



Editorial

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Anesthetic concerns during cytoreductive surgery with hyperthermic intraperitoneal chemotherapy

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Hyperthermic intraperitoneal chemotherapy (HIPEC) is a well-established surgical technique for intraperitoneal administration of chemotherapeutic drugs in patients with primary peritoneal carcinomatosis, or peritoneal metastasis from gynecological or gastrointestinal cancer after cytoreductive surgery (CRS) that involves surgical removal of visible tumors in the abdomen [1]. The goal of HIPEC is to destroy any residual microscopic cancer cells and to prevent recurrence because tumors are more sensitive to cytotoxic drugs during heated chemotherapy [2]. In patients with stage III epithelial ovarian cancer, the addition of HIPEC to intervals of CRS results in longer recurrence-free survival and overall survival than surgical treatment alone [3].

HIPEC is a form of heated chemotherapy that is administered to the abdominal cavity in the operating room under general anesthesia; therefore, the anesthesiologist plays a pivotal role in CRS with HIPEC. Massive fluid shift, blood loss, and temperature imbalance leads to hemodynamic alterations [2], and anesthetic considerations are needed with respect to cardiovascular, respiratory, and renal functions, as well as electrolyte balance and thermoregulation.

During the debulking phase of CRS, the amount of fluid and blood loss is mainly associated with the extent of resection, and, therefore, appropriate fluid management, and transfusion are required. During the HIPEC phase, injection of saline-enriched chemotherapeutic drugs into the abdominal cavity increases intra-abdominal pressure, and this decreases venous return and cardiac output [4]. Adequate administration of crystalloids and colloids is required for adequate organ perfusion and urine output. A previous randomized controlled trial compared standard fluid therapy and goal-directed therapy and found that goal-directed therapy improved postoperative outcomes, including major abdominal and systemic postoperative complications and the length of hospital stay, compared to the standard fluid therapy protocol [5]. Fluid overload and subsequent electrolyte imbalance along with coagulation abnormalities should be properly managed during CRS along with HIPEC.

Invasive hemodynamic monitoring is also recommended because of fluid shift and hyperdynamic circulation during HIPEC. A significant amount of fluid shift and blood loss may occur during CRS. During the HIPEC phase, heated chemotherapy results in vasodilation and hyperdynamic circulation. Vasodilation decreases systemic vascular resistance and mean arterial pressure and increases heart rate and cardiac output. Furthermore, the administration of saline-enriched cytotoxic drugs into the closed abdominal cavity increases intra-abdominal pressure and may further decrease venous return and cardiac output [4]. Invasive monitoring in the form of cardiac output and stroke volume variation is useful during such a hyperdynamic procedure [2].

A systemic review revealed that fluid management protocol guided by an advanced

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monitoring system (FloTrac[®], LiDCO[®], Pulsioflex[®] or PiCCO[®]) seems to be related to less postoperative morbidity and mortality following HIPEC [6]. Recently, less invasive methods for the monitoring of cardiac index (CI) have been widely introduced during anesthesia, and four different methods (FloTrac[®], ProAQT[®], ClearSight[®], and arterial pressure waveform analysis from PiCCO[®]) were investigated and compared with transpulmonary thermodilution (TPTD) during CRS with HIPEC [7]. Among these, FloTrac[®], ProAQT[®], and ClearSight[®] systems could not reliably measure CI compared to TPTD. Strategy on hemodynamic monitoring and fluid management during HIPEC should be individualized to minimize the postoperative complications.

In addition to hemodynamic management, protective mechanical ventilation is recommended considering cephalad displacement of the diaphragm and the subsequent increase in airway pressure [8]. Fluid management based on hemodynamic monitoring should ensure adequate urine output to prevent acute kidney injury [2]. Electrolyte imbalance and coagulation abnormalities should also be corrected.

CRS with HIPEC is a high-risk surgical procedure that is associated with major hemodynamic and metabolic changes; therefore, a team approach with continuous and vigilant care is required. Reports on anesthetic management till date are insufficient, and guidelines on intraoperative hemodynamic management have not been established. Furthermore, future studies on the impact of hemodynamic management during CRS with HIPEC on postoperative outcomes are needed.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

Author Contributions

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