Current Applications of Intraperitoneal Chemotherapy

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ABSTRACT

Peritoneal carcinomatosis presents significant therapeutic challenges due to the unique characteristics of peritoneal metastases, such as their widespread nature, variability in size, and limited blood supply. Intraperitoneal chemotherapy (IPC) was first introduced in 1955 as a targeted treatment modality to address these challenges. By delivering cytotoxic agents directly into the peritoneal cavity, IPC enhances drug concentration at tumor sites while minimizing systemic toxicity. Two primary methods of IPC are Hyperthermic Intraperitoneal Chemotherapy (HIPEC) and Early Postoperative Intraperitoneal Chemotherapy (EPIC), each with distinct protocols and advantages. HIPEC is administered during cytoreductive surgery under hyperthermic conditions, while EPIC is applied post-surgery over an extended period. Patient selection is critical, and the technique is most effective when tumor burden is manageable post-cytoreduction. This review explores the molecular properties of IPC agents, their clinical applications across various cancers, adverse effects, and long-term outcomes, highlighting IPC's potential as a life-saving treatment for patients with peritoneal metastases.

KEYWORDS: Intraperitoneal Chemotherapy; HIPEC; EPIC; peritoneal carcinomatosis

INTRODUCTION

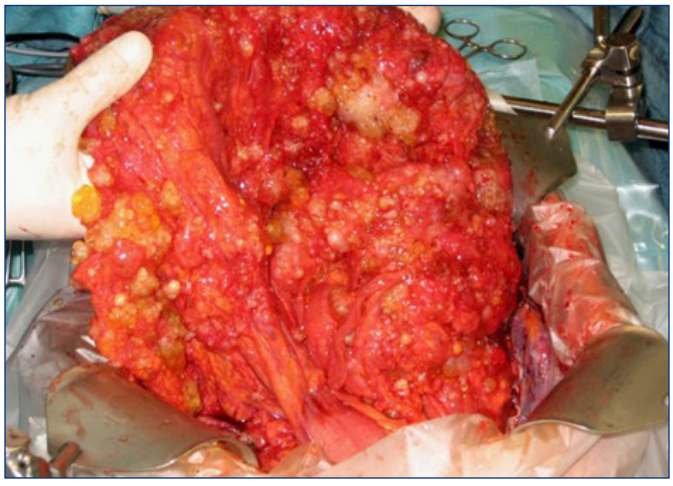
Peritoneal metastases pose a unique issue when considering treatment modalities. These tumors, often arising from colon, appendix, stomach and ovary, can be widespread, variable in size, and occupy organs with relatively sparse blood supply compared to other tumor locations.[1] Because of these characteristics, patients with peritoneal carcinomatosis are poor candidates for both local radiation therapy and systemic chemotherapy. This problem was first tackled in 1955 by Weissberger with the advent of intraperitoneal chemotherapy (IPC), an administration technique that allows for cytotoxic therapies to make direct contact with tumor deposits and penetrate via passive diffusion.[2] Since its introduction to the oncologic space, several patient populations with previously fatal prognoses have demonstrated significant benefit from its effects.[3] Our aim is to outline the specific current applications of IPC in terms of patient selection and cancer type, and to discuss adverse effects and overall clinical outcomes.

MECHANISM OF INTRAPERITONEAL CHEMOTHERAPY

IPC involves the direct instillation of cytotoxic drugs into the peritoneal cavity, maximizing drug-tumor cell contact.[2] The therapeutic agents reach tumor deposits through passive diffusion, allowing for enhanced local drug concentration while minimizing systemic toxicity.[2] This approach is particularly beneficial for treating peritoneal metastases, which are often difficult to reach through traditional systemic chemotherapy due to their limited vascular supply. IPC is more effective when the tumor deposits are small (typically no larger than 2.5 mm) as drug penetration is generally limited to 1–3 mm.[4] As such, cytoreductive surgery is crucial for reducing tumor burden prior to IPC[2] [**Figure 1**].

