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Emergency Anaesthesiologic Management of Septic Shock Following Gangrenous Foot In Elderly patient with Multiple Comorbidities In A Low Income Setting- Case Report

Prise en charge en urgence d'une gangrène compliquée de choc septique chez un sujet âgé avec de multiples comorbidités en contexte de ressources limitées : cas clinique

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Cas clinique

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ABSTRACT

Septic shock following advanced gangrene is a severe and challenging presentation in diabetic patients in our African context. When such a patient presents with others significant co-morbidities such as heart failure, anaesthesiologic management becomes more complex and challenging especially in a low resource setting. We thus describe the successful surgical management of grade 5 Megitt-Wagner gangrene of the right foot in an elderly 70-year-old male, known hypertensive and diabetic complicated by septic shock and heart failure stage C in a low resource setting Buea, Cameroon. Trans-femoral amputation under general anaesthesia was done. The report suggests that successful management of such a patient with multiple comorbidities, in a setting of limited resources (such as lack of invasive monitoring techniqucs and high end drugs), prompts to the importance of good clinical skills and careful articulation on patient peculiarities in limited resource settings.

RESUME

Le choc septique consécutif à une gangrène du pied est une présentation grave chez les patients diabétiques dans notre contexte africain. Cependant, lorsqu'un tel patient présente d'autres comorbidités importantes telles que l'insuffisance cardiaque, la prise en charge anesthésiologique devient plus complexe et difficile, en particulier dans un contexte de pays en développement. Nous décrivons donc la pris en charge chirurgicale réussie d'une gangrène de Megitt-Wagner de grade 5 du pied droit chez un homme âgé de 70 ans, hypertendu et diabétique connu, compliquée d'un choc septique et d'une insuffisance cardiaque de stade C. Une amputation trans-fémorale sous anesthésie générale a été réalisée. Le cas suggère que la prise en charge réussit d'un tel patient avec de multiples comorbidités, dans un contexte de ressources limitées peut-être possible quand le clinicien prend en comptes les détails cliniques et a un minimum nécessaire pour la prise en charge.

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Introduction

Diabetic foot ulcer is a major public health problem in diabetic patients often leading to septic shock. Combined, septic shock following a gangrenous foot is a leading cause of morbidity and mortality in 6.3% of the population globally particularly in males [1]. In Cameroon, the prevalence goes up to 13% [2]. In our setting, patients often present late with advanced disease, probably due to the long process taken to accept surgical treatment, by amputation of the affected area or limb. As a result, many are seen with sepsis or septic shock leading to a high mortality of up to 8.9% in some amputees [3].When septic shock is associated with heart failure such as dilated cardiomyopathy with reserved left ventricular dysfunction (LVD), the risk of mortality increases and anesthesiologic management could become even more challenging [4], this, especially in a resource limited setting. We thus present a case of successful anesthesiology management of a challenging case of emergency limb amputation in advanced diabetic foot ulcer in our resource limited setting.

Case Presentation

A 70-year-old male of African descent, known hypertensive and diabetic for over 20 years, chronic smoker (30 pack years) was referred to the anesthesiology department for management of emergency trans-femoral amputation of the right lower limb due to advanced diabetic foot ulcer of the right foot complicated by septic shock (QSOFA 2/3). Patient is known with heart failure, associating left ventricular dysfunction with a systolic ejection fraction of 35% during last 3 months. He had undergone de-articulation of the right great toe 3 weeks earlier (in another local health facility) but with poor progress of the wound on this limb, a trans-tibial amputation was proposed but the patient and family didn't consent to this. They later on asked for discharge from the health facility and the patient was transferred to our hospital for better management. While in the surgical ward, management for 2days was based on wound dressing and antibiotherapy. However, with poor progress of the wound and worsening of the patient's general physical state, the patient's family finally consented to an amputation. An anesthesiologic review was then requested.

