Proceedings of Anticancer Research, 2024, Volume 8, Issue 6
http://ojs.bbwpublisher.com/index.php/PAR
ISSN Online: 2208-3553
ISSN Print: 2208-3545

Observation on the Therapeutic Effect of Hypotonic Hyperthermic Intraperitoneal Chemotherapy in the Treatment of Advanced Gastric Cancer and Ovarian Cancer Accompanied by Ascites

Wei Mi*, Tetsu Fukunaga, Yang Yu

Juntendo University, School of Medicine, Bunkyo-ku, Tokyo 113-8421, Japan

Corresponding author: Wei Mi, 149526131@qq.com

Abstract: *Objective:* To observe the time of ascites disappearance, time to ascites recurrence, improvement rate in quality of life, and the effective rate of ascites treatment in patients with advanced gastric and ovarian cancer with ascites following hypotonic hyperthermic intraperitoneal chemotherapy. *Methods:* Forty patients with advanced gastric and ovarian cancer with ascites, treated in our hospital from January 2021 to August 2024, were selected as research subjects. They were divided into a treatment group and a reference group using a random number table method. The treatment group received hypotonic hyperthermic intraperitoneal chemotherapy, while the reference group received conventional treatment. The treatment effects of the two groups were compared. *Results:* In the treatment group, the ascite disappearance time was (6.13 ± 1.32) days, and the recurrence time was (22.58 ± 8.21) months. The ascite disappearance time was significantly shorter than that of the reference group, and the ascite recurrence time was significantly longer. Both *P*-values were less than 0.05, indicating statistical significance. The effective rate of quality of life improvement was 95%, with only 1 patient showing a decrease in quality of life. The effective rate of ascites treatment was 95%, with only 1 patient showing an increase in ascites. Both the quality of life improvement rate and the effective rate of ascites treatment were significantly higher than those of the reference group, with *P*-values of 0.037 and 0.018, respectively, indicating statistical significance. *Conclusion:* For patients with advanced gastric and ovarian cancer with ascites, hypotonic hyperthermic intraperitoneal chemotherapy can accelerate ascites disappearance, prolong the time to recurrence, and significantly improve both the quality of life improvement rate and the effective rate of ascites treatment.

Keywords: Hypotonic hyperthermic intraperitoneal chemotherapy; Advanced gastric cancer; Ovarian cancer; Ascites

Online publication: November 27, 2024

1. Introduction

When mutations occur in the *BRCA1* and *BRCA2* genes in females, their risk of developing gastric and ovarian

cancer increases significantly. Additionally, a diet high in long-cooked and pickled foods can also increase the risk of these cancers. Gastric cancer metastasis to the ovary is a form of ovarian metastatic cancer and is among the more common presentations of ovarian metastatic tumors. Hypotonic hyperthermic intraperitoneal chemotherapy is a novel treatment method for abdominal tumors, with advantages including rapid onset, minimal trauma, relatively few side effects, and durable therapeutic effects. It has shown promising results in the treatment of advanced gastric and ovarian cancer with ascites. This study selected 40 patients with advanced gastric and ovarian cancer with ascites, treated in our hospital from January 2021 to August 2024, as research subjects.

2. Materials and methods

2.1. General information

Forty patients with advanced gastric cancer and ovarian cancer with ascites treated in our hospital from January 2021 to August 2024 were selected. Their basic information is shown in **Table 1**.

Table 1. Basic information of patients with advanced gastric cancer and ovarian cancer with ascites

Group	Female patients	Age range	Average age
Treatment group (20 cases)	20 cases	41–74 years	58.2 ± 5.7 years
Reference group (20 cases)	20 cases	39–72 years	56.8 ± 4.3 years

2.2. Methods

2.2.1. Reference group

Patients in the reference group received conventional treatment using docetaxel combined with cisplatin. On the first day, patients received an intravenous infusion of docetaxel at 75 mg/m², followed by an intraperitoneal injection of cisplatin at 40 mg/m² once a week for three weeks of treatment.

2.2.2. Treatment group

Patients in the treatment group received conventional treatment combined with hypotonic hyperthermic intraperitoneal chemotherapy, as shown in the previous study [1].

2.2.2.1. Catheter placement

With the assistance of imaging techniques, puncture points were identified in the left upper abdomen, right upper abdomen, left lower abdomen, and right lower abdomen. Silicone tubes were then placed at each puncture point for hypotonic hyperthermic intraperitoneal chemotherapy.

2.2.2.2. Drug selection

Cisplatin (100 mg) and fluorouracil (1,000 mg) were added to 3,000 mL of normal saline.

