

Techniques and Safety Issues for Intraperitoneal Chemotherapy



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KEYWORDS

- Hyperthermia • Safety • Intraperitoneal chemotherapy • Technique
- Peritoneal neoplasms • Occupational hazard

KEY POINTS

- Several methods of delivering hyperthermic intraperitoneal chemotherapy (HIPEC) have been described, but no significant differences in treatment outcomes, morbidity, or safety have been found among them, and the ultimate choice between them is left to individual preference or institutional criteria.
- Administration of HIPEC is safe for the personnel working in the operating room; chemotherapy exposure during the procedure is negligible provided universal precautions, individual protection measures, and environmental safety guidelines are followed.
- Proper education of operating room staff about the essentials of HIPEC and proper chemotherapy handling is the first safety requirement.

INTRODUCTION

The combination of complete cytoreductive surgery (CRS) and perioperative intraperitoneal chemotherapy (PIC) provides the best chance for long-term survival for selected patients diagnosed with a variety of peritoneal neoplasms, either primary or secondary to digestive or gynecologic malignancies.^{1–4} Its clinical application is fully developed and well-established in specialized centers around the world.⁵ New treatment centers are emerging on a yearly basis.

Hyperthermic intraperitoneal chemotherapy (HIPEC) delivered in the operating room once the cytoreductive surgical procedure is finalized constitutes the most common

Disclosure: The authors have nothing to disclose.

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Surg Oncol Clin N Am 27 (2018) 495–506

<https://doi.org/10.1016/j.soc.2018.02.005>

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form of administration of PIC. HIPEC combines the pharmacokinetic advantage inherent to the intracavitary delivery of certain cytotoxic drugs, which results in regional dose intensification, with the direct cytotoxic effect of hyperthermia. Hyperthermia exhibits a selective cell-killing effect in malignant cells by itself, potentiates the cytotoxic effect of certain chemotherapy agents, and enhances the tissue penetration of the administered drug.⁶ HIPEC may be complemented in some instances with early postoperative intraperitoneal chemotherapy (EPIC), delivered for the first 5 postoperative days in normothermia, although EPIC may be used alone.

The specific contribution of PIC to the overall oncological outcomes observed for the combined procedure remains to be elucidated. This issue is addressed by the French randomized trial PRODIGE-7, whose final outcome results are still awaited.⁷

Randomized controlled studies have not been performed to formally assess which modality of PIC is more advantageous. A few retrospective comparative studies are available showing a trend for or even an advantage for HIPEC alone over HIPEC followed by EPIC or EPIC alone, in terms of morbidity (fistula formation), although not in terms of survival.^{8,9} These conclusions, however, need to be interpreted with caution.

Although the use of HIPEC has gained wider acceptance, the specifics of its administration still lack uniformity. This article describes different techniques in use and the technology available for the administration of HIPEC, discussing its advantages and disadvantages. It also reviews the safety features that must be taken into consideration when performing this procedure to prevent occupational hazards.

HYPERTHERMIC INTRAPERITONEAL CHEMOTHERAPY TECHNIQUES

By principle, HIPEC is delivered in the operating room once a complete macroscopic cytoreduction has been achieved. There are 2 main methods for intraperitoneal administration of hyperthermic chemotherapy: open abdomen technique and closed abdomen technique. Mixed methods (semiopen or semiclosed) have been reported also.

Open Technique

The open technique is referred to as the coliseum technique, as described by Sugarbaker.¹⁰ Once the cytoreductive phase has been finalized, 4 closed-suction drains are placed through the abdominal wall and made watertight with a purse-string suture at the skin. These drains will remain in place for the postoperative period. An inflow line is placed over the abdominal wall into the peritoneal cavity and may be secured by a silk tie at the retractor frame. A different number of temperature probes may be used for intraperitoneal temperature monitoring; at least one in the in-flow line or under the right diaphragm and another one at a distance from this point (pelvis) are employed, but a more intensive monitoring may be used. Probes' tips may be secured with a silk tie to the tip of the corresponding drains to prevent migration. The skin edges of the abdominal incision are suspended up to a self-retaining retractor whose frame has previously been elevated 15 to 20 cm over the patient, thus creating an open space in the abdominal cavity. This is done by a running monofilament number 1 suture. A silastic sheet is incorporated into this suture to prevent chemotherapy solution splashing from occurring. A cut in the plastic cover is made to allow the surgeon's double-gloved hand access to the abdomen and pelvis. Impervious gown, double gloving, and protection goggles are mandatory. A smoke evacuator is placed under the plastic sheet to clear chemotherapy vapors or small droplets that may be liberated during the procedure. During the 30 to 90 minutes of perfusion, all the anatomic structures within the peritoneal cavity and the laparotomy incision are uniformly exposed to heat and

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