Upon physical examination, we had a 72kg black male, with an altered general state marked by altered consciousness, Glasgow coma score (GCS) 8/15, signs of severe dehydration (dry tongue, poor skin turgor) and clinical signs of anaemia, notably muco-cutaneous parlor and poor capillary refill. Venous assess was poor. There was generalized gangrene involving more than two-thirds of the right foot. We concluded that the picture corresponded to grade 5 of Megitt-Wagner system [5]. Vital signs revealed BP 110/60, radial pulse 115bpm, Oxygen saturation 90%. Intubability criteria was favorable. Work-up revealed leukocytosis 25.00 10*9 and severe anaemia with hemoglobin concentration (Hb) of 7.8g/dl. Bleeding time 3minutes, Clotting Time 2minutes. Altered renal function with urea of 70mg/dl serum creatinine of 3.1mg/dl. Serum electrolyte profile revealed hypernatremia 160mmol/l, with a fluid deficit of 5l. Random blood sugar (RBS) was 159mg/dl. Cardiac ultrasound done 3 months earlier had revealed low ejection fraction of 35% with LVD and high filling pressures of the left ventricle. We therefore concluded that our patient was a class IV patient according to the American Society of Anesthesiology Classification (ASA). Pre-operative management consisted of placing good venous assess with a size 16G central line in the region of the left subclavian vein. Initial resuscitation was with 4.5% Saline solution created by administering 500ml of 0.9%Normal saline alongside 500ml of 5 % Glucose solution in a y connection. He received blood transfusion of 1 unit of red blood cell concentrate. Rehydration was further planned for a duration of 72hours, with 2 liters above usual fluid requirements of free water daily to correct fluid deficit. After initial resuscitation of 3 hours, the patient was slightly more alert and was taken to the theater. A checklist was used to open the theater, and monitoring was done with the aid of a cardioscope. Antibiotherapy was with intravenous meropenem 2g and Metronidazole 500mg. We then proceeded with pre-oxygenation for 3minutes after which Induction of anesthesia then followed with a mixture of propofol and ketamine at a ratio 1: 3 (1mg/kg and 3mg/kg). Atropine at a dose of 0.1mg/kg was given. As analgesic we administered Fentanyl 50microgams IV in association to ketamine already administered. Airway management was with the aid of a size 4 laryngeal mask. After, induction, we had a drop in BP values to 88/40mmHg. Immediately an infusion of dobutamine was initiated at a rate of 2.5micrograms per Kg/min, helping us to achieve a mean arterial pressure range of 65-70 mmHg. Maintenance of anaesthesia was with a mixture of isoflurane 1% and oxygen. Patient was ventilated manually throughout the procedure intraoperative resuscitation was with transfusion of another unit of blood and hydration at a rate of 4ml/kg/hour of normal saline alongside blood transfusion.

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Hypoglycemia was prevented with 125 Glucose 5% infusion. Trans-femoral amputation was done, and stump closed following the fish mouth design. Estimated blood loss was 500ml, surgery lasted 1hr 20mins. The laryngeal mask was removed and the patient transported to the ICU for further management. Pain management post operatively was with Paracetamol 1000mg, nefopam 20mg and tramadol 100mg IV. The patient was maintained on cathecholamine support for blood pressure for 36 hours post-surgery, after which mean arterial pressure was spontaneously maintained at ≥ 65mmHG. Intensive antibiotherapy was with meropenem 1g/8hourly, Vancomycin 1g/12hourly and Metronidazole 500mg/8hourly IV. He received 1 unit of cross matched red blood cell transfusion post operatively within 24hours. Prevention of deep vein thrombosis was with low molecular weight heparine, enoxaparine sodium at 4000IU/day subcutaneously 24hourly. Three days post op, patient had a GCS of 15/15, HB of 10g/dl and was transferred to the surgical ward for further management.

