

Ionotropes Induced Symmetrical Peripheral Gangrene: A Case Report

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Introduction

Symmetrical peripheral gangrene is characterised by presence of distal ischemic changes in two or more extremities without the vessel obstruction.^[1] It is a rare but serious complication in patients of septic shock receiving ionotropes.^[2] which may lead to limb amputation.

Case Report

42 year female, with complains of pain abdomen and fever from past 2 days was admitted in our hospital. After initial investigations and treatment with fluids, antibiotics and other supportive treatment patient was taken up for exploratory laprotomy under GA, and was found to have a ruptured appendicular abscess and pyoperitoneum on exploration.

At the time of emergency PAC her vitals were noted to be pulse rate at 140/min and blood pressure at 100/60 mmhg.

Intraoperatively, radial artery cannulation on right hand was done before the beginning of the surgery. Despite adequate fluid resuscitation, patient's blood pressure was ranging from 70/40 mmhg to 90/50 mmhg with mean blood pressure between 50-60 mmhg. Hence the patient was taken on norad support starting 7ug/kg and titrated to keep MAP > 65mmhg. But in view of persistent hypotension patient was also started on adrenaline at 10ug/kg/min.

Postoperatively on day one, patient had persistent tachycardia with hypotension so small dose of vasopressin was added. Along with patient was under the cover of broad spectrum antibiotics.

On post operative day 2, patient had persistent tachycardia with blood pressure 110/60 mmhg noted in morning at 9AM. She was on multiple ionotropes with noradrenaline at 20ug/kg/hr, adrenaline at 10 ug/kg/hr and vasopressin at 0.05 units/min. discoloration was noted on the extremities of the patient, especially on the right hand at the site of radial artery cannulation. Radial artery cannula was taken off.

Post operative day 3, discoloration started in all 4 limbs, finger tips and hence ascending in progress with no demarcation.

Post operative day 4, blisters and blebs were noticed on both arms and gangrenous discoloration in all 4 limbs, while still on high dose of ionotropes. Fauxaparin was advised, but a common

consensus could not be made with the surgeons to put her on LMWH.

Post operative day 5, progression in gangrenous changes.

Post operative day 6, despite high dose of ionotropes, patient had cardiac arrest, and she succumbed to her sepsis.



RIGHT ARM



RIGHT HAND



LEFT ARM



LEFT HAND



LEFT FOOT



LEFT LEG

Discussion

Shock is the state of acute circulatory failure with inadequate or inappropriately distributed tissue perfusion resulting in generalised cellular hypoxia, shock does not mean hypotension although two are often used together.^[3] Also the low perfusion associated with shock on long term basis may lead to peripheral ischemia. It is well established that the digital perfusion will drop to zero in presence of persistently low perfusion pressures of 35–60 mmHg.^[4] Other etiological factors responsible for SPG include^[5]:

Table 1: Etiologies of symmetrical peripheral gangrene

Infective	Noninfective
Bacterial <ul style="list-style-type: none"> • <i>Streptococcus pneumoniae</i> • <i>Staphylococcus aureus</i> • <i>Neisseria meningitidis</i> • <i>Streptococcus pyogenes</i> • <i>Klebsiella pneumoniae</i> • <i>Salmonella paratyphi</i> • <i>Proteus vulgaris</i> • <i>Proteus mirabilis</i> • <i>Pasteurella multocida</i> • <i>Enterococcus faecalis</i> • <i>Mycobacterium tuberculosis</i> • <i>Capnocytophaga</i> 	Cardiovascular <ul style="list-style-type: none"> • Myocardial infarction • Cardiac failure • Hypovolemic shock • Hypertension • Pulmonary embolism • Supra ventricular tachycardia
Parasitic <ul style="list-style-type: none"> • <i>Plasmodium falciparum</i> 	Drugs <ul style="list-style-type: none"> • Adrenaline • Nor adrenaline • Dopamine
Viral <ul style="list-style-type: none"> • Viral gastroenteritis • <i>Rubeola</i> • <i>Varicella zoster</i> 	Malignancy <ul style="list-style-type: none"> • Hodgkin's lymphoma • Acute lymphatic leukemia • Other paraneoplastic conditions
	Connective tissue disorders <ul style="list-style-type: none"> • Systemic lupus erythematosus • Polymyalgia rheumatica • Antiphospholipid syndrome
	Miscellaneous <ul style="list-style-type: none"> • Deficiency of protein C and protein S • Dog bite • Appendicitis • Extra corporeal shock wave lithotripsy • Suprapubic prostatectomy • Cholecystectomy • Sickle cell disease • Cryoglobulinemia • Hyper osmolar coma • Hypermotremic dehydration

Aggravating factors are diabetes mellitus,^[6] renal failure,^[7] and use of vasopressors which cause spasms and difficult microcirculation.^[8]

Symmetrical peripheral gangrene is known to present with pallor or cyanosis, coldness, and pain in the extremity in the initial phases. If appropriate care is not provided at this stage, the digits may progress to become erythematous with dusky discoloration of skin followed by development of bullae or blisters that subsequently result in formation of gangrene. Pulses may be intact in the early stages and large vessels are often spared.^[9] Septic shock is a systemic derangement affecting all organ systems including coagulation and microcirculation, resulting hypoperfusion to peripheries. Adding vasopressors along with any of the above comorbidities, will cause vasopressor induced

spasms of the vessels and adding up to microcirculation problems.^[8] Norepinephrine is recommended as the first line vasopressor of choice. It stimulates β 1-adrenergic receptors and α -adrenergic receptors and causes increased contractility and an improved heart rate, in addition to vasoconstriction.^[10] The vasospastic effects of noradrenaline may be more intense in the digital vascular beds and hence it should not be surprising to find gangrene in patients on high doses.

Norepinephrin-induced skin necrosis typically occurs on the fingers and toes, while vasopressin spares them. This is related to the unique distribution of the target receptor of vasopressin, vasopressin receptor type 1 (V1 receptor), which is located in smooth muscles of the blood vessels, mainly in the territory of the splanchnic circulation, kidney, myometrium, bladder, adipocytes, hepatocytes, platelets, spleen, testis and skin circulation.^[11] It might be explained by wider areas of skin, such as thighs and calves, which have more V1 receptors and more likely to be affected by vasopressin.^[12]

Early recognition and prompt management should be the strategy in treating PSG. With preventive means having ace importance, the first line of management includes aggressive resuscitation with fluids, and the aim to discontinue vassopressors support as soon as possible. Consider the following steps for management of patient with SPG:

1. Identify and treat the cause if possible
2. Monitoring for presence or aggravation of ischemic changes on patients on ionotropes.
3. Use of sympathetic blockers, intravenous vasodilators, local injection of alpha-blockers and phosphodiesterase inhibitors.^{[9],[13]}
4. Consider using anticoagulants after considering the coagulation profile.^[14]
5. Consider, amputation if a clear line of demarcation develops. In our case there was no clear line of demarcation.

The patient that we have reported in this article had septic shock (later confirmed by blood culture reports) at presentation with persistently low blood pressures requiring high doses of vasopressors.

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