Digital Tourniquet: Evaluation of a New Device

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Introduction

There are three commonly used methods to stop the blood flow from a lacerated finger: a Penrose drain, the rolled glove finger, and the Tourni-cot. A well known complication of these digital tourniquets is neurovascular damage due to excessive pressure generated beneath the tourniquet. Previous studies have demonstrated that each of these methods may exert pressure to the digit that exceeds what is generally considered to be safe; often the result of using the wrong size tourniquet or applying it too tightly. Contributing to the risk is the lack of a way to monitor the pressure to alert the user when excessive pressure is being applied. A new device claims to apply a safe and effective pressure for all adult finger sizes.

Objective

To determine the average and range of finger circumference sizes in the Emergency Department population in order to assess the safety and efficacy of the T-Ring across the range of adult finger sizes; and to compare the performance of the T-Ring to the current, commonly used finger tourniquets.

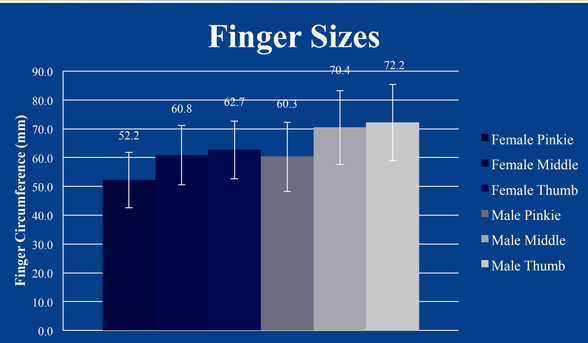
Methods

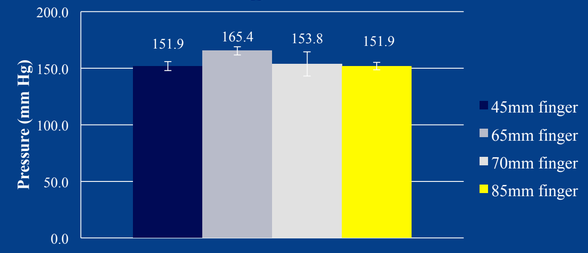
•Finger circumferences of the 1st, 3rd, and 5th digits of 200 males and 200 females in the UCI Medical Center ED were recorded.

•The mean and standard deviations were calculated and 4 finger sizes were selected as representatives of the size range of the average population

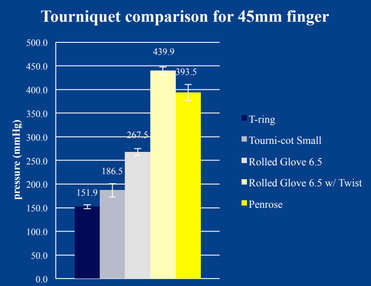
•A pressure transducer was placed on the dorsum of the hand distal to the metacarpal-phalangeal joint. The tourniquet was slid over the sensor of each finger and the pressure was measured through a computer. A pulse oximeter was used to monitor blood flow to the finger to determine the ability of the tourniquet to stop blood flow into the digit.

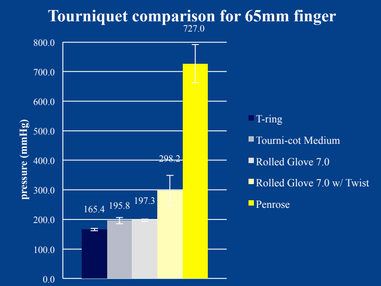
Results





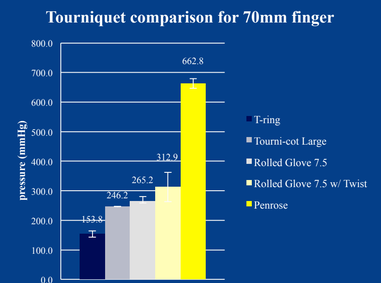
Pressure Measurements of Various Tourniquet Devices Covering Adult Size Range

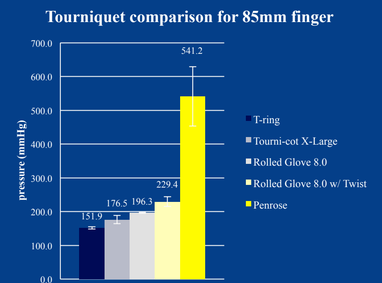




Results (cont.)

Pressure Measurements of Various Tourniquet Devices Covering Adult Size Range





Conclusions

We found that the T-Ring successfully prevented blood flow across the entire range of adult finger sizes, while consistently applying less pressure than all other digital tourniquet devices. Additionally, we noted that the T-Ring applied essentially the same safe and effective pressure (range 152 –165mm Hg) to the digit regardless of its size, from the smallest finger (43 mm) to the largest thumb (85 mm). Other methods applied a much wider range of pressure readings, several readings easily exceeding what is considered to be safe. A consistently safe pressure has never before been demonstrated by a digital tourniquet; the use of the T-Ring will eliminate the excessive pressures that have been associated with all previously used methods and prevent unnecessary injury to the underlying neurovascular structures.

Acknowledgements

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