Discussion

This case represents the complexity of managing a patient with both septic shock and heart failure. Looking at the sepsis factor, the problems the Anaesthesiologist faces firstly is with regards to the risk of hemodynamic instability which may be worsened during induction by anaesthesia agents leading to severe hypotension due to vasodilation and myocardial depression[5]. Extreme sensitivity to negative inotropic agents in patients with HF or septic shock frequently warrants that these patients receive inotropic support per op. Our patient had both conditions and as such, operative planning took into consideration the need of inotropes per op. It is advisable to optimize haemodynamics before induction and to have vasopressors readily available or ongoing to prevent the inevitable adverse effects of the agents of induction[6]. Choice of antibiotherapy is crucial for the survival of patients. Our choice of antibiotic prophylaxis depended on the bacteria ecology of diabetic ulcers in our area. A study in the central region of Cameroon, showed that more than one flora was causative of infection in a group of Cameroonian patients with diabetic foot ulcer. A mean of 2,5 bacteria species were identified per person and usually, these were G negative and G + bacteria sensitive to carbapenems, Amikacin and Vancomycin respectively [7]. This sensitivity pattern motivated our choice of antibiotherapy. It should also be noted that antifungal coverage may be considered at high-risk patient population [6] . The resuscitation bundle for initiation of antibiotics in sepsis proposes that antibiotherapy should be initiated within 3 hours, ideally, within one hour due to the fact that, each hour delay in administration of effective antimicrobial agents could increase mortality in sepsis by 7.6 %[6]. In our case, antibiotics were administered within 3hours prior to surgery as soon as the patient was evaluated.

Intra operatively, monitoring of patients should be intensive. Ideally, patients with septic shock , especially when associated with cardiac failure should have invasive arterial monitoring and a central venous catheter in addition to standard monitoring [5, 6]. The goal being to maintain mean arterial pressure (MAP) ≥ 65 mmHg, central venous pressure (CVP) 8- 12 mmHg, and central venous or mixed venous oxygen saturation ≥ 70% both pre- and per-op [6]. In our setting, these invasive forms of monitoring weren't available. However, our patient was closely monitored by frequent peripheral BP checks and continuous ECG and SpO_2 monitoring with the aid of a cardioscope. A decrease in saturation was noticed once, momentarily per-op, but this was fast corrected with the initiation of blood transfusion of RBCs concentrate in our patient.

According to the American Heart Association (AHA) classification of heart failure (4 stages, A, B, C, and D)[8], those with stage C have current or previous evidence of heart failure with known LV dysfunction and corresponds to the case of our patient. The two principal cardiovascular events to control during anaesthesia in such patients are myocardial depression and peripheral vasodilatation [4]. The majority of patients with impaired LV function are dependent on their preload to maintain ventricular filling and many patients with heart failure also rely on increased sympathetic tone to maintain tissue perfusion and cardiac output [4, 8]. Dilated cardiomyopathy manifests as a large, poorly contractile heart, with stroke volume preserved by dilatation and increased LV end-diastolic volume [4].This too describes our patients cardiac pathology.

Choice of agents of anaesthesia must take into consideration the complex pathologies of the patient; sepsis and heart failure. Ketamine and etomidate are the agents of choice due to their limited hemodynamic effects compared to other anesthetic drugs [5]. The myocardial depression induced by ketamine is counterbalanced by its stimulation in catecholamine release, which

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however may be blunted in critically ill patients [9]. Experimental evidence suggests that *in vitro*, ketamine may have an anti-inflammatory effect reducing the production and release of cytokines in endotoxemia [11]. As for the agent etomidate, a retrospective study showed that etomidate was associated with less hypotension than ketamine during intubation of septic patients in the emergency department [11]. However, there is scarce evidence for which is the superior hypnotic agent between ketamine and etomidate. Moreover, our patient was an active smoker at risk of bronchopathy. The use of ketamine was going to enhance bronchodilatation preventing bronchospasms an effect rather desired for our patient. This, associated with propofol permitted good hypnosis with less cardiovascular stimulation as well as less myocardial depression. Endotracheal intubation and mechanical ventilation was avoided in our patient due to associated risks of bronchospams, vagal stimulation, and decrease in cardiac output associated with mechanical ventilation in an already compromised heart. This associated with the estimated short duration of the intervention motivated the use of a laryngeal mask. Ventilation was manual, and sometimes spontaneous thus preventing haemodynamic compromise that could be seen with mechanical ventilation. Isoflurane was used to maintain anaesthesia as it appears to have certain cardio protective properties. Sevoflurane, unlike isoflurane and desflurane, does not induce a tachycardia, however sevoflurane is much more expensive and not often readily available. Halothane is hepatotoxic [4, 6]. Thus our choice for Isoflurane for maintenance of anaesthesia in our patient, over the other agents. Hypoglycaemia was prevented per-op by the use of 5% glucose infusion. Post op-glycaemia during one-time check was 150mg/dl.

