

ACR–AIUM–SPR–SRU PRACTICE PARAMETER FOR THE PERFORMANCE OF SCROTAL ULTRASOUND EXAMINATIONS

The American College of Radiology, with more than 40,000 members, is the principal organization of radiologists, radiation oncologists, and clinical medical physicists in the United States. The College is a nonprofit professional society whose primary purposes are to advance the science of radiology, improve radiologic services to the patient, study the socioeconomic aspects of the practice of radiology, and encourage continuing education for radiologists, radiation oncologists, medical physicists, and persons practicing in allied professional fields.

The American College of Radiology will periodically define new practice parameters and technical standards for radiologic practice to help advance the science of radiology and to improve the quality of service to patients throughout the United States. Existing practice parameters and technical standards will be reviewed for revision or renewal, as appropriate, on their fifth anniversary or sooner, if indicated.

Each practice parameter and technical standard, representing a policy statement by the College, has undergone a thorough consensus process in which it has been subjected to extensive review and approval. The practice parameters and technical standards recognize that the safe and effective use of diagnostic and therapeutic radiology requires specific training, skills, and techniques, as described in each document. Reproduction or modification of the published practice parameter and technical standard by those entities not providing these services is not authorized.

PREAMBLE

This document is an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. Practice Parameters and Technical Standards are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care¹. For these reasons and those set forth below, the American College of Radiology and our collaborating medical specialty societies caution against the use of these documents in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the practitioner considering all the circumstances presented. Thus, an approach that differs from the guidance in this document, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in this document when, in the reasonable judgment of the practitioner, such course of action is indicated by variables such as the condition of the patient, limitations of available resources, or advances in knowledge or technology after publication of this document. However, a practitioner who employs an approach substantially different from the guidance in this document may consider documenting in the patient record information sufficient to explain the approach taken.

The practice of medicine involves the science, and the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment. Therefore, it should be recognized that adherence to the guidance in this document will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The purpose of this document is to assist practitioners in achieving this objective.

¹ *Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing*, 831 N.W.2d 826 (Iowa 2013) Iowa Supreme Court refuses to find that the "ACR Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures (Revised 2008)" sets a national standard for who may perform fluoroscopic procedures in light of the standard's stated purpose that ACR standards are educational tools and not intended to establish a legal standard of care. See also, *Stanley v. McCarver*, 63 P.3d 1076 (Ariz. App. 2003) where in a concurring opinion the Court stated that "published standards or guidelines of specialty medical organizations are useful in determining the duty owed or the standard of care applicable in a given situation" even though ACR standards themselves do not establish the standard of care.

I. INTRODUCTION

The clinical aspects contained in specific sections of this practice parameter (Introduction, Indications, Specifications of the Examination, and Equipment Specifications) were developed collaboratively by the American College of Radiology (ACR), the American Institute of Ultrasound in Medicine (AIUM), the Society of Radiologists in Ultrasound (SRU), and the Society for Pediatric Radiology (SPR). Recommendations for Qualifications and Responsibilities of Personnel, Written Requests for the Examination, Documentation, and Quality Control and Improvement, Safety, Infection Control, and Patient Education vary among the four organizations and are addressed by each separately.

These practice parameters are intended to assist practitioners performing ultrasound studies of the scrotum. In some cases, additional and/or specialized examinations may be necessary. Although it is not possible to detect every abnormality, adherence to the following practice parameters will maximize the probability of detecting most of the abnormalities that occur in the scrotum.

II. INDICATIONS

Indications for scrotal ultrasound include, but are not limited to [\[1,2\]](#), the following:

1. Evaluation of scrotal pain, including, but not limited to, testicular trauma, ischemia/torsion, postsurgical and infectious or inflammatory scrotal disease [\[3-10\]](#)
2. Evaluation of a palpable inguinal, intrascrotal, or testicular mass [\[1,2,11-13\]](#)
3. Evaluation of scrotal asymmetry, swelling, or enlargement [\[1,2,14-16\]](#)
4. Evaluation of potential intrascrotal hernia [\[17\]](#)
5. Detection/evaluation of varicoceles [\[18\]](#)
6. Evaluation of male infertility [\[1\]](#)
7. Follow-up of prior indeterminate scrotal ultrasound findings [\[19\]](#)
8. Localization of nonpalpable testes [\[20,21\]](#)
9. Evaluation of inguinal testes [\[22\]](#)
10. Detection of an occult primary tumor in patients with metastatic germ cell tumor [\[23\]](#) or unexplained retroperitoneal adenopathy
11. Follow-up of patients with prior primary testicular neoplasms, leukemia, or lymphoma [\[24\]](#)
12. Evaluation of an abnormality noted on other imaging studies (including, but not limited to, computed tomography [CT], magnetic resonance imaging [MRI] and positron emission tomography [PET])
13. Evaluation of a disorder of sexual development [\[25\]](#)

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

See the [ACR–SPR–SRU Practice Parameter for the Performance and Interpretation of Diagnostic Ultrasound Examinations](#) [\[26\]](#).

