Operational Impact of Long-Term Storage on CAT Tourniquet Performance in Combat Settings

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Introduction

Uncontrolled hemorrhage remains the leading cause of preventable death on the battlefield. The Combat Application Tourniquet (CAT) is a cornerstone of Tactical Combat Casualty Care (TCCC) for rapid hemorrhage control. Despite widespread use, no manufacturer-defined shelf life exists. This study evaluates the operational performance of CAT tourniquets after prolonged storage under variable environmental conditions relevant to deployed military settings..

Methods

A comparative analysis was conducted between CAT tourniquets stored for 1 year (control) and 10 years (wrapped and unwrapped) in IDF operational warehouses. Devices underwent visual inspection, functional assessment using the HapMed simulator, and mechanical testing. Primary outcomes included occlusion pressure and number of turns required to achieve effective arterial occlusion (≥200 mmHg), reflecting real-world application efficiency.

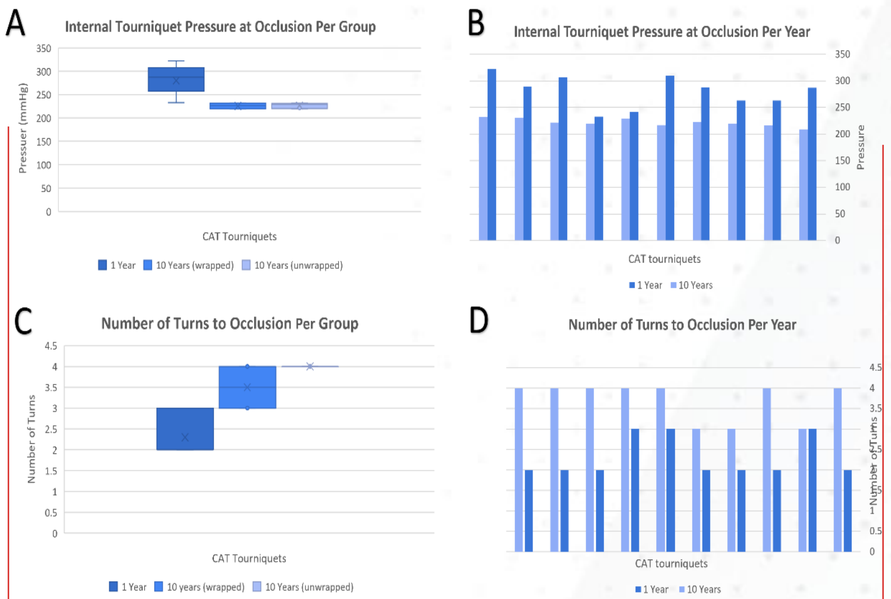

Figure 1. Functional pressure testing using HapMed Tourniquet Trainer (A) Internal tourniquet pressure at occlusion per group; (B) Internal tourniquet pressure at occlusion per tourniquet year; (C) Number of turns to occlusion per group; (D) Number of turns to occlusion per tourniquet year.

Results

All devices passed visual inspection. Ten-year-old CATs demonstrated significantly reduced occlusion pressures compared to controls (mean ~222 mmHg vs. 280 mmHg, $p<0.001$) and required more turns to achieve occlusion (3.7 vs. 2.3, $p<0.001$), indicating decreased application efficiency. No significant differences were observed between wrapped and unwrapped devices. Despite performance decline, all tourniquets achieved the minimum threshold for hemorrhage control. Mechanical testing showed partial material degradation with variable component resilience

Conclusion

CAT tourniquets maintain baseline hemorrhage control capability after prolonged storage but demonstrate reduced efficiency that may impact rapid application in combat scenarios. These findings have direct implications for TCCC performance, prolonged field care, and medical logistics. Extension of tourniquet shelf life should be approached cautiously and supported by routine functional validation to ensure combat readiness and optimal casualty outcomes.

Disclaimer: This study was conducted by the listed researchers. Statements and opinions published in this abstract are solely those of the individual abstract authors and not the Israel Defense Forces (IDF). This study did not receive external funding or support. All authors had access to the data utilized in this study.

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