "penciling" and involved a one inch open wound in the abdomen. Two of the cases involved rib fractures due to the blunt force trauma. The final notable case involved a bullet hitting within 1/16 of an inch from the edge of the vest and penetrating the vest. These select cases will be presented in detail.

The data that is yielded by this research project will help humanity by better protecting the law enforcement officers that protect the citizens. This research will provide valuable insights that will ultimately drive new standards of officer care, provide recommendation for changes to the current certification standard, allow for validation of current research models and improve the collection and analysis of vests that have protected officers from a ballistic impact.

Reference:

[1] *IACP/DuPont Kevlar Survivors' Club* 2007, International Association of Chief of Police and DuPont. http://www2.dupont.com/Kevlar/en_US/uses_apps/law_enforcement/survivors_club.html.

**Behind Armor, Backface Signature, Wound Ballistics**

 ** Presenting Author*