IPC agents are typically high molecular weight, hydrophilic, and ionized molecules. These properties facilitate the passive diffusion of the drugs into tumor deposits while limiting their passage across the plasma-peritoneal barrier, which helps reduce systemic toxicity.[6] Any drug that does cross the barrier is either metabolized by the liver or excreted by the kidneys, further minimizing bioavailability and preventing significant systemic effects.[1]

Figure 1. Omental caking due to peritoneal carcinomatosis – cytoreductive surgery[5]



HIPEC VS EPIC

The two primary IPC modalities are Hyperthermic Intraperitoneal Chemotherapy (HIPEC) and Early Postoperative Intraperitoneal Chemotherapy (EPIC). While the overarching goal of therapy are the same, they have important distinctions.

HIPEC is the intra-operative administration of cytotoxic drugs at an ideal temperature range of 41–43°C that allows for the synergistic destruction of tumor cells.[2] It is administered at the time of cytoreductive surgery for 30 to 120 minutes, just after resection has taken place and while the patient is still under general anesthesia. Hyperthermia is thought to amplify the cytotoxic effects of chemotherapy drugs through multiple mechanisms, particularly in hypoxic and nutrient-deprived environments.[10] By heating the chemotherapeutic agents to an ideal temperature of 41–43°C, the following changes occur:

1. The protein distribution across the plasma membranes of the tumor cells is shifted, leading to enhanced permeability of the tumor cells to the drugs;
2. The transmembrane efflux pumps are modulated to a lower functioning state;
3. DNA repair is impaired;
4. Heat shock proteins are activated.[10]

These changes enhance drug penetration and tumor cell destruction, and therefore, proponents of HIPEC believe hyperthermia to be an important component of HIPEC.

EPIC on the other hand, is administered on postoperative day one and can be readministered for up to seven days postoperatively. The cytotoxic drug is instilled and dwelled within the patient for 23 hours before draining and re-instilling the next day. Unlike HIPEC, EPIC utilizes cell cycle specific drugs which require prolonged tumor cell exposure and thus lengthened installation.[2]

The utilization of one modality over the other remains a matter of surgeon preference. Several studies have attempted to compare differences in survival outcomes and adverse effects when utilizing HIPEC vs EPIC. A recent study found EPIC to be an independent risk factor for major surgical complications.[7] Another study argued that HIPEC led to longer operative times, which naturally can lend itself to anesthesia-related complications.[7] Regardless of these findings, overall survival between the two groups were similar.[7] Certain retrospective analyses have also shown a benefit to overall survival when adding EPIC to CRS + HIPEC.[8] The addition of EPIC after initial treatment with CRS + HIPEC provides another opportunity to eradicate tumor cells that may have been left behind by HIPEC and incorporated themselves into postoperative adhesions. This has been named "the tumor entrapment theory," and poses a convincing argument to incorporate both modalities of IPC but can be challenging for patients to tolerate.[9]

PROCESS OF ADMINISTRATION

After complete cytoreduction surgery and before creation of any anastomoses, HIPEC can be administered by either the open abdomen or closed abdomen technique [**Figure 2**].

In the open abdomen technique, a Tenckhoff catheter is placed in the abdominal cavity as well as several closed suction drains.[1,2] The abdominal walls are suspended by a self-retractor and the open space is covered with a plastic sheet to maintain the elevated temperature. A heat exchanger is attached, and the chemotherapy is infused while the surgeon constantly manipulates and agitates the abdomen to ensure the solution covers as much surface area as possible. This is done for a duration of 30–120 minutes.[1,2]

The closed abdomen technique is similar, except that the skin edges are sutured after placement of the catheters in order to create a closed circuit for the perfusate to instill [**Figure 3**]. The volume of fluid is higher, as is the intra-abdominal pressure, which can aid in better tissue penetration. The closed technique also lessens heat dissemination due to the closed circuit.[1,2]

EPIC is administered on postoperative day one following cytoreduction surgery.[2] Intraperitoneal catheters are placed at the time of surgery, which are then used for the next one to seven days to percutaneously administer and then drain the cytotoxic medication once the 23-hour cycle completes.[2]

