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[Shock VS Neurogenic and Spinal Reflexes, New Classification and SST and SOCATRA CRITERIA for Diagnosis and Prognosis]

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Abstract:
Shock is abroad medical term that has undergone for many decades to research and study and no medical book forgets shock from physiology books to medical and surgical books.
Most extensive studies concerning about classification and management of shock and also criteria for diagnosis shock, despite these there is dissociation between classification and criteria and management.
As we know and studied, we have four types of shock according to Blalock's 1934 description Cardiogenic, hematogenic, Vasogenic and Neurogenic.
And other classifications also insert Neurogenic reflex as a shock and take anaphylactic shock out.
These classifications make ذ in management of septic and anaphylactic shock and give more importance for Neurogenic shock that not meet any criteria of shock
So, I discuss the criteria and classification, pathophysiology, management of shock and proof that Neurogenic reflex is not a shock and provide new classification and Shock Specific Therapy (SST).
Also, most important things in this study are The NEW CRITERIA FOR DIAGNOSIS AND PROGNOSIS PURPOSES.
I CALL IT AS (SOCATRA CRITERIA)
Keyword: Shock.

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[الصدمة مقابل ردود الفعل العصبية والعمود الفقري، تصنيف جديد ومعايير SST ومعايير SOCATRAللتشخيص]

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الملخص:

الصدمة مصطلح طبي في الخارج خضع لعقود طويلة من البحث والدراسة ولا ينسى أي كتاب طبي الصدمة من كتب علم وظائف الأعضاء إلى الكتب الطبية والجراحية.

تتعلق معظم الدراسات المكثفة بتصنيف الصدمة وإدارتها وكذلك معايير تشخيص الصدمة، على الرغم من وجود انفصال بين التصنيف والمعايير والإدارة.

كما نعلم ودرسنا، لدينا أربعة أنواع من الصدمات وفقًا لوصف بلالوك عام 1934: قلبية المنشأ، دموية المنشأ، وعائية المنشأ، وعصبية المنشأ.

والتصنيفات الأخرى تقوم أيضًا بإدخال المنعكس العصبي كصدمة وإخراج الصدمة التأقية.

تثير هذه التصنيفات ارتباكًا في إدارة الصدمة الإنتانية والصدمة التأقية وتعطي أهمية أكبر للصدمة العصبية التي لا تلبي أي معايير للصدمة.

لذلك أناقش المعايير والتصنيف والفيزيولوجيا المرضية وإدارة الصدمة وإثبات أن المنعكس العصبي ليس صدمة وأقدم تصنيفًا جديدًا وعلاجًا محددًا للصدمة.(SST)

كلمات مفتاحية: الصدمة.

METHOD

Depending on base evidence study and cases follow up and management for 355 cases in 4 Yemeni hospitals that diagnosed as shock of different types.

After documentation and follow up the cases divided to the following:

1. Cardiogenic shock 52 cases
2. Hemorrhagic shock 144 cases
3. Anaphylactic shock 37 cases
4. Neurogenic shock and spinal shock 49 cases
5. Septic shock 61 cases
6. Mixed shock 22 cases

About 50 cases was expired and 14 case discharged with neurological sequels

INTRODUCTION

1. Definition

Shock is a state of imbalance between oxygen delivery and consumption as result of circulatory changes leading to body organ injury and if untreated lead to irreversible organ failure

Neurogenic and Spinal phenomenon Defined as the state of disruption of sympathetic and parasympathetic input from spinal cord to the heart and peripheral vasculature due to acute trauma usually above T6.

2. Pathophysiology

<At cellular and subcellular level>

As mitochondria use 95%of body oxygen for aerobic chemical energy production using fuel substrates with oxygen to carbon dioxide and water.

Inadequate oxygen delivery due to hypo perfusion the mitochondria can't produce sufficient energy to maintain cell processes and the cell catabolize fuel to lactate leading to accumulation of toxic chemicals in the cells.

