

CASO CLÍNICO

Use of RUSH Protocol in the Differential Diagnosis of the Patient in Shock

Utilização do Protocolo RUSH no Diagnóstico Diferencial do Doente em Choque

Joana Sousa^{1*}, Tiago Duarte¹, Gonçalo Almeida¹, Maria Pereira¹

Afiliação

¹ Anesthesiology Service, Centro Hospitalar Universitário de Lisboa Central, Lisbon, Portugal.

Keywords

Aged; Anaphylaxis; Clinical Protocols; Diagnosis, Differential; Geriatric Assessment; Shock/diagnostic imaging; Wounds and Injuries

Palavras-chave

Anafilaxia; Avaliação Geriátrica; Choque/diagnóstico por imagem; Diagnóstico Diferencial; Ferimentos e Lesões; Idoso; Protocolos Clínicos

ABSTRACT

Trauma geriatric patients have become increasingly common and assessment of these patients presents a unique challenge. In trauma, massive hemorrhage is the main cause of preventable death.

We describe a case of an unexpected severe anaphylactic shock in a fisherman victim of a shipwreck. The patient presented in the emergency room with his thigh sliced through with a broken wooden oar, hemodynamically stable. In the operating room to avoid the platelet dysfunction induced by aspirin, a platelet concentrate was administered. 30 minutes into surgery the patient became hypotensive and vasopressor support was initiated with transitory response. RUSH examination excluded hypovolemia, cardiac dysfunction or pneumothorax. A generalized erythema was found and treatment for anaphylaxis was initiated. Anaphylactic shock is rare potentially life-threatening reaction and in anesthetized patients is recognition presents a challenge. Although hemorrhage is the main cause of death in trauma we must be prepared to exclude other causes of shock.

RESUMO

A abordagem do idoso vítima de trauma, com incidência cada vez mais frequente, representa um desafio único. A hemorragia maciça é a principal causa de morte evitável no trauma.

Descrevemos o caso de um choque anafilático, num pescador de 80 anos, vítima de trauma. Uma ferida penetrante no membro inferior era visível, mas o doente encontrava-se hemodinamicamente estável. No bloco operatório, e para evitar a disfunção plaquetária, foi administrado um pool de plaquetas. Trinta minutos após o início da cirurgia o doente ficou hipotenso e a resposta ao vasopressor foi transitória. A ultrassonografia RUSH excluiu hipovolémia, disfunção

cardíaca e pneumotórax. A descoberta de um eritema generalizado permitiu orientar o tratamento. O choque anafilático constitui uma reação sistémica rara potencialmente fatal, e o seu reconhecimento nos doentes anestesiados é um desafio. Apesar de a principal causa de morte no trauma ser hemorrágica, devemos estar tecnicamente preparados para excluir outras causas de choque.

INTRODUCTION

Trauma is the leading global cause of death among young adults and massive hemorrhage is the main cause of preventable trauma death.¹

Worldwide population is aging, and trauma geriatric patients have become increasingly common. Assessment of elderly trauma patients presents a unique challenge due to comorbid health conditions, prescribed medications and frailty. The aging process diminishes the physiologic reserve of elderly trauma patients and chronic cardiac, respiratory, and metabolic diseases can impair their ability to respond to injury, becoming more vulnerable to trauma and its complications. Mortality increases 6.8% for every year beyond 65 years.^{2,3}

We present a case of an unexpected severe anaphylactic shock in a fisherman victim of a shipwreck that was brought to our ED.

CASE REPORT

Eighty years-old male, with a past medical history of ischemic cardiomyopathy, hypertension and dyslipidemia, medicated with aspirin, a beta-blocker and a statin on daily basis. He was transferred to our trauma center after his boat sank. He had one visible lesion: his right thigh sliced through with a broken wooden oar (Fig. 1).

Autor Correspondente/Corresponding Author*:

Joana Fernandes de Sousa

Morada: Rua da Beneficência nº 8. 1069-166, Lisboa, Portugal.