Figure 2. HIPEC machine (from ThermaSolutions)[11]

Figure 3. Intraoperative set up of HIPEC instillation – closed abdomen technique[12]

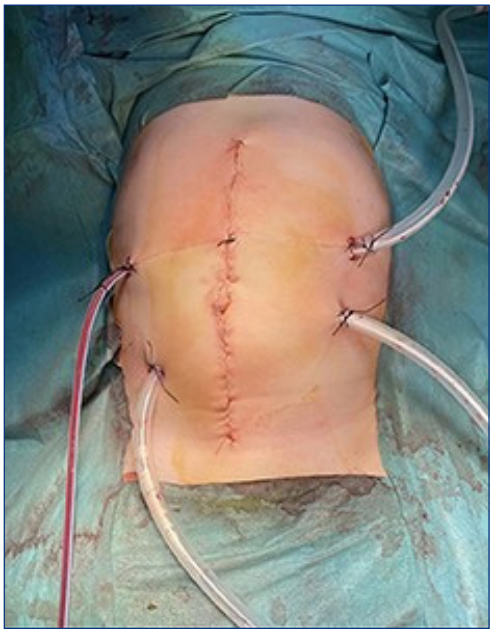
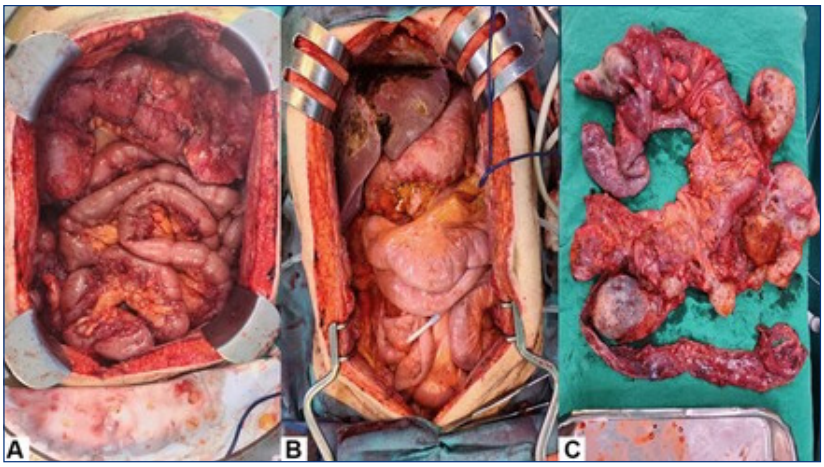


Figure 4. Before and after cytoreductive surgery with HIPEC30. [**A**] Before cytoreduction; [**B**] After cytoreductive surgery; [**C**] Tumor with involved organs removed



While EPIC provides the benefits of longer dwell times and repeated administration opportunities, it does have the limitations of potential patient discomfort as well as the lack of hyperthermic conditions.[2]

PATIENT SELECTION

Careful patient selection is crucial for the effective use of HIPEC. Treatment with HIPEC is generally reserved for patients with tumor burdens that can be feasibly removed on cytoreduction within 2-3 mm[13] [**Figure 4**]. Patients with larger or unresectable tumor burdens after cytoreduction are poor candidates due to limitations of chemotherapy penetration. Scoring systems such as the complete cytoreduction score are available to quantify residual tumor burden and have been shown to have prognostic significance for patient outcomes.[14] Similarly, patients must be able to tolerate cytoreduction and HIPEC administration. As a result, severe malnutrition and poor performance status are contraindications to this procedure just as with any other major surgery.[13] It is also recommended to delay or abort cytoreduction if there is concern for active peritonitis or sepsis.[13] Treatment agent specific contraindications are also important factors when considering patient selection for HIPEC, such as platinum-based chemotherapeutic agents, which are renally cleared and may not be tolerated by patients with renal disease.[13] An individualized and patient specific approach is important to optimize patient inclusion while limiting ineffective or potentially harmful attempts at treatment.

