

# Contents

## **Preface: Modern Imaging of Reproductive Age Women: Image Soundly and Wisely** **xv**

Liina Pöder

## **Imaging Safety and Technical Considerations in the Reproductive Age Female** **199**

Michael A. Ohliger, Hailey H. Choi, and Jesse Coutier

This article discusses the 4 main imaging modalities used to evaluate reproductive-aged women: ultrasound, magnetic resonance imaging, computed tomography, and fluoroscopy. For each modality, major clinical indications are described, along with important technical considerations unique to imaging reproductive-aged women. Finally, key safety issues are discussed, particularly with regard to imaging pregnant patients.

## **Imaging of Infertility, Part 1: Hysterosalpingograms to Magnetic Resonance Imaging** **215**

Bryce A. Merritt, Spencer C. Behr, and Nadia J. Khati

Infertility, or subfertility, is the inability to achieve a clinical pregnancy after a 1-year period of regular unprotected sexual intercourse in women younger than 35 and after 6 months in women older than 35. Although initial assessment involves a multitude of factors, including a detailed medical history, physical examination, semen analysis, and hormonal evaluation, diagnostic imaging of the female partner often plays an important role in establishing the etiology for infertility. This article provides an overview of the multimodality imaging assessment of female infertility and details the developmental and acquired pelvic abnormalities in which diagnostic imaging aids in evaluation.

## **Imaging of Infertility, Part 2: Hysterosalpingograms to Magnetic Resonance Imaging** **227**

Bryce A. Merritt, Spencer C. Behr, and Nadia J. Khati

Infertility, or subfertility, is the inability to achieve a clinical pregnancy after a 1-year period of regular unprotected sexual intercourse in women younger than 35 and after 6 months in women older than 35. Although initial assessment involves a multitude of factors, including a detailed medical history, physical examination, semen analysis, and hormonal evaluation, diagnostic imaging of the female partner often plays an important role in establishing the etiology for infertility. This article provides an overview of the multimodality imaging assessment of female infertility and details the developmental and acquired pelvic abnormalities in which diagnostic imaging aids in evaluation.

## **Imaging Spectrum of Benign Uterine Disease and Treatment Options** **239**

Stephanie Nougaret, Martina Sbarra, and Jessica Robbins

Benign uterine diseases are common gynecologic conditions affecting women of all ages. Ultrasonography is traditionally the first-line imaging technique but patients are increasingly referred to magnetic resonance (MR) imaging because it is more accurate for diagnosis and patient management. This article highlights the added value of MR imaging in the diagnosis of the most common benign uterine diseases, describes therapeutic options, and delineates the role of MR imaging in treatment planning.

**Imaging of Benign Adnexal Disease****257**

Nadia J. Khati, Tammy Kim, and Joanna Riess

 Video content accompanies this article at <http://www.radiologic.theclinics.com>.

This article provides an overview of the imaging evaluation of benign ovarian and adnexal masses in premenopausal and postmenopausal women and lesions discovered during pregnancy. Current imaging techniques are discussed, including pitfalls and differential diagnosis when necessary, as well as management. It also reviews the now well-established American College of Radiology (ACR)/Society of Radiologists in Ultrasound consensus guidelines and covers the more recently introduced Ovarian-Adnexal Reporting and Data System by the ACR and the recently published ADNEx Scoring System.

**Imaging Spectrum of Endometriosis (Endometriomas to Deep Infiltrative Endometriosis)** **275**

Nicole Hindman and Wendaline VanBuren

In this article, the authors review the optimal imaging protocols for ultrasound and MR imaging of suspected endometriosis, review the compartmental approach to dictating these examinations, discuss the diagnostic criteria for endometriosis detection by anatomic site and the differential diagnosis, review pearls and pitfalls in diagnosis, and review what the referring physician needs to know.

**Magnetic Resonance Imaging of the Female Pelvic Floor: Anatomy Overview, Indications, and Imaging Protocols****291**

Rania Farouk El Sayed

This article reviews different approaches for describing pelvic floor anatomy; “Classic 3-Compartment Approach”, “Active and Passive Conceptual Approach” and “Multi-layered System Approach”. However, these approaches cannot explain pathogenesis of various dysfunctions. “Functional 3-Part Pelvic Supporting Systems Approach” a new, more function-based classification of the pelvic floor support system is introduced in which all structures that contribute to same function are grouped under 1 system. Indications for MR imaging of pelvic floor dysfunction, patients’ preparation, static, dynamic and MR Defecography imaging protocols are detailed according to the concordance of experts in two recently published consensus papers.

**Integrated MR Analytical Approach and Reporting of Pelvic Floor Dysfunction: Current Implications and New Horizons****305**

Rania Farouk El Sayed

Reporting MR imaging of pelvic floor dysfunction can be made easy if radiologists understand the aim of each MR sequence and what to report in each set of MR images. For an MR imaging report that is critical in decision making for patient management, it is of paramount importance to the radiologist to know what to look for and where to look for it. This article presents a new term, integrated MR analytical approach. A reporting template is included in which all MR findings are presented in a schematic form that can be easily interpreted by clinicians from different subspecialties.

