Abdominal compartment syndrome
Anesthetic & I.C.U management

Essay

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List of abbreviations

Abbreviation	Meaning
ACS	Abdominal compartment syndrome
APP	Abdominal perfusion pressure
ARDS	Acute respiratory distress syndrome
CS	Compartment syndrome
CVP	Central venous pressure
FG	Filtration gradient
GFP	Glomerular filtration pressure
GFR	Glomerular filtration rate
IAH	Intra abdominal hypertension
IAP	Intra abdominal pressure
ICP	Intra cranial pressure
IJP	Internal jugular pressure
ITP	Intra thoracic pressure
LCS	Limb compartment syndrome
MAP	Mean arterial pressure
mmHg	Millimeters of mercury
MODS	Multi organ dysfunction syndrome
MOF	Multi organ failure
NMB	Neuro muscular blockade
PAOP	Pulmonary artery occlusion pressure
PCWP	Pulmonary capillary wedge pressure
PTP	Proximal tubular pressure
PVC	Poly vinyl carbon
SICU	Surgical intensive care unit
SOFA	Sequential organ failure assessment
STAR	Staged abdominal repair
TAC	Temporary abdominal closure
UTI	Urinary tract infection
WSACS	World society of abdominal compartment syndrome

Introduction

Compartment syndrome (CS) is a condition in which increased pressure in a confined anatomical space adversely affects the function and viability of the tissues therein. The confined anatomical spaces mostly associated with compartment syndromes are the spaces of the extremities, the orbital globe (glaucoma), the cranial cavity (epidural or subdural hematoma), the pleura, pericardium, abdominal cavity, etc. ***(Georgi petrov 2008).***

Abdominal compartment syndrome (ACS) is defined as a constellation of pathological alterations of intra and extra-abdominal organs leading to a certain group of symptoms, all of which are caused by a sustained increased pressure within the abdominal cavity (compartment). Abdominal compartment syndrome is observed when the intra-abdominal hypertension (IAH) develops quickly within several hours and lasts for 6 or more hours.

(Malbrain, et al 2006)

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 ***(Georgi petrov 2008).***

For the first time the term abdominal compartment syndrome was used in 1984 by Kron et al., who described 11 oliguric patients undergoing an operation for ruptured abdominal aortic aneurism with intra-abdominal pressure >25 mmHg in the postoperative period. Following abdominal decompression seven of the patients recovered. The other four patients not operated on developed acute renal failure and died. The authors suggested that if the intra-abdominal pressure exceeds 25 mmHg in the postoperative period and is associated with renal dysfunction despite adequate cardiac output and circulating blood volume, then decompression of the abdomen should thus be considered. The same author applied the universal intra-vesical method of indirect measurement of intra-abdominal pressure IAP ***(Kron, et al. 1984)***.

Anatomical bases:

Abdominal structure:

There are five anatomically distinct structures associated with the abdomen that may be subject to volume changes and modulate pressure:

1-Solid intra-abdominal organs such as liver and spleen, changes are generally slow and may induce chronic IAH.

2-Hollow viscera may increase acutely in size from traumatic or infectious inflammation, ileus, or bowel obstruction.

3-Blood and lymphatic vessels may contribute acutely to the development of IAH when the patient is fluid overloaded. This is most likely to occur during crystalloid resuscitation for hemorrhagic shock and abdominal surgery.

4-The peritoneum itself may absorb huge amounts of fluid when inflamed. ***(Lierse, 1985).***

5-The peritoneal cleft may increase by accumulation of fluid because of either overproduction or reduced outflow via diaphragmatic lacunae. Also, this space may increase in volume iatrogenically when the abdominal cavity is packed with gauze for hemostasis.

In clinical reality, it is difficult, if not impossible, to differentiate between these structures. Volume increase is mainly seen with peritoneal edema, dilated bowel, tumors, or fluid accumulations.

The peritoneum comprises a total area of approximately 1.8 m^2, an area equal to that of the body surface. It covers all intestinal organs and the abdominal wall, the diaphragm, the retroperitoneum, and the pelvis. When with inflammation the peritoneum increases only 0.5 cm in thickness, the peritoneal inflammatory edema may absorb approximately 9 L of fluid (1.8 m^2 = 180,000 cm^2 x 0.5 cm thickening = 9,000 m.L). An analogy, therefore, can be drawn to the fluid shifts and associated systemic responses seen with burn injuries to the skin.

Also, the reactivity of the peritoneum to injuries is fast, and its huge size allows quick reactions to irritations. Transudates or exudates are formed quickly, further increasing volume and pressure ***(Ivy., 2006)***.

Abdominal wall compliance:

Understanding the dynamic relation between volume and pressure within the abdomen is important, because after a relatively long period of compensation, deterioration is fast due to limited abdominal wall compliance (Fig. 1A, Fig. 1B).

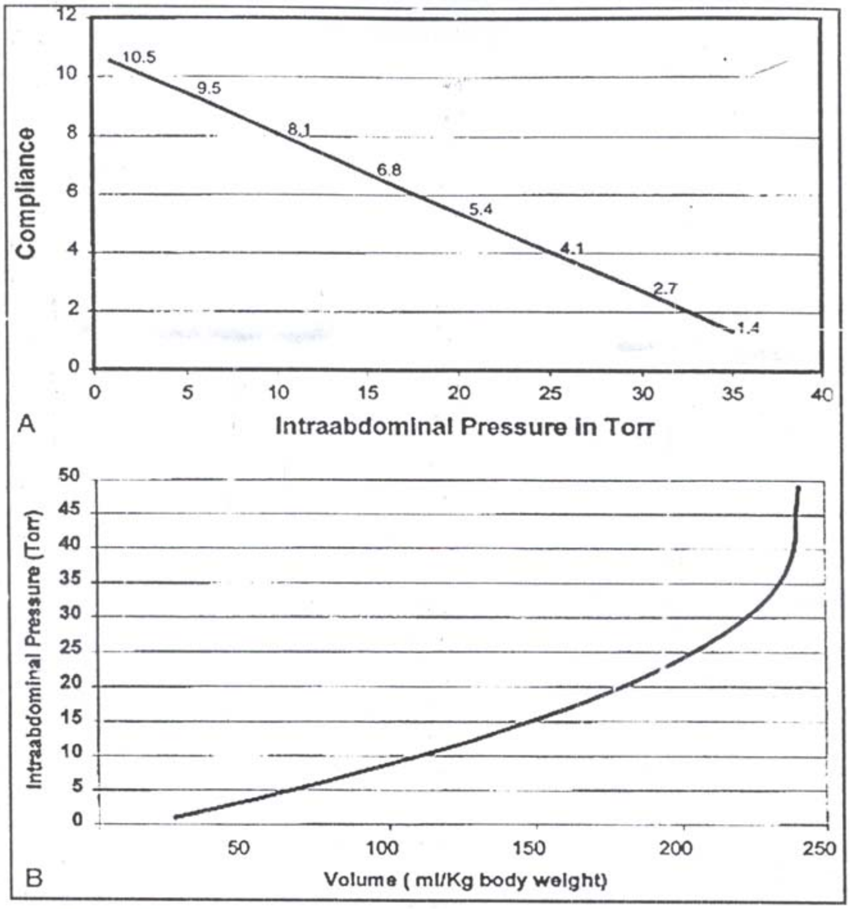

Fig 1:Relation between intra-abdominal pressure and abdominal wall compliance (A) and intra abdominal volume increase (B)

(*Barnes, et al., 1985)*