APPLICABLE CANCERS

Ovarian

The most common route of metastases of ovarian cancer to the peritoneum is by the shedding of cancerous ovarian cells into the peritoneal cavity.[15] The most common chemotherapeutic agent for ovarian cancer is cisplatin, administered every three weeks for six cycles.[2] Studies have demonstrated improved overall survival of patients with ovarian cancer when systemic chemotherapy was combined with IPC.[2] HIPEC and cytoreduction treatment was found to have a five-year progression free survival rate of 12.3% compared to 6.6% in patients who underwent surgery alone.[16]

Appendiceal/pseudomyxomaperitonei(PMP)

PMP is a difficult clinical condition in which a neoplasms, typically appendiceal in origin, secrete a gelatinous mucin causing profound mucinous ascites and can lead to bowel obstruction.[17] They have a characteristic peritoneal spread and have been shown to be responsive to CRS + HIPEC. The most commonly used agent for PMP is mitomycin C, typically administered in two separate doses[2]. Treatment with cytoreduction and HIPEC was found to be associated with 10-year overall survival rates of 37% versus 16% in patients who underwent surgery alone.[18]

Gastric

Carcinomatosis due to gastric cancer represents a majority of gastric cancer related deaths at a range of 53–60%.[19] The use of both HIPEC and EPIC in peritoneal gastric cancer has been studied and shown to be effective for improving survival. HIPEC typically uses mitomycin C and cisplatin, while EPIC uses 5-FU.[2] In patients who underwent surgery alone versus HIPEC and surgery, overall five-year survival rates improved from 53.4 to 86.8%.[20]

Colorectal

Colorectal cancer continues to occupy a large portion of annual cancer deaths, ranking at number two in the US in terms of cancer-related mortality. Researchers have estimated up to 10% of patients have peritoneal spread at the time of diagnosis, making this a significant patient population to be considered for IPC.[21] While systemic therapy with FOLFOX and certain biologics remain a mainstay of colorectal cancer treatment, when HIPEC is employed for peritoneal metastases, mitomycin C as well as oxaliplatin are often used.[2] Compared to systemic chemotherapy alone, there was improved outcomes in survival in those who received combined cytoreductive surgery and HIPEC where median survival lengthened from three to seven months to 41 months.[22]

Malignant peritoneal mesothelioma

Typically related to asbestos exposure, malignant peritoneal mesothelioma is a rare, aggressive entity that leads to the formation of plaque-like tumor deposits within the abdominal

cavity.[23] Prior to the development of IPC, the median survival with systemic chemotherapy, surgical resection, and total abdominal radiation was 12 months.[23] Now, CRS + HIPEC ± EPIC is used for MPM and has increased the median survival up to 92 months.[23] The most common agents used in HIPEC for MPM are mitomycin C, doxorubin, and cisplatin, while paclitaxel is commonly used in EPIC.[2]

AGENTS

As previously discussed, the ideal IPC drug is one that has a high molecular weight, hydrophilicity, and is ionized. These properties allow for maximal penetration into micrometastases while reducing systemic toxicity.[2] Currently, the most commonly used agent in US is Mitomycin C(MMC).[24] It works by adding alkyl groups to DNA, leading to cross-linking and strand breaks, which hinders cancer cell replication.[25] MMC is often used in HIPEC due to its favorable pharmacokinetics, including a satisfactory area under the curve (AUC) ratio of intraperitoneal to plasma concentrations, high tissue penetration distance of up to 5mm, low systemic absorption rate, stability at elevated temperatures, and synergistic effects with heat. It is the drug of choice for appendiceal, colorectal, and, in combination with other drugs, gastric malignancies.[2] Other agents that have shown to be effective with tolerable side effect profiles include 5-FU, oxaliplatin, doxorubicin, cisplatin, and paclitaxel.[2]