E-mail: joanacfsousa@gmail.com



Figure 1. Impalement of the right thigh with a broken wooden oar

During the transport to our emergency department (ED) the patient was given 4 mg intravenous (IV) of midazolam, 6 mg IV of morphine as well as 1 g IV of tranexamic acid. On arrival, he was confused and agitated, with equally reactive pupils on a rigid backboard with cervical collar. Wound dressings were bloody and blood pressure (BP) was 87/46 mmHg, HR 76 bpm and O₂ saturation 99% with FiO₂ 28%. Posterior tibial pulses were palpable bilaterally. Two peripheral 16 G venous catheters with crystalloid solution were in place. We intubated the patient to protect the airway, after a rapid sequence induction with fentanyl 2 mcg/kg, etomidate 0.2 mg/kg and rocuronium 1.2 mg/kg. Sedation with 1 mg/kg/h of propofol and 0.5 mcg/kg/h of fentanyl 1 was started. Blood analysis revealed a hemoglobin of 12.4 g/dL with a hematocrit count 36.4%, 185.000 platelets, PT 13.9 seconds, international normalized ratio (INR) 1.24, activated partial thromboplastin time (APTT) 25.8 seconds, fibrinogen 2.3 g/dL, creatinine clearance 86 mL/min/1.75, and serum electrolytes were within normal values. Tranexamic acid perfusion with 1 g was started at a rate of 6.25 mL/h. Computed tomography (CT) scan of the head, spine, thorax, abdomen and pelvis was negative for acute life threatening lesions. Radiography of the right lower limb was negative for fractures. Spinal immobilization was removed and two units of blood and one platelet concentrate were ready. The patient was transferred to the operating room (OR) where propofol infusion was interrupted and anesthesia was maintained with sevoflurane 1.5% (for a bispectral index-BIS range 50-60). Volume control regulated by pressure (VCPR) mode ventilation was used and fentanyl infusion was increased according to surgical stimulus. Before surgery, ultrasound-guided central venous line was placed in the right internal jugular vein and an arterial line in the left radial artery. To avoid the platelet dysfunction induced by aspirin, a platelet concentrate was administered at the beginning of surgery.

During the procedure, the integrity of the main blood vessels and nerves was verified and multiple myotomies were done. Thirty minutes into surgery, there was a sudden fall in BP from 100/85 mmHg to 50/30 mmHg and a decrease in HR from 80 to 60 bpm. The surgical team was flagged but no active bleeding was found. Cardiac auscultation revealed hypophonetic sounds and pulmonary auscultation diminished pulmonary sounds but ventilation was stable. Crystalloid resuscitation began using a fast flow fluid warmer infusion system, and 30 mg IV of ephedrine were administered in an attempt to raise mean arterial pressure (MAP), without success. Noradrenaline IV perfusion was started but MAP remained 30-40 mmHg despite dose escalation until 2 mcg/kg/min. A bolus of 50 mcg IV of adrenalin was administered with favorable transitory effect. RUSH (rapid ultrasound in shock) did not find any intra-abdominal or intra-thoracic hemorrhage, cardiac dysfunction or pneumothorax. During inspection of the extremities, a generalized erythema and periorcular and lip swelling were evident (Fig. 2).



Figure 2. Scattered erythema throughout the body

An anaphylactic shock was diagnosed and the platelet concentrate was considered the probable cause and suspended. After administering 750 mcg of adrenaline while maintaining noradrenaline at 2 mcg/kg/min, MAP started to improve, BP reached 100/50 mmHg, HR 120 bpm and electrocardiogram (ECG) was normal. Adrenaline 0.5 mg IM, hidrocortisone 200 mg IV, clemastine 2 mg IV and ranitidine 100 mg IV were administered. After MAP was restored, noradrenaline infusion was stopped. The immunotherapy service was notified.

The patient was transferred to the intensive care unit (ICU) intubated, sedated and hemodynamically stable. Extubation was possible 24 hours postoperatively and the patient transferred to the ward. The postoperative period was uneventful and one week later he was transferred to a tertiary hospital near home.

DISCUSSION

Shock can be defined globally as any state in which oxygen delivery to end organs is insufficient to sustain normal metabolic processes.⁴ Most of trauma patient's mortality is related to hypovolemic (hemorrhagic) shock however obstructive, cardiogenic, neurogenic, and rarely septic shock should also be considered. RUSH examination helps practitioners to diagnose the source of shock, namely cardiac dysfunction, pneumothorax, intra-abdominal hemorrhage, abdominal aortic aneurysm, hypovolemia, pulmonary embolism, and improves its proper management.^{5,6}

