Intra-Abdominal Hypertension: Evolving Concepts

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KEYWORDS

- Abdominal pressure • Abdominal hypertension
- Abdominal compartment syndrome
- Measurement • Diagnosis • Pathophysiology
- Organ support • Treatment

A compartment syndrome (CS) exists when increased pressure in a closed anatomic space threatens the viability of enclosed tissue.[1] Within the body there are four types of compartments, the head, the chest, the abdomen, and the extremities, but when a compartment syndrome occurs in the abdominal cavity the impact on end-organ function both within and outside of the cavity can be devastating (**Table 1**). Intra-abdominal hypertension (IAH) is a graded phenomenon and can evolve to the end-stage abdominal compartment syndrome (ACS), which is an all or nothing phenomenon. The ACS is not a disease and as such it can have many causes and it can develop within many disease processes. The development of IAH is of extreme importance in the care of critically ill patients, because of the impact of increased intra-abdominal pressure (IAP) on end-organ function. Recent animal and human data suggest that the adverse effects of elevated IAP can occur at much lower levels than previously thought and even before the development of clinically overt ACS. This review gives a concise overview of the definitions, epidemiology, pathophysiology, and management of IAH and ACS.

DEFINITIONS

The term ACS was first used by Fietsam and colleagues[2] in the late 1980s to describe the pathophysiologic alterations resulting from IAH secondary to aortic aneurysm surgery: "In four patients that received more than 25 L of fluid resuscitation increased IAP developed after aneurysm repair. It was manifested by increased ventilatory pressure, increased central venous pressure, and decreased urinary output. This set of findings constitutes an *abdominal compartment syndrome* caused by massive interstitial and retroperitoneal swelling… Opening the abdominal incision was associated with dramatic improvements…."

The World Society on Abdominal Compartment Syndrome (WSACS, www.wsacs.org) was founded in 2004 to serve as a peer-reviewed forum and educational resource for all health care providers as well as industry who have an interest in IAH and ACS. Recently the first consensus definitions on IAH and ACS have been published.[1,3] **Table 2** summarizes these consensus definitions: a sustained increase in IAP equal to or above 12 mm Hg defines IAH where ACS is defined by a sustained IAP above 20 mm Hg with new-onset or progressive organ failure.

RECOGNITION OF ABDOMINAL COMPARTMENT SYNDROME

Clinical Awareness

Despite an escalation of the medical literature on the subject, there still appears to be an underrecognition of the syndrome. The results of several surveys on the physician's knowledge of IAH and ACS have recently been published.[4,5] The bottom line is that there is still a general lack of clinical

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Clin Chest Med 30 (2009) 45–70
doi:10.1016/j.ccm.2008.09.003
0272-5231/08/$ – see front matter

Table 1
The four compartments

	Head	Chest	Abdomen	Extremities
Syndrome	Cerebral herniation	Thoracic compartment syndrome	Abdominal compartment syndrome	Extremity compartment syndrome
Potential implication	Brain death	Cardiopulmonary collapse	Multiple organ dysfunction	Extremity loss
Primary physiologic parameter	Intracranial pressure (ICP)	Intrathoracic pressure (ITP)	Intra-abdominal pressure (IAP)	Extremity compartment pressures (CP)
Secondary parameter	Cerebral perfusion pressure (CPP)	Peak/mean airway pressure	Abdominal perfusion pressure (APP)	Peripheral arterial perfusion pressure
Fluid	Cerebrospinal fluid (CSF)	Pleural fluid	Ascites	Interstitial fluid
Enclosure	Skull	Rib cage	Abdominal cage	Muscle fascia
Therapeutic intervention	Lower ICP: CSF drainage Increase CPP: vasopressors, fluids	Lower ITP Escharotomy, chest tube	Lower IAP: ascites drainage Increase APP: vasopressors, fluids	Lower CP
Resuscitative plan	Open compartment Decompressive craniectomy	Open compartment Decompressive sternotomy	Open compartment Decompressive laparotomy	Open compartment Decompressive fasciotomy
Importance	Adaptation of ventilatory support essential	Recognition of syndrome can be life saving	Prevention of bacterial translocation and MODS can be life saving	Recognition can be limb saving

Abbrevations: APP, abdominal perfusion pressure; CP, compartment pressure; CPP, cerebral perfusion pressure; CSF, cerebrospinal fluid; IAP, intra-abdominal pressure; ICP, intracranial pressure; ITP, intrathoracic pressure; MODS, multiple organ dysfunction syndrome.

Adapted from Cheatham M. Compartment syndrome. The four compartment syndromes. 2008. Available at: http://www.surgicalcriticalcare.net/Lectures/compartment_syndrome.pdf; with permission.