As hypoxic cells cause potassium ion leak out and sodium and water entry to the cells leading to cell swelling.

Also hypoxic cells leak glucose leading to insulin resistance hyperglycemia and increased glycogenolysis.

The above changes combined with increased catecholamine circulation lead to increased level of amino acids and fatty acids =called sick cell syndrome

<At tissues and organ>

ALL organs in the body affected by shock as the failure of auto regulation.

Histological finding includes Hemorrhage, micro thrombi and necrosis.

Failure of auto regulation leads to acute tubular necrosis in the kidneys and boundary zone infarction in the brain and selective neuronal necrosis and subendocardial infarction in the heart.

Anaphylactic shock occurred when allergen react with basophil in the blood and mast cell located in tissue immediately outside the small blood vessels, the mast cell and basophil sensitized by attachment of IgE regains and histamine release to circulation causing wide body vasodilation and permeability of capillaries

SPINAL AND NEUROGENIC PHENOMENONS

Result from injury to spinal cord above T6 and injury to the brain.

Neurogenic reflex lead to Loss of sympathetic tone with unopposed parasympathetic control, leading to cardiovascular instability and autonomic dysreflexia temperature dysregulation, hypotension and bradycardia last 1_6 weeks.

spinal reflex Transient loss of reflexes and sensorimotor function below level of injury leading to hypotension, bradycardia and areflexia early and late hyperreflexia and difficulty in breathing and bowel and bladder dysfunctions and priapism.

Also cause flaccid paralysis and last days to month.

3. STAGES OF SHOCK

There are four stages of shock:

1.initial stage in which the body react to initial change by maintaining normal functions

2.compensated stage in which the body exert effect to maintain function such as increased respiratory rate, tachycardia and decrease urine output

3.decompensated stage body failure to maintain function and organ failure progress

4.irriversible stage leading to the death

4. CLASSIFICATION

The most widely used classification is the old classification that classified the shock to 4 major categories:

1. Hematogenic
2. Cardiogenic
3. Neurogenic
4. Vasogenic

But this classification depending on the physiological change that occur after the shock happened SO that we can't treat the shock on this classification as that Septic shock and Anaphylactic shock out of this classification.
MY THOUGHT that the best Classification of shocks is to THREE BROAD CATEGORIES according to treatment goals:
1. MEDICALLY TREATABLE SHOCK.
2. SURGICALLY TREATABLE SHOCK.
3. MIXED SHOCK.

Table 1 (TSC) Treatable shock classification

Sl No	TYPES	CAUSES
01	Medically Treatable shock	• Hypovolemic of any causes other than hemorrhagic • Anaphylactic Shock • Cardiogenic Shock
02	Surgically Treatable Shock	• Hemorrhagic Shock • Arterial Emboli
03	Mixed Treatable Shock (needs medical and surgical management)	Septic shock • Medically treatable 1. Chest Infection 2. Meningitis 3. Uro-sepsis • Surgically treatable 1. Necrotizing fasciitis 2. Fournier gangrene 3. Cellulitis 4. Abdominal abscess

5. CRITERIA OF SHOCK

Many Criteria was developed to help in diagnosis of the shock state.
Most widely used criteria is SIRS (Systemic Inflammatory Response Syndrome), this criteria use:
_ Temperature as abnormal high or low
_ Respiratory rate
_ Heart rate
_ WBC
Others criteria like
NEWS
MEWS
SOFA
QSOFA
These criteria mostly used for prognosis.
The new Criteria used for both DIAGNOSIS AND PROGNOSIS of the shock
We call it SOCATRA CRITERIA
Table 2