2.2.2.3. Precautions

The chemotherapy machine temperature was set to 43°C to 45°C to heat the drugs. The temperature of the drugs entering the patient's body was controlled at around 44°C, and the temperature of the drugs exiting the patient's body was maintained at around 42°C. The infusion rate was controlled at 250–500 ml per minute. The

drug solution was circulated continuously in the patient's body under constant temperature for 60–90 minutes before being discharged. The interval between the two treatments was 3 days. During treatment, if patients experienced adverse gastrointestinal symptoms, antiemetic and gastric mucosal protective treatments were promptly provided. If patients developed fever, cooling measures were implemented in a timely manner [2].

2.3. Observation indicators

The disappearance time and recurrence time of ascites were compared between the two groups. The quality of life improvement after treatment was assessed using the KPS score. Significant improvement was defined as an increase in the KPS score of at least 20 points, improvement as an increase of at least 10 points, and a decrease as a drop of more than 10 points. The effective rate was calculated as (number of significant improvements + number of improvements) / total number of cases × 100%. The treatment effect on ascites was evaluated based on complete disappearance (ascites disappeared and persisted for more than 4 weeks), partial remission (ascites reduced by at least 50% and persisted for more than 4 weeks), and ascites increase (increased abdominal fluid volume with worsened symptoms). The effective rate was calculated as (number of complete disappearances + number of partial remissions) / total number of cases × 100%.

2.4. Statistical analysis

SPSS 22.0 statistical software was applied, with measurement data (mean ± standard deviation) analyzed using the *t*-test and count data [*n* (%)] analyzed using the χ^2 test. A *P*-value < 0.05 was considered statistically significant.

3. Results

3.1. Disappearance and recurrence time of ascites after treatment in two groups of patients with advanced gastric cancer and ovarian cancer accompanied by ascites

The ascites disappearance time in the treatment group receiving hypotonic hyperthermic intraperitoneal chemotherapy was significantly shorter than in the reference group, while the recurrence time was significantly longer. There were significant differences between the two groups, with *P*-values below 0.05, indicating statistical significance. See **Table 2** below for details.

Table 2. Comparison of ascites disappearance time and recurrence time between the two groups (mean ± SD)

Group	Time of ascites disappearance (days)	Time of recurrence (months)
Treatment group (20 cases)	6.13 ± 1.32	22.58 ± 8.21
Reference group (20 cases)	8.64 ± 1.61	13.75 ± 7.24
t	5.392	3.608
P	< 0.05	< 0.05

3.2. Comparison of quality of life after treatment between the two groups

The quality of life after treatment was assessed for both the treatment group and the reference group. The effective rate of quality of life improvement in the treatment group was 95%, which was significantly higher than in the reference group. There was a significant difference between the two groups, with a *P*-value of 0.037,

indicating statistical significance. Details are shown in **Table 3**.

Table 3. Comparison of quality of life after treatment between the two groups [*n* (%)]

Group	Significant improvement	Improvement	Decrease	Effective rate
Treatment group (20 cases)	10 (50.00)	9 (45.00)	1 (5.00)	19 (95.00)
Reference group (20 cases)	3 (15.00)	11 (55.00)	6 (30.00)	14 (70.00)
χ^2				4.329
P				0.037

3.3. Comparison of the effective rate of ascites treatment between the two groups

The effective rate of ascites treatment was compared between the treatment group and the reference group. The effective rate of ascites treatment in the treatment group was 95%, which was significantly higher than in the reference group. There was a significant difference between the two groups, with a *P*-value of 0.018, indicating statistical significance. Details are shown in **Table 4**.

Table 4. Comparison of the effective rate of ascites treatment between the two groups [*n* (%)]

Group	Complete remission	Partial remission	Ascites increase	Effective rate
Treatment group (20 cases)	11 (55.00)	8 (40.00)	1 (5.00)	19 (95.00)
Reference group (20 cases)	4 (20.00)	9 (45.00)	7 (35.00)	13 (65.00)
χ^2				5.635
P				0.018

4. Discussion

Gastric cancer and ovarian cancer are malignant diseases with high incidence rates. Many patients lose their lives to these cancers, and their quality of life during the survival period is severely affected. Currently, no standardized chemotherapy regimen exists specifically for advanced gastric cancer and ovarian cancer with ascites [3]. The conventional treatment approach involves the use of docetaxel combined with cisplatin. Although this chemotherapy method has some therapeutic effects on patients with advanced gastric cancer and ovarian cancer with ascites, the results are not very significant, making it difficult to notably improve patients' quality of life [4].

Gastric cancer cells can metastasize to the ovaries through the lymphatic channels, particularly in premenopausal women aged between 40 and 50. Gastric cancer cells may also shed into the abdominal cavity, leading to ovarian implantation metastasis. Additionally, gastric cancer cells may metastasize to the ovaries via blood circulation. If the patient's ovaries are rich in blood flow and highly active, they are more likely to be affected by hematogenous metastasis.