COMPLICATIONS/ADVERSE EFFECTS

The combined treatment of cytoreductive surgery and HIPEC has been associated with mortality rates of 0–18% and morbidity rate between 30–70%.[26] The PRODIGE 7 trial comparing cytoreductive surgery and HIPEC vs. cytoreductive surgery alone demonstrated an increased rate of 26% versus 15% occurrence of grade 3 or worse events within 60 days of treatment.[27] Common postoperative complications include enterocutaneous fistulas, neutropenia, post-operative bleeding, anastomotic leaks, systemic sepsis, and infection.[28] Of the various post-operative complications, the most common is infections, resulting in a decreased overall survival and recurrence free survival rate.[28] After initial surgery, there was an associated re-operation rate of 14.5% performed seven to nine days after initial treatment for fascial dehiscence, intraabdominal hemorrhage and anastomotic leak along with a 1–4% 30-day mortality rate.[26,29] Factors associated with increased morbidity and mortality are increased age, hypoalbuminemia, high peritoneal carcinomatosis index, cytoreductive surgery involving bowel resection, diaphragmatic involvement, performance of distal pancreatectomy, hepatobiliary and urologic procedures.[26]

OUTCOMES

The beneficial outcomes of IPC in patients with peritoneal metastases and malignancies range from increased long-term survival to improved quality of life. While these metrics vary depending on the type of cancer and individual patient, several studies have correlated IP with better outcomes.

A retrospective study in 2015 looking at 876 patients with metastatic ovarian cancer demonstrated a median survival of 61.8 months (95% CI, 55.5 to 69.5) in the IP chemotherapy group compared to 51.4 months (95% CI, 46.0 to 58.2) in the intravenous systemic chemotherapy group.[31] They also showed that for each cycle of IP chemotherapy completed, the risk of death decreased by 12% (AHR, 0.88; 95% CI, 0.83 to 0.94; P < .001).[31] After a median follow-up of over 10 years, the HIPEC group exhibited a median overall survival of 44.9 months, compared to 33.3 months in the surgery-only group.[32] The five-year overall survival rates were 36.9% for the HIPEC group versus 19.7% for the control group, and the 10-year overall survival rates were 16.1% versus 10.9%, respectively.[32] Multiple other studies have concluded that there was an improved overall survival when IPC is administered.[1]

Beyond survival, peritoneal carcinomatosis can also be extremely life-limiting due to its associated symptoms. McQuellen et al used various scales to assess the quality of life (QoL) and functional status of patients after treatment with IPC.[33] Using the Functional Assessment of Cancer Therapy–Colon (FACT-C) scale, a measure of QoL after debulking and HIPEC, they found that the majority of patients returned to their functional baseline by three months post-treatment.[33] Dodson et al used several scales of measure, including the SF-36 Physical Functioning scale, FACT-C, the Brief Pain Inventory, the Center for Epidemiologic Studies Depression scale, and the Eastern Cooperative Oncology Group (ECOG) performance status, and concluded that the majority of patients showed an improved scoring at six months after treatment with CRS and HIPEC.[34] Even for patients seeking palliation only, the administration of IPC can contribute to improved quality of life by lessening pain, decreasing bloating and early satiety, and lessening the need for paracentesis in cases of advanced pseudomyxoma peritonei.[35]

FUTURE DIRECTIONS

IPC is a consistently evolving treatment option for the management of peritoneal malignancies. One promising avenue of development is the use of neoadjuvant intraperitoneal and systemic chemotherapy (NIPS).[36] This approach has been shown to be a feasible option to reduce tumor burden and improve the likelihood of resection with negative margins.[36] Prospective research regarding efficacy and ideal patient selection for NIPS is ongoing.[37] As laparoscopic and robotic surgery continues to push the boundaries of what can be

accomplished without open surgery, minimally invasive CRS and HIPEC may also become more frequently utilized.[38] With more data from ongoing studies becoming available, standardized protocols should be established as few are currently available.[1] IPC remains an area of active research and development with exciting potential to improve patient outcomes moving forward.

