

Measurement of hazardous pressure levels and gradients produced on human limbs by non-pneumatic tourniquets

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Pneumatic tourniquets are commonly used in surgery to safely establish a bloodless surgical field. It is estimated that at least 15,000 surgical procedures are performed each day on limbs with the benefit of pneumatic tourniquet systems. The introduction and widespread use of automatic tourniquet systems, with microcomputer control and improved pneumatic cuff designs to reduce pressure levels and pressure gradients, has greatly reduced the reported severity and number of tourniquet-related hazards and injuries. It is well established in the medical literature that the probability of tourniquet-related injuries increases as tourniquet pressure levels increase, and as the pressure gradients near the edges of tourniquet cuffs increase. Recently, new types of pneumatic and non-pneumatic tourniquets have been introduced for use in combat in Afghanistan and Iraq. This paper reports on a novel transducer developed for improved quantitative investigations of the levels of applied pressures and pressure gradients produced on human limbs by non-pneumatic tourniquet straps, and by non-pneumatic elastic bandages and elastic rolls when used as tourniquets, for comparison to benchmark data for pneumatic tourniquet cuffs commonly used in surgery at present.