



Perioperative Nursing Consideration after Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy

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Abstract

Introduction: The management of peritoneal metastasis remain a controversial issue. The majority of medical society believes that this condition remains with poor prognosis and survival expectation remains to 3-6 months.

On the other hand the selection of patients with strict criteria offers with locoregional treatments of Cytoreductive Surgery (CRS) plus Hyperthermic Intraperitoneal Chemotherapy (HIPEC) a ray of hope in the possibility of long term survival.

The aim of the study is to present protocols based on our 20 years experience with patients with Peritoneal Metastasis (PM) and CRS and HIPEC.

Patients and Methods: From 6050 patients with PM, 1350 (22.31%) of them we performed CRS+HIPEC the last 20 years, 65% of the cases are from gynecological cancer (ovaries or endometrial).

Results: We perform a special protocols concerning intra-operative and post-operative period management. We include extubation criteria and special algorithms for each postoperative days (1st to 10st) in order to decrease the post-operative morbidity and mortality.

With our nursing protocol which includes special medical orders we achieved a 22,5% of grade 3 and 4 complications and only 2,5 mortality rate.

Conclusions: The management of PM with CRS+HIPEC offers a better Disease Free survival and disease free overall survival. The most important factors are Performance status, Low Peritoneal Cancer Index (PCI) completeness, Cytoreduction Score (CCs) and finally meticulous postoperative nursing monitoring



Introduction

The management of Peritoneal Metastasis (PM) remains a contentious issue within the medical community. Despite recent progress in managing peritoneal metastases, this diagnosis often predicts a poor outcome with expected survival rates of only 3-6 months [1].

However, advancements in locoregional treatments, particularly Cytoreductive Surgery (CRS) combined with Hyperthermic Intraperitoneal Chemotherapy (HIPEC), have provided a glimmer of hope for long-term survival in select patient groups [2].

The CRS technique involves extensive surgical procedures aimed at removing visible tumors from the peritoneal cavity. This often requires multiple organ resections and peritoneal stripping, making it a highly invasive and technically demanding surgery [3,4].

Following CRS, HIPEC is administered to target any remaining microscopic disease. Chemotherapy is heated to 41-43°C and circulated within the peritoneal cavity for 30-90 minutes [5]. The heat enhances the efficacy of the chemotherapy agents, increasing their penetration and cytotoxic effects while reducing systemic toxicity [6-8]. The success of CRS+HIPEC is measured by the completeness of cytoreduction, which is categorized by the Completeness of Cytoreduction Score (CCs) a lower CCs, indicating minimal residual disease, is associated with better outcomes, as well as Performance Status, patients must have a good performance status, typically a Karnofsky Performance Score (KPS) of 70 or above, Peritoneal Cancer Index (PCI), the PCI is a scoring system that quantifies the extent of peritoneal disease. Patients with a low to moderate PCI (typically less than 20) are considered better candidates, also Absence of Extrapertitoneal Disease, patients should not have unresectable extraperitoneal metastases and Adequate Organ Function [3,4,11].

Furthermore, perioperative complications following CRS+HIPEC independently affect survival prognosis [9-11].

The arm of the study is to present protocols based on our 20 years experience with patience with peritoneal metastasis and CRS+HIPEC retrospectively. We highlight the critical role of perioperative nursing in the successful management of peritoneal metastasis through CRS and HIPEC, drawing from our extensive experience and emphasizing the importance of specialized nursing protocols in improving patient outcomes [12].

Our protocols, are an evidence-based, aimed at improving postoperative rehabilitation, decreasing morbidity and mortality.

Key components of protocols include extubation criteria, fluid administration criteria, antibiotic therapy, central venous catheter management, enterodermal fistulas management, arrhythmias -tachycardia management, drains removal guidelines, optimizing per-os feeding, urinary catheter management, home care instructions.

Patients and Methods

From May 2004 to May 2024, 6050 patients were diagnosed with PM, 65% of the cases are from gynecological cancer (ovaries or endometrial), based on clinical symptoms, *imaging tests* include computed tomography (CT scan), magnetic resonance imaging (MRI), ultrasound, positron emission tomography (PET scan) and identified in the final histopathology. To 1350 (22.31%) of them we performed CRS+HIPEC the last 20 years.

PM from gynecological cancer diagnosis and perioperative protocols after CRS + HIPEC are presented. All the patients were observed first 24 hours in ICU departments and the other 10-11 days in rooms on the floor unit.

Retrospective and prospective cohort studies, case-control and randomized control studies comparing nurse care protocols with standard perioperative care for CRS and CRS+HIPEC associated, also guidelines for perioperative care in CRS with or without HIPEC for peritoneal surface malignancies were considered for inclusion [13-17].

The unpublished experience that currently apply to the protocols were included.

