Sonography of the Scrotum: Self-Assessment Module

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ABSTRACT
Sonography is the primary technique for the imaging evaluation of diseases of the scrotum. Imaging features of disease should be correlated with clinical features to guide management. The educational objectives of this self-assessment module are for the participant to exercise, self-assess, and improve his or her understanding of clinical and sonographic features of diseases of the scrotum.

INTRODUCTION
This self-assessment module on sonography of the scrotum has an educational component and a self-assessment component. The educational component consists of four required articles that the participant should read. The self-assessment component consists of 10 multiple-choice questions with solutions. All of these materials are available on the ARRS Web site (www.arrs.org). To claim CME and SAM credit, each participant must enter his or her responses to the questions online.

EDUCATIONAL OBJECTIVES
By completing this educational activity, the participant will:
A. Exercise, self-assess, and improve his or her understanding of the sonographic features of diseases of the scrotum.
B. Exercise, self-assess, and improve his or her understanding of the clinical features of diseases of the scrotum.

REQUIRED READING

INSTRUCTIONS
1. Complete the required reading.
3. Using your member login, order the online SAM as directed.
4. Follow the online instructions for entering your responses to the self-assessment questions and complete the test by answering the questions online.

Keywords: acute testicular torsion, extratesticular scrotal masses, scrotum, segmental testicular infarction, testicular microlithiasis

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## QUESTION 1
Which sonographic feature is most specific for acute testicular torsion?

A. Heterogeneous echotexture.
B. Absence of flow.
C. Diffuse enlargement of the affected testis.
D. Hydrocele.

## QUESTION 2
Which of the following is TRUE regarding segmental testicular infarction?

A. It usually involves the inferior portion of the testis.
B. It can be easily distinguished from testicular tumor by color Doppler sonography.
C. Embolic disease is the proposed mechanism.
D. It has been linked to sickle cell disease and hypersensitivity angitis.

## QUESTION 3
Which sonographic feature is most sensitive for scrotal inflammation?

A. Scrotal skin thickening.
B. Hydrocele.
C. Hyperechoic epididymal echotexture.
D. Scrotal or epididymal hyperemia.
E. Enlargement of the epididymis or scrotum.

## QUESTION 4
In the United States, what is the most common causative organism in acute epididymoorchitis in men older than 50 years?

A. *Mycobacterium tuberculosis*.
B. *Escherichia coli*.
C. *Neisseria gonorrhoeae*.
D. *Chlamydia* organisms.
E. *Klebsiella* organisms.

## QUESTION 5
Which of the following is NOT a current management recommendation for patients with testicular microlithiasis?

A. Physical examination at least annually.
B. Annual sonographic examinations.
C. Consideration of biopsy to detect intratubular germ cell neoplasia.
D. Screening CT of the chest, abdomen, and pelvis.
E. Prophylactic orchiectomy.

## QUESTION 6
Sonography of a nontender, palpable testicular mass in a young adult man shows a well-circumscribed mass in the testis with alternating hyperechoic and hypoechoic rings. Which of the following is the most likely diagnosis?

A. Seminoma.
B. Lymphoma.
C. Epidermoid cyst.
D. Adenomatoid tumor.
E. Lipoma.

## QUESTION 7
Which of the following is TRUE regarding extratesticular scrotal masses?

A. Cystic masses are usually malignant.
B. Epididymal papillary cystadenomas are associated with von Hippel-Lindau syndrome.
C. Most supernumerary testes are intraperitoneal.
D. Adenomatoid tumors are the most common.

## QUESTION 8
Which of the following is the most common tumor involving the spermatic cord?

A. Leiomyoma.
B. Rhabdomyosarcoma.
C. Primary lymphoma.
D. Lipoma.
E. Adenomatoid tumor.

## QUESTION 9
Which of the following is TRUE regarding adenomatoid tumors of the scrotum?

A. They are usually malignant.
B. They usually involve the epididymal head.
C. They may be intratesticular.
D. They occur mostly in older men.