CONCLUSION

IPC allows for localized high-dose drug delivery directly to the peritoneal cavity, overcoming limitations of other treatment modalities. While HIPEC and EPIC are the primary IPC techniques, current evidence does not show a clear advantage of one over the other. IPC has demonstrated survival benefits in select malignancies, particularly ovarian and colorectal cancers, but results in gastric cancer and other peritoneal surface malignancies remain investigational. Further research is needed to optimize patient selection, refine treatment protocols, and clarify IPC's long-term benefits in managing peritoneal metastases.

References

1. Ben Aziz M, Di Napoli R. Cytoreduction (CRS) and Hyperthermic Intraperitoneal Chemotherapy (HIPEC). In: *StatPearls*. StatPearls Publishing; 2025. Accessed March 17, 2025. http://www.ncbi.nlm.nih.gov/books/NBK570563/
2. Goodman MD, McPartland S, Detelich D, Saif MW. Chemotherapy for intraperitoneal use: a review of hyperthermic intraperitoneal chemotherapy and early post-operative intraperitoneal chemotherapy. *J Gastrointest Oncol*. 2016;7(1):45-57. doi:10.3978/j.issn.2078-6891.2015.111
3. Foster JM, Sleightholm R, Patel A, et al. Morbidity and Mortality Rates Following Cytoreductive Surgery Combined With Hyperthermic Intraperitoneal Chemotherapy Compared With Other High-Risk Surgical Oncology Procedures. *JAMA Netw Open*. 2019;2(1):e186847. doi:10.1001/jamanetworkopen.2018.6847
4. Rationale and techniques of intra-operative hyperthermic intraperitoneal chemotherapy - PubMed. Accessed March 17, 2025. https://pubmed.ncbi.nlm.nih.gov/11908929/
5. Glockzin G, Schlitt HJ, Piso P. Peritoneal carcinomatosis: patients selection, perioperative complications and quality of life related to cytoreductive surgery and hyperthermic intraperitoneal chemotherapy. *World J Surg Oncol*. 2009;7:5. doi:10.1186/1477-7819-7-5
6. Yan TD, Cao CQ, Munkholm-Larsen S. A pharmacological review on intraperitoneal chemotherapy for peritoneal malignancy. *World J Gastrointest Oncol*. 2010;2(2):109-116. doi:10.4251/wjgo.v2.i2.109
7. Jeong MH, Kang SJ, Park SY, et al. Comparison of EPIC Versus HIPEC in the Treatment of Colorectal Peritoneal Metastases and Appendix Tumors Using Inverse Probability of Treatment Weighting. *Ann Surg Oncol*. 2024;31(10):7111-7121. doi:10.1245/s10434-024-15674-2
8. Soucisse ML, Liauw W, Hicks G, Morris DL. Early postoperative intraperitoneal chemotherapy for lower gastrointestinal neoplasms with peritoneal metastasis: a systematic review and critical analysis. *Pleura Peritoneum*. 2019;4(3):20190007. doi:10.1515/pp-2019-0007
9. Sugarbaker PH. A narrative review of what can HIPEC do. *Eur J Surg Oncol*. 2023;49(9):106976. doi:10.1016/j.ejso.2023.07.002
10. Helderman RFCPA, Löke DR, Kok HP, et al. Variation in Clinical Application of Hyperthermic Intraperitoneal Chemotherapy: A Review. *Cancers*. 2019;11(1):78. doi:10.3390/cancers11010078
11. ThermaSolutions – Hyperthermic Intraperitoneal Chemotherapy. ThermaSolutions – Hyperthermic Intraperitoneal Chemotherapy. Accessed March 19, 2025. https://www.thermasolutions.com/
