Shock

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9.1 Definition

Shock is a clinical diagnosis of multi-organ hypoperfusion. As defined by the Oxford English Dictionary, shock is "an acute medical condition associated with a fall in blood pressure, caused by such events as loss of blood, severe burns, bacterial infection, allergic reaction, or sudden emotional stress, and marked by cold, pallid skin, irregular breathing, rapid pulse, and dilated pupils" [12]. According to the American College of Surgeons, shock is defined more succinctly as "tissue hypoperfusion due to an imbalance between oxygen supply and demand in the tissues of the body" [5]. Ultimately, however, it should be noted that shock is a clinical diagnosis.

Shock is a life-threatening medical emergency that requires early recognition, diagnostics, and intervention. Despite the emphasis placed on this, however, mortality rates still exceed 20–50 % [7].

Shock has been further subdivided into five basic categories, first described by Blalock: cardiogenic, neurogenic, hypovolemic, anaphylactic, and septic shock [10, 3]. Additional subdivisions have been described in the recent literature. While all of these types of shock are medical emergencies, within the realm of urology however, hypovolemic and septic shock predominate. In particular, septic shock from urosepsis is an important etiology of shock in the urologic patient.

Hypovolemic or hemorrhagic shock is characterized by a rapid reduction in blood volume. It is further divided by degree into Class I–IV, based on percentage of blood volume lost: Class I (0–15 %), Class II (15–30 %), Class III (30–40 %), and Class IV (>40 %).

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Table 9.1 Definitions of the sepsis spectrum

Bacteremia	Presence of viable bacteria in the blood
SIRS (systemic inflammatory response syndrome)	Presence of more than one of the following clinical findings
	1. Body temperature >38 or <36 °C
	2. Heart rate >90 beats/min
	3. Hyperventilation (resp. rate >20/min OR $PaCO_2$ <32 mmHg)
	4. WBC >12,000 cells/μL or <4,000 cells/μL
Sepsis	SIRS criteria plus evidence of infection
Severe sepsis	Sepsis and presence of organ dysfunction
Septic shock	Sepsis and evidence of acute circulatory failure/evidence of shock

Levy et al. [8]
Dellinger et al. [4]

On the SIRS (systemic inflammatory response syndrome) spectrum, sepsis and septic shock represent the most severe manifestations. The full spectrum with definitions can be found in Table 9.1. Sepsis and septic shock in the urology patient are the most common presentations of shock, typically due to infection from the genitourinary (GU) tract. Mortality rates due to septic shock range from 30 to 60 % [1, 2, 9], and a urinary source accounts for 9–31 % of all septic shock [9].

9.2 Medical History

A high index of suspicion is necessary for early diagnosis and management of patients in shock. As such, a thorough history and physical exam are critical in early workup. However, the resuscitative efforts should NOT be delayed for medical history taking, physical exam, or diagnostics.

The history is an important portion of any evaluation of a critically ill patient. However, in a patient in shock, a full history may not be directly available. It may be necessary to question support staff, family members, and other individuals to obtain the necessary history. History should be focused on identifying key points that will help narrow the etiology of shock.

The physical exam is a critical portion of the evaluation as shock is often a clinical diagnosis. The exam should also be focused, with an emphasis on vital signs, neurologic status, cardiorespiratory function, and end-organ perfusion. From a urologic perspective, a Foley catheter or urine output monitoring is an important component of evaluation and should be placed early in the evaluation of the patient.

Some of the key physical exam findings include [11] hypotension (brachial artery systolic blood pressure <90 mmHg), tachycardia (HR >90 beats/min) or bradycardia (HR <60 beats/min) as a sign of decompensation, tachypnea (respiratory rate >20 breaths/min), altered mental status, oliguria, and hypoxemia. Certain

findings may be more specific to certain categories of shock, including temperature extremes in septic or inflammatory shock and cutaneous hypoperfusion in all other forms of shock.

9.3 Diagnostics

Diagnostic testing for patients in shock occurs simultaneously to the clinical assessment of the patient, as time is of the essence.