## QUESTION 10
In children, which of the following is TRUE regarding extratesticular masses detected on sonography?

A. They are less likely to be malignant than in adults.
B. When painful, they are more likely to be malignant.
C. If present, cystic components indicate a benign process.
D. A history of antecedent trauma suggests the possibility of pseudotumor.
Solution to Question 1
In torsion, the testis becomes enlarged and heterogeneous within the first 6 hours. Heterogeneous echotexture, however, is a common finding on sonography for the evaluation of acute scrotal pain regardless of cause. Option A is not the best response. Testicular enlargement (option C) and hydrocele (option D) are frequent, but nonspecific, findings in patients with testicular torsion. Unilateral absent flow is the most specific sign of acute testicular torsion [1]. However, intermittent or incomplete torsion may result in false-negative studies. **Option B is the best response.**

Solution to Question 2
Segmental testicular infarction is an ischemic process observed on sonography as a focal rounded or wedge-shaped avascular area, most often in the upper or middle portion of the testis. Option A is not the best response. Differentiation from a small, hypovascular, intratesticular tumor on sonography is difficult and, in many cases, the diagnosis is made after orchiectomy. Option B is not the best response. MRI may prove helpful to make a more specific preoperative diagnosis [2]. Although no clear cause has been determined, the proposed mechanism is torsion and detorsion of the testis producing ischemia in the upper pole of the testis, a region with an inconstant collateral arterial supply. Option C is not the best response. The list of conditions associated with segmental testicular infarction is long and includes acute epididymoorchitis, polycythemia, sickle cell disease, hypersensitivity angiitis, Wegener’s granulomatosis, and pelvic surgery, especially herniorrhaphy. **Option D is the best response.**

Solution to Question 3
The hallmark of scrotal inflammation is hyperemia of the epididymis, testis, or both, on color Doppler sonography. The sensitivity of color Doppler sonography for scrotal inflammation is close to 100%. Furthermore, in 20% of patients with epididymitis and 40% of patients with orchitis, grayscale sonography is normal and hyperemia may be the only finding [4]. **Option D is the best response.** Scrotal skin thickening, reactive hydrocele, and increased epididymal echotexture are frequent, but nonspecific, findings in patients with acute scrotal pain. Options A, B, and C are not the best responses. Epididymal enlargement can be seen in torsion, trauma, epididymitis, and infiltrative processes such as leukemia and lymphoma. Option E is not the best response.

Solution to Question 4
Worldwide, approximately 2–4% of tuberculous infections involve the genitals; however, epididymal tuberculosis is uncommon in the United States [5]. Option A is not the best response. Infectious epididymoorchitis is usually the result of descending infection caused by urinary tract pathogens, most commonly *Escherichia coli* in older men. **Option B is the best response.** In young adults, scrotal infection most commonly results from sexually transmitted diseases. Options C and D are not the best responses. *Pseudomonas* organisms, *Proteus mirabilis*, and *Klebsiella* organisms are less common urinary tract pathogens and less common causes of epididymitis. Option E is not the best response.

Solution to Question 5
Microlithiasis is often discovered incidentally on sonography performed for scrotal pain or trauma. A lack of consensus exists regarding the preferred follow-up of microlithiasis in patients without a concurrent neoplasm, and many differing recommendations can be found in the literature and in practice [6]. Most authors agree that at least annual physical examinations and scrotal sonography are prudent. Options A and B, which are correct, are not the best responses. Others have gone further, advocating testicular biopsy to detect concurrent premalignant intratubular germ cell neoplasia. Option C, which is correct, is not the best response. Because the relative risk of concurrent neoplasm in a patient with testicular microlithiasis has been reported to be as high as 21.6-fold [7], some experts recommend screening CT of the chest, abdomen, and pelvis when microlithiasis is detected. Option D, which is correct, is not the best response. Unlike prophylactic mastectomy in high-risk women, prophylactic orchiectomy for testicular microlithiasis has not been advocated in the literature. **Option E, which is not correct, is the best response.**

