

Role of MRI in Pre-Operative Assessment of Patients with Advanced Ovarian Cancer Candidate for Cytoreductive Surgery, A Brief Review

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Received date: November 11, 2021; **Accepted date:** November 24, 2021; **Published date:** January 06, 2021

Citation: Tajiknia V., Hassani S., Seifmanesh H., Afrasiabi A., Hosseinpour H. (2022). Role of MRI in Pre-Operative Assessment of Patients with Advanced Ovarian Cancer Candidate for Cytoreductive Surgery, A Brief Review. *J. Obstetrics Gynecology and Reproductive Sciences*; 6(2)
DOI:10.31579/2578-8965/107

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Abstract:

When it comes to gynecologic cancer, ovarian cancer with no doubt is the deadliest and most challenging. The reason often falls into the late presentation, in fact the clinical symptoms are not prominent until the disease is disseminated

In patients with advanced ovarian cancer cytoreductive surgery procedure is the key element in treatment plan. One of the best tools to predict successful and complete cytoreductive surgery is using prior imaging. Magnetic resonance imaging is one of the newly described imaging modality for advanced ovarian cancer patients selected for cytoreductive surgery.

Here we discussed the application of MRI in advanced ovarian cancer underwent cytoreductive surgery.

Keywords: pre-operative assessment; ovarian cancer; cytoreductive surgery

Introduction:

Gynecologic cancers involve the female genital organs, such as the vulva, vagina, cervix, endometrium, ovaries, and fallopian tubes,[1] but ovarian cancer is among the most fatal ones.

In 2020 there were 21,750 reported new cases of ovarian cancer with mortality of 13,940 in the United States. [2].

The current guidelines for treatment of ovarian cancer is a multidisciplinary approach and consist of cytoreductive surgery (CRS) and platinum- based chemotherapy [3–5].

MRI is highly effective in assessment of ovarian cancer with peritoneal carcinomatosis with the best correlation to surgical findings[6]. Assessing an advanced ovarian cancer case, key prognostic factor is residual disease (RD) after primary cytoreductive surgery[7, 8].

Conventionally preoperative diagnostic imaging before surgery in advanced ovarian cancer is done by CT scan. The main disadvantage of CT scan is due to small tumor size which can be missed on CT scan and also differentiating the malignant tissue from the benign is difficult.

On the other hand, MRI with great image contrast of soft tissue and a much precise view of structures and tumor deposition seems to have a great potential of application in pre-operative diagnostic imaging [9].

Cytoreductive surgery Patient selection using MRI:

Comprehensive preoperative assessment plays a key role in optimal patient selection for CRS. Using MRI for evaluation of advanced ovarian

cancer cases prior to surgery, metastases and peritoneal cancer index shows very promising results.

Optimal cytoreduction has been described as the greatest diameter of residual disease of less than 1 cm [10].

Study	Design	Methods	Results
USA, MD Anderson center	50 patients with advanced OC underwent cytoreduction and WB-DWIBS/MRI.	The PCI scores tumor burden (0-3) in 13 anatomical regions (global range of 0-39). Two radiologists (Rad1/Rad2) assessed the PCI preoperatively and with surgical findings.	78% (39/50) achieved complete cytoreduction. Average global-PCI was 7. The pelvis and right hypochondrium showed the highest positive rate, while the intestinal regions presented the lowest
Denmark	prospective observational cohort study, 50 advanced stage EOC patients All patients were deemed amenable for upfront CRS.	Imaging PCI was determined for DW-MRI by separate readers blinded to the surgical findings.	The median surgical PCI was 18 (range: 3-32) the mean differences between the surgical PCI and the imaging PCI was 4.4 (95% CI: 2.9-5.8) for DW-MRI
Switzerland	92 patients with suspected EOC who underwent pre-operative WB DWI MR were included. The association between clinical and radiological criteria with sub-optimal cytoreduction was tested to identify a final model to predict sub-optimal cytoreduction.	77/92 (83.7 %) were optimally cytoreduced. 92 MR examination were evaluated .predicting score for suboptimal cytoreduction included: mesenteric carcinomatosis; mesenteric retraction; large bowel carcinomatosis.	WB DWI MR showed overall higher accuracy than CT in assessing all sites, MRI performed significantly better than CT specifically for involvement of mesentery, lumbo-aortic lymph nodes, pelvis, large bowel, sigmoid-rectum.
Netherlands	observational prospective study, 25 patients with epithelial ovarian cancer scheduled for cytoreductive surgery were included	Patients underwent a 3 T DW-MRI scan prior to surgery. The Peritoneal Cancer Index (PCI) was determined on DW-MR images (MRI-PCI) by two readers, independently, and was compared to (S-PCI).	DW-MRI is accurate in predicting the S-PCI and can be helpful to predict whether a complete resection in ovarian cancer patients is feasible.

In a study at MD Anderson cancer center on 50 patients with ovarian cancer with the emphasis on the role of peritoneal carcinomatosis index (PCI) as key prognostic factor, Diffusion-weighted magnetic resonance imaging with correlation to surgical findings were assessed, WB-DWIBS/MRI was described as an essential imaging in prediction of complete cytoreductive surgery in patients with advanced ovarian cancer and peritoneal carcinomatosis.[11]

In a cohort study in Denmark different imaging modality were discussed for evaluation of EOC patients before cytoreductive surgery,

although there was no significant difference between DW-MRI and FDG PET/CT, but this study highlighted the accuracy of DW-MRI in the assessment of peritoneal cancer index compared to what was read by surgical findings.[12]

In a study of 92 patients in Switzerland on Role of whole body diffusion weighted imaging MR and CT scans in the selection of patients suitable for primary debulking surgery of ovarian cancer patients, the results indicated that MRI is superior to CT Scan in accuracy and prediction of suboptimal cytoreductive resection [13].

In a study on 25 patients on the feasibility of performing complete cytoreduction with the peritoneal cancer index (PCI) in advanced stage ovarian cancer patients with use of MRI, it was demonstrated that DW-MRI is significantly accurate to predict the surgical peritoneal carcinomatous index and can be used as a strong clinical tool to determining if a complete cytoreductive surgery is feasible [14].

Discussion:

Using the best clinical tools to clarify if complete cytoreductive surgery is possible in advanced ovarian cancer patients is a necessity in treatment guideline, there were only few studies on application of MRI in advance ovarian cancer patient selection for cytoreductive surgery. However, these handful reports show a very promising result; MRI can accurately predict the disseminated disease and feasibility of complete cytoreductive procedure and maybe in near future it can substitute the need of laparoscopic surgery for determination of primary plan of treatment, also additional studies are needed to fully describe it.

In conclusion clinical use of MR imaging specially DW-MRI in comparison with other imaging techniques is beneficial in predicting the complete cytoreductive surgery with acceptable concordance to surgical findings, thus gynecologists and hematologist should consider this as a strongly helpful element in treatment plan of advanced ovarian cancer patients.

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DOI: [10.31579/2578-8965/107](https://doi.org/10.31579/2578-8965/107)

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