

What is the Ideal Way to Wrap an Ace Bandage? The Relationship between Stretch and Pressure for the ACE Bandage Dressing

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Andrew Yang, MD; Karan Dua, MD; Erika Kuehn, MD; Bhaveen H. Kapadia, MD; Dipal Chatterjee, MD;
William P. Urban, MD

Department of Orthopaedic Surgery and Rehabilitation Medicine, State University of New York (SUNY), Downstate Medical Center, Brooklyn, NY, USA

INTRODUCTION

- The all-cotton elastic (ACE) bandage has been an extremely common compression dressing for nearly 100 years since its invention by Oscar O.R. Schwidetzky.
- There are many reported problems secondary to the tightness of ACE bandages that have led to compartment syndromes, compression injuries, skin abrasions/necrosis, pressure ulcers, and complex regional pain syndrome.
- Changes in the level of stretch and overlap can lead the bandage to be applied in a safe, low-pressure manner or an unsafe wrap at the level of tourniquet.

Study Goals

- This study sought to determine the relationship between stretch and pressure under the bandage to identify the ideal amount of stretch with which to apply the dressing.

METHODS

- Healthy individuals without hand pathology were recruited. Patient demographics were collected.
- ACE bandages were marked with 2cm stripes along one edge of the stretch for each application of the bandage.
- The pressure measurements were then taken using a pressure transducer by incorporating a 50cc empty normal saline bag into the dressing at the level of the wrist.
- The dressing was then wrapped over the normal saline bag with 50% overlap at 0%, 10%, 25%, and 50% levels of stretch. The stretch was verified by measuring the increase in length of the 2cm stripe at each marking.
- A new ACE bandage was used for each hand. Pressure measurements were then taken at increasing pressures by increasing the swelling and inflating the normal saline bag at set intervals.

RESULTS

- Fifteen patients (n=30 hands; mean age: 35.9 years; 9M:6F) were recruited for this study. Two subjects were left hand dominant (13.3%).
- Intra-dressing pressures were found to increase linearly, corresponding to the increase in volume of simulated swelling. Also, intra-dressing pressures were found to increase proportionately with increasing amounts of stretch (**Figure 1**).
- At 50% stretch, an intra-dressing pressure of 60.11 mmHg (range: 7.51-78.28 mmHg) was observed.
- At 25% stretch, pressure reached a maximum of 42.52 mmHg (range: 3.77-74.63 mmHg).
- Even at only 10% stretch, intra-dressing pressure of 30.57 mmHg (range: 0-52.81 mmHg) was measured.
- Maximal pressure with 0% stretched was 18.75 mmHg (range: 0-38.20 mmHg).

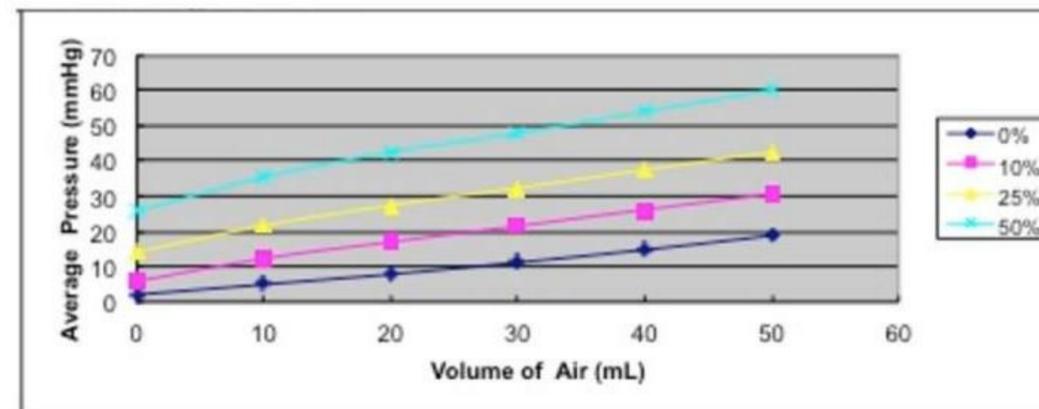


Figure 1. Average cast pressure for each incremental level of stretch as pressure in the dressing is increased.

CONCLUSIONS

- ACE bandages are commonly used dressings; however, most surgeons know from clinical experience that wrapping an ace bandage too tightly can have severe consequences.
- Studies have shown that the pressure needed to occlude the arteriolar capillaries is between 30-60 mmHg, and the pressure needed to occlude skin microcirculation causing skin necrosis is 60-75 mmHg.
- The results of the study demonstrate that to keep the ACE dressing within a safe zone, the stretch of the ACE bandage should be between 0-10%.
- We confirmed that pressure increases with increased swelling and that pressure increases with increased stretch.

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