



# Use of Digital Arterial Pulse Volume Recordings (PVR) to diagnose A Rare Post-Operative Complication of Elective Digital Surgery: Venous Congestion Mimicking Gangrenous Changes



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## Purpose

The development of gangrene after an elective digital surgery is a rare complication that ultimately results in an amputation. The purpose of this case study is to demonstrate that venous congestion can mimic gangrenous changes in a post-operative toe.

## Literature Review

### Venous Congestion

- Venous congestion can occur acutely after surgery.<sup>1</sup>
- Irregularities in coagulation, vessel structure, intravascular pressures, and other anatomic changes can obstruct outflow and lead to venous congestion.<sup>1</sup>
- Due to the discrepancies in intravascular pressures, trapped leukocytes in the post-capillary venules release proteolytic enzymes resulting in free radical formation and damaged tissue.<sup>1,2</sup>
- Cyanosis and tissue ischemia results from the margination of leukocytes, which acts as a diffusion barrier to oxygen and nutrients, and passive hyperemia, which results in accumulated blood in the venous system.<sup>1,2</sup>

## Pre-Operative & Post-Operative Plain Film Radiographs



Figure 1: Pre-Operative AP Plain Film



Figure 2: Post-Operative AP Plain Film

## Case History

- A 70 year old type 2 diabetic (HbA1c 5.2%) male, with a history of a right #4 digital amputation and a left #4 disarticulating amputation at the level of the PIPJ, presented to the podiatry clinic for left foot pain. The patient elected to undergo surgical correction of his bunion and revisional surgery for his left hammer toes (Figure 1).
- The patient underwent a left Austin bunionectomy with screw fixation, left #2 and #3 revisional hammertoe arthrodesis with use of bone autograft from the ipsilateral calcaneus and staple fixation, dorsal capsulotomies of the left #2 and #3 MTP joints, a flexor tendon transfer of the #2 toe, and a left #4 digital amputation (Figure 2).
- The patient was seen in clinic on post-op day 4. Discoloration was noted to the left #3 toe. 1 week s/p surgery, the patient presented to the emergency department (ED) with erythema and darkening of the left #3 toe (Figures 3,4).
- The patient was admitted and placed on IV Vancomycin/Levofloxacin. Blood cultures were obtained (anaerobic and aerobic) on Day 1 and Day 2. No growth was noted.
- The Left #3 digit remained dark at Day 1 of the

## Early Case Photos

(PVR) or all remaining digits were ordered.



Figure 3: ED Presentation



Figure 4: ED Presentation



Figure 5: Admission Day 1

## Arterial-PVR

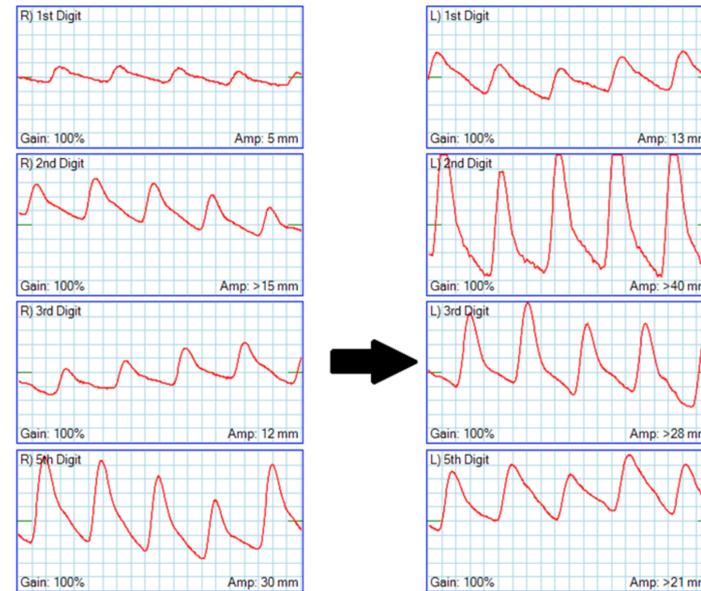


Figure 6: Digital Waveforms of the Remaining Eight Digits (Arrow = Left #3 Toe)

## Results

- The Arterial-PVR study demonstrated good waveforms at the left #3 digit (Figure 6).
- Orders were placed for the patient to keep his left foot in an elevated position atop of 2 pillows. The patient was compliant with elevating during his stay.
- At Day 3 of the admission, improvement was noted to the left #3 toe (Figure 7).
- The patient was discharged from the hospital on doxycycline 100mg PO BIDx7days and followed on an outpatient basis in the Podiatry clinic.
- 2 week s/p surgery, the patient underwent removal of necrotic epidermal tissue and nail (Figure 8). Bleeding was noted (Figure 9).
- The toe continued to visually improve with elevation and healed without any complications. At 12 months, the toe remained healed.

## Case Photos



Figure 7: Admission Day 3



Figure 8: Necrotic Epidermis Removed



Figure 9: s/p Removal of Necrotic Epidermis

## Analysis & Discussion

- Venous congestion, by the same mechanism that causes stasis ulcerations, can mimic gangrenous changes in post-operative toe.
- If venous congestion is suspected, a surgeon should not be quick to amputate. Arterial-PVR should be ordered and will demonstrate good blood flow to the digit.
- Treatment of digital venous congestion includes prolonged elevation to better enhance return.

## References

1. Beach RA, Mamelak AJ. 'New' approaches to venous congestion. *Expert Review of Dermatology*. 2010;5(6): 589-591.
2. Trent JT, Falabella A, Eaglstein WH, Kirsner RS. Venous ulcers: pathophysiology and treatment options. *Ostomy Wound Manage*. 2005;51(5): 38-54.

## Acknowledgements

This material is the result of work supported with resources and the use of facilities at the Charlie Norwood VAMC in Augusta, Georgia. The contents do not represent the views of the U.S. Department of Veterans Affairs or the United States Government.

Financial Disclosures: None