The patient is a healthy and active 63-year-old truck driver who sustains blunt abdominal and thoracic trauma in a motor vehicle accident. Initial BP in the emergency room is 80/60 mm Hg. He is taken to surgery after resuscitation and stabilization, where the following is performed; bilateral tube thoracostomies, splenectomy, small bowel resection, repair of vena cava lacerations and exteriorization of a shattered transverse colon (colostomy). After control of all hemorrhage, transient hypotension to 60 mm Hg systolic occurs with premature ventricular contractions (PVCs) responsive to fluid and intravenous lidocaine.

The patient is transferred, still ventilated, to the surgical intensive care unit (SICU) and 6 hours after surgery becomes hypotensive again. A Swan-Ganz catheter is passed.

**Study Questions**

1. Discuss the initial management of hemorrhagic shock in the multiple-trauma patient.

2. What are the levels of automatic physiologic adjustment and compensation in human hemorrhagic shock (sympathoadrenal and baroreceptor reflexes, Starling’s law of capacitance, endocrine)?

3. How do you assess postoperative hypotension?

4. Explain the hemodynamics of invasive monitoring; how do you interpret the date (Swan-Ganz catheter).

5. Draw a chart comparing the different physiologic effects of hemorrhagic, cardiogenic, septic shock on the following parameters; blood pressure, pulse, urine output, central venous pressure (CVP), pulmonary capillary wedge (PCW) pressure, total peripheral resistance (TPR), cardiac index (CI), and blood gases.

6. How would you diagnose and treat the postoperative hypotension? What are the roles of pressors and their actions/side effects/complications?

7. Discuss the diagnosis and treatment of septic shock in the patient with multisystem failure. Discuss hemodynamic parameters, pressors, fluids, antibiotics, steroids, and reoperative surgery.
SHOCK – Continued

Vomiting and Hypotension

The patient is a 38-year-old carpenter transferred from a local community hospital to your surgical intensive care unit because of hypotension to 70 mm Hg systolic on the basis of profuse vomiting over the previous 5 days caused by gastric outlet obstruction for his chronic duodenal ulcer.

After initial fluid resuscitation he stabilized but falls conservative (nonoperative) management of his obstructed ulcer and undergoes antrectomy and truncal vagotomy. The duodenum was noted to be scarred and fibrosed, dissection difficult, blood loss excessive and operation time prolonged. The patient does well initially but on the 9th postoperative day develops abdominal distension, pain, vomiting, and hypotension and is transferred back to the SICU.

Study Questions

1. What metabolic disturbances underlie this patient’s initial hypotension? What would you predict his electrolytes and arterial blood gases to be?

2. What is the most important initial therapy (give specifics)?

3. Does this patient need invasive hemodynamic monitoring? What simple alternative forms of bedside “monitoring” are possible and appropriate? What specific parameters would you follow?

4. What is the differential diagnosis of his problem on the 8th postoperative day? Does he now need invasive hemodynamic monitoring? If so, what would you predict his CVP, CI, and TPR to be?

5. What are the fundamental principles in the management of the resuscitation and definitive treatment of a complication such as that occurring to this patient on the 9th postoperative day?

Postoperative Shock

A 67-year-old obese female diabetic with known coronary artery disease undergoes urgent cholecystectomy for acute calculus cholecysitis. During induction of anesthesia there was transient hypotension to 60 mm Hg systolic, which responded promptly to the administration of fluids. The operation was “difficult” due to inflammation and blood loss, recorded in the operative note as 1400 ml. You are the intern on call that night and are called at 9:00 P.M. because the patient has become suddenly hypotensive to 50 mm Hg systolic. She is alert, oriented, and has no other complaints.
Study Questions

1. What are the five most common causes of postoperative hypotension that could explain this patient’s change in status?

2. What would be the proposed pathophysiology for this patient’s shock based on each of the following five etiologies: (a) Cardiogenic shock; (b) Hemodynamic shock; (c) Respiratory.

3. What physical findings and simple maneuvers and procedures at the bedside would yield working diagnosis and initial therapeutic plan within five minutes?

4. Does this patient need to be transferred to SICU/ Invasive hemodynamic monitoring?

5. Describe, in detail, the workup and definitive treatment of each of the five etiologies of postoperative shock listed in question 2.

Posttraumatic Shock

While bicycle riding, a 13-year-old is struck by a fast-moving automobile and thrown 50 feet. He is brought by ambulance to the trauma center stabilized on a backboard with one intravenous running, comatose, and in profound shock. There is bleeding laceration of the frontal scalp, abrasions and contusions over the lower check and abdomen, and an obvious compound fracture of the left femur.

Study Questions

1. What is the cause of the hypotension?

2. The hypotension improves only slightly with volume resuscitation and endotrachael intubations. Can neurogenic shock explain the recalcitrant hypotension?

3. What are the priorities in workup and treatment of this multiply injured boy? What sites of suspected or apparent injury, in order of importance, require urgent and specific attention to treat the shock?

4. What is your specific course of action of this patient? Enumerate your sequential actions with the expected response of the patient to each action.
Fever, Chills, and Hypotension

A 65-year-old woman with known cholelithiasis, previously asymptomatic, is admitted to the hospital with fever, chills, and jaundice. You are called to see her because the admitting nurse found her blood pressure to be 80/0 mm Hg with a thready pulse at a rate of 130 and fever of 40º C (104º F.). You confirm these findings and find the patient to be confused, lethargic, and obviously severely ill. She is clinically jaundiced and her abdomen is diffusely tender with guarding in the right upper quadrant and absent bowel sounds.

1. What is your preliminary diagnosis? What is Whipple’s triad?
2. What initial resuscitative measure would you institute?
3. What laboratory/radiological studies would you order?
4. Assuming that your initial diagnosis is correct and that the patient responds to your resuscitative efforts, what definitive treatment would you recommend?
5. What other conditions can result in this type of shock? What are the basic principles of management?

SHOCK

Objectives

1. Define shock and list the three most commonly encountered types of shock.
2. List at least three causes of each type of shock.
3. Contrast the effect of each category of shock on the heart, kidney, brain, lung and gut.
4. List hemodynamic features (i.e. systemic vascular resistance, cardiac output, etc.), diagnostic tests, and physical finding which differentiate each type of shock.
5. Name and briefly describe the monitoring technique, which help in the diagnosis and management of each category shock.
6. For each category of shock, outline the general principles of fluid, pharmacological and surgical intervention.