KSN SEOUL, KOREA 2023
April 27(Thu) - 30(Sun), 2023
Coex, Seoul, Korea

Submission No.: PG03-9003
Session Title: PG Education 3 (Fluid & Electrolyte)
Date & Time, Place: April 27 (Thu), 10:30 - 12:00, Room 4

Fluid therapy in Critically Ill Patients

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Fluid therapy is important in Critically ill patients. Fluid therapy restores systemic blood pressure, cardiac output, and renal perfusion pressure. Thus, total renal blood flow is increased and the risk of AKI is decreased. In hypovolemic state, venous return become decreased, and cardiac output also decreases. This results in hypotension, perfusion failure, and organ dysfunction. Fluid therapy can improve these organ dysfunctions by restoring venous return.
Fluid resuscitation is one of the mainstays in the acute management of sepsis. The most recent Surviving Sepsis Campaign guidelines recommend 30 cc/kg of crystalloid within the first 3 h for any hypovolemic septic patient. In the recent CLOVERS trial (N Engl J Med. 2023;388(6):499-510.), a restrictive fluid strategy and a liberal fluid strategy were compared. Among patients with sepsis-induced hypotension, the restrictive fluid strategy did not result in significantly lower (or higher) mortality than the liberal fluid strategy. However, Vasopressors were more commonly used in the restrictive fluid group than the liberal fluid group (in 59% vs. 37% of the patients). These results suggest that sufficient fluid therapy is important.
0.9% sodium chloride, or normal saline, is the most commonly used intravenous fluid worldwide, yet there is a risk of hyperchloremic metabolic acidosis and is associated with increased inflammatory markers. Hyperchloremia induces tubuloglomerular feedback, afferent arterior vasoconstriction, and would increases the risk of AKI. On the other hand, balanced crystalloids have an electrolyte content more closely resembling that of plasma including a much lower chloride concentration than normal saline. In SMART trial (N Engl J Med. 2018;378:829-39.), the use of balanced crystalloids for intravenous fluid administration resulted in a lower rate of the composite outcome of death from any cause, new renal-replacement therapy, or persistent renal dysfunction than the use of saline. There was no difference in in-hospital mortality. Other similar randomized controlled trials also found no difference in survival benefit between balanced crystalloids or saline. However, in subgroup analyses, there were the difference in the rate of the primary outcome between the balanced-crystalloids group and the saline group. Therefore, individual patient characteristics and other factors, including cost and availability of the fluids, and drug compatibility may determine which fluids are used.
Colloid solutions are suspensions of large plasma-derived or semisynthetic molecules that cannot pass through intact semipermeable membranes. Theoretically, colloids enhance the effects of fluid administration in hemodynamics and reduce the development of edema, compared with crystalloids. In most RCTs, albumin showed no benefit in survival compared to saline. Albumin may have beneficial effects for some patients with sepsis, particularly those with cirrhosis or other conditions predisposing to hypoalbuminemia (Hepatol Int. 2021;15(4):983-994.). The VISEP, CRYSTMAS, and CHEST trials found that semisynthetic colloids did not require substantially less fluid volume compared with crystalloids and that they may increase the risks of acute kidney injury, renal replacement therapy, or death. Given the potential risks, use of semisynthetic colloids should be avoided in the management of patients with sepsis.

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