Solution to Question 6
Seminoma is the most common type of testicular tumor. It usually is a well-circumscribed, hypechoic mass containing low-level echoes, but not calcifications. Option A is not the best response. Lymphoma typically presents as either focal or more diffuse hypechoic regions with increased Doppler flow and occasional involvement of the adjacent epididymis. Option B is not the best response. Alternating bands of increased and decreased echogenicity, the so-called onion-ring or onion-skin appearance, are characteristic of an epidermoid cyst; however, the sonographic appearance is variable [8]. Epidermoid cysts with a target appearance, a sharply defined mass with a rim of calcium, and a solid mass with an echogenic rim have been described [9]. **Option C is the best response.** Adenomatoid tumors are mixed-echoicity tumors of the epididymis. Option D is not the best response. Lipomas typically arise in the spermatic cord. Option E is not the best response.

Solution to Question 7
In contrast to testicular masses, most extratesticular scrotal masses are benign [10]. Cystic scrotal masses are especially likely to be benign. Option A is not the best response. Papillary cystadenoma, a benign tumor of the epididymis, has a strong association with von Hippel-Lindau
(VHL) disease. Bilateral epididymal cystadenomas are virtually pathognomonic for VHL. **Option B is the best response.** Supernumerary testes are rare, usually presenting as a painless, scrotal mass. Twenty percent of supernumerary testes are inguinal, 75% are intrascrotal, and 20% are retroperitoneal [10]. Option C is not the best response. Adenomatoid tumor is the most common epididymal tumor; however, lipomas, which usually occur in the spermatic cord, are the most common extratesticular scrotal tumor [10]. Option D is not the best response.

**Solution to Question 8**

Lipomas are the most common extratesticular scrotal tumor, arising most often in the spermatic cord. **Option D is the best response.** They account for approximately half of all cord tumors. Other benign tumors of the cord include leiomyoma, lymphangioma, and dermoid, but these are much less common. Option A is not the best response. Rhabdomyosarcoma and liposarcoma are the most common sarcomas of the scrotum, usually arising from the mesoderm of the spermatic cord [10]. Rhabdomyosarcomas predominantly occur in children and often present with retroperitoneal adenopathy and distant metastasis. Option B is not the best response. Lymphoma involving the epididymis or spermatic cord without testicular involvement is extremely rare. Option C is not the best response. Adenomatoid tumors involve the epididymis. Option E is not the best response.

**Solution to Question 9**

Adenomatoid tumors of the epididymis account for approximately 30% of paratesticular neoplasms. They are invariably benign [10]. Option A is not the best response. Although adenomatoid tumors can occur anywhere in the epididymis, they most often arise in the epididymal tail. Option B is not the best response. Intratesticular extension can be seen, in which case it can be indistinguishable from germ cell tumor. **Option C is the best response.** Most adenomatoid tumors are diagnosed in men between the ages of 20 and 50 years. Option D is not the best response.

**Solution to Question 10**

Extratesticular masses are much more likely to be malignant in children than in adults [10]. Option A is not the best response. Approximately 50% of painless extratesticular scrotal masses in children are malignant, with rhabdomyosarcoma being the most common [11]. Painful masses are less likely to be malignant, and often represent entities such as abscess, torsed appendix, and epididymal inflammation. Option B is not the best response. The sonographic appearance of rhabdomyosarcoma may range from mostly solid to primarily cystic with solid nodules; therefore, the presence of cystic components may be associated with malignancy. Option C is not the best response. Antecedent trauma suggests fibrous pseudotumor, a reactive nonneoplastic lesion caused by fibroinflammatory reaction to infection or trauma that manifests as one or more painless masses that involve the tunica. **Option D is the best response.**

**References**