Sl No	TYPES	DESCRIPTION	SCORE
01	Shock Index	Division of SBP by Heart rate (SBP/ HR ≥ 1)	1
02	Oxygen Delivery	SpO_2 <70% - indicates tissue hypoxia	1.5
03	Circulation(cardio vascular) and respiratory	SBP ≤ 90 Pale skin Narrow pulse pressure Tachycardia/ tachypnea	2
04	Acidosis	PH < 7.35 Indicate tissue hypo perfusion	1.5
05	Temperature	Abnormal High or Low temperature	1
06	Renal	Reduced glomerular filtration rate Reduced urine output	2
07	Altered mental state	Drowsy Lethargy confusion	1

6. EVALUATION.

A. cardiovascular manifestations.
Dry skin
Weak thready pulse
Hypotension SBP<100
Tachycardia
Delayed capillary refill
Narrow pulse pressure

B. Pulmonary
Tachypnea
Acidotic breath
Deep and shallow breathing
C. CNS
Drowsy
Altered mental state
Weakness
D. Renal
Reduced urine output
Oliguria
Anuria
Signs of UTI
E. Gastrointestinal
Jaundice
Dry mucus membrane
Sign and symptoms of GIT source of shock
F. Skin
Coldness or hotness
Dryness

Signs and symptoms of source of shock
G. Neurogenic and spinal reflexes manifest AS
Hypotension
Bradycardia
Hyperreflexia or areflexia
Temperature dysregulation
Flaccid paralysis
Bowel and bladder dysfunctions
B. Laboratory investigations
_complete blood count that may show signs of infection or blood loss
_ Renal and liver functions test indicate renal impairment and elevated liver enzymes
_ Serum lactate if >4 indicate shock
_ ABG for metabolic changes and tissues hypoxia
Lactic acidosis
_ Cardiac markers indicate myocardial injury
_ Pregnancy test
_ Coagulation profile
_ Urinalysis
_ ECG indicates of myocardial injury or primary cause of the shock as myocardial infarction
_ CXR indicates the presence of consolidation as primary cause of the shock
_ POCUS (Point of Care Ultrasound) OR
RUSH Protocol (Rapid Ultrasound in Shock and Hypotension) used mostly in hemorrhagic shock and hypovolemic shock in trauma.
Also used in evaluation of IVC Inferior Vena Cava and for fluid response.
_CT SCAN for spine and brain in cases of Neurogenic and spinal phenomenons.

7. TREATMENT

Treatment of shock divided into 3 phases
Phase 1 initial
Phase 2 SST (Specific Shock Therapy)
Phase 3 end point therapies
Phase 1 initial therapy consists of:
ABCDEF
A - Airway securing and cervical spine immobilization
B - Breaching must be good and equal and connect patient to oxygen
C - Circulation establish at least 2 large i v line and IV fluids run.
Check BP, capillary refill and urine output if hemorrhage first controls it.
FAST OR RUSH OR POCUS must be done at this point.
D - Disabilities in all cases of shock.
E - Exposure also must be done for every shocked patient.
F- Fast determine the cause of shock
Phase 2 SST
Treatment aims at this phase to specific management of each shock and we will discuss it in details in other topic.
Now we discuss it briefly.
SST consists of:

A. Adrenaline 》 anaphylactic shock
B. Blood and blood product 》 hemorrhagic shock DON'T start inotrope or vasopressors before blood transfusion
C. Debridement, drainage 》 septic shock DON'T start inotrope or vasopressors before debridement or drainage in necrotizing fasciitis, Fournier gangrene and anybody abscesses
D. Inotrope》 dopamine or dobutamine for unresponsive shock
E. Vasopressors 》 noradrenaline for unresponsive shock
F. Combined 》 inotrope and vasopressor in resistant shock
G. Intra-aortic balloon pump 》 in cardiogenic shock
H. Corticosteroid 》 for resistant shock to the above mentioned treatment or suspected DIC
I. Antibiotics 》 for septic shock and empirical treatment
J. Thrombectomy or embolectomy 》 for arterial occlusion
We will discuss this treatment in more details in other researches

DISCUSSION

According to our study for 365 cases and depending on clinical picture and laboratory results and pathophysiology point of view and following the patients, application of SOCATRA CRITERIA we discussed the following:

. During study the shocked patients presented with typical manifestations as most of them, little presented with atypical manifestations.