IV. SPECIFICATIONS OF THE EXAMINATION

The written or electronic request for scrotal ultrasound should provide sufficient information to demonstrate the medical necessity of the examination and allow for the proper performance and interpretation of the examination. Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). The provision of additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination. The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state scope of practice requirements (ACR Resolution 35 adopted in 2006 - revised in 2016, Resolution 12-b

The presence of two testes should be documented either on a single transverse, coronal, or coronal oblique image. Also, a cine loop survey scan, taken in both longitudinal and transverse projections, can be obtained and stored with the rest of the study. The testes should be evaluated in at least two planes, longitudinal and transverse. Transverse images should be obtained in the superior, mid, and inferior portions of the testes. Longitudinal views should be obtained centrally as well as medially and laterally. In cases of acute swelling or pain, some authors suggest that the asymptomatic side should be evaluated first and the symptomatic side afterward with the same/similar grayscale and Doppler settings [8]. Each testis should be evaluated in its entirety. The size, echogenicity, and blood flow of each testis and the epididymis should be compared with the contralateral side. Comparison of the testes is best accomplished with a side-by-side transverse image. If a palpable abnormality is the indication for the sonogram, this area should be directly imaged [1,2]. In the event that a testis is not identified within the scrotum, the ipsilateral inguinal canal and inguinal rings should be scanned.

Relevant extratesticular structures should be evaluated. The head, body, and tail of the epididymis should be evaluated when technically feasible. The spermatic cord and the suprastesticular area should be evaluated if there is suspicion for testicular torsion [9,10,27]. The scrotal wall, including the overlying skin, should be evaluated. Additional techniques, such as the Valsalva maneuver or upright positioning, can be used as needed. Any abnormality should be documented. Testicular volumes could be provided using the Lambert formula length (L) × width (W) × height (H) × 0.71 or ellipsoid formula (L × W × H × 0.52) [28].

Doppler sonography (spectral and color/power Doppler imaging) should be used as necessary in examinations of the scrotum and is required in the setting of acute scrotal pain and evaluation of varicocele. If used, color and/or power Doppler sonography should include at least one side-by-side image comparing both testes. Identical Doppler settings should be used to evaluate symmetry of flow between the testes. Low-flow detection settings should be used, if necessary, to document testicular blood flow.

V. DOCUMENTATION

Adequate documentation is essential for high-quality patient care. There should be a permanent record of the ultrasound examination and its interpretation. Comparison with prior relevant imaging studies may prove helpful. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should generally be accompanied by measurements. Images should be labeled with the patient identification, facility identification, examination date, and image orientation. An official interpretation (final report) of the ultrasound examination should be included in the patient's medical record. Retention of the ultrasound examination images should be consistent both with clinical need and with relevant legal and local health care facility requirements.

Reporting should be in accordance with the [ACR Practice Parameter for Communication of Diagnostic Imaging Findings](#) [29].

VI. EQUIPMENT SPECIFICATIONS

Equipment performance monitoring should be in accordance with the [ACR-AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment](#) [30].

Scrotal studies should be conducted with a real-time scanner, preferably using a 12 MHz or higher linear array transducer. A curvilinear or vector transducer or linear transducer with lower frequencies may be needed if the scrotum is enlarged, recognizing that there is a trade-off between spatial resolution and beam penetration. The highest possible Doppler frequencies (typically in the 5.0-10 MHz range) providing optimal resolution and flow detection should be utilized. The Doppler frequency may differ from imaging frequency. Stand-off pads can be used, if necessary, to improve imaging.

VII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education appearing under the heading *ACR Position Statement on Quality Control and Improvement, Safety, Infection Control and Patient Education* on the ACR website (<https://www.acr.org/Advocacy-and-Economics/ACR-Position-Statements/Quality-Control-and-Improvement>).

ACKNOWLEDGEMENTS

This practice parameter was revised according to the process described under the heading *The Process for Developing ACR Practice Parameters and Technical Standards* on the ACR website (<https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards>) by the Committee on Practice Parameters – Ultrasound of the ACR Commission on Ultrasound and by the Committee on Practice Parameters – Pediatric Radiology of the ACR Commission on Pediatric Radiology, in collaboration with the AIUM, the SPR, and the SRU.

Collaborative Committee

Members represent their societies in the initial and final revision of this practice parameter.

