ICU Volume 11 - Issue 3 - Autumn 2011 - Series

Long-Term Outcome After Abdominal Compartment Syndrome

Introduction

The past two decades have witnessed a tremendous evolution in our understanding and management of patients with Intra- Abdominal Hypertension (IAH) or Abdominal Compartment Syndrome (ACS). Improved diagnosis and institution of both medical and surgical management strategies have significantly increased survival, improved long-term functional outcome, and decreased hospital resource utilisation in these complex patients. Central to this evolving strategy are the use of early serial Intra-Abdominal Pressure (IAP) measurements to detect the presence of IAH, application of comprehensive medical management strategies to reduce elevated IAP and restore end-organ perfusion, and timely surgical decompression of the abdomen for refractory ACS and organ failure.

In the early days of IAH/ACS management, abdominal decompression was commonly employed as a “last ditch effort” in patients with well-established ACS resulting in a uniformly poor outcome and the perception that surgical intervention was futile. As our understanding of IAH/ACS pathophysiology improved and IAP monitoring was adopted by increasing numbers of critical care units, IAH/ACS was diagnosed at earlier stages where appropriate intervention was found to be lifesaving. Damage control laparotomy and use of the “open abdomen” in patients at risk resulted in notable decreases in the incidence of ACS and increases in both patient survival and abdominal closure rates. Much of the improvement in patient outcome has been achieved over the past several years since publication of the World Society of the Abdominal Compartment Syndrome (WSACS) consensus statements and algorithms, which for the first time, provided evidence-based definitions and recommendations for the comprehensive management of patients with elevated IAP (Malbrain 2006; Cheatham 2007). Through earlier diagnosis, (before IAH progresses to ACS), and with multi-modality IAP management to avoid end-organ failure, many centres have witnessed a marked decline in the incidence of ACS. In fact, the success of these strategies has changed the previous goal of avoiding ACS and its mortality into reducing the incidence of IAH and its detrimental effects on end-organ function.

The Fifth World Congress on the Abdominal Compartment Syndrome, recently held August 10-13th, 2011 in Lake Buena Vista, Florida, identified both the success of the IAH/ACS diagnosis and management algorithms proposed by the WSACS (http://www.wsacs.org), but also the need for increased IAP monitoring and greater worldwide implementation of these proven guidelines if IAH/ACS mortality is to decrease further.This review discusses both the current and recently presented literature regarding long-term outcome following IAH/ACS and presents a proven strategy for achieving similar results in any hospital setting.

Survival

Ennis et al. retrospectively evaluated a comprehensive resuscitation protocol in 118 burn patients that incorporated many principles from the WSACS definitions and recommendations (Ennis 2008). These included serial IAP monitoring, judicious fluid resuscitation with early use of colloids, goal-directed hemodynamic monitoring, maintenance of adequate abdominal perfusion, and decompressive laparotomy for refractory ACS. Compared to historical controls, the protocol decreased the incidence of ACS from 16% to 5% (p=0.06) and mortality from 31% to 18% (p=0.1). When ACS and mortality were combined as an endpoint, survival improved from 64% to 82% (p=0.03).

Vidal et al. prospectively studied 83 patients in a combined medical-surgical ICU (Vidal 2008).Thirty-one percent of patients had IAH upon ICU admission and another 33% developed IAH subsequently. Patients whose IAP remained below 12 mmHg had a mortality of 27% while those whose IAP exceeded that level had a mortality of 53% (p=0.02). IAP was identified to be an independent predictor of survival (p=0.003). Of note, 12% of patients developed ACS with an associated mortality of 80% as surgical decompression was not performed in patients who failed non-operative IAH/ACS management.