Conclusion

Our patient was successfully managed with our limited resources. Pre-operatively, we couldn,t estimate cardiac function and relied on past results. Intra-operatively, we lacked invasive monitoring equipment, and absence of some high end drugs highlights the importance of good clinical skills. Our choice of antibiotics represented the mastery of our local ecology in patients with diabetic foot ulcers. This case also represents the complexity of care practitioners are faced with vis-a-vis patients and their family which necessitates a tactful approach. Anaesthesiologists working in resource limited settings therefore maybe faced with severe emergencies and inability to refer. A thorough medical history, and application of good clinical as well as social skills, taking into considerations the particular needs of the patient could go a long way to saving life.

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Authors Contributions:

Berinyuy Nyuydzefon Emelinda**: Writing of manuscript and editing,** Tagakou Mboula Jules**: Writing of manuscript and editing,** Verla Vincent Siysi**: Proof reading and editing**

References

1. Zhang P, Lu J, Jing Y, Tang S, Zhu D, Bi Y. Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis †. Ann Med. 2017 Mar;49(2):106–16.
2. Tchakonté B, Ndip A, Aubry P, Malvy D, Mbanya JC. The diabetic foot in Cameroon. Bull Société Pathol Exot 1990. 2005 Jul 1;98:94–8.
3. Pisoh-Tangnyin C, Farikou I, Nonga BN, Guifo ML, Mbah SN, Ngowe MN, et al. Epidemiology of extremity amputations in yaounde-cameroon. Health Sci Dis [Internet]. 2010 [cited 2023 Jul 20];11(4). Available from: https://www.hsd-fmsb.org/index.php/hsd/article/view/65
4. Magner JJ, Royston D. Heart failure. BJA Br J Anaesth. 2004 Jul 1;93(1):74–85.
5. Monteiro-Soares M, Boyko EJ, Jeffcoate W, Mills JL, Russell D, Morbach S, et al. Diabetic foot ulcer classifications: A critical review. Diabetes Metab Res Rev. 2020 Mar;36 Suppl 1:e3272.
6. Carsetti A, Vitali E, Pesaresi L, Antolini R, Casarotta E, Damiani E, et al. Anesthetic management of patients with sepsis/septic shock. Front Med [Internet]. 2023 [cited 2023 Jul 20];10. Available from: https://www.frontiersin.org/articles/10.3389/fmed.2023.1150124
7. Yuki K, Murakami N. Sepsis Pathophysiology and Anesthetic Consideration. Cardiovasc Hematol Disord Drug Targets. 2015;15(1):57–69.
8. Yefou MD, Jingi AM, Etoga MCE, Mekobe FM, Agoons BB, Ngassam E, et al. Bacterial profile of diabetic foot infections and antibiotic susceptibility in a specialized diabetes centre in Cameroon. Pan Afr Med J [Internet]. 2022 May 18 [cited 2023 Jul 20];42(52). Available from: https://www.panafrican-med-journal.com/content/article/42/52/full
9. American Heart Association. Classes and Stages of Heart Failure [Internet]. www.heart.org. [cited 2023 Jul 20]. Available from: https://www.heart.org/en/health-topics/heart-failure/what-is-heart-failure/classes-of-heart-failure

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10. Waxman K, Shoemaker WC, Lippmann M. Cardiovascular effects of anesthetic induction with ketamine. Anesth Analg. 1980 May;59(5):355–8.

11. Kawasaki C, Kawasaki T, Ogata M, Nandate K, Shigematsu A. Ketamine isomers suppress superantigen-induced proinflammatory cytokine production in human whole blood. Can J Anaesth J Can Anesth. 2001 Sep;48(8):819–23.

12. Mohr NM, Pape SG, Runde D, Kaji AH, Walls RM, Brown CA. Etomidate Use Is Associated With Less Hypotension Than Ketamine for Emergency Department Sepsis Intubations: A NEAR Cohort Study. Acad Emerg Med Off J Soc Acad Emerg Med. 2020 Nov;27(11):1140–9.

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