The goal was to systematically review and succinctly summaries the evidence.

Our study was undertaken without any financial assistance and there are no relationships that may pose any conflict of interest. All procedures performed were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results: Cytoreductive surgery with HIPEC (CRS +HIPEC) is one of the most complex abdominal surgeries available for patients with advanced cancer. The decision to proceed with CRS+HIPEC is often challenging for patients and providers [18].

The following section details a special protocols concerning intra-operative and post-operative period management.

It is important to note that concerning CRS were specifically focused on gynecological surgery (hysterectomy).

Extubation after Being on a Ventilator

The patient is extubated in the ICU department usually in the first 24 hours after the operation in 90% of cases [19,20].

From 1,350, 1,215 patients extubated in 16 hours after operation, 55 in the first three post-operative days and 75 of them in the first week. Five of them have died during the ICU hospitalization (0,37%). One patient died due to ARDS (acute respiratory distress syndrome); 2 patients died due to DIC (disseminated intravascular coagulopathy) and 1 from massive pulmonary embolism.

Criteria for extubation in the first 24 hours:

- Operation duration less than eight hours.
- HIPEC application less/equal to 60 minutes.
- Systolic blood pressure greater than 110mm/Hg.
- PO₂ ≥ 75 mmHg.
- PCO₂ ≤ 40mmHg.
- Bicarbonate deficit HCO₃< 5 mEq/L.
- Prescription greater than 80 ml per hour.
- Heart rate ≤ 100 beats per minute.

If these data are valid, the probability of re-intubation in the first 5 postoperative days is less than 10%.

The main cause of re-intubation are intra abdominal bleeding and re-operation and sepsis due to pulmonary intra abdominal infection [20,36].

Fluid administration

The goal is to hydrate the patient to maintain a diuresis of more than 100 ml per hour [21-23].

From the 1st to the 5th postoperative day

We administered through a central venous line:

2 liters of total parenteral nutrition.

2 FFP **fresh frozen plasma** (morning-afternoon) and ½ half furosemide after each FFP.

1 or 2 liters N/S or R/L.

Also administration Low-Molecular-Weight Heparin (LMWH) subcutaneously.

Nothing per-os (NPO). Gastroprotection is only IV way.

Drainage control and Levin control must be performed, every 24 hours concerning the volume and the type (color).

From the 5th to the 9th postoperative day: Continuous some monitoring and stop FFP administration.

Blood (RBC) will be given if there is an indication with hemoglobin less than 8 g/dL.

There are 15% of cases which demands T.P.N (Total parenteral nutrition) more than 6 weeks due to enterocutaneous fistula (ECF) or due to short bowel syndrome as consequence of aggressive cytoreduction.

Antibiotics

For 8 to 12 days, second generation of cephalosporins with metronidazole are administered accordingly.

Antifungal treatment will also be needed in 25% of cases due to immune system disturbance of these patients since these are cases that have received multiple rounds of chemotherapy.

Antifungal treatment is administered for 13 days intravenously and 8 days per-os. The indication for antifungal treatment is fever and blood positive culture. [24,25,37].

Infection of central venous catheters

There are over 345 infections of central catheters (25.5%), the most common cause of catheter infection is the prolongation more than 10 days.

If a central venous catheter infection is suspected we take a catheter blood culture and a peripheral blood culture.

We start linezolid antibiotic class while waiting for an antibiogram.

If the catheter culture and the peripheral blood have the same microbe, we removing catheter / changing line position.

If the catheter culture and the peripheral blood have the other microbe, the catheter is changed with a wire. [26,27]

Occurrence of enterocutaneous fistulas

The most frequent intra-abdominal complication to 30% in our group of patients.

If a fistula occurs (usually drainage of intestinal contents), performing:

- Liquid supply control (quantity-quality).
- Total parenteral nutrition and coverage with intravenous fluids.
- We add Amikacin to the antibiotic treatment.
- Sandostatin 0.5 mg/ml* 2 or 3 times subcutaneously [28,29].

From 405 patients with enterocutaneous fistula:

- 90 is biliary fistula.
- 180 small bowel.
- 25 Pancreatic fistula.
- 110 colon fistula

Evaluation after three days of fistula output by CT scan must be performed and in absent of sepsis we continue conservative management.

Attention: Spontaneous closure we can achieved in 80% of cases in 2 weeks.

If there is outflow of corporate content from the wound - reoperation must be performed.

Spontaneous closure observe in 88% in the 3 week period, 15 of them are reoperated.

Arrhythmias (tachycardia) after the 3rd to 5th postoperative day

For note: in 45% of cases appears arrhythmias (tachycardia) is due to delayed toxicity from HIPEC especially if oxaliplatin has been used. [30-32]

Treatment is the administration of IV B-blockers.

