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Chemotherapy response assessment using ultrasound in ovarian cancer

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Ovarian cancer is common in gynaecologic oncology clinics. Usually, it is presented in advanced stages because of the poor availability of a guideline for screening. International Ovarian Tumour Analysis (IOTA) group ultrasound rules for ovarian masses have solved some of this problem, but they are not widely adopted by many practitioners in clinical practice, especially in developing countries. Usually, IOTA scoring is applied in adnexal masses using simple descriptors and simple rules, ovarian-adnexal reporting and data system or pattern recognition by experts in inconclusive findings. IOTA malignant cases can be staged by ultrasound or CT before surgery. After surgery, chemotherapy may be needed, especially in stage 1C and beyond. Usually, follow-up with patients is done by CT after the chemotherapy. A CT scan is uncomfortable for women, especially if done every 6 months and with the dye injection.

Using ultrasonography as a method to assess the response to chemotherapy in ovarian cancer indeed offers advantages such as non-invasiveness and promptness. This article discusses ultrasound scoring and evaluation for assessing the chemotherapy response in ovarian cancer, presenting a promising approach.

Regarding ultrasound scoring, it can be done using some criteria, including initial size, doppler signal and shape regarding the primary lesion (target) and the metastasis (non-target lesion) and comparing them with the findings after chemotherapy. The response is classified as complete response (total disappearance of the abnormal lesion in target and non-target lesion), partial response (more than 20% decrease in size of the lesion), stationary (less than 30% increase or less than 20% decrease in the size) and progressive course (more than 30% increase in the size). Further points that are assessed related to the ovary, are normalisation of the ovarian size, regularity, adhesions related to the ovary and the surroundings (indicating malignant adhesions), scoring of the Doppler signal, the symmetry between both ovaries, necrosis and change in echogenicity and echotexture of the mass. The metastasis is assessed by size, disappearance, vascularity, adhesions, persistence of ascites and effusion and the amount. The chemotherapy response is detected in target and non-target lesions, depending mainly on the size and vascularity is used for activity assessment (figure 1). Size is more important than changes in appearance, such as necrosis and vascularity. Other criteria are important for assessing activity and predicting surgical complications in surgery. A complete response on imaging can have microscopic deposits on histopathology after surgery. A persistently strong Doppler signal in a normal-size ovary may indicate active small residuals. Dead necrotic avascular mass of the same initial size can contain microscopic lesions, so it does not decrease in size and its removal is needed[1–3] (online supplemental figures 1, 2).

Advanced high-grade serous carcinoma (HGSC) accounts for most cases of ovarian cancer and the majority of fatal cases. Surgery is the cornerstone of treatment, whether preceded by or followed by chemotherapy. In the case of surgery before chemotherapy, the strongest prognostic factor is complete macroscopic disease resection. If primary debulking is not technically feasible, interval debulking surgery after 3–4 cycles of neoadjuvant chemotherapy is an accepted approach. Optimal cytoreduction has changed over the years from a residual tumour size of less than 2 cm through 1 cm to no macroscopic visible tumour nowadays. Histopathological scoring of tissue is important for assessing the response to chemotherapy. Although histopathological assessment of response is used in the breast, there is no accepted system for HGSC.[4 5]

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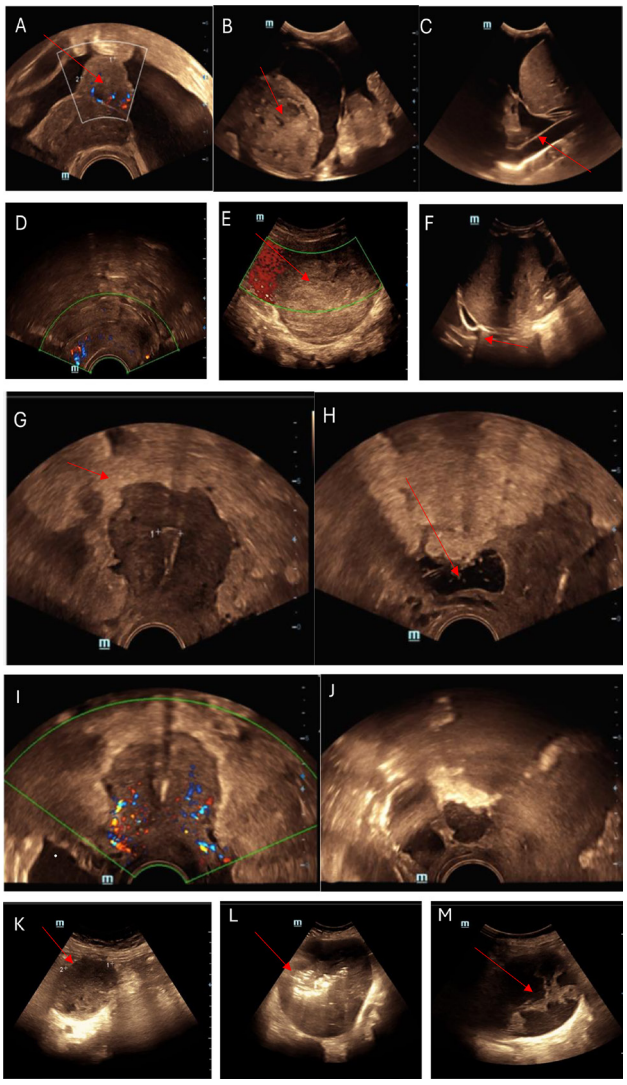

Figure 1 (A–C) ultrasound of the implant on the back of the cervix (red arrow, a), multilocular solid mass (red arrow, b) and ascites along with pleural effusion (red arrow, c) in a case of immature teratoma. (D–F) ultrasound after chemotherapy showing disappearance of the cervical implant (complete response,d), change in shape and echo texture of the mass along with no vascularity (necrosis) (stationary response) (red arrow, b) and resolution of the ascites (complete response) with encysted pleural effusion (red arrow, f) (complete response). (G and H) ultraosund showing extensive implants (red arrow,g) in the pelvis with uterine invasion and loculated ascites (red arrow, h) by malignant adhesions. (I and J) ultrasound showing persistence of implants, invasion and encysted collection after chemotherapy in a case of advanced low-grade serous ovarian tumour (stationary response). (K–M) ultrasound showing three different necrotic masses (red arrows) after chemotherapy of the same size as the initial one without vascularity detected in the omentum (stationary response, although of different appearance from the initial but size persisted, which indicates microscopic growing lesions that need removal). Necrosis can be a solid avascular mass (K), a cystic one with liquified infected contents (L) or a cystic one with amorphous floating contents (M).

This article summarises the application of ultrasound in the evaluation of chemotherapy efficacy for ovarian cancer. Previously, CT scans were mainly used, but they resulted in significant radiation exposure to patients. This summary provides some assistance to clinical work. The article proposes a classification method for evaluating the efficacy of chemotherapy. Various ultrasound features combined with histopathological microscopic features could lead to a more objective evaluation of tumour responsiveness to chemotherapy. Currently, there is limited reported research in this area, but it could be considered for clinical application. However, when it comes to clinical application, challenges remain. The challenges associated with this method include discrepancies in ultrasound equipment and operators and the universality of cut-off values for various assessment criteria.

Literature shows that ultrasound has not gained widespread acceptance and use, still being in the stage of summarising experiences. This report provides new ideas for further applying ultrasound examinations to evaluate and classify the efficacy of chemotherapy for ovarian cancer.

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