. Hemorrhagic shock patients 60% of them present with abdominal and pelvic trauma and 12% presented with peripheral vascular injury and 28% presented with chest and neck or head trauma.

. Cardiogenic shocked patients about 90 % brought with occlusive myocardial infarction, 5% with other cardiac disease and 5% of unknown cause of cardiogenic shock.

. Septic shock

. Anaphylactic shock patients 95% due to drug allergy.

. Neurogenic and spinal phenomenon all of them presented after trauma

• About 96% of all shocks presented with tachycardia heart rate >100 bpm and hypotension SBP<100mmHg initially except Neurogenic and spinal phenomenon presented with bradycardia and hypertension.

Most of shocks presented with tachypnea early and developed to respiratory failure in 39% of cases of septic shock But Neurogenic and spinal phenomenon 90 % of spinal shock presented with irregular breathing or inadequate breathing.

Fever present in 26 % of all types of shock except in 2% of Neurogenic and spinal phenomenon.

Altered mental state presented in
62% of septic shock
53% of cardiogenic shock
46% of hemorrhagic shock
Absent in spinal phenomena and in Neurogenic depending on location of lesion in the brain.

Lateralization and temperature dysregulation only EXCLUSIVELY to Neurogenic and spinal phenomenon.

• Clinical manifestations and laboratory results

CBC abnormal with elevation of WBC above 12000 in about 87% and normal in 12% in septic shock, and elevated in 70% of hemorrhagic shock and in 36% of cardiogenic shock and in 43% of anaphylactic shock patients and in 1% of Neurogenic and spinal phenomenon.

Platelets reduced in approximately 20% of all shock initially and up to 60 % after 48 hours except in Neurogenic and spinal phenomenon that remain unchanged.
Serum level of lactate elevated in 30% of all shocks except Neurogenic and spinal phenomenon in the first 2 hours and in 63% after 6 hours.
Liver enzymes elevated in 70% of cardiogenic shock and in 92% of septic shock and in 13% of anaphylactic shock But not change in Neurogenic and spinal phenomenon.
Reduced urine output in all shocks and elevated serum urea and creatinine Except in Anaphylactic shock and Neurogenic and spinal phenomenon.
ECG CHANGE in all shocks causing nonspecific changes ranging from sinus tachycardia to ST and T wave changes But cause BRADYCARDIA in Neurogenic and spinal phenomenon due to sympathetic and parasympathetic disruption.
• RUSH PROTOCOL or FAST or eFAST show:-
Location of the shock in surgically treatable shock
Diameter of Inferior vena cava that collapsed in hypovolemic and hemorrhagic shock and septic shock BUT distended in cardiogenic shock.
• Treatment in shock depends on type of the shock.
.in medically treatable shock as in anaphylactic shock only adrenaline is definitively treatment and iv fluid as helping treatment along with corticosteroids
Cardiogenic shock due to myocardial infarction treatment by primary PCI and cardiogenic shock due to heart failure treated by combination of inotrope and vasopressor or Intra-aortic balloon pump
Hypovolemic shock treated basically by IV FLUID replacement and no benefit from use inotrope or vasopressors before IV fluid.
Septic shock due to chest infection or meningitis or UTI (not emphysematous pyelonephritis) treated medically by
IV fluid, antibiotics and vasopressor and/or inotrope
.SURGICALLY treatable shocks such as arterial thrombosis or emboli treated by surgical intervention.
Septic shock due to fasciitis abdominal abscess and other abscesses treated definitively by surgical interventions along with iv fluid and no benefit from use inotrope or vasopressors before surgical intervention.
Hemorrhagic shock treated surgically immediately along with blood transfusion No benefit from use inotrope or vasopressors before controlling of bleeding and iv fluids may increase risk of bleeding.
● NEUROGENIC AND SPINAL PHENOMENONS last from hours to months and no specific therapy.
The treatment by using corticosteroid (methylprednisolone) that not fully studied.
• Mixed shock treated initially medically followed by surgical intervention OR treated initially surgically followed by medical treatment.
Corticosteroid only used in shock that failed to respond to iv fluid and vasopressor and inotrope
• LASTLY the SOCATRA SCORING applied to all cases that studied reveal the following:
- It is accurate for diagnosis of all shocks except Neurogenic and spinal phenomenon.
- Useful in prognosis of all shocks except Neurogenic and spinal phenomenon.
- is the best for using clinical and laboratory data.
- used initially and during treatment.

