F10 Arc Burn: Not a Cause of Necrosis From Stun Gun Shock Wounds

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After attending this presentation, attendees will better understand the wounds caused by electrical shock at the points of percutaneous connection of dart-firing stun guns. This presentation discusses whether wound examination can be used as an investigative tool for determining whether a stun gun shock was discharged for an unexpectedly long duration and is, therefore, suspect of an excessive use of force.

This presentation will impact the forensic science community by finding that thromboses sufficient to cause necrosis is highly unlikely to present at the percutaneous connection of a stun gun shock of any realistic duration, even upon microscopic histopathological examination of biopsied and sectioned areas of the wound. Unlike arc connecting shocks, the wounds from percutaneously connected shocks are of no value when determining whether a stun gun shock was unexpectedly protracted and requires justifying explanation.

A single shock of 5s is the maximum duration of stun gun shock needed to subdue, even those who are violent.[1]

After this presentation, attendees will also appreciate that dart-firing stun gun shocks connect to their victim at two points, the points of electrical current entry and exit. At either point, the shock(s) may arc-connect to the victim at the skin surface or the dart connectors may imbed percutaneously. These shocks may cause enduring burn wounds. Surface wounds caused by arc connecting shocks of a duration ≥6s present with increasing amounts of visible necrosis, indicating the duration of the extended shock. At percutaneous connections, the shocks do not cause enduring surface burns but, instead, a simple puncture wound.

Whether arc burning contributes to the necrosis caused by extended stun gun shocks was experimentally investigated using a porcine animal model. The pig carcass was obtained from a local butcher. This study's premise is that thrombotic occlusion of blood vessels cannot cause coagulative necrosis of dead tissue; however, burn injury can still be observed after electrical arc contact. Shocks causing major electrical injury can also cause coagulation necrosis by one or both of two mechanisms. The shocks cause thrombi. Coagulation necrosis is an often encountered sequela. In cases of major electrical injury, arc connecting shocks cause arc burning of the flesh. A zone of coagulation is present at the central and most intense area of serious burns and this is the same location where the necrosis presents with burns from arc connected stun gun shocks.

The tissue above the pig's hooves was shocked with series of shocks of 3-, 6-, 9-, and 12-second durations at 7.18W from the circuitry of a formerly manufactured dart-firing stun gun, which is no longer manufactured. This circuit was selected because it operates at approximately twice the power of the dart-firing stun guns currently marketed and has much greater capacity to cause burns. Shocks of each duration were repeated three times to different areas of skin, once on each of three of the pig's feet. Gross examinations of the skin for wound development were conducted immediately after the shock with follow-up examinations at 30s, 1m, 5m, 30m, 1h, and 2h post shock. The skin showed no evidence of necrosis. Then three different areas of the skin were each shocked three times, once on each of the same three pig's feet with 30-second discharges from the stun gun circuit. The skin still had no grossly visible injury.

Experimental findings exclude arc burning as a cause of the necrosis. The findings also reveal that once a dart connector has imbedded percutaneously and breached the body's skin integument, current passes insufficiently in parallel circuit through the skin to otherwise cause coagulative necrosis of its tissue. This should remain the case, even when the wounding shock is extraordinarily protracted.

Reference(s):

1. Kornblum R.N., Reddy S.K. Effects of the Taser in Fatalities Involving Police Confrontation. *J Forensic Sci* 1991: 36(2):434-447.

Dart-Firing Stun Gun, Electroshock Weapon Wounds, Burn Wounds

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