Hypotonic hyperthermic intraperitoneal chemotherapy exploits the differential tolerances of normal and tumor tissue cells to temperature, aiming to eliminate tumor cells. Theoretically, this treatment can rapidly and accurately destroy tumor tissue cells without significantly harming normal tissue cells. In recent years, clinical practice has confirmed that hypotonic hyperthermic intraperitoneal chemotherapy is an effective adjuvant

therapy for abdominal tumors [5]. A major advantage of this chemotherapy method is its rapid effectiveness without significantly impairing the patient's immune system. Additionally, the hypotonic peritoneal solution creates an osmotic pressure gradient between the intracellular fluid and the solution, promoting the rapid absorption of more chemotherapy drugs by tumor tissue cells and enhancing the drugs' efficacy. Furthermore, this method can remove free tumor cells from the abdominal cavity after surgical treatment, reducing the recurrence rate.

However, not all patients with advanced gastric cancer and ovarian cancer with ascites are suitable for this treatment [6]. Patients with widespread intra-abdominal adhesions, severe liver or kidney dysfunction, cardiovascular disease, intestinal obstruction, or unstable vital signs are not eligible for this chemotherapy regimen. Therefore, it is essential to thoroughly evaluate the patient's condition before administering hypotonic hyperthermic intraperitoneal chemotherapy [7].

In this study, the treatment group received hypotonic hyperthermic intraperitoneal chemotherapy, resulting in a significantly shorter time for ascites disappearance (6.13 ± 1.32 days) and a significantly longer time for ascites recurrence (22.58 ± 8.21 months) compared to the reference group. The *P*-values were less than 0.05, indicating statistical significance. The effective rate of quality of life improvement was 95%, with only one patient showing a decrease in quality of life. The effective rate of ascites treatment was also 95%, with only one patient experiencing an increase in ascites. Both the improvement rate in quality of life and the effective rate of ascites treatment were significantly higher than those in the reference group, with *P*-values of 0.037 and 0.018, respectively, indicating statistical significance.

Practical experience has shown that hypotonic hyperthermic intraperitoneal chemotherapy in patients with advanced gastric cancer and ovarian cancer with ascites leads to reduced time for ascites disappearance, prolonged time for ascites recurrence, and significantly improved rates of quality of life enhancement and ascites treatment effectiveness [8].

5. Conclusion

In summary, hypotonic hyperthermic intraperitoneal chemotherapy demonstrates promising therapeutic effects in the treatment of advanced gastric cancer and ovarian cancer with ascites. It significantly improves patients' quality of life and offers a highly effective rate in ascites treatment, making it worthy of widespread clinical promotion.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Sheng W, Song M, Liu P, et al., 2023, Influencing Factors of Pulmonary Complications After Cytoreductive Surgery Combined With Hyperthermic Intraperitoneal Chemotherapy. J Clin Anesthesiol, 39(10): 1036–1039.

[2] Wang J, Liu H, Wang S, 2023, Sequential Hyperthermic Intraperitoneal Chemotherapy After Hepatocellular Carcinoma Resection for Spontaneous Rupture and Bleeding of Liver Cancer. Chin J Gen Surg, 32(7): 1014–1022.

[3] Chen T, Jiang X, Wu J, et al. Safety Analysis of Radical Resection Combined With Hyperthermic Intraperitoneal Chemotherapy in the Treatment of Locally Advanced Gastric Cancer. Mod Oncol, 31(5): 869–874.

[4] Yang Z, Su Y, Yang R, et al., 2023, Analysis of Complications and Risk Factors of Cytoreductive Surgery Combined With Hyperthermic Intraperitoneal Chemotherapy in the Treatment of Malignant Peritoneal Mesothelioma. Chin J Clin Oncol, 50(13): 661–666.

[5] Chang X, Wang H, Wang J, et al., 2024, Application of Cytoreductive Surgery Combined With Hyperthermic Intraperitoneal Chemotherapy in the Treatment of Locally Recurrent Nephroblastoma. J Clin Pediatr Surg, 23(5): 464–468.

[6] Chinese Anti-Cancer Association Cervical Cancer Professional Committee, Li J, Lin Z, 2024, Expert Consensus on Clinical Drug Application of Hyperthermic Intraperitoneal Chemotherapy for Gynecologic Tumors (2024 Edition). Chin J Pract Gynecol Obstet, 40(1): 62–67.

[7] Liu X, Zhou J, Gao Y, et al., 2023, Nursing Care of a Patient With Lymphatic Leakage After Total Gastrectomy Combined With Hyperthermic Intraperitoneal Chemotherapy. Nurs Res, 37(13): 2467–2470.

[8] Huang C, Shi H, Zhang H, et al., 2023, Prognostic Analysis and Safety Evaluation of Hyperthermic Intraperitoneal Chemotherapy in the Treatment of Gastric Cancer Patients With Peritoneal Metastasis. Chin J Clin Oncol, 50(14): 703–707.