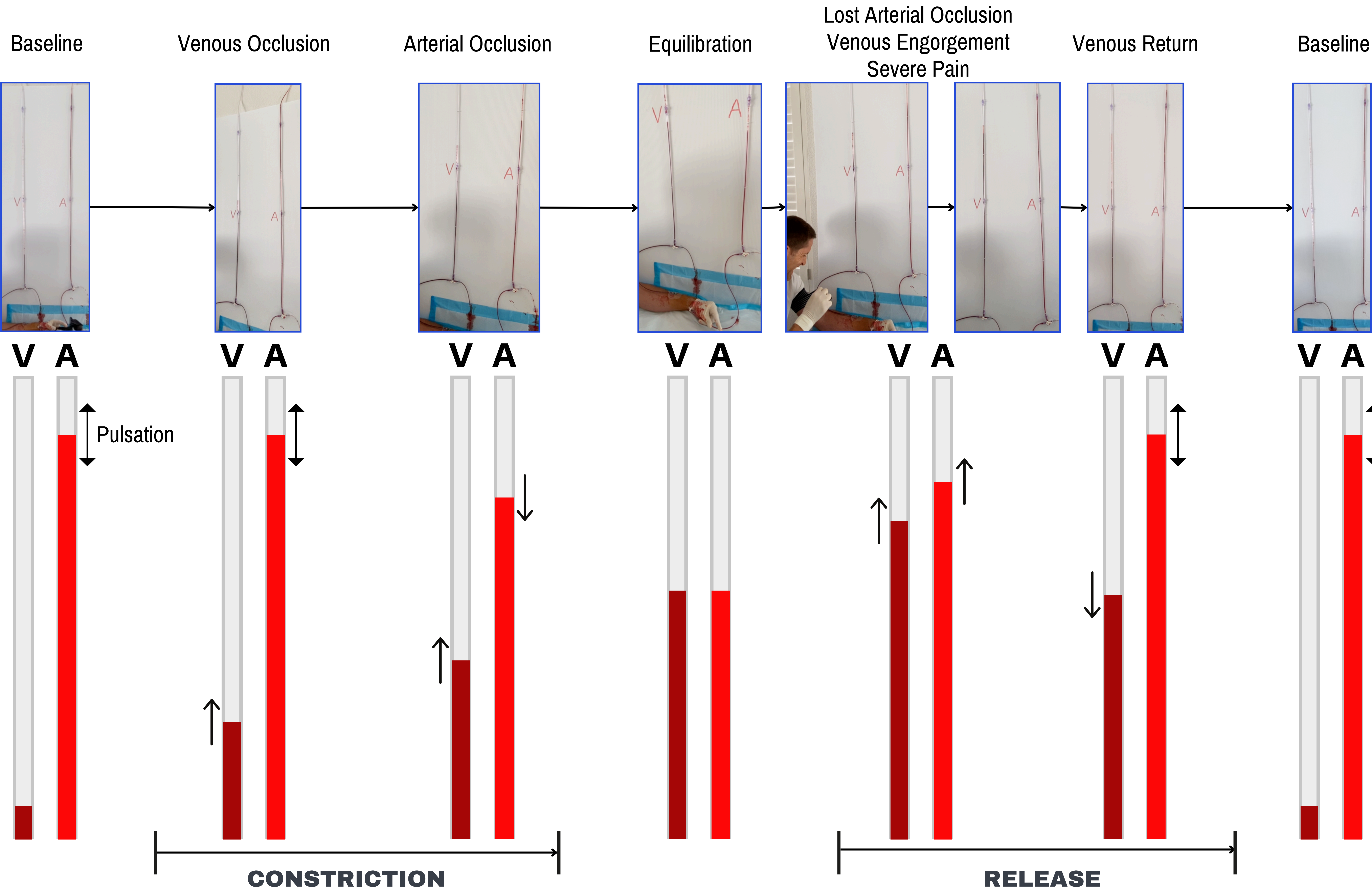


Lost Arterial Occlusion Following Tourniquet Application Causes Excess Bleeding and Pain

By Sam Slishman, MD - September 2024



INTRODUCTION

Tourniquets must occlude arterial flow within limbs to be effective. Lost arterial occlusion is common even in trained hands¹ in part because pressures drop within minutes of tourniquet application.² But is falling a little bit short of arterial occlusion still somewhat helpful? Is there a grey zone? Is lost occlusion all that bad?

To better understand the consequences of lost occlusion, arterial and venous pressures were visualized using actual blood columns during gradual limb circumferential constriction followed by release.

OBJECTIVE

Visualize arterial vs. venous pressure changes associated with limb constriction and release.

METHODS

An arterial line was inserted into the author's left radial artery and connected to clear vertical tubing. In the same limb an IV was inserted and connected to clear vertical tubing oriented parallel to the arterial column to allow pressure and color comparison. 0.5mg of heparin was added to each column. Both were visualized during the process of limb constriction and release using an elastic wrap.

RESULTS

Initial arterial pulsation was easily visualized in the arterial fluid column. Initial venous pressure was virtually nil. With gradual constriction, venous pressure increased with no significant change to arterial pressure. Once arterial occlusion was reached, pulsation in the arterial column was extinguished and the meniscus descended as pressure in the venous column ascended. Eventually both columns equilibrated.

With gradual release of constriction, pulsations in the arterial column were immediately visible. Both columns climbed together rapidly, causing an unexpected level of pain. Eventually, both columns returned to their starting pressures.

CONCLUSIONS

Tourniquets that fail to reach arterial occlusion increase blood loss and cause excess pain by way of venous engorgement, which is likely under appreciated. Therefore, for patients with tourniquets applied who complain of extreme pain, consider the possibility of lost arterial occlusion. Recheck pulses and consider conversion to a pressure dressing whenever possible.

REFERENCES

¹"Forward assessment of 79 prehospital battlefield tourniquets used in the current war" J Spec Oper Med 2012 Winter;12(4):33-38. David R King, Gwendolyn M van der Wilden, John F Kragh Jr, Lorne H Blackbourne

²"Significant Pressure Loss Occurs Under Tourniquets Within Minutes of Application" J Spec Oper Med. 2016 Winter;16(4):15-26. Mary R P Rometti, Piper L Wall, Charisse M Busing, Yvonne Gildemaster, James W Hopkins, Sheryl M Sahr

20 minute
experiment video

