

Comparison of Commercial Tourniquets in a Pediatric Trauma Patient Model

James Vretis, Center for Tactical Medicine Category of Submission: Pediatric

Background:

Young children and adolescents are frequently injured in peacetime and wartime. Reviews of trauma registries at U.S. military medical facilities during the Iraq and Afghanistan conflicts show as the age of a child decreases the injury severity and mortality increases. Tourniquet use for control of extremity hemorrhage in adult trauma patients is associated with increased survival with only minimal tourniquet associated morbidity. Use of commercial tourniquets on pediatric patients treated at US military facilities shows survival benefits similar to those seen in the adult population. Hypothesis: We hypothesized that there [would] be differences in the efficacy of commercial tourniquets designed for adults when applied to pediatric patients of different ages. Methods: The institutional Ethics Review Board approved the study. The study was a prospective and non-blinded test of nine commercial tourniquets on a pediatric arm hemorrhage test model using six sized mannequins to simulate pediatric arms. The Stretch Wrap And Tuck (SWAT), TacMed K9 (TMK9), and Rapid Application Tourniquet System (RATS) tourniquets apply compressive forces by the elastic recoil action of the tourniquet strap. The Combat Application Tourniquet (CAT), Sam XT (SAMXT), Tactical Mechanical Tourniquet (TMT), and the SOF Tactical Tourniquet – Wide (SOFTTW) use a windlass to increase circumferential compression by decreasing strap length. The Child Ratcheting Medical Tourniquet (CRMT) uses a ratchet and ladder mechanism for circumferential compression. The Mechanical Advantage Tourniquet (MAT) has a turnkey apparatus mounted on a fixed length C-shaped housing that pulls a portion of the retaining strap into the housing as a mechanism to increase circumferential pressure

Results:

The SWAT, TMK9 and RATS were successful stopping the flow of water on all sized mannequins. The CRMT was the only mechanical advantage tourniquet that was successful in stopping fluid flow on all mannequin sizes. The TMT and SOFTTW started failing on mannequins with 6.35 cm diameters. The CAT, SAMXT, TMT, and SOFTTW all failed on the 5.08 cm diameter mannequin. The MAT failed on the 7.62 and smaller diameter mannequin.

Conclusions:

We have shown that many commercially available tourniquets do not stop fluid flow in our pediatric arm hemorrhage test model.

Citation:

Abstracts for the 2018 NAEMSP Scientific Assembly, Prehospital Emergency Care, 22:1, 123.
<https://doi.org/10.1080/10903127.2017.1377791>