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## **Preface: Imaging of Gynecologic Malignancy: The Current State-of-the-Art**

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## **Malignant Epithelial Tumors of the Ovary: Pathogenesis and Imaging**

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Katherine E. Maturen, Kimberly L. Shampain, Molly E. Roseland, Michelle D. Sakala, Maggie Zhang, and Erica B. Stein

Epithelial ovarian neoplasms (EON) constitute the majority of ovarian cancers. Among EON, high-grade serous carcinoma (HGSC) is the most common and most likely to present at an advanced stage. Radiologists should recognize the imaging features associated with HGSC, particularly at ultrasound and MR imaging. Computed tomography is used for staging and to direct care pathways. Peritoneal carcinomatosis is common and does not preclude surgical resection. Other less common malignant EON have varied appearances, but share a common correlation between the amount of vascularized solid tissue and the likelihood of malignancy.

## **Malignant Germ Cell Tumors of the Ovary: Clinical and Imaging Features**

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Douglas Rogers, Christine Menias, and Akram Shaaban

Ovarian malignant germ cell tumors are a diverse set of masses originating from the primitive gonadal germ cells, often in young females. They have useful imaging and clinical features, including serum tumor marker elevation, that may aid the radiologist at the time of diagnosis, and also during follow-up. Accurate and timely diagnosis is essential, as standard-of-care therapies lead to a high rate of cancer remission.

## **Sex Cord-Stromal Tumors of the Ovary**

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Madeleine Sertic, Kyle M. Devins, Esther Oliva, Susanna I. Lee, and Aoife Kilcoyne

Ovarian sex cord-stromal tumors (OSCSTs) are a rare group of ovarian neoplasms that can be benign or malignant. They are classified into pure sex cord tumors, pure stromal tumors, and mixed SCST. The most common malignant OSCSTs are adult granulosa cell tumors. In contrast to the more common ovarian epithelial malignancies, OSCSTs present in younger patients, often at early stages, with better prognoses. Imaging features are variable, and pathology is required for diagnosis. However, certain tumors demonstrate characteristic imaging appearances that can be useful in narrowing the differential diagnosis.

## **Imaging of Endometrial Cancer**

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Martina Sbarra, Michela Lupinelli, Olga R. Brook, Aradhana M. Venkatesan, and Stephanie Nougaret

Endometrial cancer is the most common gynecologic cancer in the United States and Europe, with an increasing incidence rate in high-income countries. MR imaging is recommended for treatment planning because it provides critical information on the extent of myometrial and cervical invasion, extrauterine spread, and lymph node status, all of which are important in the selection of the most appropriate therapy. This article highlights the added value of imaging, focused on MR imaging, in the assessment of endometrial cancer and summarizes the role of MR imaging for endometrial cancer risk stratification and management.

