

Indigenous way of hyperthermic intraperitoneal chemotherapy

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Abstract

Introduction: Hyperthermic Intraperitoneal Chemotherapy (HIPEC) is a form of highly concentrated, heated chemotherapy that is delivered directly to the abdomen intra-operatively. Currently for peritoneal surface malignancy (PSM), either primary or secondary from gastrointestinal (GI) or gynecologic cancers, cytoreductive surgery (CRS) combined with peri-operative HIPEC therapy is recommended. **Aims & objectives:** The primary objective of this case report is to show that in the current era of malignancy, resource poor centers can adopt our innovative way of HIPEC therapy and can treat peritoneal neoplasms which were considered to have only palliative treatment. **Methods:** After proper pre-operative work up, 61 year old lady diagnosed with adenocarcinoma of the sigmoid colon with peritoneal deposits was taken up for cytoreductive surgery and HIPEC. In the absence of a proper HIPEC machine, we used the hotline fluid warmer used by Anesthesiologists to heat the chemotherapy solution which was then re-circulated manually. **Results:** The patient had an excellent post-operative recovery and was discharged in a hemodynamically stable condition on post-operative day (POD) 6. She has completed 18 months of follow-up and has no signs of recurrence. **Conclusions:** To treat cancer like peritoneal neoplasm in resource-poor centers, the hotline machine can be a good option.

Introduction

Peritoneal surface malignancy (PSM) for a long time was classified as a non-surgical advanced stage of cancer because of long, complex surgery and limited peritoneal penetration of systemic chemotherapy. At present, cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (HIPEC) is a multimodality procedure that is being performed to treat peritoneal neoplasm, either primary or metastatic.

The purpose of this article is to report a non-conventional or innovative way of delivering HIPEC therapy which may be adopted in resource poor centers to treat such advanced malignancies.

Case Report

A 61 year old lady patient presented with lower abdominal pain for the past 1 year and 1-2 episodes of bleeding per-rectum along with change in stool consistency for last 2 months. She had a history of total abdominal hysterectomy along with bilateral salpingo-oophorectomy and total omentectomy, done 2 years back for papillary serous adenocarcinoma of right ovary.

Clinically she was found to have a firm mass (3*2 cm) around 7 cm from the anal verge.

The diagnosis was confirmed by colonoscopy and biopsy which came as moderately differentiated adenocarcinoma sigmoid colon. Investigations such as CECT whole abdomen and PET-CT were also done to rule out distant metastasis. Pre-operatively baseline value of tumor markers such as carcinoembryonic antigen levels was also checked.

The TNM staging of the disease (AJCC 8th) was cT4aN1cM1c (Stage IVC).

Treatment

The entire procedure was performed in a tertiary health care center situated at Kolkata, India (Institute Of Post-Graduate Medical Education and Research and Seth Sukhlal Karnani Memorial Hospital).

On exploratory laparotomy, the growth was found at the sigmoid colon with peritoneal deposits. Liver, spleen *etc.* were free from metastatic deposits. The peritoneal cancer index (PCI) score was 4/39. Cytoreductive surgery was done achieving a completeness of cytoreduction (CC) score of 0.

Intra-operative HIPEC therapy was instituted with Inj. Cisplatin (75 mg/m²) at 41°C (105.8°F) for 1 h.

To heat the chemotherapy solution, we used the hotline fluid

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warmer machine used by Anesthesiologists (Figure 1). The chemotherapy solution was manually re-circulated into the machine to maintain the desired temperature. The liquid heater was maintained at a temperature of 41°C (105.8°F).

The HIPEC was performed by the open method (Coliseum technique) (Figure 2). In order to ensure the desired temperature, the intraperitoneal temperature monitoring was done using temperature probes secured to the skin edge.

Adequate measures were taken to avoid the hazards of cytotoxic drugs to the health-care workers inside the operating theatre.

The patient had a good post-operative recovery and was discharged in a hemodynamically stable condition on post-operative day 6.



Figure 1. The hotline fluid warmer machine.



Figure 2. Intra-op HIPEC therapy (Open technique).

Follow-up

The patient has completed 18 months of follow-up. In the follow-up period she has been assessed both clinically and by certain investigations like carcinoembryonic antigen, CECT whole abdomen etc. There have been no signs of recurrence till her last date of follow-up.

Discussion

HIPEC is a form of highly concentrated, heated chemotherapy treatment which delivers chemotherapy directly to cancer cells in the abdomen and reduces systemic absorption. Currently cytoreductive surgery and HIPEC is recommended for a variety of peritoneal neoplasm, either primary or secondary to gastro-intestinal or gynecological malignancies.¹ Unlike in systemic chemotherapy, HIPEC ensures a high regional concentration along with low systemic concentration of cytotoxic drugs.

Inhibitions of RNA synthesis, mitosis arrest and increase in the activity of lysosomal enzymes²⁻⁴ etc. are some of the effects of hyperthermia in cellular level. Increased penetration of drugs, temperature-dependent increase in the activity of drugs, inhibition of various repair mechanisms⁵⁻⁷ etc. are some of the other significant effects of hyperthermia. The choice of drug to be administered primarily depends on: i) activity of the drug against the primary disease, ii) the suitability of the drug for intra-operative administration.

Literature on HIPEC in low resource centers is limited. Bhatt *et al.* in their article on *The 'homemade' HIPEC machine – a cost-effective alternative in low-resource countries* described the use of homemade HIPEC machine (HMM) by cardiopulmonary bypass machine as a cost-effective alternative in low-resource countries without compromising the efficacy and safety concerns.⁸

Limitations of our case report

- i) The technique was applied to only one case. To validate the innovative method, further large-scale studies are required.
- ii) The flow of the chemotherapy solution couldn't be controlled with this method.

Conclusions

HIPEC is generally given with the help of HIPEC machine. But in resource poor centers we can use the hotline fluid warmer machine to heat the chemotherapy solution which is cost-effective, although temperature dissipation remains a concern. Such innovations if applied can tackle many advanced peritoneal neoplasms as is evident from our case report.

References

1. González-Moreno S, González-Bayón LA, Ortega-Pérez G. Hyperthermic intraperitoneal chemotherapy: Rationale and technique. *World J Gastrointest Oncol* 2010;2:68-75.
2. Cavaliere R, Ciocatto EC, Giovannella BC, et al. Selective heat sensitivity of cancer cells. *Biochemical and clinical studies. Cancer* 1967;20:1351-81.

3. Overgaard J. Effect of hyperthermia on malignant cells in vivo. A review and a hypothesis. *Cancer* 1977;39:2637-46.
4. Sticca RP, Dach BW. Rationale for hyperthermia with intraoperative intraperitoneal chemotherapy agents. *Surg Oncol Clin N Am* 2003;12:689-701.
5. Panteix G, Guillaumont M, Cherpil L, et al. Study of the pharmacokinetics of mitomycin C in humans during intraperitoneal chemohyperthermia with special mention of the concentration in local tissues. *Oncology* 1993;50:366-70.
6. Sticca RP, Dach BW. Rationale for hyperthermia with intraoperative intraperitoneal chemotherapy agents. *Surg Oncol Clin North Am* 2003;12:689-701.
7. Jacquet P, Averbach A, Stuart OA, et al. Hyperthermic intraperitoneal doxorubicin: pharmacokinetics, metabolism, and tissue distribution in a rat model. *Cancer Chemother Pharmacol* 1998;41:147-54.
8. Bhatt A, Prabhu R, Sethna K, et al. The “homemade” HIPEC machine – a cost-effective alternative in low-resource countries. *Pleura Periton* 2017;2:163-70.

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