CONCLUSION

After discussion above we conclude that:-

• Neurogenic and spinal shock are not true shock but phenomenon or reflexes because of:

Not meet any criteria of shock either clinical or lab. Such as tachycardia, tachypnea and low urine output and elevated lactate or change in blood tests.

Present with neurological symptoms more than systemic symptoms.

No end organ damage as in other shock.

Present with bowel and bladder dysfunctions.

Present with temperature dysregulation.

Treated by corticosteroids such as methylprednisolone

Present with lateralization.

Diagnosed by exclusion.

LASTING FROM HOURS TO DAYS TO WEEKS TO MONTHS.

• Classification of shock to medically TREATABLE and surgically TREATABLE shock is the best for treatment

• DON'T USE INOTROPE OR VASOPRESSORS BEFORE SURGICAL INTERVENTION IN SURGICALLY TREATABLE SHOCK.

• DON'T USE INOTROPE OR VASOPRESSORS BEFORE IV FLUID IN HYPOVOLUMIC SHOCK.

• DON'T USE INOTROPE OR VASOPRESSORS BEFORE CONTROLLING HEMORRHAGE IN HEMORRHAGIC SHOCK.

● SOCATRA Criteria is the best tool for diagnosis and prognosis of the shock

- Score 1-3 has good prognosis

-Score 4-6 poor prognosis

Score >6 has very bad prognosis.

References:

ROSEN'S EMERGENCY MEDICINE: CONCEPTS AND CLINICAL PRACTICE, TENTH EDITION VOLUME 1 VOLUME 2 Copyright © 2023

SABISTON: TEXTBOOK OF SURGERY: THE BIOLOGICAL BASIS OF MODERN SURGICAL PRACTICE, TWENTY FIRST EDITION Copyright © 2022

Harrison's Principles of Internal Medicine, Twenty-First Edition 2022

Tintinalli's Emergency Medicine A Comprehensive Study Guide Ninth Edition 2020

MUIR'S TEXTBOOK OF PATHOLOGY Fifteenth Edition 2014

GUYTON AND HALL TEXTBOOK OF MEDICAL PHYSIOLOGY, FOURTEENTH EDITION INTERNATIONAL EDITION Copyright © 2021

UDD K et al: Global, regional, and national sepsis incidence and mortality, 1990-2017: Analysis for the global burden of disease study. Lancet 395:10219, 2020

GITZ HOLLER et al: Etiology of shock in the emergency department: A 12-year population-based cohort study. Shock 51:60, 2019

TEHRANI BN et al: A standardized and comprehensive approach to the management of cardiogenic shock. JACC Heart Fail 8:879, 2020.

Krishna U, Joshi SP, Modh M. An evaluation of serial blood lactate measurement as an early predictor of shock and its outcome in patients of trauma or sepsis. Indian J Crit Care Med. 2009;13:66–73.

Connelly CR, Schreiber MA. Endpoints in resuscitation. Curr Opin Crit Care. 2015;21:512–519.

