Abdominal Compartment Syndrome

Updates in Anesthetic and Intensive Care Unit Management

Essay
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List of abbreviations

- ACS : Abdominal compartment syndrom
- AP : Acute pancreatitis
- APP : Abdominal perfusion pressure
- ARDS : Acute respiratory distress syndrome
- ATP : Intra-cellular adenosine triphosphate
- CCP : Cerebral perfusion pressure
- CI : Cardiac index
- CIAP : Continous intra-abdominal pressure
- COPD : Chronic obstructive pulmonary disease
- CSF : Cerebro-spinal fluid
- CVP : Central venous pressure
- FG : Renal filtration gradient
- FiO_2 : Fraction of inspired oxygen
- GEDV : Global end-diastolic volume
- GEDVI : Global end-diastolic volume index
- GFP : Glomerular filtration pressure
- HES : Hydroxy-ethyl starch

- HHS : Hypertonic hyperoncotic saline
- HSS :Hypertonic saline solution
- IAH : Intra-abdominal hypertension
- IAP : Intra-abdominal pressure
- ICP : Intra-cranial pressure
- LCS : Limb compartment syndrome
- MAP : Mean arterial pressure
- N_2O : Nitrous oxide
- NMB : Neuro-muscular blockade
- $PaCO_2$: Partial pressure of carbon dioxide in arterial blood
- PaO_2 : Partial pressure of oxygen in arterial blood
- PAOP : Pulmonary artery occlusion (wedge) pressure
- PEEP : Positive end expiratory pressure
- PTP: Proximal tubular pressure
- RSI : Rapid sequence induction
- RVEDV : Right ventricular end-diastolic volume
- RVEDVI : Right ventricular end-diastolic volume index
- SaO_2 : Arterial oxygen concentration
- SAP : Severe acute pancreatitis
- SIRS : Systemic inflammatory response syndrome

- SVV : Stroke volume variation
- TIVA : Total intravenous anesthesia
- Vd : Volume dead space
- Vt : Tidal volume
- WSACS : The world society of the abdominal compartment syndrome

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Introduction

Introduction

There has been an increased awareness of the presence and clinical importance of abdominal compartment syndrome. It is now appreciated that elevation of abdominal pressure occur in a wide variety of critically ill patient**. (An et al., 2008)**.

The abdomen behaves as a hydraulic system with a normal IAP of about 5-7 mmHg, and with higher baseline levels in morbidly obese patients of about 9-14 mmHg. ***(De Keulenaer et al., 2009).***

Intra-abdominal pressure (IAP) is an important parameter and prognostic indicator of the patient's underlying physiologic status. ***(Malbrain et al., 2009).***

Increased intra-abdominal pressure (IAP) has received growing attention in critically ill patients. Pathophysiologically, it deranges cardiovascular haemodynamics, respiratory and renal functions and may eventually lead to multi-organ failure. It is primarily seen in surgical intensive care units and is frequently associated with abdominal trauma but also occurs after elective abdominal

surgery. Non-surgical intensivists shoud be aware that the syndrome is also seen in a wide spectrum of medical conditions, e.g. acute pancreatitis. An expert panel has recently set up definitions of increased intra-abdominal pressure (sustained or repeated pathological elevation in IAP > or = 12 mmHg) and abdominal compartment syndrome (ACS, sustained IAP > 20 mmHg associated with a new organ dysfunction or failure). It is hoped that the consensus definitions will contribute to a broader recognition and effective treatment of this life-threatening syndrome **(*Scheppach, 2009)***.

Liberal IAP measurement in the presence of known risk factors combined with implementation of an evolving and comprehensive resuscitation strategy have resulted in significant improvements in both short and long-term outcome for patients who develop increased IAP/ACS. All clinicians should be aware of the risk factors that predict development of increased IAP/ACS, the appropriate measurement of IAP, and the current resuscitation options for managing these highly morbid syndromes ***(Cheatham, 2009).***

Preventive strategies were developed to reduce their incidence. Once viewed as a syndrome with almost uniform mortality, systematic preventative strategies and therapeutic efforts have reduced the prevalence, morbidity, and mortality of the syndrome ***(Balogh et al., 2009)***

Chapter 1

History

History

The compartment syndrome was described for the first time in 1881 by Volkmann—limb compartment syndrome (LCS), a condition in which raised pressure within a closed fascial space reduces the blood perfusion of the muscles and leads to a contracture. The treatment of LCS was reported 7 years later by Petersen and it was experimentally shown in 1926. Marey and Burt reported for the first time in 1863 the relationship between the level of IAP and respiratory function. The relationship between intra-abdominal hypertension and oliguria was recognized in 1876 ***(Kron et al., 1984)***.

In 1890, Heinricius showed that intra-abdominal hypertension of 27 to 46 cmH_2O was fatal in cats and guinea pigs. He attributed the deaths to the suppression of respiration by interference with thoracic expansion. In the first half of the 20th century some reports appeared giving details on the adverse effects of intra-abdominal hypertension on cardiovascular, renal, and pulmonary function. This became possible after the development of crude ventilatory support. When surgeons started treating