**Imaging of Acute Pelvic Pain: Nonpregnant****329**

Jeffrey Dee Olpin and Loretta Strachowski

Acute pelvic pain in the nonpregnant woman is one of the most common conditions requiring emergent medical evaluation in routine clinical practice. Although clinical

evaluation and laboratory testing are essential, imaging plays a central role. Although various adnexal and uterine disorders may result in acute pelvic pain of gynecologic origin, other nongynecologic disorders of the gastrointestinal and genitourinary systems may likewise result in acute pelvic pain. Ultrasound is first choice for initial evaluation of acute pelvic pain of gynecologic origin. Computed tomography is performed if pelvic sonography is inconclusive, or if a suspected disorder is nongynecologic in origin.

## **Imaging of Acute Pelvic Pain: Pregnant (Ectopic and First-trimester Viability Updated) 347**

Kyle K. Jensen, Mehtab Sal, and Roya Sohaey

 Video content accompanies this article at <http://www.radiologic.theclinics.com>.

Pelvic pain in the first trimester is nonspecific, with causes including pregnancy complications, pregnancy loss, and abnormal implantation, and symptom severity ranges from mild to catastrophic. Ultrasonography is the imaging modality of choice and essential to evaluate for the location of pregnancy, either intrauterine or not. If there is an intrauterine pregnancy, ultrasonography helps assess viability. If there is not an intrauterine pregnancy, ultrasonography helps assess for abnormal implantation, which accounts for a high percentage of maternal morbidity and mortality.

## **Nonfetal Imaging During Pregnancy: Acute Abdomen/Pelvis 363**

Courtney C. Moreno, Pardeep K. Mittal, and Frank H. Miller

Abdominal pain is a common occurrence in pregnant women and may have a variety of causes, including those that are specific to pregnancy (eg, round ligament pain in the first trimester) and the wide range of causes of abdominal pain that affect men and women who are not pregnant (eg, appendicitis, acute cholecystitis). Noncontrast magnetic resonance (MR) imaging is increasingly performed to evaluate pregnant women with abdominal pain, either as the first-line test or as a second test following ultrasonography. The imaging appearance of causes of abdominal pain in pregnant women are reviewed with an emphasis on noncontrast MR imaging.

## **Nonfetal Imaging During Pregnancy: Placental Disease 381**

Priyanka Jha, Gabriele Masselli, Michael A. Ohliger, and Liina Pöder

Placenta is a vital organ that connects the maternal and fetal circulations, allowing exchange of nutrients and gases between the two. In addition to the fetus, placenta is a key component to evaluate during any imaging performed during pregnancy. The most common disease processes involving the placenta include placenta accreta spectrum disorders and placental masses. Several systemic processes such as infection and fetal hydrops can too affect the placenta; however, their imaging features are nonspecific such as placental thickening, heterogeneity, and calcifications. Ultrasound is the first line of imaging during pregnancy, and MR imaging is reserved for problem solving, when there is need for higher anatomic resolution.

## **Fertility-Sparing Approaches in Gynecologic Oncology: Role of Imaging in Treatment Planning 401**

Erica B. Stein, Jean M. Hansen, and Katherine E. Maturen

Gynecologic cancers impact women of all ages. Some women may wish to preserve their capacity for future childbearing. With appropriate patient selection, acceptable oncologic outcomes may be achieved with preservation of fertility. Determination of eligibility for fertility preservation is guided by patient factors, tumor histology, and

preoperative local staging with pelvic MR imaging. The aim of this article is to educate radiologists on the current guidelines for fertility-sparing techniques in women with early stage cervical, endometrial, and ovarian malignancies.

### **Imaging of Gynecologic Malignancy in a Reproductive Age Female: Cancer During Pregnancy**

**413**

Charis Bourgioti, Marianna Konidari, and Lia Angela Moulopoulos

Gynecologic malignancies are common among cancers diagnosed during pregnancy, especially those of cervical and ovarian origin. Imaging is an important part of the diagnosis, staging, and follow-up of pregnancy-associated gynecologic tumors, with sonography and magnetic resonance (MR) imaging being the most suitable modalities. MR imaging is particularly useful in cervical cancer for the evaluation of tumor size, nodal, and extrapelvic disease. Ovarian tumor is initially diagnosed with sonography; MR imaging should be performed in cases of indeterminate ultrasonography findings and for staging. Pregnancy-related changes may be responsible for erroneous diagnosis; radiologists should be aware of such pitfalls to avoid misinterpretation.

### **Imaging of Postpartum/Peripartum Complications**

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Sherry S. Wang, Dorothy Shum, and Anne Kennedy

There are various complications that can occur in the postpartum period, including pain, bleeding, and infection. These include complications related to cesarean section, postpartum hemorrhage and hematomas, bladder injury, torsion and uterine dehiscence, and rupture. It is important the radiologist is aware of these entities and the associated imaging features to help guide timely and appropriate management.

### **Role of Interventional Procedures in Obstetrics and Gynecology**

**445**

Michael Weston, Philippe Soyer, Matthias Barral, Anthony Dohan, Sacha Pierre, Rana Rabei, Kirema Garcia-Reyes, and Maureen P. Kohi

Radiological guided intervention techniques are discussed in obstetric and gynecologic patients. Fallopian tube recanalization, postpartum hemorrhage control, techniques of treating uterine leiomyomas, pelvic congestion treatment, and the use of percutaneous and transvaginal ultrasonography-guided aspirations and biopsy are covered. These techniques use basic radiological interventional skills and show how they are adapted for use in the female pelvis.