In this case report, although previous CT scan did not reveal life threatening lesions, rapid ultrasound in the intraoperative period was used to find out the origin of the refractory shock. Trauma patients are dynamic and the image exams are not 100% sensitive. After ruling out hypovolemic, cardiogenic and obstructive shock we considered distributive shock. Septic shock did not seem likely given the timing of the accident. The favorable response to adrenaline made us look for other signs and finding the rash was crucial. The surgical drapes delay recognition and treatment of anaphylactic shock in anesthetized patients. It is a potentially life-threatening, systemic allergic reaction with an acute onset (minutes to hours) after contact with an allergy-causing substance.⁷ Estimated incidence and prevalence is 2%. It may involve the skin, mucosal tissue, and/or respiratory and circulatory system after exposure to the allergen.^{7,8} Incidence of allergic reactions to platelet transfusions ranges from 0.09% to 21%.⁹ In this case, we assumed that the trigger were the platelet concentrate because no other medication has been given since the beginning of surgery. It was administered to reverse the antiplatelet aspirin effect, assuming the trauma could be associated with vascular injury. The point-of-care platelet function testing in our center was unavailable at the time. In elderly trauma patients, underlying comorbidities and the use of certain medications can mask trauma physiologic effects. Slight changes in HR or BP may signal unrecognized injury and should be investigated thoroughly.³ This is a rare case of a severe anaphylactic shock due to platelet concentrate given to reverse aspirin effect in an elderly trauma patient. We should take into consideration that prior to administration of platelet concentrate and if available, point-of-care platelet function testing should be available.

Responsabilidades Éticas

Conflitos de interesse: Os autores declaram a inexistência de conflitos de interesse na realização do presente trabalho.

Fontes de Financiamento: Não existiram fontes externas de financiamento para a realização deste artigo.

Confidencialidade dos dados: Os autores declaram ter seguido os protocolos da sua instituição acerca da publicação dos dados de doentes.

Consentimento: Consentimento do doente para publicação obtido.

Proveniência e revisão por pares: Não comissionado; revisão externa por pares.

Ethical Disclosures

Conflicts of interest: The authors have no conflicts of interest to declare.

Financing support: This work has not received any contribution, grant or scholarship.

Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

Patient Consent: Consent for publication was obtained.

Provenance and peer review: Not commissioned; externally peer reviewed.

Submissão: 21 de dezembro, 2018 | Aceitação: 24 de maio, 2019

Received: 21st of December, 2018 | Accepted: 24th of May, 2019

REFERENCES

1. Cantle PM, Cotton BA. Balanced resuscitation in trauma management. *Surg Clin North Am.* 2017;97:999-1014. doi: 10.1016/j.suc.2017.06.002.
2. ATLS Subcommittee; American College of Surgeons' Committee on Trauma; International ATLS working group. Advanced trauma life support (ATLS®): the ninth edition. *J Trauma Acute Care Surg.* 2013;74:1363-6. doi: 10.1097/TA.0b013e31828b82f5.
3. Reske-Nielsen C, Medzon R. Geriatric Trauma. *Emerg Med Clin North Am.* 2016;34:483-500. doi: 10.1016/j.emc.2016.04.004.
4. Moranville MP, Mieure KD, Santayana EM. Evaluation and management of shock States: hypovolemic, distributive, and cardiogenic shock. *J Pharm Pract.* 2011;24:44-60. doi: 10.1177/0897190010388150.
5. Rahmani F, Ebrahimi Bakhtavar H, Shahsavari Nia K, Mohammadi N. Transient Unexplained Shock in 30-year-old Trauma Patient. *Emerg.* 2014;2:101-3.
6. Blanco P, Aguiar FM, Blaivas M. Rapid Ultrasound in Shock (RUSH) Velocity-Time Integral: A Proposal to Expand the RUSH Protocol. *J Ultrasound Med.* 2015;34:1691-700. doi: 10.7863/ultra.15.14.08059.
7. Jacobsen RC, Gratton MC. A case of unrecognized prehospital anaphylactic shock. *Prehosp Emerg Care.* 2011;15:61-6. doi: 10.3109/10903127.2010.519823.
8. Sampson HA, Muñoz-Furlong A, Campbell RL, Adkinson NF Jr, Bock SA, Branum A, et al. Second symposium on the definition and management of anaphylaxis: summary report--Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium. *J Allergy Clin Immunol.* 2006;117:391-7.
9. Kiefel V. Reactions Induced by Platelet Transfusions. *Transfus Med Hemother.* 2008;35:354-8