Cannon WB. The emergency function of the adrenal medulla in pain and the major emotions. Am J Physiol. 1914;33:356–372

Sperry JL, Frankel HL, Nathens AB, et al. Characterization of persistent hyperglycemia: what does it mean postinjury? J Trauma. 2009;66:1076–1082.
Dellinger RP, Levy MM, Carlet JM, et al. Surviving sepsis campaign: International guidelines for management of severe sepsis and septic shock: 2008. Crit Care Med. 2008;36:296–327.
Plurad D, Martin M, Green D, et al. The decreasing incidence of late posttraumatic acute respiratory distress syndrome: the potential role of lung protective ventilation and conservative transfusion practice. J Trauma. 2007;63:1–7.
Dente CJ, Shaz BH, Nicholas JM, et al. Improvements in early mortality and coagulopathy are sustained better in patients with blunt trauma after institution of a massive transfusion protocol in a civilian level I trauma center. J Trauma. 2009;66:1616–162
Kaukonen KM, Bailey M, Suzuki S, et al: Mortality related to severe sepsis and septic shock among critically ill patients in Australia and New Zealand, 2000–2012. JAMA 311:1308–1316, 2014.
Dellinger R, Levy M, Rhodes A, et al: Surviving Sepsis Campaign: international guidelines for the management of severe sepsis and septic shock 2012. Crit Care Med 41:580–637, 2013
Odom SR, Howell MD, Silva GS, et al: Lactate clearance as a predictor of mortality in trauma patients. J Trauma Acute Care Surg 74:999–1004, 2013
Rivers E, Nguyen B, Havstad S, et al: Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med 345:1368–1377, 2001.
Rivers E, Nguyen B, Havstad S, et al: Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med 345:1368–1377, 2001.
Jones AE, Shapiro N, Trzeciak S, et al: Lactate clearance vs central venous oxygen saturation as goals of early sepsis therapy: a randomized clinical trial. JAMA 303:739746, 2010.
Mutschler M, Nienaber U, Brockamp T, et al: A critical reappraisal of the ATLS classification of hypovolaemic shock: does it really reflect clinical reality? Resuscitation 84:309–313, 2013.
Corbo S, Doty CI. Vertebral column and spinal cord trauma. In: Stone CK, Humphries RL, editors. Current Diagnosis and Treatment: Emergency Medicine. 8th ed. New York, NY: McGraw-Hill Education; 2017
Claydon VE, Steeves JD, Krassioukov A. Orthostatic hypotension following spinal cord injury: Understanding clinical pathophysiology. Spinal Cord. 2006;44(6):341-351
James G et al. Traumatic central cord syndrome: Results of surgical management. Journal of Neurosurgery: Spine. 2002;97(1):25-32
Lim E et al. Traumatic atypical Brown-Sequard syndrome: Case report and literature review. Clinical Neurology and Neurosurgery. 2003;105(2):143-145
Dvorak MF et al. Factors predicting motor recovery and functional outcome after traumatic central cord syndrome: A long-term follow-up. Spine. 2005;30(20):2303-2311
Ropper AH et al. Disorders of nonpainful somatic sensation. In: Adams and Victor's Principles of Neurology. 11th ed. New York, NY: McGraw-Hill Education; 2019
Ropper AH et al. Disorders of nonpainful somatic sensation. In: Adams and Victor's Principles of Neurology. 11th ed. New York, NY: McGraw-Hill Education; 2019
Go S. Spine trauma. In: Tintinalli JE et al., editors. Tintinalli's Emergency Medicine: A Comprehensive Study Guide. 8th ed. New York, NY: McGrawHill Education; 2016
Ziu E, Mesfin FB. Spinal Shock. StatPearls Publishing; 2019
Hall OT et al. The burden of traumatic spinal cord injury in the United States: Disability-adjusted life years. Archives of Physical Medicine and Rehabilitation. 2019;100(1):95-100
Levine DN. "Sherrington's" the integrative action of the nervous system: A centennial appraisal. Journal of the Neurological Sciences. New York. 2007;253(1-2):1-6.