12. Garnier H, Murawski M, Jastrzebski T, et al. Case Report: Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy Application in Intraperitoneally Disseminated Inflammatory Myofibroblastic Tumor and in the Youngest Patient in the World: New Indication and Modification of Technique. *Front Surg*. 2021;8:746700. doi:10.3389/fsurg.2021.746700
13. Simkens GA, Rovers KP, Nienhuijs SW, de Hingh IH. Patient selection for cytoreductive surgery and HIPEC for the treatment of peritoneal metastases from colorectal cancer. *Cancer Manag Res*. 2017;9:259-266. doi:10.2147/CMAR.S119569
14. Munoz-Zuluaga CA, King MC, Diaz-Sarmiento VS, et al. Defining "Complete Cytoreduction" After Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy (CRS/HIPEC) for the Histopathologic Spectrum of Appendiceal Carcinomatosis. *Ann Surg Oncol*. 2020;27(13):5026-5036. doi:10.1245/s10434-020-08844-5
15. Yeung TL, Leung CS, Yip KP, Au Yeung CL, Wong STC, Mok SC. Cellular and molecular processes in ovarian cancer metastasis. A Review in the Theme: Cell and Molecular Processes in Cancer Metastasis. *Am J Physiol - Cell Physiol*. 2015;309(7):C444-C456. doi:10.1152/ajpcell.00188.2015
16. HIPEC/Cytoreduction Produces Long-Term Survival in Advanced Ovarian Cancer. Cancer Network. December 19, 2023. Accessed March 17, 2025. https://www.cancernetwork.com/view/hipec-cytoreduction-produces-long-term-survival-in-advanced-ovarian-cancer
17. Scally CP, Fournier KF, Mansfield PF. Hyperthermic Intraperitoneal Chemotherapy in Pseudomyxoma Peritonei After Cytoreductive Surgery. *JAMA Surg*. 2021;156(3):e206364. doi:10.1001/jamasurg.2020.6364
18. Wang B, Ma R, Shi G, Fan X, Rao B, Xu H. Hyperthermic intraperitoneal chemotherapy in patients with incomplete cytoreduction for appendiceal pseudomyxoma peritonei: a 10-year treatment experience in China. *Orphanet J Rare Dis*. 2024;19(1):8. doi:10.1186/s13023-023-02995-w
19. Okines A, Verheij M, Allum W, Cunningham D, Cervantes A. Gastric cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol*. 2010;21:v50-v54. doi:10.1093/annonc/mdq164
20. Wu Z, Li Z, Ji J. Morbidity and mortality of cytoreductive surgery with hyperthermic intraperitoneal chemotherapy in advanced gastric cancer. *Transl Gastroenterol Hepatol*. 2016;1:63. doi:10.21037/tgh.2016.07.03
21. Drittone D, Schipilliti FM, Arrivi G, Mazzuca F. Cytoreductive surgery followed by hyperthermic intraperitoneal chemotherapy applications in upper and lower gastrointestinal cancer, a review. *Oncol Rev*. 2024;18:1496141. doi:10.3389/or.2024.1496141
22. Sarofim M, Wijayawardana R, Ahmadi N, Morris DL. Repeat cytoreductive surgery with HIPEC for colorectal peritoneal metastases: a systematic review. *World J Surg Oncol*. 2024;22(1):99. doi:10.1186/s12957-024-03386-6
23. Enomoto LM, Shen P, Levine EA, Votanopoulos KI. Cytoreductive surgery with hyperthermic intraperitoneal chemotherapy for peritoneal mesothelioma: patient selection and special considerations. *Cancer Manag Res*. 2019;11:4231-4241. doi:10.2147/CMAR.S170300
24. Ihemelandu CU, Shen P, Stewart JH, Votanopoulos K, Levine EA. Management of Peritoneal Carcinomatosis from Colorectal Cancer. *Semin Oncol*. 2011;38(4):568-575. doi:10.1053/j.seminoncol.2011.05.011