Firstly, must be excludes for the existence of sepsis, bleeding, pulmonary embolism, dehydration.

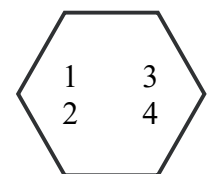
Drains removal protocol

If there is no suspicion of a fistula or leakage, the drains come out as follow 1st which is on the upper right in 5 to 7 days

2nd lower right lower right 6 to 8 day

3rd upper left 9 to 10 day

4th lower left in 10 to 12 day



Also if there are chest tubes (Billow) they will be removed out according to indications.

Per-os feeding

In our study:

Levin removal on sixth postoperative day must be performed, excluded the evidence gastrectomy. [16,34,35].

The diet must take into account the type of visceral resections

- Is the ileocecal valve missing?

- How much length of small intestine has remained?
- How long does the colon have functionality?

Urinary catheter

If the visceral peritoneum of the urinary bladder has been peritonectomized, we start exercise on the 8th (eighth) postoperative day and remove it on the 11th.

If the resection has been done - the catheter will come out in 3 weeks [16,17].

Home care instructions

Treatment with Low-Molecular-Weight Heparin (LMWH) subcutaneously for the first month after the operation [14,13].

Diet adapted to the gastrointestinal tract. Dietary supplement usually used of low osmolality and elemental or semi-elemental nutrition [34,35].

Guidelines for stomia care

The implementation of this nursing protocol has yielded remarkable results. Among the patient population studied, the rate of grade 3 and 4 complications was achieved to 22.5%, indicating a significant improvement in managing severe postoperative issues.

Moreover, the protocol has contributed to an exceptionally low mortality rate of 2.5%, underscoring its effectiveness in enhancing patient safety and survival rates.

Discussion

The management of peritoneal metastasis with cytoreductive surgery and hyperthermic intraperitoneal chemotherapy offers a better Disease Over All Survival and Disease Free Overall Survival. The most important factors are Performance status, Low Peritoneal Cancer Index (PCI) completeness, Cytoreduction Score (CCs) and finally meticulous intraoperative assessment and postoperative nursing monitoring.

The success of the present comprehensive nursing protocols, with its special medical orders, highlights the importance of meticulous planning, continuous monitoring, and individualized patient care in improving surgical outcomes for performance of the complex procedure such CRS+HIPEC. By achieving a substantial reduction in severe complications and maintaining a low mortality rate, these protocols serve as a model for other healthcare facilities aiming to enhance their patient care standards and outcomes. The dedication and expertise of the nursing staff, combined with a well-structured protocol, have proven to be instrumental in these achievements [16-18].

Perioperative Protocols and Special Medical Orders

The development and implementation of specific nursing protocols were crucial in achieving these positive outcomes. Our protocols included intraoperative and postoperative management strategies:

Extubation Criteria: By establishing clear criteria for extubation within the first 24 hours post-operation, we minimized the risk of respiratory complications and reintubation.

Fluid Administration: A targeted approach to fluid management helped maintain optimal hydration and renal function, critical in the immediate postoperative period.

Antibiotic and Antifungal Prophylaxis: The use of prophylactic antibiotics and antifungal treatments reduced the incidence of infections, particularly in immunocompromised patients.

Management of Catheters: Regular monitoring and prompt intervention for suspected infections were vital in preventing sepsis and related complications.

Handling of Enterodermal Fistulas: Proactive measures for the early identification and treatment of fistulas contributed to better patient outcomes.

Arrhythmia Management: Monitoring for and treating post-operative arrhythmias, particularly those induced by chemotherapy agents, was essential in maintaining cardiac stability.

Nutritional Support: Adjusting nutritional support based on tolerance and requirements, including the use of parenteral nutrition if needed.

Home care instructions: Empowering patients with knowledge and skills to manage their health post-discharge is essential.

Conclusions

The role of specialized nursing care cannot be overstated. Nurses trained in these protocols are equipped to respond swiftly and effectively to complications, ensuring that patients receive the highest standard of care. The low mortality rate of 2.5% achieved in our study is a testament to the efficacy of these specialized nursing interventions.

Perioperative nursing considerations for patients undergoing cytoreductive surgery and HIPEC are critical due to the complexity and invasiveness of the procedures, the physiological stress involved, and the heightened risk of complications. Effective perioperative care enhances recovery, reduces the risk of complications, and supports the overall well-being of the patient, justifying its importance in the surgical care continuum.

The findings from our 20-year experience highlight the critical role of nursing in enhancing surgical outcomes and provide a framework for other institutions aiming to improve their perioperative care practices. The integration of evidence-based nursing protocols should be considered a standard component of the perioperative management strategy for patients undergoing CRS+HIPEC.

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