



US DEPARTMENT OF DEFENSE

# BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

## Protective Equipment

### Effectiveness of the Combat PPS in the Prevention of Genital and Urinary Tract Injuries: An Observational Study

Historically, the incidence of genital and urinary tract injuries in major conflicts has been approximately 5 percent. In a report by the US Army Medical Department, the rate of genital and urinary tract injuries increased to 12.7 percent in 2010 from 7.2 percent in 2009. The majority of these devastating lower extremity and pelvic injuries, including external genital injuries, stem from a blast when Service Members encounter IEDs on foot patrols. In response to the increasing incidence of genital injuries, and to mitigate the risk of blast injury to the external genitalia, the United States and United Kingdom issued protective overgarments and undergarments to troops deployed in support of OEF. These two systems combined constitute the PPS.

The NHRC collaborated on this research in an attempt to evaluate if PPS use is associated with a reduction of genital and urinary tract injuries in subjects exposed to dismantled IED blasts. Two groups were identified for comparison: those who were confirmed to have worn the PPS at time of injury ( $n = 58$ ) and a historical control group who were confirmed as not wearing the PPS (non-PPS;  $n = 61$ ). Patients with any level of lower extremity amputation from a dismantled IED blast mechanism were included. Injury information for each of the patients was identified using the NHRC's Expeditionary Medical Encounter Database (EMED), with the primary outcome measure as presence of a genital and urinary tract injury on admission. The study found that the mean injury severity score (ISS) was higher in the PPS versus the non-PPS group (26.1 versus 19.3,  $p = 0.0012$ ). Overall, 31 percent of the patients in the PPS group sustained at least one genital and urinary tract injury versus 62.3 percent in the non-PPS group. The odds ratio of sustaining a genital and urinary tract injury in the PPS group as compared with the non-PPS group was 0.28 (31 percent versus 62.3 percent; 95 percent confidence interval, 0.06-0.12;  $p = 0.001$ ). The most frequent injuries were open scrotal/testes wounds, followed by open penis and open bladder/urethra injuries. The use of the PPS is associated with a decreased odds ratio of genital and urinary tract injury. Despite a 31 percent absolute reduction, future work should focus on improved efficiency. In this observational study, the use of body armor that specifically addresses the perineal and groin area is associated with a decrease in the odds of genital and urinary tract injury. This conclusion, along with the body of literature from other studies that have shown inverse relationships between the use of body armor and penetrating injuries to protected body regions, provides strong support to the use of protective armor to mitigate injury. Injury mitigation and prevention is a primary objective for improving medical outcomes for the Service Member.



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