25. Mitomycin C. An overview | ScienceDirect Topics. Accessed March 19, 2025. https://www.sciencedirect.com/topics/chemistry/mitomycin-c
26. Newton AD, Bartlett EK, Karakousis GC. Cytoreductive surgery and hyperthermic intraperitoneal chemotherapy: a review of factors contributing to morbidity and mortality. *J Gastrointest Oncol*. 2016;7(1). doi:10.3978/j.issn.2078-6891.2015.100
27. Quénet F, Elias D, Roca L, et al. Cytoreductive surgery plus hyperthermic intraperitoneal chemotherapy versus cytoreductive surgery alone for colorectal peritoneal metastases (PRODIGE 7): a multicentre, randomised, open-label, phase 3 trial. *Lancet Oncol*. 2021;22(2):256-266. doi:10.1016/S1470-2045(20)30599-4
28. Gamboa AC, Lee RM, Turgeon MK, et al. Implications of Postoperative Complications for Survival After Cytoreductive Surgery and HIPEC: A Multi-Institutional Analysis of the US HIPEC Collaborative. *Ann Surg Oncol*. 2020;27(13):4980-4995. doi:10.1245/s10434-020-08843-6
29. Blaj S, Nedelcut S, Mayr M, et al. Re-operations for early postoperative complications after CRS and HIPEC: indication, timing, procedure, and outcome. *Langenbecks Arch Surg*. 2019;404(5):541-546. doi:10.1007/s00423-019-01808-8
30. Cytoreductive surgery and intraperitoneal chemotherapy for peritoneal metastasis of colorectal cancer: long-term follow-up results at a single institution in Korea | Request PDF. *ResearchGate*. Published online October 22, 2024. doi:10.1007/s00384-023-04340-w
31. Tewari D, Java JJ, Salani R, et al. Long-term survival advantage and prognostic factors associated with intraperitoneal chemotherapy treatment in advanced ovarian cancer: a gynecologic oncology group study. *J Clin Oncol Off J Am Soc Clin Oncol*. 2015;33(13):1460-1466. doi:10.1200/JCO.2014.55.9898
32. Aronson SL, Lopez-Yurda M, Koole SN, et al. Cytoreductive surgery with or without hyperthermic intraperitoneal chemotherapy in patients with advanced ovarian cancer (OVHIPEC-1): final survival analysis of a randomised, controlled, phase 3 trial. *Lancet Oncol*. 2023;24(10):1109-1118. doi:10.1016/S1470-2045(23)00396-0
33. McQuellon RP, Loggie BW, Fleming RA, Russell GB, Lehman AB, Rambo TD. Quality of life after intraperitoneal hyperthermic chemotherapy (IPHC) for peritoneal carcinomatosis. *Eur J Surg Oncol J Eur Soc Surg Oncol Br Assoc Surg Oncol*. 2001;27(1):65-73. doi:10.1053/ejso.2000.1033
34. Dodson RM, McQuellon RP, Mogal HD, et al. Quality-of-Life Evaluation After Cytoreductive Surgery with Hyperthermic Intraperitoneal Chemotherapy. *Ann Surg Oncol*. 2016;23(Suppl 5):772-783. doi:10.1245/s10434-016-5547-y
35. Lambert LA, Harris A. Palliative cytoreductive surgery and hyperthermic intraperitoneal chemoperfusion: current clinical practice or misnomer? *J Gastrointest Oncol*. 2016;7(1):112-121. doi:10.3978/j.issn.2078-6891.2015.132
36. Fujiwara Y, Takiguchi S, Nakajima K, et al. Neoadjuvant intraperitoneal and systemic chemotherapy for gastric cancer patients with peritoneal dissemination. *Ann Surg Oncol*. 2011;18(13):3726-3731. doi:10.1245/s10434-011-1770-8
37. Lu S, Yang ZY, Yan C, et al. A Phase III Trial of Neoadjuvant Intraperitoneal and Systemic Chemotherapy for Gastric Cancer with Peritoneal Metastasis. *Future Oncol*. 2022;18(10):1175-1183. doi:10.2217/fon-2021-1414
38. Ortega J, Orfanelli T, Levine E, Konstantinidis IT. The robotic future of minimally invasive cytoreduction and hyperthermic intraperitoneal chemotherapy for peritoneal surface malignancies. *Chin Clin Oncol*. 2023;12(2):16-16. doi:10.21037/cco-22-118

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