Cheatham and Safcsak prospectively compared the outcome of patients requiring open abdominal decompression (OAD) both before and after institution of a comprehensive resuscitation protocol incorporating the WSACS guidelines (Cheatham 2010). During the study, patient survival improved significantly from 50% to 72% (p=0.015). Clinically significant decreases in intensive care unit (ICU), hospital, and mechanical ventilator days were identified. Mean days to abdominal closure decreased from 20 ± 14 to 10 ± 10 days (p<0.01) and the rate of same-admission primary fascial closure increased from 59% to 81%. In multiple regression analysis, ACS was independently associated with a five-fold increase in mortality (Odd’s Ratio [OR] 0.18; p<0.0001) and early abdominal decompression a three-fold increase in survival (OR 3.2; p<0.0001). The use of a multi-modality surgical and medical management algorithm was an independent predictor of survival (p=0.018).

Mentula et al. retrospectively studied the benefit of OAD in 26 patients with severe acute pancreatitis resulting in ACS (Mentula 2010). While overall hospital mortality was 46%, patients who received OAD within four days of disease onset had a mortality of 18% and those decompressed after five or more days had a mortality of 100% (p<0.0001).

Acosta et al. described their four-year prospective experience in 151 vascular, general surgery, or trauma patients who required OAD and were managed using vacuum-assisted / mesh-mediated fascial closure (Acosta 2010). They achieved definitive abdominal closure in 89% of patients with an in-hospital mortality rate of 29.7%. Median IAP decreased significantly from 20 to 11 mmHg following OAD (p=0.001). Age (OR 1.21;

p=0.027) and failure to achieve fascial closure (OR 44.5; p=0.043) were independent predictors of in-hospital mortality.

In an abstract presented at the Fifth World Congress, Seternes et al. reported their retrospective experience with IAH/ACS in patients with ruptured abdominal aortic aneurysms (Seternes 2011). Survival in 2002-2005 (prior to institution of the WSACS guidelines) was 59%, while survival in 2006-2010 (incorporating a comprehensive IAH/ACS resuscitation strategy) was 73% (p=0.08) suggesting that systematic IAP measurement and prevention and treatment of ACS is associated with improved survival.

Cheatham et al. evaluated the impact of age upon survival of 405 IAH/ACS patients treated with a comprehensive IAH/ACS management protocol (Cheatham 2011). Survival by decade of life exceeded 50% through the eighth decade, but decreased to 19% for the ninth decade (greater than 80 years of age). Survival similarly varied significantly by service (trauma 72%, surgical 56%, burns 55%,medical 33%) (p<0.0001). Successful definitive abdominal closure rates (range 75-100%) were equivalent among all age groups (p=0.78). Survival following OAD thus varies by decade of life and mechanism of injury / illness, but reasonable survival rates can be expected for patients less than 80 years of age.

Arhinful et al. retrospectively studied 67 patients greater than 80 years of age who required damage control laparotomy and OAD (Arhinful 2011). They reported an in-hospital mortality of 37% and definitive abdominal closure rate of 52%, both notable figures considering the age of the population studied. Further, they documented a 66% survival at two years post-OAD. In multivariate regression analysis, congestive heart failure and postoperative acute renal failure were identified as independent predictors of mortality. Long-Term Functional Outcome While survival and abdominal closure rates are clinically important, the impact of IAH/ACS management upon long-term physical and mental health, quality of life, and subsequent employment potential are of greater importance to the patient. Cheatham et al. retrospectively surveyed 30 OAD patients in various stages of abdominal closure in the pre- WSACS guidelines era (Cheatham 2004). Patients awaiting abdominal hernia repair demonstrated significant decreases in physical health, physical capability, and energy level, and significant increases in bodily pain, social dysfunction, and emotional problems. Patients without an incisional hernia demonstrated significant decreases only in their ability to perform a full range of physical activities without limitation. Mental health was not decreased in either group. Successful abdominal reconstruction thus restored a patients' physical health to normal. Of note, none of these patients were permanently disabled or unable to resume gainful employment as a result of their abdominal decompression. These authors subsequently prospectively surveyed 44 OAD patients in the first 24 months following management using the WSACS guidelines (Cheatham 2008). At six months postdecompression, physical and social functioning were significantly decreased among patients with a chronic incisional hernia, but not among patients who had achieved definitive abdominal closure prior to hospital discharge. By 18 months, chronic incisional hernia patients had returned to normal physical and mental health perception. Quality adjusted life years did not differ between groups. Both demonstrated similar ability to resume employment (41% vs. 55%; p=0.49). Thus, OAD does not have a negative impact on long-term physical or mental health perception, quality of life, or the ability to resume employment.