ACR

Sheila Sheth, MD, FACR, Chair

Helena Gabriel, MD

Kristin L. Rebik, DO

Pallavi Sagar, MD

SPR

Richard D. Bellah, MD

Harris L. Cohen, MD, FACR

Ricardo Faingold, MD

AIUM

Pat Fulgham, MD

Bruce R. Gilbert, MD, PhD

Harvey Nisenbaum, MD

SRU

William D. Middleton, MD

Maitray D. Patel, MD

Committee on Practice Parameters – Ultrasound

(ACR Committee responsible for sponsoring the draft through the process)

Sheila Sheth, MD, FACR, Chair

Stephen I. Johnson, MD

Marcela Böhm-Velez, MD, FACR

David U. Kim, MD

Kaleigh Burke, MD

Harriet J. Paltiel, MD

Nirvikar Dahiya, MD, MBBS, FAIUM

Kristin L. Rebik, DO

Christopher Fung, MD

Henrietta K. Rosenberg, MD, FACR

Helena Gabriel, MD

Joel P. Thompson, MD

Jamie Hui, MD

Committee on Practice Parameters – Pediatric Radiology

(ACR Committee responsible for sponsoring the draft through the process)

Beverley Newman, MB, BCh, BSc, FACR, Chair

Jason Higgins, DO

Terry L. Levin, MD, FACR, Vice Chair

Jane Sun Kim, MD

John B. Amodio, MD, FACR

Jessica Kurian, MD

Tara M. Catanzano, MB, BCh

Matthew P. Lungren, MD, MPH

Harris L. Cohen, MD, FACR

Helen R. Nadel, MD

Kassa Darge, MD, PhD

Erica Poletto, MD

Dorothy L. Gilbertson-Dahdal, MD

Richard B. Towbin, MD, FACR

Lauren P. Golding, MD

Andrew T. Trout, MD

Safwan S. Halabi, MD

Esben S. Vogelius, MD

Beverly G. Coleman, MD, FACR, Chair, Commission on Ultrasound

Richard A. Barth, MD, FACR, Chair, Commission on Pediatric Radiology

Jacqueline A. Bello, MD, FACR, Chair, Commission on Quality and Safety

Mary S. Newell, MD, FACR, Chair, Committee on Practice Parameters and Technical Standards

Comments Reconciliation Committee

Timothy Crummy, MD, FACR – Chair

Bruce Gilbert, MD

Traci Pritchard, MD, FACR – Vice Chair

Mauro M. Hanaoka, MD

Richard A. Barth, MD, FACR

Howard Heller, MD

Jacqueline Anne Bello, MD

Amy L. Kotsenas, MD

Richard A. Barth, MD, FACR

William D. Middleton, MD

Richard D. Bellah, MD

Mary S. Newell, MD

Lynn S Broderick, MD, FACR

Beverley Newman, MB, BCh, BSc, FACR

Harris L. Cohen, MD, FACR

Harvey Nisenbaum, MD

Beverley Coleman, MD, FACR

Maitray D. Patel, MD

Richard Duszak, Jr., MD

Kristin L Rebik, DO

Marcey Eisen, MD

Catherine C. Roberts, MD

Ricardo Faingold, MD

Pallavi Sagar, MD

Pat Fulgham, MD

Sheila Sheth, MD, FACR

Helena Gabriel, MD

James Shwayder, MD

REFERENCES

1. Appelbaum L, Gaitini D, Dogra VS. Scrotal ultrasound in adults. Seminars in ultrasound, CT, and MR

2013;34:257-73.

