

Achieving functional outcomes for digital amputation after vasopressor-induced limb ischemia. A case report

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Case Report

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Background

INTRODUCTION. Current treatment for septic shock may include vasopressors that could result into acute limb ischemia which may lead to amputation with important functional repercussions. Therefore, the aim of this paper was to review this case of vasopressor-induced acute limb ischemia (VIALI) and offer recommendations on surgical management.

CASE REPORT. A 52-year-old man presented to the emergency department with septic shock following a transrectal ultrasound-guided prostate biopsy 48 hours earlier. He received continuous administration of norepinephrine and vasopressin over 2 days and developed irreversible necrotic changes in his upper and lower extremities. His wounds required multiple debridement. However, bilateral amputations of all fingers at the level of the proximal interphalangeal joints were required and bilateral supracondylar amputation were performed in lower extremities. The patient continued his follow-up at wound care center. Nine months after discharge patient ambulates with prostheses and lives independently, achieving a good quality of life.

DISCUSSION. In practice distal necrosis is a potentially limb-threatening condition, which may have a significant impact on normal function and independence. VIALI is a rare yet severe condition in intensive care unit patients that generally leads to amputation. The wounds should be treated with local wound care while awaiting tissue demarcation. Once complete tissue demarcation in a gangrenous limb has occurred, serial surgical debridement is performed with following flap coverage.

CONCLUSION. The best surgery is the one that will accomplish the most function, improving quality of life. Awaiting demarcation of wounds is critical for a fruitful sequel.

Keywords: limb ischemia, vasopressor, digital amputation.

Transrectal ultrasound-guided biopsy is used to find atypical prostate tissue. Though serious complications are rare, sepsis and septic shock have been reported (1). Worldwide, these conditions affect millions of patients in the intensive care unit. Current treatment for septic shock includes fluid replacement and vasopressor infusion to maintain perfusion pressure to vital organs(2). However, prolonged use of vasopressors causes significant vasospasm that may lead to irreversible ischemia to multiple areas of the body, including extremities(3). Acute limb ischemia may lead to amputation with important functional repercussions for patients(4).

The aim of this paper was to review this case of vasopressor-induced acute limb ischemia (VIALI) and offer recommendations on surgical management that provide the best functional outcomes based on current literature.

Case report

A 52-year-old man with medical history of type 2 diabetes, arterial hypertension and benign prostatic hyperplasia presented to the emergency department with septic shock following a transrectal ultrasound-guided prostate biopsy 48 hours earlier. At emergency room the blood pressure of the patient had dropped to 92/54 mm/Hg, together with fever, decreased levels of white blood cells and metabolic acidosis. The patient was diagnosed with urosepsis and admitted to the intensive care unit (ICU). His blood pressure further dropped and continuous administration of norepinephrine and vasopressin was performed over 2 days until normalization of blood pressure. Simultaneously, he developed irreversible necrotic changes in his upper and lower extremities, which were side effects of the medication (figure 1 & 2).

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Figure 1. Irreversibly necrotic bilateral hands

During hospitalization in ICU, he received antimicrobial treatment with meropenem, vancomycin and caspofungin, where he stayed for 16 days before being transferred to medical ward.

His wounds required multiple debridement (fig 3). Topical silver sulfadiazine and ketanserin were used to salvage viable tissue. Nevertheless, bilateral amputations of all fingers at the level of the proximal interphalangeal joints were required. Lower extremities were treated by the Department of Orthopedics with bilateral supracondylar amputation.

After amputations, the patient continued his follow-up at our hospital wound care center. Cryopreserved allograft of human epidermal keratinocytes (Epifast) enhanced re-epithelization. Five months after surgery the patient can feed independently, writing and grooming himself. Nine months after discharge patient ambulates with prostheses (figure 4), achieving a good quality of life.



Figure 2. Irreversibly necrotic bilateral feet



Figure 3. Upper extremity after serial debridement.

Discussion

Septic shock has a high rate of fatality, therefore excessive treatment sometimes occurs with the aim of stabilizing patients. Blood pressure support may be a necessary life-preserving aim and norepinephrine (NE) is commonly recommended as a first-line vasopressor treatment for most adult patients with acute circulatory failure(5).

As we know, norepinephrine stimulates adrenergic receptors, causing vasoconstriction and the rise of blood pressure. However, complications of its use may include extreme vasoconstriction, tissue hypoperfusion and necrosis. Depending on clinical state, norepinephrine may be administered up to 3.49 mcg/kg/min(6). Nevertheless, the optimal dose of norepinephrine is 0.2 to 1.3 mcg/kg/min to reduce the incidence of ischemic necrosis of end organs(6).

Unfortunately, in practice distal necrosis is a potentially limb-threatening condition, which may have a significant impact on normal function and independence. Consequently, current guidelines recommend that vasopressor therapy be withdrawn as early as possible to minimize risk of peripheral ischemia(7).

VIALI is a rare yet severe condition in ICU patients that generally leads to amputation. However, before surgical management of multiple extremity ischemia, patients should be medically optimized. The wounds should be treated with local wound care while

awaiting tissue demarcation. Once complete tissue demarcation in a gangrenous limb has occurred, serial surgical debridement is performed until negative cultures in wound bed are achieved. Excisional debridement removes necrotic tissue and promotes granulation tissue formation, both of which are important before consideration of soft tissue coverage(4).

In this case, ketanserin and silver sulfadiazine were applied. Topical ketanserin has demonstrated healing acceleration of diabetic chronic ulcers in some clinical trials. On the other hand, silver sulfadiazine is commonly used in burn centers for partial-thickness burns. Wound treatment with this dressing in animal models had resulted in significantly more contraction and a higher number of nerves in healing wounds, compared with other dressings(8).

Depending on the magnitude of irreversible necrosis, some patients can undergo minor amputation with following flap coverage. As it has been reported, limb salvage does not always yield significantly improved outcomes(9). In some cases, patients may experience more complications, a major quantity of surgeries, and higher healthcare costs. Therefore, limb salvage should be attempted in healthy patients who comprehend and agree the possible risk of additional surgeries or a secondary amputation if reconstruction fails.



Figure 4. Patient with functional hands, ambulating with prostheses 9 months after treatment.

The surgeon's objective should be to achieve optimal function and quality of life for the patient. Nowadays, amputations are performed with the intent of reestablishing a functional limb that is prosthetically optimal(4). The decision between limb salvage versus amputation of ischemic limbs should be individualized.

Conclusion

There are limited reports vasopressor-induced acute limb ischemia as sequelae in the setting of sepsis. In our experience, a multidisciplinary approach with careful planning leads to successful functional outcome. Awaiting demarcation of wounds is critical for a successful sequel. Also, the best surgery is the one that will accomplish the most function, and thereby improve quality of life.

Conflicts of interests

There was no conflict of interest during the study, and it was not funded by any organization.

Acknowledgements

Special recognition to the health care workers (medical staff, nurses, stretcher-bearer, cleaners, and administrative personnel) for their invaluable efforts in taking care of our patient at wound care center.

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