Chemotherapy or drug induced treatment of invasive epithelial ovarian cancers.

Kathy Wright*

Department of Obstetrics & Gynecology, University of Toronto, Toronto, ON, Canada

Introduction

The majority of ovarian cancers respond to surgery and cytotoxic medicines, making it one of the most curable solid tumours. However, the illness commonly recurs and persists, with the greatest fatality-to-case ratio of all gynecologic cancers. Ovarian cancer accounts for one-fourth of all cancers of the female genital tract, yet it is the leading cause of death among women with gynecologic cancers. Ovarian carcinomas make about 4% of all malignancies in women in the United States, trailing lung, breast, colon, and uterus cancers.

The FIGO system (Federation Internationale de Gynecologie et d'Obstétrique) analyses the degree of tissue involvement, lymph node status, and the magnitude of metastases when staging ovarian cancer. 10 As a result, early stage cancer refers to malignancies that are limited to the pelvic cavity, whereas advanced stage cancer refers to tumours that have progressed beyond the pelvic cavity. Early discovery of ovarian cancer allows for successful treatment; yet, due to the lack of symptoms in the early stages of the disease, it is seldom diagnosed [1].

Melphalan and combinations of melphalan

Cytoreductive surgery and radiotherapy were the most common treatments for advanced ovarian cancer. The use of alkylating drugs such as melphalan, which causes cytotoxicity against tumour cells by alkylating DNA at the N7 position of guanine and causing DNA inter-strand cross-linkages, inhibiting replication and transcription, improved the treatment. 63 Patients with advanced ovarian cancer benefited from the administration of single-agent melphalan. The CR was 20%, the median progression-free survival (median PFS) was 7.7 months, and the median overall survival (median OS) was 12.3 months, with adverse symptoms such myelosuppression and neutropenia. 19,20 In comparison to the combination of adriamycin and cyclophosphamide, which produced a slightly improved CR of 32%, median PFS of 9.5 months, and median OS of 14.2 months, the combination of melphalan and hexamethylmelamine produced a CR of 28%, median PFS of 6 months, and median OS of 13.5 months; however, it produced significant hematologic and gastrointestinal toxicity. Melphalan's use is restricted since it induces significant myelosuppression [2].

Cyclophosphamide

Other alkylating drugs, such as cyclophosphamide and the anthracycline doxorubicin, have shown to be effective. The GOG (Gynecologic Oncology Group) trial compared cyclophosphamide, melphalan, and doxorubicin and found that doxorubicin improved response rate but did not increase overall survival. In clinical trials, this combination resulted in a 26% CR and a median OS of 15.7 months, with adverse events included nausea, vomiting, and leukocyte toxicity.

Cisplatin

The addition of cisplatin to a chemotherapy treatment for advanced ovarian cancer was a watershed moment. Cisplatin binds to nuclear DNA, causing transcription and/or DNA replication to be disrupted, resulting in cell death initiated by cell repair machinery. A Cochrane review and meta-analysis found that women with advanced stage epithelial ovarian cancer who received platinum-based combination chemotherapy had a modest 2- and 5-year survival benefit over those who received combination therapy without platinum. The use of cisplatin in combination with thio-TEPA resulted in a better CR, but not a favourable OS. Cisplatin, cyclophosphamide, and doxorubicin in combination resulted in a 51% increase in CR and a median OS of 19.7 months. In women with advanced ovarian cancer, chemotherapy combinations including an alkylating agent and a platinum coordination complex showed a high response rate. When compared to alkylating drugs alone or combinations without cisplatin, cisplatin-based combination treatment showed enhanced CR and Progression-Free Interval (PFS). In the cisplatin-cyclophosphamide group, the CR was 60% and the median OS was 24.4 months.

Carboplatin

Carboplatin, which has a higher efficacy and lower toxicity than cisplatin, was first used as a first-line chemotherapeutic drug in the 1980s. Carboplatin passes the cell membrane and is hydrolyzed to 1,1-cyclobutanedicarboxylate, gaining a positive charge in the process. The positively charged intermediate forms covalent bonds with nucleophilic molecules like DNA or RNA at the N7 position of purine bases, resulting in platinum adduct formation [3]. Carboplatin is less hazardous than cisplatin because it creates an intermediate 1,1-cyclobutanedicarboxylate, which has a worse leaving group than chloride and hence has a lower reactivity rate, resulting in fewer adducts. Because cisplatin clearance is mostly mediated by host tissues, but carboplatin clearance

***Correspondence to:** Kathy Wright, Department of Obstetrics & Gynecology, University of Toronto, Toronto, ON, Canada, E-mail: wrightkaty@uhn.ca

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is primarily mediated by renal function, targeted area-under-the-curve (AUC) dosage based on predicted renal clearance enhanced carboplatin safety and tolerability [3]. Carboplatin with etoposide, which shown considerable synergistic effect in animal models of ovarian cancer, had a low CR of just 43% and a higher toxicity rate.

Paclitaxel

In patients with relapsed platinum-refractory illness, paclitaxel was found to be the most effective treatment. It works by binding to intracellular -tubulin, causing microtubule stability, G2-M arrest, and apoptosis through both p53-dependent and p53-independent mechanisms. Previously, cyclophosphamide and cisplatin were the most often utilised combination; however, the OS was insufficient. Paclitaxel was used in first-line chemotherapy for patients with sub-optimally debulked advanced ovarian cancer at this time, which resulted in an increase in PFS and OS. Paclitaxel, when administered alone, has proven to be an effective and safe treatment for advanced ovarian cancer. The addition of paclitaxel to a platinum analogue improved response and survival significantly. At this point, a combination of paclitaxel, cisplatin, and ifosfamide was tested, which yielded an 85% CR. When compared to the usual carboplatin-paclitaxel combination, the combination of paclitaxel, cisplatin, and doxorubicin yielded a CR of 64 percent and a moderate improvement in PFS; nevertheless, there was an improved survival benefit. It's worth noting that combinations of paclitaxel and carboplatin, as well as a third drug have been explored in a number of clinical trials [4].

Biomarkers and chemotherapy resistance

Despite early response to carboplatin and paclitaxel chemotherapy, the emergence of chemo-resistant tumours is a critical challenge that necessitates clarification of its pathophysiology. The finding of biomarkers has been aided by the identification of molecular signatures in these tissues. Biomarkers are biological macromolecules that may be objectively tested and examined to show how biological processes and pharmacologic responses in the human body are working. Biomarker research has made significant progress in medicine and health. Understanding biomarkers in advanced ovarian cancer chemotherapy resistance will help to: (a) elucidate the molecular mechanisms at a cellular level that dictate drug resistance, (b) design new therapeutic strategies to overcome drug resistance, (c) plan the best chemotherapeutic strategy and improve patient management, (d) improve patient compliance and reduce financial expenditure, and (e) predict tumour sensitivity to chemo. Despite the fact that chemo-resistance has hampered CR and survival in advanced ovarian cancer since the inception of chemotherapy, research into predictive biomarkers has only recently begun. It's worth noting that most chemo-resistance biomarker research has been on transcriptomics and proteomics, with only a few genomic studies examining the same [5].

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