Laboratory tests to obtain include but are not limited to the following: (1) basic metabolic panel to assess renal function, evidence of electrolyte disturbances, bicarbonate deficit, and blood sugar disturbances; (2) complete blood count with differential to assess for leukocytosis or leukopenia, evidence of bleeding, or thrombocytopenia or thrombocytosis; (3) coagulation factors to assess for bleeding diathesis; (4) arterial blood gas to assess for acid/base status, need for ventilation or oxygenation, and correctable metabolic disturbances; (5) lactic acid to assess for hypoperfusion and ischemia; and (6) urinalysis. Other lab tests that may be indicated based on clinical picture include blood cultures, urine or sputum culture, type and cross, amylase/lipase, D-dimer and fibrin assays, toxicology screen, and cardiac enzymes.

Initial radiographic and functional assessment of the patient includes a standard upright chest x-ray and 12-lead electrocardiogram. Additional testing can be ordered based on the suspected etiology of the shock and the patient's clinical and social history. These studies include abdominal plain films, CT abdomen/pelvis, CT chest, CT head, or echocardiogram.

Invasive monitoring may also need to be placed in a patient in acute shock. Typical monitoring includes (1) arterial line for more accurate blood pressure monitoring and (2) central venous catheter for central pressure assessment, fluid status assessment, additional venous access for interventions, and possible pulmonary artery catheterization. As mentioned before, Foley catheter placement or equivalent method of draining the bladder is strongly recommended.

9.4 Differential Diagnosis

The differential diagnosis of shock is very broad. Classification of shock into different categories based on initial presentation, as described earlier, helps direct initial interventions and management. However, in conjunction with early management, efforts should be made to identify and treat the underlying pathology. Refer to Fig. 9.1 for a review of the etiologies and initial workup of a patient in shock.

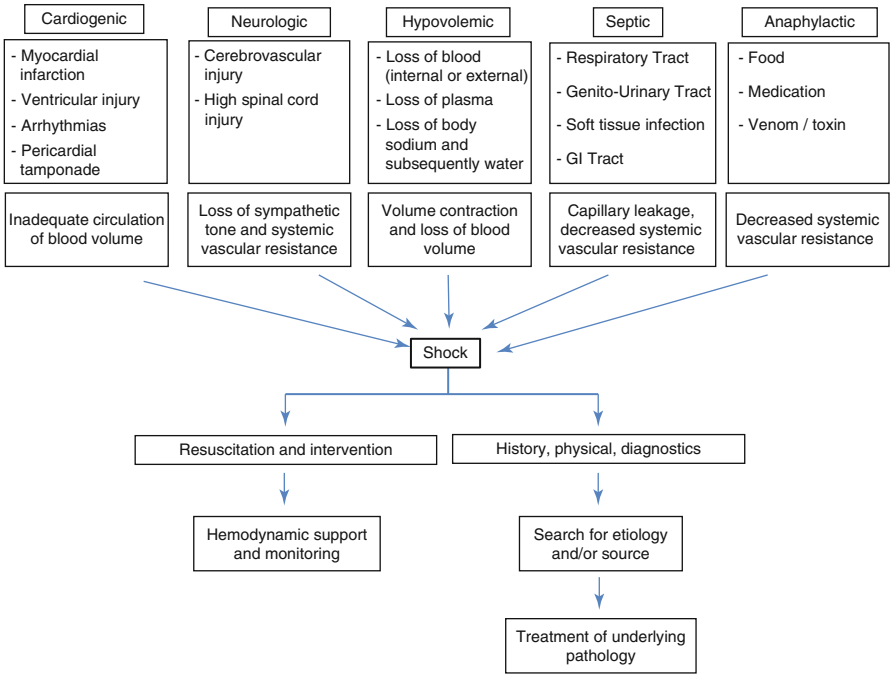

Fig. 9.1 Flowchart: differential diagnosis and initial management of a patient in shock

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