- Current Concepts in the Imaging of Uterine Sarcomas** 627  
Robert Petrocelli, Nicole Hindman, and Caroline Reinhold
- Uterine sarcomas are a group of rare uterine tumors comprised of multiple subtypes with different histologic characteristics, prognoses, and imaging appearances. Identification of uterine sarcomas and their differentiation from benign uterine disease on imaging is of critical importance for treatment planning to guide appropriate management and optimize patient outcomes. Herein, we review the spectrum of uterine sarcomas with a focus on the classification of primary sarcoma subtypes and presenting the typical MR imaging appearances.
- MR Imaging in Cervical Cancer: Initial Staging and Treatment** 639  
Taamee Pak, Elizabeth Sadowski, and Krupa Patel-Lippmann
- Cervical cancer remains a significant contributor to morbidity and mortality for women globally despite medical advances in preventative medicine and treatment. The 2018 Internal Federation of Gynecology and Obstetrics committee modified their original 2009 staging scheme to incorporate advanced imaging modalities, where available, to increase the accuracy of staging and to guide evolving treatments. Having a robust understanding of the newest staging iteration, its consequences on treatment pathways, and common imaging pitfalls will aid the radiologist in generating valuable and practical reports to optimize treatment strategies.
- Imaging of Vaginal and Vulvar Malignancy** 651  
Melissa McGettigan, Maria Zulfiqar, and Anup S. Shetty
- Vaginal and vulvar malignancies are rare gynecologic malignancies but can be associated with high morbidity and mortality if undiagnosed and untreated. Advanced imaging modalities such as MRI enable assessment of the local extent of disease and evaluation for regional or distant spread. Accurate identification and description of the primary lesion and sites of involvement as well as detection and localization of suspicious lymph nodes are critical in guiding appropriate management. Additionally, radiologists should be aware of potential mimickers on imaging and the differential diagnoses for vaginal and vulvar lesions.
- Adnexal Mass Imaging: Contemporary Guidelines for Clinical Practice** 671  
Molly E. Roseland, Katherine E. Maturen, Kimberly L. Shampain, Ashish P. Wasnik, and Erica B. Stein
- Several recent guidelines have been published to improve accuracy and consistency of adnexal mass imaging interpretation and to guide management. Guidance from the American College of Radiology (ACR) Appropriateness Criteria establishes preferred adnexal imaging modalities and follow-up. Moreover, the ACR Ovarian-Adnexal Reporting Data System establishes a comprehensive, unified set of evidence-based guidelines for classification of adnexal masses by both ultrasound and MR imaging, communicating risk of malignancy to further guide management.
- MR Imaging of Gynecologic Tumors: Pearls, Pitfalls, and Tumor Mimics** 687  
Michela Lupinelli, Martina Sbarra, Aoife Kilcoyne, Aradhana M. Venkatesan, and Stephanie Nougaret
- MR imaging is the modality of choice for the pre-treatment evaluation of patients with gynecologic malignancies, given its excellent soft tissue contrast and multiplanar capability. However, it is not without pitfalls. Challenges can be encountered in the assessment of the infiltration of myometrium, vagina, cervical stroma, and parametria, which are crucial prognostic factors for endometrial and cervical cancers.

Other challenges can be encountered in the distinction between solid and non-solid tissue and in the identification of peritoneal carcinomatosis for the sonographically indeterminate adnexal mass.

### **PET/MRI in Gynecologic Malignancy**

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Matthew Larson, Petra Lovrec, Elizabeth A. Sadowski, and Ali Pirasteh

Patients with gynecologic malignancies often require a multimodality imaging approach for initial staging, treatment response assessment, and surveillance. MRI imaging and PET are two well-established and widely accepted modalities in this setting. Although PET and MRI imaging are often acquired separately on two platforms (a PET/computed tomography [CT] and an MRI imaging scanner), hybrid PET/MRI scanners offer the potential for comprehensive disease assessment in one visit. Gynecologic malignancies have been one of the most successful areas for implementation of PET/MRI. This article provides an overview of the role of this platform in the care of patients with gynecologic malignancies.

### **Image-Guided Radiotherapy for Gynecologic Malignancies: What the Radiologist Needs to Know**

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Megan C. Jacobsen, Ekta Maheshwari, Ann H. Klopp, and Aradhana M. Venkatesan

Pelvic imaging is integral to contemporary radiotherapy (RT) management of gynecologic malignancies. For cervical, endometrial, vulvar, and vaginal cancers, three-dimensional imaging modalities aid in tumor staging and RT candidate selection and inform treatment strategy, including RT planning, execution, and posttherapy surveillance. State-of-the-art care routinely incorporates magnetic resonance (MR) imaging, 18F-fluorodeoxyglucose-PET/computed tomography (CT), and CT to guide external beam RT and brachytherapy, allowing the customization of RT plans to maximize patient outcomes and reduce treatment-related toxicities. Follow-up imaging identifies radiation-resistant and recurrent disease as well as short-term and long-term toxicities from RT.

### **Radiomics and Radiogenomics of Ovarian Cancer: Implications for Treatment Monitoring and Clinical Management**

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Camilla Panico, Giacomo Avesani, Konstantinos Zormpas-Petridis, Leonardo Rundo, Camilla Nero, and Evis Sala

Ovarian cancer, one of the deadliest gynecologic malignancies, is characterized by high intra- and inter-site genomic and phenotypic heterogeneity. The traditional information provided by the conventional interpretation of diagnostic imaging studies cannot adequately represent this heterogeneity. Radiomics analyses can capture the complex patterns related to the microstructure of the tissues and provide quantitative information about them. This review outlines how radiomics and its integration with other quantitative biological information, like genomics and proteomics, can impact the clinical management of ovarian cancer.