2. Mirochnik B, Bhargava P, Dighe MK, Kanth N. Ultrasound evaluation of scrotal pathology. *Radiologic clinics of North America* 2012;50:317-32, vi.
3. Deurdulian C, Mittelstaedt CA, Chong WK, Fielding JR. US of acute scrotal trauma: optimal technique, imaging findings, and management. *Radiographics : a review publication of the Radiological Society of North America, Inc* 2007;27:357-69.
4. Dogra V, Bhatt S. Acute painful scrotum. *Radiologic clinics of North America* 2004;42:349-63.
5. Liang T, Metcalfe P, Sevcik W, Noga M. Retrospective review of diagnosis and treatment in children presenting to the pediatric department with acute scrotum. *AJR. American journal of roentgenology* 2013;200:W444-9.
6. Sung EK, Setty BN, Castro-Aragon I. Sonography of the pediatric scrotum: emphasis on the Ts--torsion, trauma, and tumors. *AJR. American journal of roentgenology* 2012;198:996-1003.
7. Vijayaraghavan SB. Sonographic differential diagnosis of acute scrotum: real-time whirlpool sign, a key sign of torsion. *Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine* 2006;25:563-74.
8. Rebik K, Wagner JM, Middleton W. Scrotal Ultrasound. *Radiologic clinics of North America* 2019;57:635-48.
9. Yusuf GT, Sidhu PS. A review of ultrasound imaging in scrotal emergencies. *J Ultrasound* 2013;16:171-78.
10. Bandarkar AN, Blask AR. Testicular torsion with preserved flow: key sonographic features and value-added approach to diagnosis. *Pediatric radiology* 2018;48:735-44.
11. Philips S, Nagar A, Dighe M, Vikram R, Sunnapwar A, Prasad S. Benign non-cystic scrotal tumors and pseudotumors. *Acta Radiol* 2012;53:102-11.
12. Wasnik AP, Maturen KE, Shah S, Pandya A, Rubin JM, Platt JF. Scrotal pearls and pitfalls: ultrasound findings of benign scrotal lesions. *Ultrasound quarterly* 2012;28:281-91.
13. Gupta A, Bhatt S. Ultrasound Findings of Benign Scrotal Lesions: A Pictorial Review. *Ultrasound quarterly* 2019.
14. Cooper ML, Kaefer M, Fan R, Rink RC, Jennings SG, Karmazyn B. Testicular microlithiasis in children and associated testicular cancer. *Radiology* 2014;270:857-63.
15. Richenberg J, Brejt N. Testicular microlithiasis: is there a need for surveillance in the absence of other risk factors? *European radiology* 2012;22:2540-6.
16. Rizvi SA, Ahmad I, Siddiqui MA, Zaheer S, Ahmad K. Role of color Doppler ultrasonography in evaluation of scrotal swellings: pattern of disease in 120 patients with review of literature. *Urology journal* 2011;8:60-5.
17. Rubenstein RA, Dogra VS, Seftel AD, Resnick MI. Benign intrascrotal lesions. *The Journal of urology* 2004;171:1765-72.
18. Beddy P, Geoghegan T, Browne RF, Torreggiani WC. Testicular varicoceles. *Clinical radiology* 2005;60:1248-55.
19. Balawender K, Orkisz S, Wisz P. Testicular microlithiasis: what urologists should know. A review of the current literature. *Cent European J Urol* 2018;71:310-14.
20. Aganovic L, Cassidy F. Imaging of the scrotum. *Radiologic clinics of North America* 2012;50:1145-65.
21. Delaney LR, Karmazyn B. Ultrasound of the pediatric scrotum. *Seminars in ultrasound, CT, and MR* 2013;34:248-56.
22. American Institute of Ultrasound in M, American Urological A. AIUM practice guideline for the performance of an ultrasound examination in the practice of urology. *Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine* 2012;31:133-44.
23. Scholz M, Zehender M, Thalmann GN, Borner M, Thoni H, Studer UE. Extragonadal retroperitoneal germ cell tumor: evidence of origin in the testis. *Annals of oncology : official journal of the European Society for Medical Oncology / ESMO* 2002;13:121-4.
24. Stoehr B, Zangerl F, Steiner E, et al. Routine scrotal ultrasonography during the follow-up of patients with testicular cancer leads to earlier detection of asynchronous tumours and a high rate of organ preservation. *BJU international* 2010;105:1118-20.
25. Pires CR, De Moura Poli AH, Zanforlin Filho SM, Mattar R, Moron AF, Debs Diniz AL. True hermaphroditism-the importance of ultrasonic assessment. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology* 2005;26:86-8.
26. American College of Radiology. ACR–SPR–SRU Practice Parameter for the Performance and Interpretation of Diagnostic Ultrasound Examinations. Available at: <https://www.acr.org/-/media/ACR/Files/Practice->

Revised 2020 (Resolution 5). [US Interpret.pdf](#). Accessed March 5, 2019.

27. Baud C, Veyrac C, Couture A, Ferran JL. Spiral twist of the spermatic cord: a reliable sign of testicular torsion. *Pediatric radiology* 1998;28:950-4.
28. Paltiel HJ, Diamond DA, Di Canzio J, Zurakowski D, Borer JG, Atala A. Testicular volume: comparison of orchidometer and US measurements in dogs. *Radiology* 2002;222:114-9.
29. American College of Radiology. ACR Practice Parameter for Communication of Diagnostic Imaging Findings. Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CommunicationDiag.pdf>. Accessed January 15, 2019.
30. American College of Radiology. ACR-AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment. Available at: <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/US-Equip.pdf>. Accessed March 5, 2019.

*Practice parameters and technical standards are published annually with an effective date of October 1 in the year in which amended, revised, or approved by the ACR Council. For practice parameters and technical standards published before 1999, the effective date was January 1 following the year in which the practice parameter or technical standard was amended, revised, or approved by the ACR Council.

Development Chronology for this Guideline

1993 (Resolution 5)

Revised 1997 (Resolution 30)

Revised 2001 (Resolution 38)

Revised 2006 (Resolution 42, 35)

Revised 2010 (Resolution 33)

Amended 2014 (Resolution 39)

Revised 2015 (Resolution 35)

Revised 2020 (Resolution 5)

Amended 2023 (Resolution 2c)