Zarzaur et al. surveyed a select group of 41 OAD patients who required delayed abdominal wall reconstruction a median of six years post-injury (Zarzaur 2011). In contrast to the previous study, they identified a significant decrease in physical health, but found that 67% of patients had resumed employment following abdominal reconstruction. They also noted that 65% of their patients screened positive for depression and 23% for post-traumatic stress disorder (PTSD). They concluded that OAD patients can achieve near-normal quality of life, but that depression or PTSD may occur as a result of their critical illness. Legend: IAP – intra-abdominal pressure; IAH – intra-abdominal hypertension; ACS – abdominal compartment syndrome; APP – abdominal perfusion pressure Table 1.

Resource Utilisation

In the early days of IAH/ACS management, Split-Thickness Skin Grafting (STSG) of the exposed viscera, commonly after insertion of absorbable mesh and subsequent granulation, was considered standard therapy. This management strategy is labour-intensive, costly, and associated with significant morbidity and potential mortality (Cheatham 2010; Cheatham 2011; Zarzaur 2011). Given the improved survival and long-term physical and mental health outcome associated with abdominal closure, same admission definitive fascial closure should be the goal following OAD. A recent study of 324 patients OAD patients identified significant differences in resource utilisation depending upon the abdominal closure method utilised (Cheatham 2011). Following riskadjustment for severity of illness, primary fascial closure was associated with significantly reduced ICU and hospital length of stay, mechanical ventilator days, and hospital charges when compared to progressive abdominal closure, biologic mesh, STSG, or skin-only closure techniques (p<0.05). Days to abdominal closure (p<0.0001) and development of an enteroatmospheric fistula (EAF) (p=0.002) were identified as independent predictors of increased hospital charges following OAD. Further, patients who underwent early OAD had significantly lower hospital charges compared to those requiring emergent decompression for ACS (p=0.002). Thus, early abdominal closure, when physiologically appropriate, should be the goal following OAD. STSG is costly, resource-intensive, and should be avoided except in those patients where attempts at fascial closure have failed or are contraindicated as in the presence of an EAF. To subject all patients with an open abdomen to STSG incurs unnecessary risk, cost, morbidity, and potential mortality.

The Future

Over the past decade, the clinical importance of elevated IAP has been widely recognised, but comprehensive medical and surgical management strategies and resuscitation algorithms have been implemented by relatively few centres worldwide. Many ICUs still do not measure IAP in patients at risk and many physicians do not provide timely therapy to patients who develop IAH/ACS. The reasons for withholding these potentially lifesaving interventions are multi-factorial, but typically stem from a misunderstanding of these disease processes or unfamiliarity with the current medical literature. As a result, patient survival and long-term outcome is not what it could be. As the developing evidence outlined above illustrates, earlier recognition and appropriate intervention in patients at risk for IAH/ACS significantly increases patient survival, improves long-term functional outcome, and reduces hospital resource utilisation. A plethora of ongoing clinical trials will further confirm these findings. These improvements in patient outcome can be recognised in any hospital setting with minimal capital expense. The process for improving the diagnosis and management of patients with IAH/ACS is well-outlined in the patient care algorithms proposed by the WSACS (http://www.wsacs.org). Increased awareness of the etiology, prevalence, and patient groups at risk for IAH/ACS is the first step. This requires serial IAP monitoring in appropriate patients to both detect the presence of IAH and guide ongoing resuscitative therapy. A series of key hospital performance indicators to achieve such improvements in patient outcome is listed in Table 1. If physicians and hospitals were to adopt these indicators and implement a multi-disciplinary IAH/ACS management protocol, they would be well on the way to providing patients with the best care possible and making a significant difference in their future.

Published on : Thu, 15 Aug 2013